

Innovation to Achieve Sustainable Competitive Advantage of Processed Fishery Products Sector in Central Java

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ABSTRACT

The fisheries sector in Indonesia plays a vital role in the country's economy, making it the second-largest producer globally, after China, and fulfilling 25% of the world's seafood demand. Between 2019 and 2023, Indonesian fisheries exports showed positive growth, achieving a surplus of USD 5.63 billion in 2023, with key exports including shrimp, tuna, and squid. However, despite this success, Indonesian products face challenges in international markets due to limited innovation. Central Java, one of Indonesia's major fisheries exporters, has experienced fluctuating export values, primarily because of weak competitiveness and the lack of value-added products. Optimizing natural resources through market-oriented product innovation is essential to overcome these challenges. A market-oriented approach is crucial for enhancing the value of Indonesian fisheries exports, which include fresh, frozen, canned, dried, salted, smoked, fermented, cooked, and surimi-based products. Ensuring product standardization is equally important to meet the strict regulations of destination countries. Companies should implement a Sustainable Competitive Advantage (SCA) analysis using the VRIO framework (Valuable, Rare, Inimitable, and Organizational) to achieve long-term profitability and competitive advantage. This strategy aims to bolster the competitiveness of processed seafood products in Central Java to meet global market demands. Canned tuna and swimming crab products gain a premium status by adopting sustainable practices and certifications like the Marine Stewardship Council (MSC) and eco-labelling. Certified sustainable tuna fetches a higher market price, underscoring the value of sustainability. Additionally, a well-organized supply chain gives canned crab a competitive edge globally. Policies that promote sustainability in swimming crab fisheries also help producers maintain an advantage. Meanwhile, although the milkfish products have only a temporary edge due to their easy replication, Central Java's traditional processing methods and cultural significance add a unique value.

INTRODUCTION

The fisheries sector is one of the productive sectors driving the Indonesian economy (Yusuf *et al.*, 2018). Indonesia is the second largest fisheries producer in the world after China (Tran *et al.*, 2018) and meets around 25% of global fisheries demand

(IICB, 2022). From 2019 to 2023, the value of Indonesian fisheries exports showed a positive trend, increasing by 3.67% per year. In 2021, Indonesia's fisheries trade balance reached a surplus of USD 5.63 billion. The most significant export commodity value comes from shrimp, tuna-skipjack, and squid-cuttlefish-octopus (MMAF, 2023). However, the innovation trend in fisheries products in the international market puts pressure on Indonesian fish products. Hence, Indonesian fisheries products often fail to penetrate the international market (Yusuf *et al.*, 2015; Yusuf *et al.*, 2018).

Central Java is one of Indonesia's provinces with the highest volume of fisheries exports. However, the export value generated from 2017-2021 is very volatile (MMAF, 2022). One of the causes is the weak competitiveness strategy and value-added products (Yusuf *et al.*, 2021). Although the availability of raw materials and the supply chain of the Central Java fisheries industry is excellent, an aggressive and effective strategy is needed to penetrate the global market by utilizing opportunities and strengthening the industry internally (Yusuf *et al.*, 2021). One strategy that can be proposed is optimizing natural resources through a market-oriented processed product innovation approach (Foss *et al.*, 2011). Market orientation is critical in increasing the value obtained from Indonesian fisheries commodities (Yusuf *et al.*, 2013).

Currently, a small part of the fisheries industry in Central Java has produced processed fish that is oriented to global market needs. Based on global market needs, there are various types of fish products and their processed products that have export potentials, such as fresh products, frozen products (raw and cooked), canned products (sterilization and pasteurization), dried products, dried salted products, smoked products, fermented products, cooked products, and surimi-based products (leaching or minced) (MT, 2014). Based on the latest survey, ten processed fishery products from MSMEs in Central Java have great potential to meet global market needs. However, several factors must be considered, starting from ecological, economic, and social obstacles to export (Yusuf & Puspita, 2023). In addition, product standardization is an important issue that must also be considered in order to increase exports. Each export destination country has stringent standards, and it is not uncommon for processed products from Indonesia to be rejected because they do not meet these standards (Salim, 2016).

