

# Combining Lean and Agile Supply Chains for Top Results

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## ABSTRACT

The increase in globalization has led businesses to face challenges in their supply chain. The supply chain strategy is introduced to control the supply chain's activities to cope with the rapid changes in market demand. Two main strategies have been developed, commonly adopted by successful companies. These two strategies are lean supply chain strategy and agile supply chain strategy. Lean focuses on reducing cost by eliminating unwanted activities within the supply chain, whereas agile focuses on flexibility in adapting to market demand changes. This research paper aims to analyze these two strategies and outline characteristics, benefits, and markets that are suitable for implementing these strategies. It will also highlight the leagile, the hybrid of lean and agile strategies. The study will be based on secondary sources, hence qualitative, primarily based on the review of literature pertaining to the topic. The study's findings will reveal that lean, agile, and leagile supply chain management are popular and widely discussed in the literature. However, there are some disputes concerning differentiating these types of management from tools and instruments such as outsourcing, single sourcing, quick response, and postponement. In this study, the concepts mentioned above are discussed in a positive light as tools for achieving a competitive advantage in supply chains. This research will provide insight into implementing agile or lean supply chain methodology depending on the business model and product types. It will also propose that it is possible and sometimes necessary to implement both and take a combination approach to supply chains.

## Introduction

Supply chain management (SCM) is considered as one of the vital aspects in performing business. SCM comprises stakeholders that design new products and services, procure raw materials, manufacture them into semi-finished and finished products and deliver them to the end user (Lu & Swaminathan, 2015). SCM is also defined as managing downstream and upstream relationships with customers and suppliers to create an improved value at the end of the marketplace at the lowest cost to the supply chain (Madhani, 2019). With continuous market demand fluctuation, the firms take a step to adopt the supply chain strategy to increase their performance and achieve long-term goals (Rana et al., 2015). Companies must pay attention continuously in responding to customer demand and enhancing the efficiency process of the business to survive in the marketplace (Duman et al., 2015). Multiple drivers influence a firm's performance. One of the drivers is supply chain strategy (Madhani, 2020). Designing an appropriate supply chain is critical in supply chain management. Today, firms face various challenges, such as long or short product life cycle, diversifying products, producer and demand uncertainty, and thus, selecting the right supply chain strategy become very critical. Various supply chain strategies; generally, be efficient or lean and responsive or agile (Daneshvar et al., 2020). In some instances, combining lean and agile strategies is preferable (Baras et al., 2014).

## Literature Review

### Supply Chain Strategy

Supply chain strategy (SCS) refers to a set of utilized approaches to integrate manufacturing, suppliers, stores, and warehouses so that the products are produced and distributed at the right time, right quantity, and in the right location in order to reduce the cost of the vast system and at the same time satisfying the required service level (Madhani, 2017). SCS is a tool to control the transportation, supply, production and distribution of goods to the final user (Madhani, 2017). According to (Arif-Uz-Zaman & Ahsan, 2014), having a strategic fit between supply chain strategy and competitive performance is a critical characteristic of the supply chain. They found that competitive choice of supply chain strategy impacts the supply chain and business performance as the degree of strategic fit between competitive strategy, situation, leadership, and organizational culture can improve the business performance.

### Lean Supply Chain

The lean concept originated from the Toyota Motor Company, also known as Toyota Production System (TPS) (Ugochukwu, n.d.). Lean philosophy eliminates non-value-adding activities (Deshmukh & Vidre, 2020). Lean supply chain (LSC) focuses on eliminating non-value steps or wastes that take place within the supply chain (Daud, 2010), such as inventory, labour, space, and equipment (Mollenkopf et al., 2010). LSC requires the least resources that can efficiently fulfil the job. Therefore, a low inventory level, low warehouse space, and optimised shipment are required to minimise the moving of the inventories. Furthermore, having a stable long-term supply contract is required as the lean design it is preferred to refrain from engaging with second-tier suppliers because of its high cost to maintain (Kovac, 2013). Qrunfleh and Tarafdar (2013) confirmed that implementation of LSC requires prioritising cost reduction and thus building and maintaining long-term relationships with the suppliers to improve the strategy execution. According to Kovac (2013), these factors can minimise supply chain operations costs, making it tremendously cost-efficient. However, it will constrain the ability of the supply chain to adapt to any demand changes or other results due to inflexible design build. Huxel (2014) identified the critical characteristic of LSC: continuous improvement, waste reduction, and time compression. There are many benefits of implementing lean: minimises inventory, reduces lead time, provides a better understanding of the process, less rework, wastage reduction, increased financial savings, improved product quality, and increased customer satisfaction (Virmani & Saha, 2018).

