An Investigation of Open Innovation Paradigm Using Value Chain Framework: A Case of Indonesian Milk Cooperative

Hisyam[*1], Rifi Wijayanti Dual Arifin[2], Yuliani Dwi Lestari[3], Yoshiyuki Matsuura[4]

[1,2,3] *School of Business and Management, Institut Teknologi Bandung, Jl. Ganesha No. 10, Bandung, Indonesia.*

[4] *Graduate School of Innovation and Technology Management, Yamaguchi University, Tokiwadai 2-16-1, Ube City, Yamaguchi Prefecture 755-8611, Japan*

[1]*hisyam@sbm-itb.ac.id*
[2]*rifi_wijayanti@sbm-itb.ac.id*
[3]*yuliani.dwi@sbm-itb.ac.id*
[4]*matu@yamaguchi-u.ac.jp*

***Abstract*— Milk cooperatives have struggled in facing a number of challenges as the complexity of their organization has increased constantly. However, their lack of capability and limitation of resources have made the impediments hard to tackle. Under such circumstances, open innovation considered as a proper solution for sustaining the operational and innovation process at a bearable cost. However, the question of how to implement open innovation has been an issue that is yet to be examined. Its practicality in various industries and countries has slowly emerged, as this paradigm is constrained to the contextual aspect. Thus, to make headway in understanding and implementing open innovation, this study utilizes Porter's value chain as a framework to create a map of collaboration in one of Indonesia's leading milk cooperatives. The results show that the milk cooperative is currently at the private open innovation level, and the key factor for it to stay relevant in the industry is by being open to collaborate with academicians, business partners, communities, and government. Additionally, the investigation using a value chain framework also proved to generate a clear visualization of how inbound, outbound, and bidirectional knowledge flows are streamed simultaneously across the milk chain while increasing the innovativeness of the cooperative.**

***Keywords*—** *Value Chain; Innovation; Open Innovation; Milk Chain; Milk Cooperative; Indonesia*

1. Introduction

Generally speaking, innovation is a strategy performed by firms to attract customers in making purchases of products and services. Formerly, this action was the main strategy for most companies to give added value for their products, but now innovation is something that must be done continuously. This phenomenon is happening due to many factors but mainly because of the trend of rapid technology change. It is confirmed by the capability of technological innovation in enabling manufacturers to efficiently build low-defect, advanced innovation products. What happened in the manufacturing industry also has had a domino impact on other business sectors. The pattern of heightened competition quickly spread to other industries: fashion and even agricultural products.

Research on risk management for agricultural production remain scarce. When there is any, they predominantly investigate the management from stakeholders along the value chain point of view individually [1]. That leaves the process of coping with risk in the agricultural sector siloed if not closed. Additionally, the likelihood segmented revelations considered inadequate to handle the intricacy of supply chain for agricultural production. As a result, stakeholders along the value chain should cooperate in minimizing the risk. Thus, this study is designed to show how the value chain could be a suitable framework for mapping innovation partners. The idea in mapping these parties is to better understand the potential role of each stakeholder in creating value for the cooperative's innovative products.

To provide fruitful investigation, we did a case study of one of the leading milk cooperatives in Indonesia. This milk cooperative has been very open in terms of its innovation processes. It supplies a significant amount of milk to some large milk processing industries (MPIs) and also processes some milk in its own facility. As the cooperative has flourished to stay relevant in the industry, it has constantly augmented its products, services, and processes and collaborated with actors from different backgrounds. These innovation partners range from academicians to business partners, communities, and government. To illuminate practitioners at other similar cooperatives to keep the organization growing and competing in the milk industry, this study used the value chain framework created by Michael Porter [2]. By utilizing this framework, this study analyzed the milk cooperative's collaboration strategy for innovation purposes. Therefore, the interventions provided by the actors along the supply chain became apparent [3].

2. Theoretical Foundation

We draw our theoretical foundation from three main research streams: cooperative business model, operation management (value chain), and innovation management (open innovation). Each of those streams is explained in what follows.