Therefore, a generic and effective strategy is needed for companies to obtain profitability above the industry average and have a sustainable competitive advantage. This strategy can be achieved using the sustainable competitive advantage (SCA) analysis using valuable, rare, imitational, and organizational (VRIO) indicators. Further analysis of this condition will reveal how many resources the company has that can provide sustainable profits, temporary profits and losses (Trondsen *et al.*, 2012; Yusuf *et al.*, 2013). Based on the description above, formulating the research problem is a strategy for strengthening the competitiveness of processed food products in the Central Java fisheries industry to meet global market needs.

MATERIALS AND METHODS

This study aimed to identify the critical success characteristics necessary for fisheries export that nations must meet to compete in the modern fishing sector. The research process involved direct interviews with industry stakeholders, relevant agencies, and a review of existing literature. Respondents were selected proportionately to represent different types of processors, as well as individuals or groups seeking comprehensive data. Secondary data were compared with field observations and interview findings. Primary data were collected from knowledgeable stakeholders in fish processing in Central Java, including managers in the fisheries sector, using structured questionnaires. This research focuses on market-oriented innovations in fishery product development.

The procedures for assessing critical performance indicators (CPI) involve several restrictions. First, parameters for both positive and negative trends are established. A higher value is preferable for positive trends, while a lower value is preferred for negative trends. The lowest value for each positive trend criterion is set at 100, with other values adjusted accordingly higher. Conversely, the minimum value for each negative trend criterion is also set at 100, with other values proportionally adjusted lower. The evaluation results for each criterion are summed after translating the values, and the criteria's weights are multiplied to facilitate decision-making based on value ranking.

The primary data for this study, which was further analyzed, were collected from ten businesses. Data were obtained through the direct distribution of questionnaires to targeted respondents in various districts and cities within Central Java. The 4P and VRIO frameworks were used to evaluate innovations for export-oriented product development. The innovation assessment employed a scoring system of 1–10, with weights of 0.4, 0.3, and 0.3 assigned to different criteria. Negative trend criteria represent inhibiting factors, while positive trend criteria indicate support for innovation.

The 4P framework

The marketing mix consists of four elements that form the foundation of a business's marketing system and that the organization may regulate as efficiently as feasible (Hesterly & Barney, 2014; Whittington *et al.*, 2020). Any company that wants to succeed in the marketplace must have a firm plan. A company's marketing department is one area where this is very important. The marketing mix should always be adaptive to changes in the external and internal environments. External factors include competitors, new technological developments, laws and regulations, the state of the economy, and the social and cultural environment. Internal factors are the marketing mix's components, including the product, price, place, and promotion.

The VRIO framework

A company's internal circumstances are sometimes the starting point for identifying its strengths and flaws. An additional examination of this situation will reveal the number of resources the business has that can offer a long-term benefit, a transient advantage, and a disadvantage. The analytical technique for knowing these requirements is VRIO (Valuable, rare, imitate to cost and organized). VRIO may be utilized to compare the internal circumstances of the company's strengths and shortcomings (Stanten, 2008; Barney, 2022). Aspects such as valuable, rare, imitate costing & organizing exploit resources are evaluated using the VRIO framework analysis. VRIO assessment and testing using the following questions for every condition:

1. Valuable; do these circumstances motivate businesses to take advantage of outside possibilities and counteract threats?
2. Rare; do other firms seldom hold these conditions, or are they solely under the hands of a limited number of corporations?
3. Imitate to Cost, is it difficult for other firms to duplicate these conditions?
4. Organized; does the business support and handle these situations appropriately?

Research framework

The development of management information systems to facilitate decision-making through process optimization or conclusion drawing based on a range of criteria is known as a decision-making system. A multiple criteria analysis is performed after alternative decisions as the key elements are chosen in order to reach the correct result. The method composite performance index (CPI) is a technique-based decision performance that uses heterogeneous criteria (Yusuf & Trondsen, 2014). A composite index, or CPI for short, is a tool that may be used to rate or evaluate many options (i) according to a variety of criteria (j). The CPI method's formula is as follows:

1. Normalization matrix

Normalization matrix by using the provided weight values to modify the criteria value.

