

## Production and Disruptions of Prawn and Crab: Basis for Supply Chain Management Strategies



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**ABSTRACT:** Supply chain management strategies will help the prawn and crab growers mitigate and adapt to the impact of various disruptions such as typhoons, water-borne diseases, and climate change. The study was conducted to determine the production and disruptions and prawn and crab basis for supply chain management strategies of the growers. The study employed a descriptive research design using quantitative data. The study used secondary data for performance and disaster history. A content analysis was used in processing the data. The researchers validated the findings and results of the study, and a random interview was conducted. Findings revealed that disruptions affect the production of prawn and crab, growers have their fishing technique and management practices, supply chain management strategies were not prioritized for value-adding and technology accessibility. A supply chain management strategy may be employed to operate and produce prawns and crabs in the Province of Capiz to achieve profitability and sustainability. It should be noted that the data is from 2011 to 2017. The data coverage is the Province of Capiz and focuses on the volume and value of prawns and crab (tiger prawn, endeavor prawn, and mud crab).

Supply Chain Management (SCM) of the growers in the Province of Capiz is not given priority in improving its competitive performance of the entire network through the application of an integrated approach to the planning and control of material, information, and cash streams. Also, it has less priority on the practice of the business in breaking changes in sustainable fishing practices to improve business performance. No network is present in the province solely on the same industry of production of prawns and crabs. It is expected that the proposed SCM strategies are all contextualized based on the present needs of the growers. These strategies can be used to become proactive and agile in decision-making and facing possible disruptions.

**KEYWORDS:** Disaster risks of the supply chain, Fishing technique, Risk Management, Technology accessibility, and innovation.

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### I. INTRODUCTION

Supply chain disruption is the major breakdown in the production and distribution of a supply of crabs and prawns, including natural disasters, quality issues, water-born diseases, and an unexpected surge in capacity. Thus, an increasing number of firms are introducing the supply chain function into their organizations to respond to challenges faced in their current business environments. The role of this function is to provide a mechanism for the creation of supply chain networks that integrate material, information, and cash flows among independent organizational units that exist beyond the boundaries of a single enterprise (Cited by Lockamy III, 2014 the study of Boute et al., 2011). Supply chain management (SCM) seeks to improve the competitive performance of the entire network through the application of an integrated approach to the planning and control of material, information, and cash streams among its membership (Jabbour et al., 2011).

According to Fantasy et al., 2010, SCM represents a significant change to business practice, while Ou et al., 2010 suggest that SCM is one of the most effective ways to improve business performance. An important result of adopting integrated supply chain networks by organizations is their increased dependence on inter-organizational relationships to ensure the efficient and effective flow of materials, information, and cash to all supply chain members (Kotzab et al., 2009). Thus, an organization increases its reliance on integrated supply chain networks and becomes more vulnerable to its supplier's disaster risk profiles and other risk categories linked to supply chains.

Supplier disaster risks represent events driven by external forces such as weather, earthquakes, and artificial calamities. Risk is also an incident whose occurrences result in the overall disruption of supply chain performance. Supplier disaster risks are a key

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element of supply chains' external risks, including unfavorable political events, harmful regulatory policies, and disruptive market forces. Although it is often impossible to precisely predict when such events will occur, it is possible to assess their probability via the development of supplier risk profiles. Thus, organizations must analyze the degree of disaster risk associated with suppliers who comprise their supply chain networks (Lockamy, A., 2014). The purpose of this study is to determine the production and disruptions of prawn and crab. The results and findings of the study will be used in crafting supply chain management strategies in the Province of Capiz.

The study was conducted to determine the production and disruptions of prawn and crab basis for supply chain management strategies. Specifically, the study aimed to answer the following: (1) What if the volume produces (metric tons) of prawn and crab in the Province of Capiz from the year 2011-2017; (2) What is the value (in pesos) of prawn and crab in the Province of Capiz from the year 2011 to 2017; (3) What are the disruptions that affect the production of prawn and crab in the Province of Capiz from the year 2011 to 2017 and; (4) What supply chain management strategies can be developed based on the results of the study?

### THEORETICAL FRAMEWORK

Hanfield and McCormack (2007) developed an assessment model to evaluate each supplier's risk. This model incorporates data from several sources to provide a 360-degree view of a supplier's risk profile.