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2.1. Cooperative Business Model: Indonesian Context

The industrial economy in Indonesia has gone through a remarkable evolution. Similar to other countries around the world, Indonesia began its industrial activity from the agricultural industry. Known to have an abundance of agricultural sources such as herbs, Indonesia during the 1970s and 1980s focused its agricultural development on food corps [4]. Along the way, commodities from the Indonesian agricultural sector became managed by cooperatives. Recently, these have been acknowledged as contributing significantly to Indonesia's economic growth. According to Agus Muharram [5], a reformation plan was designed beginning in 2014 by the Indonesian government to support cooperatives in boosting Indonesia's gross domestic product (GDP) up to 8% by 2019. Meanwhile, the government reported that cooperatives' contribution to GDP reached 4,48 % in total during the third quarter of 2017. Although this growth is still far from the goal, the increase is considered to be significant compared to expectations for a three-year ongoing program.

Historically, cooperatives in Indonesia were initiated through a presidential decree (No. 4/1973) which has since gone through some revisions. These changes granted cooperatives to be independent in managing their own economic activities [4]. However, the nature of economic activities in cooperatives is different compared to that in corporations. The ownership of cooperatives is not based on stocks, but membership of local kinship [7]. Thus, all members have equal rights and can freely use their voices, although there is structural hierarchy in managing the organization. Other than that, cooperatives are diverse and are concentrated in different types of sectors. This study focuses on Indonesian milk cooperatives which are located in Bandung.

In Indonesia it is reported that there is a shortage of milk supply to MPIs [6]. This shortage occurred due to the limited capability of milk cooperatives in supplying good-quality milk to the MPIs. There are several constraints that hinder the organization in fulfilling the supply. First, there are inadequate cold chain trucks to distribute the milk and the cooperative's innovative products. Second, there are geographical issues that disperse the members and the cooperative's plant. Third, the number of dairy cattle is not growing. These issues are only a few among many that still have not been covered. If we look closer, the obstacles are evenly spread from the barn up to the cooperative's customers. Therefore, the milk cooperative needs a solution to mitigate poor occurrences so that stakeholders along the value chain will not be disadvantaged.

2.2. Porter's Value Chain

In 1985, Michael Porter [2] introduced the value chain framework through his work titled "Competitive Advantage: Creating and Sustaining Superior Performance". The framework is one of the decision support tools which consists of five primary activities and four support activities. Figure 1 illustrates the famous value chain framework being discussed.

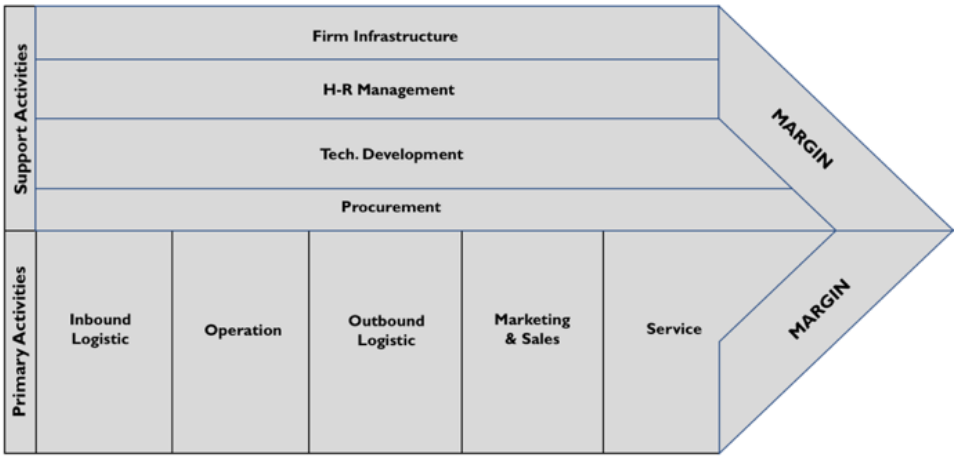

Figure 1. The value chain frameworks (Source: Porter, 1985)

