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An Insight into Tasnee's Supply Chain Strategy for Polymer Products

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Abstract

The importance of supply chain management has been progressively rising in competitive business. Companies must embrace a suitable supply chain management strategy to compete effectively within the supply chain domain. Companies harness their efforts and capabilities to meet their customers' demands. In addressing these demands, they encounter ongoing market fluctuations. Consequently, due to the company's desire to fulfill their customer's needs, the competition has shifted from among companies to competition between the supply chains within these companies. The complexity of the petroleum industry's supply chain surpasses that of many other sectors. The intricate nature of petrochemical supply chain management originates from the crucial need to maintain uninterrupted plant operations and facilitate the transport of final products. Tasnee (National Industrialization Company) is a prominent Saudi Arabian diversified industrial company operating in various sectors, including petrochemicals, chemicals, plastics, metals, and other industrial businesses. The company has a significant presence in the global market. This paper seeks to understand Tasnee's supply chain approach for polymer products, contrasting the lean/efficient supply chain strategy with the agile/responsive supply chain strategy. A comprehensive literature review gathered insights from pertinent studies and relevant publications. In addition to the literature survey, semi-structured one-to-one interviews were conducted with various managerial levels in supply chain management at Tasnee to acquire further insights into the supply chain strategies. Based on the collected information, it is evident that Tasnee predominantly adheres to a Lean supply chain strategy for Polymer products, except for applying a Leagile supply chain strategy in managing profit margins. Overall, Tasnee aligns with an efficient supply chain model.

Keywords

Supply chain strategy, Tasnee, Lean, agile, Leagile

1. Introduction

Companies harness their efforts and capabilities to meet their customers' continuous and changing demands. In addressing these demands, they encounter ongoing market fluctuations. Consequently, due to the company's desire to fulfill their customer's demands, the competition has shifted from among companies to competition between the supply chains within these companies. A supply chain strategy encompasses a company's enduring blueprint to steer it efficiently.

Supply chain term refers to the interconnected system of activities, individuals, and enterprises involved in the production and distribution of goods, spanning from the acquisition of raw materials to the final delivery of finished products to customers (Agi et al. 2022), (Akhavan et al. 2022).

Gansler et al. (2004) define SCM as ensuring everything - like materials, money, and information - is handled and organized correctly as things move from getting raw materials to giving the final product to the person who will use

it. Monczka et al. (2020) describe the "supply chain" as a network of multiple entities encompassing three or more organizations that directly facilitate the flow of products, services, finances, and information from the Source to the customer.

A supply chain strategy outlines the procurement of raw materials, transportation logistics, product manufacturing, and service provision. It also encompasses the distribution of products to customers, followed by any necessary after-sales services. In the value chain context, the supply chain strategy dictates the specific areas where operations, distribution, and service will focus and excel (Hofmann 2010). Supply Chain Strategies (SCS) involve four essential components: 1) supply chain goals, 2) supply chain design, 3) supply chain planning, and 4) supply chain operations (Phengsuk et al. 2023). Established in 1985, the National Industrialization Company (Tasnee) boasts a diverse portfolio of investments encompassing petrochemicals, chemicals, plastics, metal manufacturing, industrial services, and environmental technologies. Tasnee stands out as the first Saudi private sector wholly owned joint stock industrial company dedicated to advancing economic diversification in Saudi Arabia. The company not only offers industrial services but also markets its products globally. Beyond regular business transactions, Tasnee endeavors to foster a more profound connection among individuals. Its goal involves integrating industries and diversifying products and services to cater to local, regional, and international customer markets. Tasnee prides itself on providing distinctive products and services within its primary productive sectors: Petrochemicals, Downstream, and Advanced Metals (www.tasnee.com). Polymer products fall under the petrochemical family in Tasnee company and are considered essential products in Tasnee.

Competitive business environments demand a critical alignment between the expectations of customers and the operational performance of supply chains. This synchrony is called 'Strategic Fit,' where the compatibility between customer demands and supply chain efficiency is pivotal for success (Chaharsooghi et al. 2011).