2. Determine criteria values:

$A_{ij} = (X_{ij}/X_{ij(MIN)}) \times 100$; if the trend criterion in positive

$A_{ij} = (X_{ij(MIN)}/X_{ij}) \times 100$; if the trend criterion in negative

3. Determine CPI value:

$I_i = \sum_{j=1}^m A_{ij}B_{ij}$; $I = 1,2 \dots, n$ dan $j = 1,2, \dots, m$

A_{ij} : Alternative value i to criteria j

X_{ij} : The initial value of alternative i on criteria j

$X_{ij(MIN)}$: Alternative value i to criteria j

B_j : The weight of the criteria value to j

I_i : Composite index of criteria for alternative i

SCA framework

The SCA value of an industry is defined as the ability to survive and succeed in a dynamic competitive environment. SCA is also said to be an industry's ability to ensure its advantages resist to competition. Therefore, an industry to achieve SCA must develop socially acceptable profit-seeking behavior supported by value-enhancing resources and capabilities and an appropriate supporting institutional context. The VRIO model provides an exciting way to obtain SCA. Knowing where to place resources can be a way to achieve SCA (Murcia *et al.*, 2022).

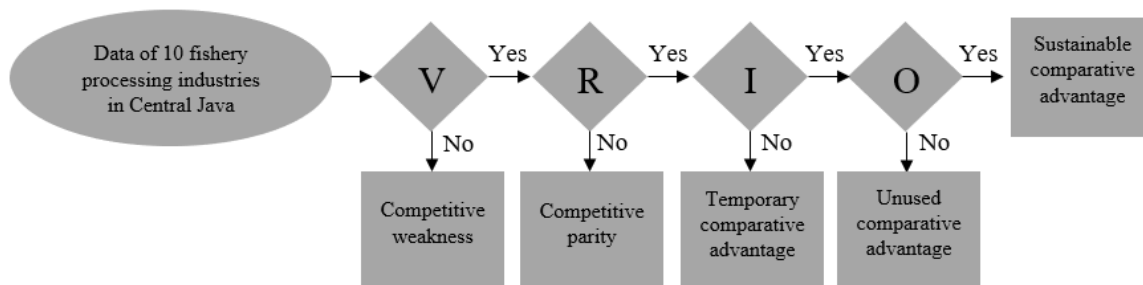


Fig. 1. SCA analysis method based on VRIO value

RESULTS AND DISCUSSION

1. The 4P value

Table 1. The initial matrix for evaluating the development of fish products based on 4P criteria

4P element	Innovation	Supporter	Inhibitor
<i>Canned tuna</i>			
Product quality	8,5	8,5	8,1
Place in market	7,5	7,3	7,0
Price offered	6,6	6,8	6,3
Promotion effort	7,5	7,2	7,4
<i>Milkfish</i>			
Product quality	7,5	7,6	7,8
Place in market	8,5	8,3	8,1
Price offered	8,2	8,1	7,8
Promotion effort	8,0	8,1	7,6
<i>Canned swimming-crab</i>			
Product quality	8,5	8,2	8,1
Place in market	7,8	7,9	7,4
Price offered	6,8	6,6	6,4
Promotion effort	7,0	7,1	6,6

All measurement parameters were included after the initial evaluation findings of the three processed items were proportionately converted based on positive and negative trends. The performance index for the four P factors in canned tuna products

is presented in Table (2). Product quality ranks first, with a total score of 112.3, followed by market placement (score 104.7), promotional efforts (score 102.8), and price offered (score 100.0). For swimming crab products, "product quality" also takes the top spot with a total score of 111.0, while "market placement" ranks second at 107.7. "Promotional efforts" come in third with a score of 102.5, and "price offered" is 100.0.