Although it has been 33 years since the framework was established, Harvard Business Review still considers it as a solid tool to understand an organization's strategy in gaining competitive advantage. Although there are studies employing the value chain to better understand organizational strategy, the approach is still new for examining the agricultural industry [7], [8]. Through the value chain, a firm may be able to be guided in arranging strategy that would help it both reduce costs and increase the value of activities that are related to improved positioning [11]. Moreover, as suggested by Porter, the practical use of the value chain framework in mapping an organization's chain of activities needs to trace the business unit (micro) instead of taking the organizational view (macro) [2]. By doing so, the extracted information would help knowledge seekers in understanding the designated organization's key strategies in increasing its margin. Additionally, such a strategy could provide ideas on what action could be contributed to support such an organization [8]. This study takes Porter's value chain framework to disaggregate a milk cooperative's collaboration strategy, such that the adoption of open innovation along its value chain becomes understandable.

2.3. Open Innovation

The evolution of innovation began a long time ago, and it was beginning to gain recognition when the classification of five types of innovation was announced in the first publication by Schumpeter [9]. Along the way, business

players start to shift the way they conduct innovation processes as the social condition changed and rapid growth of technology eased the organizations in general to conduct the process of innovation [10]. According to Henry Chesbrough [11], open innovation is acknowledged to be suitable in tackling current innovation competition. The open concept that this paradigm offered has made ideas, know-how, resources, and even the technology to process them to possibly be derived from outside of the organizational boundaries. In other words, organizations are now becoming more open to take insights from their customers and even their competitors as part of their consideration in making innovation. Not only that, the manifestation of openness also can be seen from the fact that there is a plethora of collaboration among the quadruple helix agents (academicians, business players, community, and government).

The original definition of open innovation mentioned that the key-driven factors of this paradigm are on the knowledge flows, inbound and outbound [11], [12]. Hence, prior studies on open innovation never missed to feature one of the knowledge flows on the discussion, if not both [13]-[15]. Not long after the introduction, studies on open innovation are inflamed [16]. Eventually, the knowledge flows were further developed and not limited to inbound and outbound but also coupled, goes in bidirectional simultaneously [17]. However, it is found that previous research discussing the knowledge flows were substantial on the inbound flows compared to the other two [14], [18]. Thus, to fill the gap, this study intent to cover the analysis of open innovation knowledge flows from the inbound, outbound, and coupled flows of knowledge.

As the open innovation theme became topical, the surge of publications in this area has formed some separate research streams. The streams are also evolving as the paradigm is gaining in popularity. During the early stage, the discussion regarding the conceptualization of this innovation model was blooming [19]. The literature around that time focused on the factors that would smooth the implementation of open innovation. Then, the literature expanded its focus on the newness of innovation outcomes, and the concepts of radical and incremental innovation were continuously discussed and further defined [20], [21]. Adjacent to that, the discussion extended its concern to the level of firm size. Other researchers have argued that the paradigm is more feasible to be implemented by large and high-tech enterprises [10]. The reason behind this is that these firms' employees are considered to be more technologically literate, and their organizational culture makes them ready to embrace open innovation practice [22]. Consequently, research on open innovation in SMEs has flourished [10], [23]-[26]. To further enrich the body of knowledge on open innovation, this study aimed to unravel a further understanding in regards to the open innovation possessed by one of the leading milk cooperatives in Indonesia.

3. Methodology

3.1. Sampling and Data Collection

To evaluate our research questions, the research strategy practiced in this study is a case study with grounded theory [27]. Specifically, the case involves one of the leading milk cooperatives in Bandung, Indonesia. We developed our theory while processing the data that we collected through a semi-structured interview with seven sources in mid-April 2018. These sources were sampled non-probabilistically using the snowball sampling method [28]. From that sampling approach, we successfully gathered a diverse range of informants across the milk cooperatives, from downstream practitioners (farmers and operational level) to upstream stakeholders (experts and consultants).

The initial interview lasted 30–60 minutes, while the follow-up interview was less than 30 minutes on average. From those sources we collected information regarding the practicality of dairy production, from the milking process to the distribution process to the market channel. Simultaneously, we sought to find information related to innovation activities along the milk chain. In that manner, we are able to see the pattern of innovation not only from a macro level but also from a micro level.