Towill and Christopher (2002) propose three distinct supply chain strategies: agile, lean, and hybrid. Their research includes a case study demonstrating the successful combination of lean and agile approaches, resulting in a strategy they refer to as the "hybrid" or "leagile" supply chain. This strategy effectively integrates the principles of both lean and agile supply chains.

In the context of any supply chain, agility refers to the capability to deliver customer-centric products and services while effectively navigating unforeseen challenges in logistic and distribution systems (Christopher et al. 2004). Evaluating agility within supply chains holds significant importance, indicating the strategic sustainability position (Vinodh, S.; Prasanna. 2011), (Vinodh et al. 2011). Al-Husain et al. (2006) highlighted the complexity of the petroleum industry's supply chain compared to many other industries. The intricate nature of petrochemical supply chain management originates from the crucial need to maintain uninterrupted plant operations and facilitate the transport of final products. This necessitates the seamless integration and synchronization of various processes, from sourcing and delivering raw materials to orchestrating multiple product manufacturing stages and ultimately shipping the final goods. Supply and demand dynamics dictate precise timing for sourcing and transporting raw materials and finished products. The importance of managing the supply chain has been progressively rising in competitive business. Companies need to embrace a suitable supply chain management strategy to compete effectively within the supply ch The supply chain for polymer products encompasses a series of interconnected processes, from raw material procurement to the delivery of finished goods to end-users. At its core, a robust supply chain strategy aims to streamline these processes, enhance operational efficiency, and ultimately meet customer demands effectively.

The journey of a polymer product begins with the procurement of raw materials. A well-structured supply chain strategy involves meticulous selection and management of suppliers. Organizations must establish relationships with reliable suppliers to ensure a stable flow of high-quality raw materials. Establishing enduring collaborations between

buyers and suppliers is centered on ensuring mutual benefits for both parties, with the shared goal of accomplishing future objectives.

2. Objectives

This paper aims to give insight into Tasnees's supply chain strategy for polymer products concerning the following categories: lean/efficient supply chain strategy, agile/responsive supply chain strategy, and leagile supply chain strategy.

3. Literature Review

An extensive literature review has been conducted to achieve the paper's objective, incorporating insights from Fisher (1997), who proposed that determining a supply chain strategy can rely on product attributes. Fisher distinguished between two primary product categories: those primarily functional and those mainly innovative.

Additionally, he introduced the concept of two distinct supply chain strategies: a physically efficient supply chain and a market-responsive supply chain. Fisher's framework suggested that a physically efficient supply chain is most effective for functional products, while innovative products perform optimally when integrated with a market-responsive supply chain. Table 1 shows a visual representation of efficient versus responsive supply chains based on Fisher (1997).

Table 1. Efficient versus responsive supply chains (Fisher 1997)

	Efficient supply chain	Responsive supply chain
Primary purpose	Supply predictable demand efficiently at the lowest possible cost	Respond quickly to unpredictable demand to minimize stockouts, forced markdowns, and obsolete inventory.
Manufacturing focus/ inventory strategy	Maintain a high average utilization rate. Generate high turns and minimize inventory throughout the chain.	Deploy excess buffer capacity. Deploy significant buffer stocks of parts or finished goods
Lead time focus	Shorten lead time as long as it does not increase cost	Invest aggressively in ways to reduce lead time
Product-design strategy	Maximize performance and minimize cost	Use modular design to postpone product differentiation for as long as possible.
Supplier selection criteria	Select primarily for cost and quality	Select primarily for speed, flexibility, and quality

Harris et al. (2015) conducted a quantitative analysis examining the validity of Fisher's framework in enhancing performance. The study demonstrated that the proposed framework for aligning the supply chain is accurate for both the most stable and most variable ends of the product spectrum, establishing a robust basis for further research in supply chain alignment. The transition between these two alignment strategies, the Hybrid Solution Space, requires further investigation.