The risk assessment model identifies and quantifies the risk of a supply disruption using a framework that describes the attributes of suppliers, their relationships, and their interactions with the organization performing the assessment. The model consists of: relationship factors (influence, level of cooperation, power, alignment of interest); past performance (quality, on-time delivery, shortages); human resource (HR) factors (unionization, relationship with employees, level of pay compared to the norm); supply chain disruptions history; environment (geographic, political, shipping distance and method, market dynamics); disaster history (typhoon, earthquake, flood, el niño); and financial factors (ownership, funding payables, receivables). The assessment model uses a set of measures and scales that apply to each risk construct.

### The framework of the study

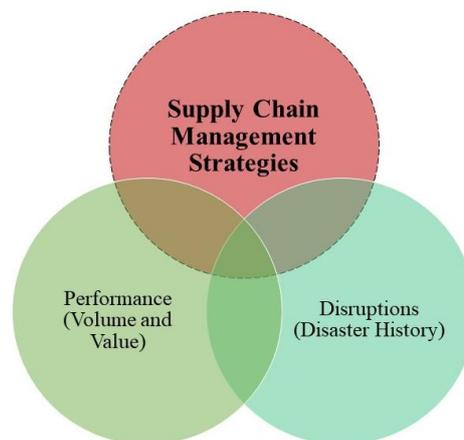


Figure 1. Showing the framework of the study.

## II. METHODOLOGY

The study employed a descriptive research design using quantitative data. The study used secondary data for performance and disaster history. A document analysis was used to process the data taken from the Fisheries Statistics of the Philippines from 2011 to 2017. A random interview was conducted with the workers and owners to validate the findings of the researchers.

## III. RESULTS AND DISCUSSIONS

This section presents the results and findings of the study on the production and disruptions of prawn and crab from the year 2011 to 2017. In the presentation of the value inflation rate of different years was being considered.

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### The volume of Prawn and Crab from the year 2011 to 2017

Figure 2 shows the volume of prawn and crab in metric tons. It shows the volume produced in terms of species; the tiger prawn has decreased production from 2015 to 2017. The highest volume produced was in 2011, with 1,352.64 metric tons. Endeavor prawn production has a little increment every year and the highest year of volume produced was 2017 with 99.45 metric tons, and on mud crab the has seasonal changes and the highest volume produced was in 2017 with 2,048.37 metric tons.

**Table 1. The volume of prawns and crabs in metric tons (2011-2017).**

	2011	2012	2013	2014	2015	2016	2017
	Volume						
	(MT.)						
Tiger Prawn	1,352.64	1,450.74	1,333.39	1,253.28	1,007.50	873.42	754.59
Endeavor Prawn	57.93	63.31	68.55	77.31	85.37	93.44	99.45
Mud Crab	1,651.66	1,831.38	1,638.72	1,764.81	1,544.23	1,702.55	2,048.37

Source: Fisheries Statistics of the Philippines (2011-2017).

### Value of Prawns and Crab from the year 2011 to 2017

Figure 3 shows the value of prawn and crab in Pesos. In the production of tiger prawns, the value was also part of the performance of the production. The highest value of tiger prawn was recorded in 2012 with a total of 549,246.92; endeavor prawn's highest value was 15,962.21 in 2017, and mud crab its highest value was 853,046.57 in 2017.

**Table 2. Value of prawn and crab in Pesos (2011-2017).**

	2011	2012	2013	2014	2015	2016	2017
	Value						
	Peso						
Tiger Prawn	506,184.76	549,246.92	535,035.87	474,528.30	420,695.67	373,153.94	332,134.39
Endeavor Prawn	6,967.88	8,198.04	9,181.58	11,965.43	12,856.18	14,430.30	15,962.21
Mud Crab	459,840.86	549,484.14	530,223.10	617,134.47	575,522.38	649,070.51	853,046.57

Source: Fisheries Statistics of the Philippines (2011-2017).