3.2. Data Analysis

The semi-structured interview was recorded with consent from the sources. For convenient analysis, the audio recordings were transcribed, then analysed in detail by means of CAQDAS data analysis software (ATLAS.ti) [29]. Upon analysis, we found some emerging issues related to the innovation process undertaken by the milk cooperative in collaboration with academicians, business partners, the community, and a government representative. The collaboration issue covered some aspects of innovation incorporated with products, service, and process innovation.

To elevate our understanding, we mapped the critical process that exists within the cooperative onto Porter's value chain framework, then added the cooperative's innovation partners along the value chain framework to see the distribution of collaboration. Through this process we were able to examine whether the collaboration activity involved more than two different parties under one innovation project.

4. Findings and Discussions

4.1. Value Chain Analysis

As mentioned, the value chain is divided into two broad parts: primary and supporting activities. Within the first activities there are several blocks related to product development activities. These activities include acquiring resources (inbound logistics), manufacturing the raw material (operations), distributing the goods (outbound logistics), doing the promotion (marketing and sales), and conducting after-sales activities (service). Support activities are related to the organization's infrastructure, human resources management, technology development, and procurement.

Figure 1 shows how this study mapped the milk cooperative's primary and supporting activities to each block on the framework. Figure 2 represents how the cooperative increased its margins to lift up the welfare of local society, which mostly are the cooperative's members. Drawing upon Porter's value chain framework, the key themes were grouped in accordance with the blocks constructing the framework.

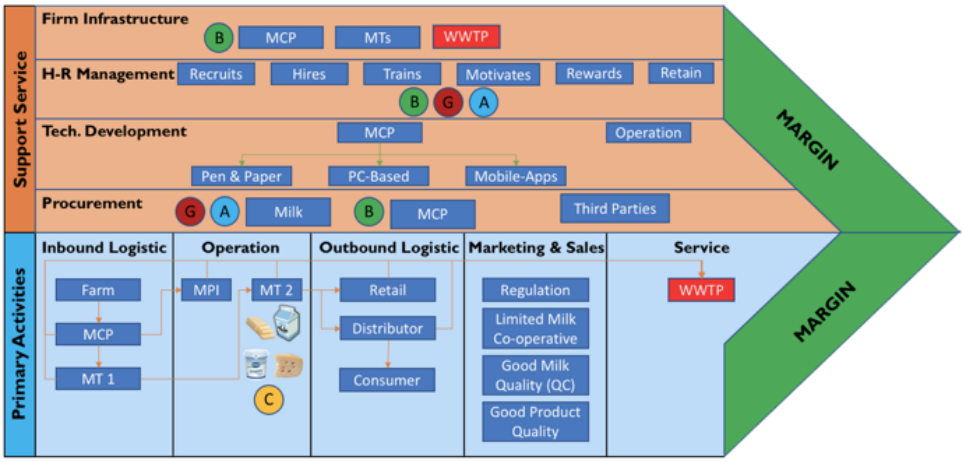

Figure 2. Value chain of Indonesian leading milk cooperative

Unlike the usual value chain analysis, the novelty of this study is in its emphasis on the cooperative's collaboration with academicians, business partners, communities, and governments in supporting the cooperative to improve the performance along its milk chain and also gain value proposition.

4.1.1. Primary Activities

(a) Inbound logistic

Because the cooperative's core business is milk, its main suppliers are dairy cattle farmers, who also act as the members of the cooperative. According to our interviewees, the milk cooperative receives milk twice a day from the farmers, in early morning and the afternoon. Additionally, the farmers' milking processes differ from one another. Some use advanced technology while others still do it conventionally.

> *"... Each barn has different technology in milking their dairy cattle; this barn used automated milking machines to do the labour. The harvesting time will differ from barn to barn due to number of dairy cattle they owned, but we have obligation to deliver the milk twice a day..."*
>
> *(Male, Milk Cooperative Consultant, Cattle Barn)*

To preserve the milk quality, the cooperative built several milk collecting points (MCPs) near the farmers. These MCPs have a similar basic function as the next checkpoint, which is milk treatment 1 (MT1), where all the milk from every MCP is collected and stored. However, MCPs and MT1 have different expected outputs. MCPs screen the milk quality, but MT1 extends the job to storing and pasteurizing some milk that will be processed further. From our interviewees we confirmed the chain of inbound logistic that occurred from the barn to the MPI and milk cooperative operational plant.