The fisheries industry in Central Java produces a variety of goods, including canned tuna and swimming crab. Product quality is highly valued, particularly in export markets that require adherence to international standards such as HACCP and ISO (Suseno, 2021). Innovation in fishery products is strongly influenced by processing, packaging, and preservation methods (Ficano, 2022). Eco-friendly labeling and sustainable cultivation practices can help differentiate fishery products in the global market (Maesano *et al.*, 2020).

The pricing of fishery products in Central Java varies by market segment. In the local market, prices tend to be more competitive, reflecting consumer purchasing power. Conversely, in the export market, premium quality products are priced higher (Curzi & Pacca, 2015). Seasonal factors and product availability also influence prices, which typically rise during low fish seasons (Lukum *et al.*, 2023).

Table 2. Transformation matrix through a 4P comparison performance index technique

4P element	Innovation	Supporter	Inhibitor	Total value	Rating
<i>Canned tuna</i>					
Product quality	128,8	125,0	77,8	112,3	1
Place in market	113,6	107,4	90,0	104,7	2
Price offered	100,0	100,0	100,0	100,0	4
Promotion effort	113,6	105,9	85,1	102,8	3
<i>Milkfish</i>					
Product quality	100,0	100,0	97,4	99,2	4
Place in market	113,3	109,2	93,8	106,2	1
Price offered	109,3	106,6	97,4	104,9	2
Promotion effort	106,7	106,6	100,0	104,6	3
<i>Canned swimming-crab</i>					
Product quality	125,0	124,2	79,0	111,0	1
Place in market	114,7	119,7	86,5	107,7	2
Price offered	100,0	100,0	100,0	100,0	4
Promotion effort	102,9	107,6	97,0	102,5	3

For milkfish products, the first rank is the element "place in market" with a total value of 106.2. The second rank is "price offered" with a value of 104.9. The third is "promotion effort" with a value of 104.6. Finally, "product quality" with a value of 99.2. The distribution of milkfish in the local market of Central Java is carried out through various traditional markets and supermarkets, where this product is easily

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accessible to everyday consumers. According to **Arsiwi *et al.* (2018)**, the distribution of fresh fish in traditional markets is one of the leading sales channels, especially in coastal areas. In addition, the milkfish also has a market abroad. The main export markets for the Indonesian milkfish are Asian countries such as Taiwan, the Philippines, and Japan, with some shipments also going to the European and North American markets (**Hikmayani & Putri, 2014**). The milkfish may be better known as a product available in large quantities at affordable prices, hence consumers focus more on factors other than quality, such as price or processing methods that suit their preferences. On the other hand, tuna and swimming crab are considered premium products, where product quality is a major determining factor because consumers expect high standards and a more exclusive consumption experience.

2. The VRIO value

Table 3. The initial matrix of innovation assessment for the development products based on VRIO

VRIO element	Innovation	Supporter	Inhibitor
<i>Canned tuna</i>			
Valuable	8,1	7,8	7,7
Rare	7,3	7,0	6,8
Imitational	7,6	7,6	7,3
Organizational	7,9	7,3	7,0
<i>Milkfish</i>			
Valuable	7,4	7,2	7,1
Rare	7,6	7,0	7,0
Imitational	6,0	5,8	6,0
Organizational	6,2	6,1	6,2
<i>Canned swimming-crab</i>			
Valuable	7,9	7,8	7,2
Rare	7,5	7,6	7,5
Imitational	7,4	7,3	7,0
Organizational	8,3	7,9	7,7

Table (4) displays the outcomes of the VRIO composite performance index analysis measures' transformation. With a total score of 104,3, the "value" aspect in canned tuna goods comes in top, followed by the "organizational" element in second place with a total score of 103,7, the "imitational" element in third place with a total score of 102,2, and the "rareness" factor in last place with a total score of 100,0. The "value" element comes in second place with a total value of 111,9, followed by the "organizational" element with a total score of 101,9, and the "imitational" element at the bottom with a total value of 100,0 in milkfish goods. The "rareness" element ranks first with a total value of 112,6. Tuna is a significant contributor to the global seafood trade. The value of tuna comes from its demand in premium markets, especially for sushi and sashimi, where high-quality tuna (such as Bluefin and