### Disruptions from the year 2011 to 2017

The following disruptions were recorded from 2011 to 2017 that significantly affect the prawn and crab supply chain in the Province of Capiz. In 2017, the total fisheries production volume went down by 1.04 percent compared to the previous year's level. Of the major species, tiger prawn indicated a production shortfall of 6.29 percent (Fisheries Situation Report, January to December 2017). Typhoon Haiyan (Yolanda) struck the Province of Capiz from November 7 to 8, 2013, destroying farms and businesses. This scenario also impedes the supply chain of prawns and crabs because of destroyed cages and ponds. It resulted in a low supply of prawns and crabs.

Since supply chains comprise trading partners, they are interconnected by financial, information, and material flows (Fugate et al., 2006). Effective supply chains maximize customer value and profits for each trading partner. To enhance supply chain effectiveness, a growing number of suppliers of prawns and crabs may adopt a principle associated with supply chain management (Singh et al., 2005; Li et al., 2006; Gunasekaran et al., 2008) to solve the problems contributed by different disruptions. Another disruption that hampers the production of prawns and crabs is the typhoon *Juan* on October 21, 2010, typhoon *Pedring* on September 26 to 28, 2011.

Another inevitable challenge experienced by the suppliers is climate change which has an adverse impact such as increased incidence of flooding, water shortages, pests, and water diseases constantly threaten the aquaculture output and productivity.

Kleindorfer and Saad (2005) provide a conceptual framework that reflects the joint risk assessment and mitigation activities that they believe are fundamental to managing supply chain disruption risks. Due to the effect disasters can have on the operating

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cash flow, financial leverage, and total asset turnover of supply chain trading partners, Altay and Ramirez (2010) suggest that firms adopt supply chain-wide mitigation strategies. Juttner (2006) notes that developing a supply chain risk management in the production area, along with risk management principles and processes, is necessary to mitigate the impact of disasters.

In the Province of Capiz, the suppliers also used traditional fishing techniques and management practices. It is highlighted that since the suppliers used a traditional practice, the operating cost also increased, affecting the prices of the prawn and crabs. On the health and condition of prawns and crabs, the Province of Capiz also suffered Red Tides (Harmful Algal Blooms) caused by microscopic algae that produce toxins that kill fish and other aquaculture species and other research the prawn and crabs also affected by Luminous bacterial (Larval mortalities associated with luminescence have been observed in epizootic proportions in black tiger prawn hatcheries in Panay Island (Lavilla et al., 2000). Due to the high demand for prawns and crabs, the production has no limit, and the cages have Dissolved oxygen (DO) it refers to the poor water quality in aquaculture fishing. It resulted in unhealthy prawns and crabs.

### **Supply Chain Management Strategies**

Based on the study's findings, the researchers recommend these supply chain management strategies to help the growers achieve productivity and sustainability. The SCM strategies

First, suppliers may have consolidated management of information, material, and cash flows across multiple functional areas of the business; second, they may be a coordination of functional and supply chain trading activities in the production with organizational strategies that are aligned with organizational structures such as mitigation the impact of disruptions on the productions, core processes, management cultures, incentive systems, and human capital. Lastly, improved physical goods flow through end-users, distributors, and retailers for enhanced value to customers. Growers may adapt technological innovation in the customer order and tracking of logistics to answer the potential impact of disruptions.

### **CONCLUSIONS AND RECOMMENDATIONS**

Based on the findings drawn, the following conclusions and recommendations were made. First, supply chain management (SCM) of the growers in the Province of Capiz is not given priority in improving its competitive performance of the entire network through the application of an integrated approach to the planning and control of material, information, and cash streams. Also, it has less priority on the practice of the business in breaking changes in sustainable fishing practices to improve business performance. No network is present in the province solely on the same industry of production of prawns and crabs.

With the conclusions drawn, the following recommendations were highlighted; first, develop an integrated aquaculture map to identify the comparative advantage of each grower in terms of volume and value and other related factors; second, facilitate the use of appropriate farm and fishery machinery equipment; third, strengthen the business advisory system for the improvement of supply chain management strategies of the growers; fourth, improve hygiene practices of the process in production; fifth, strengthen the value chain and technology access of the growers; and lastly, strengthen the capacity of the growers in the disruption risks through proper information and monitored activities; and lastly, to disseminate the findings and results of the study there will be a series of a forum to the prawn and crabs growers on the supply chain management strategies developed and further discuss to them the recommendations based on the results of the study.

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