> *"...Our job in this milk collecting point is to receive the milk that being delivered by the farmers. We run some quick tests to check the bacterial tests and start the weighing and sampling using this computer when the milk passed the test. Once the data collection is done, the milk is collected in there [huge milk tank] and the milk is ready to be delivered to MPI..."*
>
> *(Male, Head of MCP, MCP1)*

> *"... We usually receive the milk from the farmer around 07:00 am and run some quick tests to see if the milk is not separated [sign of bad quality of milk] when it mixed with this chemical. Then we weigh the milk using this scale which connects to our mobile application that would record the detail about the milk quality before it is stored in that huge tank to be brought to MT1..."*
>
> *(Female, MCP-Mobile Staff, MCP-M)*

> *"...I am doing some tests on the rejected milk for a second check as well as re-run a quick test on the milk that was being brought by the tank trucks from the MCPs before it was weighed. The milk that is stored will be divided into two, one being pasteurized while the other just stored at a certain temperature..."*
>
> *(Female, Central Laboratory Staff, MT 1)*

To sum up, the milk cooperative receives its supply twice a day from farmers who deliver their milk to MCPs, and the tank trucks distribute the milk to the cooperative's business partner (MPI) and the treatment plant (MT1).

(b) Operation

Once the milk is stored in MT1, it is injected through a pipe that connects to the production floor located in milk treatment 2 (MT2). Here the cooperative arranges the machines for processing the milk into products such as pasteurized milk, butter, yoghurt, and mozzarella cheese. Our interviewee explained that the amount of milk for each product differs from one to another.

> *"...We have machines to produce our products such as pasteurized milk, butter, yoghurt, and mozzarella cheese. We also pack and store all the production in this plant. Each machine has different capacity. For making mozzarella cheese we usually consume 3000 litres of milk to produce 900 kilos of mozzarella cheese. Meanwhile for making yoghurt we use 800 litres of milk to produce the same amount..."*
>
> *(Female, Quality Control Staff, MT 2)*

During the interview she also added that the production is sold only to the cooperative's own retail operations around the area and its distributors in Bandung and Jakarta. The distributors still a relative to the cooperative's

member. In addition, the distributors have frequent buyers which sometimes propose their ideas to the cooperative for customization or new-product innovation.

"…Mostly those who buy our products from the distributors are SME restaurants and they ask if we can make other dairy products such as butter and cheese. We respond to that idea and conduct the development in our R&D. When the product is made, we send it to the consumer to be tested. We then receive input regarding the improvement that should we done…"

(Female, Quality Control Staff, MT 2)

(c) Outbound logistic

Prior to delivering the products, the milk cooperative receives order requests from its distributors. Then the cooperative checks its inventory based on the demand. These products are loaded onto a truck that is equipped with refrigeration equipment to preserve the quality.

"…We deliver products as per request using a truck that has a cooling system on it. Prior to the deliverance we check the temperature because we once neglected to check it and our products arrived at the destination in a bad condition. The colour of the product changed because the temperature was above 8°C…"

(Female, Quality Control Staff, MT 2)

As we learned from the description, the cooperative utilizes cold-chain distribution from another company to ship products to the distributor. Although the coverage is still limited, this collaboration benefits the milk cooperative in expanding its market and lets the organization avoid allocating budget for maintaining its own fleet.

(d) Marketing & Sales

Based on what we observed, the milk cooperative does not specify its marketing activity. Since its role is actually as a supplier for the MPIs, it is more focused on finding ways to increase its supply to those MPIs. At the same time, it tries to maintain its relationship with the MPIs that are long-time partners. To do so, it makes sure the milk meets the standard of the MPIs. Moreover, the milk cooperative is also transparent with the milk data that it supplies to the MPIs. In that manner, the MPI can monitor and retrace the milk it receives from the cooperative, which enables the cooperative to gain trust from the MPIs.