Yellowfin) can fetch premium prices. This product's value is increasing with international certification and quality standards, such as HACCP and ISO (Mursit *et al.*, 2022). Tuna exports contribute significantly to the GDP of many developing nations, including Indonesia (Putra & Nasrudin, 2023). Fishery products in Central Java, such as the milkfish, canned tuna, and other processed fish products, have high value in the domestic and international markets. A study by Riana *et al.* (2014) shows that processed fish products, such as presto milkfish and salted fish, provide significant economic value to coastal communities. Fishery products are valuable because they contribute to food security and the livelihoods of local communities. Fisheries make an important contribution to the income of fish farmers and create jobs in coastal areas (Humairoh *et al.*, 2024). Some fishery products from Central Java, especially those from sustainable cultivation and local innovation, can be considered rare in the global market. Presto milkfish produced with local recipes and traditional preservation technology is unique (Alamsyah, 2010).

Table 4. Transformation matrix through VRIO comparison performance index technique

VRIO element	Innovation	Supporter	Inhibitor	Total value	Rating
<i>Canned tuna</i>					
Valuable	111,0	111,4	88,3	104,3	1
Rare	100,0	100,0	100,0	100,0	4
Imitational	104,1	108,6	93,2	102,2	3
Organizational	108,2	104,3	97,2	103,7	2
<i>Milkfish</i>					
Valuable	123,3	124,1	84,5	111,9	2
Rare	126,7	120,7	85,7	112,6	1
Imitational	100,0	100,0	100,0	100,0	4
Organizational	103,3	105,2	96,8	101,9	3
<i>Canned swimming-crab</i>					
Valuable	106,8	106,8	97,2	103,9	2
Rare	101,4	104,1	93,3	99,8	4
Imitational	100,0	100,0	100,0	100,0	3
Organizational	112,2	108,2	90,9	104,6	1

Finally, the ranking of crab products based on organizational value, imitation, and rarity is as follows: organizational value (104.6), imitation (103.9), rarity (100.0), and organizational capabilities (99.8). The success of crab products in Central Java heavily relies on the capabilities of the organizations involved, including coordination among farmers, entrepreneurs, and government entities. Strong collaboration between fish farmer associations, local governments, and international certification bodies has facilitated the entry of fishery products into the global market (Widyastuti *et al.*, 2023).

Infrastructure and logistical support are essential for optimizing the value of fishery products (Vorozhbit & Korneyko, 2016). Key factors for success include the availability of cold storage facilities, an efficient distribution system, and access to export markets. Additionally, investing in training and skill development for farmers and fishery businesses is crucial for sustaining these products in the market. Improving management capabilities and access to modern technology can enhance production efficiency and product quality (Rowan, 2023).

Positioning presto milkfish as an exclusive or authentic Indonesian product can boost global demand. Crafting a narrative that highlights its origins, traditional production methods, and cultural significance will appeal to international markets interested in unique and high-quality products. Obtaining certifications related to quality, food safety, or eco-labeling can further enhance global market confidence in presto milkfish, helping to maintain its reputation as a rare and high-quality food.

