Institutional analysis of milkfish supply chain using interpretive structural modelling (ISM) (case study of UD. Bunda Foods, Sidoarjo District)

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Abstract. UD. Bunda Foods is an SME located in the district of Sidoarjo. UD. Bunda Foods has problems of maintaining its milkfish’s quality assurance and developing marketing strategies. Improving those problems enables UD. Bunda Foods to compete with other similar SMEs and to market its product for further expansion of their business. The objectives of this study were to determine the model of the institutional structure of the milkfish supply chain, to determine the elements, the sub-elements, and the relationship among each element. The method used in this research was Interpretive Structural Modeling (ISM), involving 5 experts as respondents consisting of 1 practitioner, 1 academician, and 3 government organisation employees. The results showed that there were two key elements include requirement and goals elements. Based on the Drive Power-Dependence (DP-D) matrix, the key sub-elements of requirement element, consisted of raw material continuity, appropriate marketing strategy, and production capital, were positioned in the Linkage sector quadrant. The DP-D matrix for the key sub-elements of the goal element also showed a similar position. The findings suggested several managerial implications to be carried out by UD. Bunda Foods include establishing good relationships with all involved institutions, obtaining capital assistance, and attending the marketing training provided by the government.

1. Introduction

There are many milkfish-processing SMEs in Sidoarjo City. One of their processed milkfish products is smoked milkfish, currently known as Sidoarjo City specialty product. In Sidoarjo, there are 13 SMEs of smoked milkfish, one of them is UD. Bunda Foods. Not only smoked milkfish, UD. Bunda Foods also produces milkfish presto, milkfish otak-otak, and milkfish nugget. This SME has five (5) employees and the production capacity is about 80 kg/month.

The goals of effective supply chain activity are to have precise amount of specific products, to be available in the right place, and to cost with the right range of price [1]. The supply chain is related to the product or service flow and transformation from raw material providing phase, until the final product reaches the consumer [2]. UD. Bunda Foods obtained their raw material (i.e. milkfish) from the breeders and the sellers in the market. However, the problems of maintaining the milkfish’s quality assurance and developing marketing strategies are faced by UD. Bunda Foods. Those problems need
to be tackled if UD. Bunda Foods want to market its product, enabling the SME to compete with other similar SMEs and to expand the business.

The supply chain organisation is defined as a well-structured series of related institutions or enterprises governed by any means of strict rules and structure to control, organize and maintain the flow of the money, materials, and information from its upstream to the final user [3]. Therefore, this research is aimed to determine the structure model of smoked milkfish supply chain organisation, to identify the elements, the sub-elements, and the interaction among those elements. To achieve this, Interpretive Structural Modelling (ISM) method was employed.

2. Research Method

This research was carried out in UD Bunda Foods in Penatarsewu Village, Tanggalangin, Sidoarjo. The collected data were analysed in Agroindustry Management Laboratory, Dept. of Agroindustrial Technology (AIT), Faculty of Agriculture Technology (FAT), Universitas Brawijaya (UB), Malang. There were five expert respondents involved, include 1 SME owner, 1 lecturer form Dept. of AIT – FAT-UB, 1 Division Head of Marine and Fisheries Agency, 1 staff of Industry and Trading Agency of Sidoarjo City, and 1 Division Head of Micro Business Supervisor Agency from Cooperatives and Micro Business of Sidoarjo. Data collected from these respondents are ISM scoring with VAXO questionnaire and verbal interview to obtain company profile and milkfish business condition.

2.1. Organization analysis

In this phase, the problem limitation includes the boundary analysis of only two elements out of nine organisation program elements. Those nine elements are community involvement, program requirement, main obstacles, possible alteration, program goals, measurement parameters, planning organisation activity, measurement activity to evaluate the result of each activity, and institution involvement [4]. Therefore, the selected elements to be analysed were requirement and goal element. These elements were determined through interview with the expert respondents. Then, each element was divided by several sub-elements as seen in Table 1.

| Table 1. Elements and sub-elements of supply chain organization. |
|------------------|------------------|
| **Element** | **Sub-element** |
| Requirement | 1. Raw material continuity |
| | 2. Proper marketing strategy |
| | 3. Production capital |
| | 4. Skilled employee |
| Goal | 1. Raw material continuity assurance |
| | 2. Product quality assurance |
| | 3. Expanding marketing area |
| | 4. Increasing business income |

2.2. Data analysis

The Interpretive Structural Modelling (ISM) method was used to analyse the data of smoked milkfish supply chain organisation in UD. Bunda Foods. This method was used to analyse the system elements as a graphical representation, showing a direct relationship among elements and the hierarchical arrangement. Generally, ISM technique was divided into two parts: element classification and hierarchy arrangement [5]. ISM implementation process steps are as follows: 1) variable identification, 2) contextual relationship determination, 3) structural self-interaction (SSI) matrix development using pairwise comparison, 4) matrix transformation into Reachability Matrix, 5) transitivity assessment, 6) final reachability matrix arrangement, 7) directed graph withdrawal, and 8) transitive link deletion [6].
3. Results and Analysis

3.1. Profile of UD. Bunda Foods

UD. Bunda Foods is an SME of smoked milkfish, which its success is supported by its effective supply chain activity, from the raw material to the final product. Sole proprietorship (UD) is a self-owned business that requires no business partner [7]. If there is a person or a party supporting the business activity, they will not be in the same position as the owner. UD. Bunda Foods, founded by Lita Eka Yufida in 2014, has been producing smoked milkfish with the brand name of ‘Bitha”. This SMEs has five employees with the production capacity of 80 kg per month. Usually, SMEs have 5-19 employees [8].