"… The data stored in our database can be accessed by the stakeholders involved within the cooperatives including farmers and MPI. There are some privilege discrepancies among the actors but we assure that they are able to access the data that they need…"

(Male, Milk Cooperative Consultant, MCP-M)

(e) Service

As mentioned, milk distribution carries a high risk. When the milk or dairy products fail to arrive in good quality, they should be discarded. This milk cooperative has its own water waste treatment plant for this purpose. In this way, MPIs do not need to worry about waste management for damaged milk they receive. The same condition also applies for the goods sent to distributors.

"…As a part of our quality assurance, we have our own water waste treatment plant that functions as the place to store and process our defective production …"

(Female, Quality Control Staff, MT 2)

4.1.2. Supporting Activities

(a) Procurement

The milk is procured from farmers. Since farmers are widely dispersed, the MCPs were built near the farmers so it can increase the quantity of collected milk. There are huge milk tanks at each MCP along with simple quality checking equipment. For the innovation products, supplies such as bottles for the yoghurt and pasteurized milk and plastic to wrap the butter and mozzarella cheese are purchased from third parties.

"…We realized the importance of mitigation for milk. Thus, we facilitate the farmer with nearby MCPs. To gain competitive price for our products, we customize the packaging for our innovation products from other vendors…"

(Male, Milk Cooperative Consultant, MCP-M)

(b) Technological Development

Surprisingly, this milk cooperative is actively updating its technology for storing the data it collects through quality checking at MCPs and MT1. Initially, the data were collected using paper and pen. Then the conventional process was digitized and stored in a computer connected with an online database. To build a digitized MCP the cooperative spent around three billion rupiahs. It built the plant after it received a soft loan from an MPI and paid it before the due date. Since its pricy, the cooperative only builds several MCP that has personal computer.

"…Thanks to our business partners, we have built some MCPs with different facilities to support the milk collecting activities. However, we only installed the advance technology in a limited number of MCPs and still use paper and pen at certain plants…"

(Male, Milk Cooperative Consultant, Cattle Barn)

The government appointed an information technology (IT) consultant to overcome this problem, and he came up with a mobile application to reduce the cost. The process in building and maintaining the mobile-based system cost almost half of the pc-based plant. The technology is called MCP-M, which stands for milk collecting point-mobile. Meanwhile, it is still trying to optimize the utilization of current technologies that relate to the production.

(c) Human Resource Management

For human resources, the milk cooperative members are well aware of their obligation to the cooperative, which is to own dairy cattle and store at least five kilos of milk per day. This requirement might differ from one cooperative to another. Along with the government and academicians, the cooperative periodically holds events to educate the farmers. A government project is usually a counsel session, in which the government discusses the health care of dairy cattle and the insemination procedure. Meanwhile, academicians contribute their thoughts by disseminating their findings regarding the good formulation of dairy cattle fodder so the farmers can harvest good-quality milk.

"…Every now and then, government has actively provided the cooperative's member with some counsels related on the insemination procedure and taking care the health of the dairy cattle. … The academician also proactively shares findings about fodder ingredients that are good for the cattle…"
(Male, Milk Cooperative Consultant, Cattle Barn)

As for the members, the cooperative helps the farmers with dairy cattle health services. Moreover, the cooperative also established a grading scheme for the milk which will affect the price of the milk. Thus, farmers are motivated to keep improving their milk quality. In addition, the farmer also gets access to a cooperative application where they can monitor the amount of milk they have stored each day along with the income that they would get on the payment day.

"…We have a 24-hour health care service for the dairy cattle that belong to the cooperative member. When the cattle are sick, the farmer only needs to make a report and we will proceed with treatment …"
(Male, Milk Cooperative Consultant, Cattle Barn)

"…Each member has a personal account secured with a password. The account also comes with a unique barcode. Yet not all members have a proper device to log on and access their account. Therefore, we clustered the farmer into groups and appointed a leader to inform the transaction they have made with the milk cooperative…"
(Male, Milk Cooperative Consultant, MCP-M)

(d) Infrastructure

Generally speaking, the cooperative operationalization cost is based on funding from government and most of the members. That is why when building the MCP with pc-based system the milk cooperative received loans from the MPI. Moreover, when the cooperative builds the MTs, one of the cooperative members funds the construction and the facility that comes along with it. From the information that we gathered, government still limits its funding.