Expanding Fisher's framework, Lee (2002) incorporated both demand and supply uncertainties, suggesting that supply processes can be stable or evolving for functional and innovative products. This adaptation presents four distinct types of supply chains: efficiency, risk hedging, responsiveness, and agile strategies.

Research by Sukati and Inda (2018) delved into the correlation between supply chain management strategy and its practices, revealing a statistically significant relationship between these practices and overall supply chain performance.

Lean practices necessitate a stable product demand to facilitate consistent production schedules, thereby reducing cycle time, work-in-process, and finished goods inventories. The main objective of a lean supply chain strategy is cost reduction and improved efficiency by eliminating waste in both inter and intra-organizational processes. Lean supply chains best suit a relatively stable environment (Y. et al. 2009) (Table 2).

Table 2**.** Efficient versus responsive supply chains (Agarwal et al. 2006)

Comparison of lean, agile, and leagile			
Distinguishing attributes	Lean supply chain	Agile supply chain	Leagile supply chain
Market demand	Predictable	Volatile	Volatile and unpredictable
Product Variety	Low	High	Medium
Product life cycle	Long	Short	Short
Profit margin	Low	High	Moderate
Stockout penalties	Long-term contractual	Immediate and volatile	There is no place for stockout
Purchasing policy	Buy goods	Assign capacity	Vendor-managed Inventory
Typical products	Commodities	Fashion goods	Product as per customer demand
Forecast mechanism	Algorithmic	Consultative	Both/either
Lead-time compression	Essential	Essential	Desirable
Rapid reconfiguration	Desirable	Essential	Essential
Robustness	Arbitrary	Essential	Desirable

Piorowicz et al. (2023) reviewed metrics and developed a framework for assessing the supply chain's lean, agile, and leagile strategies. They discovered that distinct metrics are tailored for lean strategies, focusing on process orientation, cost, productivity, inventory, and delivery. In contrast, agile strategy metrics encompass flexibility, responsiveness, information sharing, and cooperation. Shared metrics apply to both strategies, emphasizing time, quality, and customer satisfaction. Metrics related to lean strategies concentrate on tangible and internal processes and products, whereas those aligned with agile strategies focus on the external environment.

Alkahtani et al. (2021) introduced an assessment method to evaluate supply chain agility, which involves identifying capabilities and catalysts for agile supply chains. Additionally, it presents a conceptual model and framework to determine both the level of agility and obstacles within the supply chain.

Anil Jindal et al. (2021) identified seven dimensions of supply chain agility and evaluated their interrelationships and impact on supply chain agility using Fuzzy DEMATEL. The findings emphasized that a firm's operational flexibility and analytical capability significantly determine supply chain agility. While IT infrastructure and sharing supplier and customer information are among the five dimensions with considerable influence on agility, they indirectly exert a dominant effect. This indirect impact stems from their significant influence on operational flexibility and analytical capability, the most influential dimensions affecting agility.

3. Methods

An extensive literature review gathered insights from pertinent studies and relevant publications. This literature review aims to establish the theoretical groundwork for an effective supply chain strategy. In addition to the literature survey,

semi-structured one-to-one interviews were conducted across various managerial levels in supply chain management at Tasnee to acquire further insights into the implemented supply chain strategies.
Table 3. presents the attributes that have been considered for examining Tasnee's supply chain strategy.

Table 3**.** Attributes have been considered for examining Tasnee's supply chain strategy

Distinguishing attributes	Lean supply chain	Agile supply chain	Leagile supply chain
Market demand	Predictable	Volatile	Volatile and unpredictable
Product Variety	Low	High	Medium
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Forecast mechanism	Algorithmic	Consultative	Both/either
Lead-time compression	Essential	Essential	Desirable
Rapid reconfiguration	Desirable	Essential	Essential
Robustness	Arbitrary	Essential	Desirable

4. Data Collection

Throughout semi-structured individual interviews with three supply chain management professionals at the managerial level, key observations centered on Tasnee's sustained high average utilization rate, leading to increased turnovers and reduced inventory levels across the chain. The interviews collectively confirmed the predictability of market demand for polymer products. They noted that while the overall market demand remains predictable and globally aligned with supply, there are instances where Tasnee benefits from aligning with new technology and innovation to meet specific customer requirements. Embracing such advancements enables Tasnee to stay competitive and cater to customers seeking innovative polymer products.