The supply chain organisation of smoked milkfish in UD. Bunda Foods can be seen in Figure 1. The figure shows that the milkfish breeders received information flow about fresh and stout milkfish request and money flow of milkfish purchase from UD. Bunda Foods. Since milkfish is herbivore, its cultivation has comparative advantages [9], such as it can easily be cultivated either using intensive or semi-intensive system with relatively lower cost [10].

![Structure of smoked milkfish supply chain organisation](image)

**Figure 1** Structure of smoked milkfish supply chain organisation

Milkfish collector receives information flow about ≥ 60 ounce-sized fresh milkfish request and money flow to fulfill that request. The seller or collector is an independent marketing institution which involved in the distribution channel with specific motive [11]. Their main motive is to earn some profits from the difference in the buying and the selling price.

In the supply chain organisation, UD. Bunda Foods distributes smoked fish product to the retailer. Retailer, as the final activity of business, is required to distribute products to consumers [12]. UD. Bunda Foods receives information flow from retailers about their selling capacity, the consumer demands, and money flow from smoked fish sales.

In addition, the government also provides information for each party in the supply chain organisation. The government provides the breeder with information about good quality for milkfish to be harvested. Government participation is essential to develop small-scale business. The government might participate by providing capital in the form of money or production instrument [13]. The collector is provided with information about determining the corresponding price for each milkfish size and quality. UD. Bunda Foods also receives information about exhibition events to sell the...
smoked fish product. The retailer receives information about strategic retail location to increase smoked fish sales.

3.2. Requirement element analysis
Figure 2 shows that the sub-elements of the requirement element are consisted of raw material continuity, proper marketing strategy, and production capital. This confirmed that business activity in UD. Bunda Foods was successfully operated because of its raw material continuity assurance from the supplier, proper marketing strategy of direct selling, and adequate production capital. Another influencing factor to the SME business success was skilled employees. Skilled employee might enhance production processes by helping the owner to process the raw material into products. Production factors involved in the business development, such as capital, employee, raw material, transportation, energy resource and marketing should be combined all together [14].

![Figure 2. Diagram of requirement element structural model](image)

Figure 3 shows that the sub-element of raw material continuity, proper marketing strategy and production capital are fitted to the Linkage sector quadrant. The results suggested that those sub-elements have strong propelling force and dependency to other sub-elements. This means that if the production capital cannot be provided, then the raw material cannot be acquired which may hindrance the marketing process. Furthermore, this occurrence may have negative impacts on the product sales. The figure also indicates that the sub-element 4 (i.e. skilled employee) is fitted in the Dependent sector quadrant. This means that this sub-element is influenced by other sub-elements within the Linkage sector. Major factors influencing the industry development include capital, employee, raw material, transportation, energy resource and marketing [15].

![Figure 3. DP-D matrix of requirement element](image)
3.3. Goal element analysis
As can be seen in Figure 4, all the sub-elements of the goal element were the key sub-elements. Those sub-elements are the goals wanted to be achieved by UD. Bunda Foods, which will enable them to maintain their business. Business success means the businesses completed or achieved their goals [16]. A small-scale business success is influenced by its company performance, which is considered as one of the businessman goals.

![Figure 4. Diagram of goal element structural model](image)

Figure 4 shows that all the sub-elements of the goal element were in the Linkage sector quadrant. This means that those sub-elements are strong, either in propelling force or dependency to other sub-elements. Therefore, the product quality can be assured if the industry is able to assure their raw material continuity. Furthermore, if the product quality can be assured, the marketing area and income can also be increased. Product quality is an obligatory factor to ensure business success [17].

![Figure 5. Matrix of goal element DP-D](image)

3.4. Managerial implication
The findings from observation and ISM analysis suggested the following managerial implication, include:
1. UD. Bunda Food may be able to maintain its business if they have good relationship with seller, collector, retailer, and related government agencies.
2. UD. Bunda foods requires proper marketing strategy, such as direct selling with support and supervision from government to maintain their business persistence.

4. Conclusion
Parties involved in the structure model of UD Bunda Foods smoked milkfish organization include breeder, collector, UD. Bunda Foods, retailer and government. Several sub-elements of the requirement element were raw material continuity, proper marketing strategy and production capital which belong to Linkage sector. The findings confirmed that these sub-elements influences the sub-element (i.e. skilled employee) in Dependent sector. The sub-elements of the goal element, such as
raw material continuity assurance, product quality assurance, marketing area expansion and business income improvement, also occupy the same position in Linkage sector.

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