"…Since funding from government is still limited, we gained support from MPI as our business partner. Through that enterprise, we were subsidized as much as 40% for the establishment of our MCP …"
(Male, Milk Cooperative Consultant, Cattle Barn)

4.2. Open Innovation

Government funding restraints have led the cooperative to collaborate to support innovation activities. By translating the value chain map into a rich picture (Figure 3), this study found some resemblance in the nature of collaboration to the open innovation described by Chesbrough.

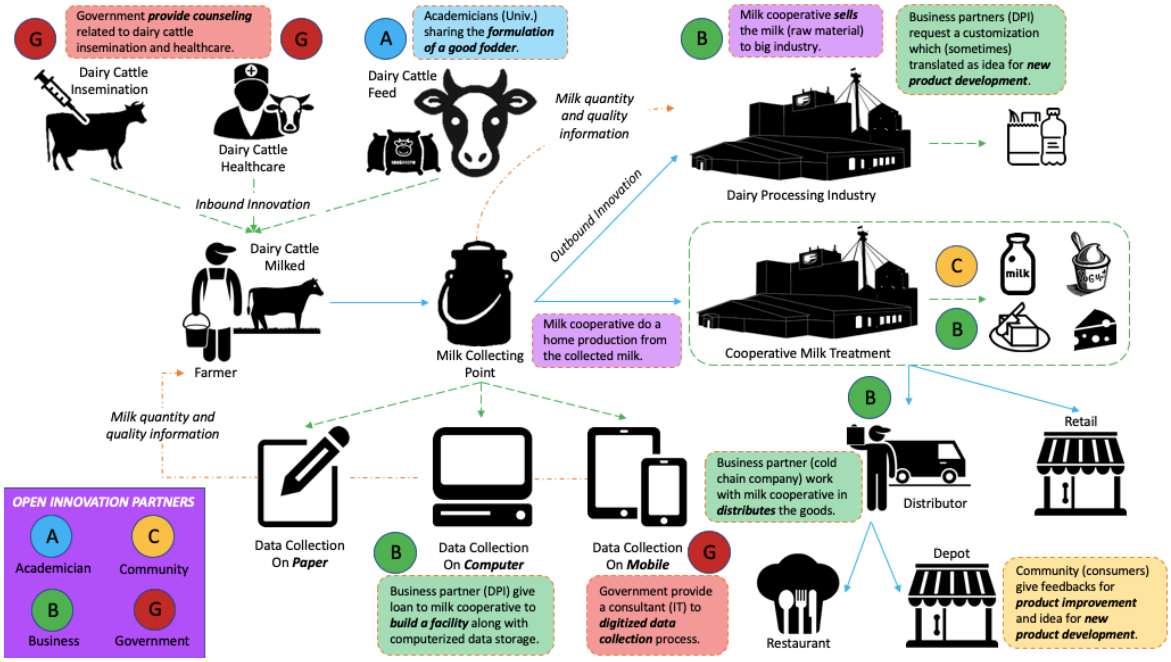

Figure 3. Rich picture of Indonesian leading milk cooperative's value chain

Figure 3 shows information that reflects the innovation activities of the milk cooperative. At the downstream level, the cooperative collaborated with both government and academicians regarding the health care of dairy cattle. In this activity, the cooperative acts as an innovation seeker who absorbs the know-how from the government and academic representatives before applying them in taking care of the dairy cattle. As for the development of technology in MCPs, the cooperative first got loans from the MPI as its business partner. The MPI built a plant to collect the milk along with the computerized online data collection.