3. SCA value

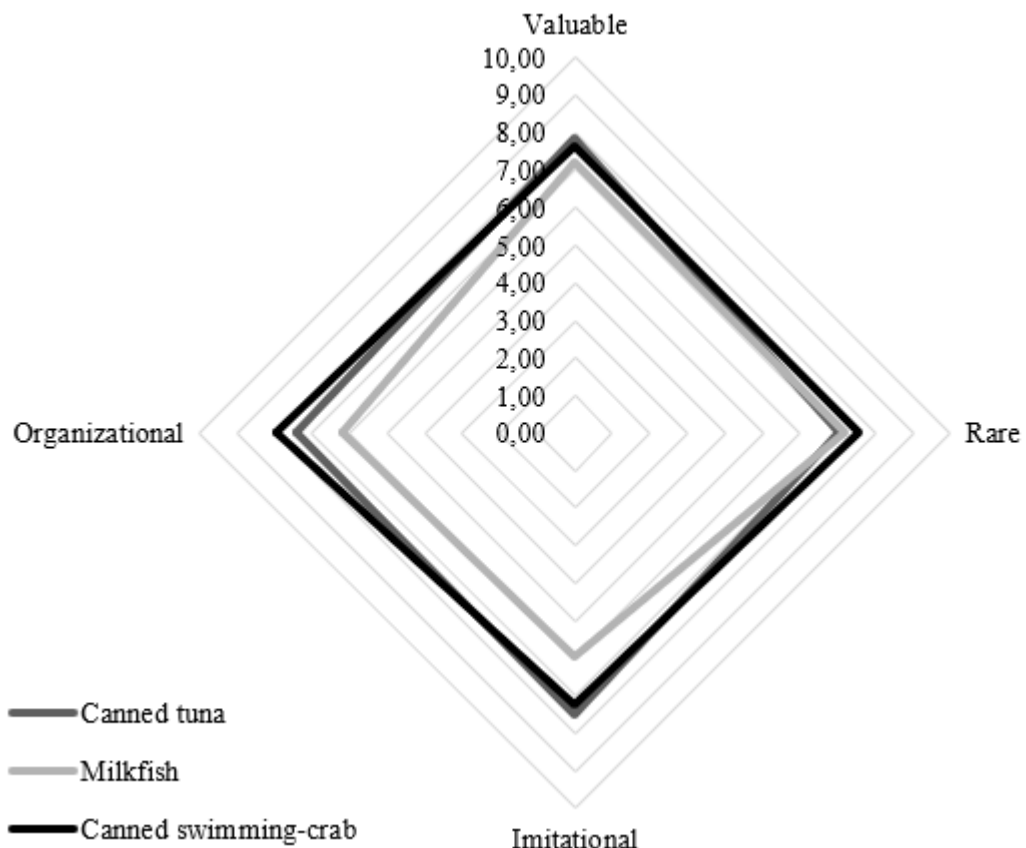


Fig. 2. SCA results based on VRIO values of processed fish products

Canned tuna has sustainable cooperative advantage value. The value of sustainably sourced canned tuna is also increasing. Marine Stewardship Council (MSC) certification and eco-labeling are essential in positioning tuna products as

premium and environmentally friendly, appealing to an increasingly environmentally conscious consumer segment (**Ramachandran, 2010**). Certified sustainable tuna often has a higher market price, making sustainability a key component of its value proposition. Furthermore, canned crab products also have sustainable cooperative advantages. Strong organization in the supply chain, including vertical integration, cooperatives, and traceability systems, helps maintain the competitive advantage of swimming crab in the global market. In many crab-producing countries, governments have implemented policies to support sustainable management of swimming crab fisheries. These policies include enforcement of fishing regulations, quota setting, and incentives for sustainable fishing practices. These supportive policies create a favorable environment for crab producers to maintain their competitive advantage in the global market (**Kusuma & Dewi, 2017**). Meanwhile, the milkfish products only have a temporary advantage. Although some fishery products in Central Java, mainly processed products such as the presto milkfish, have high value, the level of imitation of this product is relatively easy. Simple fishery product processing technology can be easily imitated. However, the attachment of local culture and traditional wisdom in the processing of presto milkfish products provides a uniqueness that is difficult for producers outside Central Java to imitate authentically (**Lukiastuti & Pantawis, 2019**).

CONCLUSION

Canned tuna and crab products have sustainable cooperative advantages, with certification and eco-labeling playing a crucial role in positioning them as premium and environmentally friendly. The market price of certified sustainable tuna is higher, emphasizing the importance of sustainability for its value proposition. Strong organization in the supply chain supports the competitive advantage of canned crab globally. Policies promoting sustainable management of swimming crab fisheries help crab producers maintain their edge. In contrast, the milkfish products have only a temporary advantage due to easy imitation, but the attachment of local culture and traditional processing methods in Central Java adds a unique touch.

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