Furthermore, in terms of product variety, the interviews highlighted that while polymer products such as PP, HDPE, and LDPE might exhibit limited overall variety, a wide range of grades and applications exist. This diversity allows Tasnee to provide tailored solutions for various industries and customer requirements within the polymer product market. All interviewees concurred that polymer products typically undergo a long product life cycle.

Regarding profitability, the interviews revealed that the profit margin for polymer products is dynamic and subject to influences such as supply and demand, oil prices, regulations, and market variables. However, the average profit margin hovers around 20%, considered moderate within the industry.

In stockout penalties, the interviews emphasized their rarity in the polymer product industry due to long-term contractual agreements and a shared understanding of commercial practices. This ensures consistent fulfillment of polymer product demands and minimizes the risk of stockout penalties.

Regarding supply chain management, a purchasing policy defines the procurement process's guidelines and principles, ensuring alignment with the organization's objectives and values. Tasnee, a significant supplier of polymer, follows its procurement process in sync with its corporate objectives.

The interviews underscored that polymer products are typically considered commodity products due to their widely available components and recipes in the market. A comprehensive understanding of algorithmic and consultative forecasting is crucial to effectively selling polymer products. Algorithmic forecasting utilizes data-driven models to predict market trends, while consultative forecasting incorporates insights from experts and customers. By combining both approaches, Tasnee can better identify optimal market opportunities.

Lead-time compression was recognized as vital in the polymer product industry. This involves reducing the time to fulfill customer orders, enhancing customer satisfaction and a competitive edge. Efficient production processes, streamlined supply chains, and effective inventory management are crucial for achieving lead-time compression.
The rapid reconfiguration of the supply chain is desirable, particularly in the polymer product industry. Tasnee's ability to swiftly adapt to market changes, introduce new products, and optimize operations is crucial. Tasnee emphasizes collaboration with partners, suppliers, and stakeholders in its supply chain operations. This approach helps address issues promptly, share information, and collectively reconfigure strategies and operations to ensure resilience and adaptability. Tasnee strategically builds its supply chain to ensure resilience and agility, enabling it to navigate challenges and changes without significant disruptions to its operations. This adaptable methodology is crucial for maintaining efficient operations and reducing disruptions in the movement of goods and services.

5. Results and Discussion

Table 4. shows the type of supply chain strategy in Tasnee based on interview results.

Table 4. The type of supply chain strategy in Tasnee

Distinguishing attributes	Lean supply chain	Agile supply chain	Leagile supply chain
Market demand	Predictable	X	X
Product Variety	Low	X	X
Product life cycle	Long	X	X
Profit margin	X	X	Moderate
Stockout penalties	Long-term contractual	X	X
Purchasing policy	Buy goods	X	X
Typical products	Commodities	X	X
Forecast mechanism	X	X	Algorithmic/ Consultative
Lead-time compression	Essential	X	X
Rapid reconfiguration	Desirable	X	X
Robustness	Arbitrary	X	X

6. Conclusion

Based on the information collected, it is evident that Tasnee predominantly adheres to a lean supply chain strategy in its operations related to polymer products. This approach focuses on minimizing waste, reducing excess inventory, and streamlining processes to enhance efficiency and responsiveness to market demands.

Tasnee adopts a Leagile supply chain strategy to manage profit margins. This blended approach combines Lean and Agile strategies, allowing the company to manage costs effectively while maintaining agility in responding to changes that impact profitability. Tasnee aligns itself with an Efficient supply chain model, emphasizing cost-effectiveness while striving for optimal operational efficiency.

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