Knowing that the plant has a high cost, government assigned an IT consultant to build a cheaper system. At this point the relation between the milk cooperative and the IT consultant is bidirectional—inbound and outbound. The cooperative adopts the technology to improve its process in collecting the data, and meanwhile the IT consultant sells his technological innovation to the milk cooperative through the government.

On the operations end, the products developed by the milk cooperative are based on ideas given by consumers. The cooperative collects and selects the ideas from the distributor and also from the survey that it periodically

uses. From the selected idea, the cooperative starts the new-product development project internally. As its main resource is milk, on the product development project it mostly produces a product differentiation. The output might not radical, but it produces good for the company.

Since the framework we used to analyse the open innovation activities in this study was Porter's value chain, we examined the degree of this cooperative's openness in innovation according to its innovation process and outcome. To do that, we used the degree of openness matrix as depicted in Table 1 and developed by Huizingh [22]. According to the matrix, we see that the innovation process of this milk cooperative is open in nature. The milk cooperative leverages both tangible and intangible technologies from outside its boundaries. The nature of the transfer is inbound, outbound, and even coupled in some cases. That alone reflects the knowledge flows that are characteristic of open innovation.

Table 1. Organizational matrix to measure level of openness in innovation (Source: Huizingh, 2011)

Innovation Process	**Innovation Outcome**	
	Closed	**Open**
Closed	Closed Innovation	Public Innovation
Open	Private Open Innovation	Open Source Innovation

However, the revenue from the innovation outcome only goes to the cooperative. Moreover, the market is still limited to the existing channel despite its openness. That nature shows a closed concept. Hence, referring to Table 1 we conclude that this cooperative has a private open innovation concept as the basis of its innovation strategy.

5. Conclusions

This study highlighted a comprehensive explanation regarding the compatibility of value chain analysis to investigate the innovation process in an organization, in this case a milk cooperative. By mapping the primary and supporting activities within the cooperative onto the framework along with its innovation partners, this study proved that the open innovation paradigm can also be applied in lower-level enterprises or small business organizations, even milk cooperatives.

To the best of our knowledge, prior studies have examined the implementation of open innovation in various fields of industries and enterprise levels, but not in the agricultural industry such as a milk cooperative. However, the knowledge flows of open innovation were studied modularly. In other words, the inbound, outbound, and bidirectional open innovation were not exposed simultaneously. Thus, the major novelty of this study is apparent to that extent since the map provides a clear visualization of efforts that the functional units right through the milk chain have made pertaining to inbound, outbound, and bidirectional open innovation concurrently.

In generating more implications, we extended our analysis by utilizing a framework from prior studies to measure the openness level of this milk cooperative. Accordingly, from an analysis respecting the nature of collaboration, we conclude that the milk cooperative is currently at the private open innovation level. That result shows there is still a possibility for the cooperative to grow. To act on that extended finding, the organization could either design a business model that may generate more value-sharing output or a new product development program that is more open in terms of the proprietary innovation.

Finally, this study found that the implementation of open innovation in a milk cooperative should be decentralized and tailored specifically across the chain. Therefore, the strategy could reduce the development cost, speed up the launch time, increase the amount of good-quality raw milk, and eventually add value for the cooperative and its collaboration partners.

6. Limitation and Future Research Directions

Although this is a single-case study of an Indonesian milk cooperative, it proves that open innovation has been unconsciously well adopted in Indonesia. In fact, the implementation of open innovation has helped the milk cooperative in overcoming its limitation and brought a tremendous impact to the growth of cooperative innovativeness. To generalize the findings, future research could apply a similar analysis approach to other cooperatives. By doing so, it would help other cooperatives in improving their innovativeness. It would also provide added value for the cooperative itself and its peers. Eventually, the improvement would increase cooperative revenue, which linearly affects the welfare of the local society.

Future research may also be directed toward an experimental study by adjusting the nature of open innovation revealed by the findings of this study. The organization of a future study may begin by analyzing the organizational value chain and designing possible collaboration strategies that would bring benefits for both innovation parties. The planning should consider some factors such as social culture within the cooperative and also its surroundings. As the current study looks only at the general process and outcome of the milk cooperative innovation, future studies may also consider an analysis of the technology diffusion area.

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