### Agile Supply Chain

In the early 2000s, agile supply chain (ASC) was a trend (Sillanpaa, 2014). In the broadest sense, agility refers to the ability of an organization to respond promptly to the marketplace environment that is rapidly changing (Al Humdan et al., 2020). ASC focuses on responsiveness to the rapidly changing and continuously fragmenting global market by being customer-focused, context-specific, dynamic, and growth-oriented (Daud, 2010). The objective of the agile supply chain is based on business practices, competition, adaptability, strategic response, building defences against competitors, moving toward innovation, and paradigm shift (Ambe, 2012). Huxel (2014) identified the critical characteristics of ASC: adaptability/ flexibility, speed/ quickness, and responsiveness. According to (Nandy & Habib, 2022), ASC enhances the relationship with SC partners as it requires them to work together to produce the right quantity daily rather than based on annual, monthly, or quarterly forecasts. With ASC, firms can respond more accurately to customised demand due to its flexible manufacturing system, allowing them to respond quickly without delays or interruptions and reducing costs, increasing productivity, and fast order tracking (Inbound Logistics, 2023). Furthermore, its flexible manufacturing system allows the firms to provide an extensive product variety, offering customers more options and enhancing customer relations (Virmani & Saha, 2018).

### Leagile Supply Chain

Leagile is the hybrid of lean and agile paradigms in a supply chain strategy with positioning proper decoupling points (Matawale et al., 2016). Both strategies are complementary, and neither strategy is better than the other

one; implementing one depends on the situation (El-asri, 2020). Implementing only one supply chain strategy is unsuitable for all supply chain types. Both strategies are not mutually exclusive, making the need to combine these two strategies to reap their advantages since they can co-exist (Sharma & Kulkarni, 2016), which will allow exploiting market opportunities in a cost-effective manner (Matawale et al., 2016). It is necessary to know customer demand patterns to implement leagile. Firms use different methods to know customer demand, such as questionnaires, telephonic, and market surveys (Virmani & Saha, 2018).

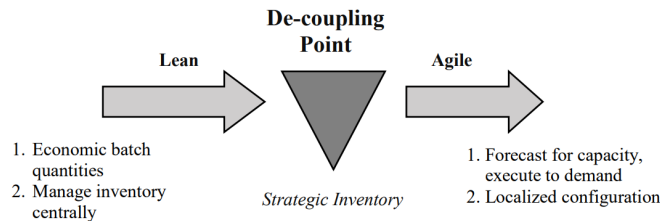


Figure 1. The decoupling point (Madhani, 2017)

According to (Meyer et al., 2017), the decoupling point is a strategic point separating the lean and agile concepts. Lean takes place in the upstream process, and agile in the downstream process. The approach starts with lean operation and producing semi-finished products, and agile deals with customisation (Madhani, 2017). The lean in the upstream point can be utilised to obtain the cost-effective advantages from predictable demand, whereas agile in the downstream deals with market uncertainty (Meyer et al., 2017). With the respect to time, the decoupling point position changes. When the demand is more stable, it will lead to the movement of a decoupling point downstream, and when the demand fluctuates, it will lead to the movement of a decoupling point upstream (Virmani & Saha, 2018).

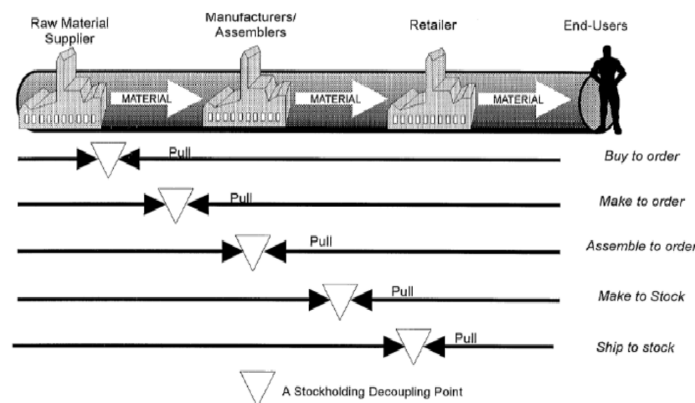


Figure 2. Postponement principal in decoupling point (Virmani & Saha, 2018)

One of the central principles of the decoupling point is postponement. Postponement is the operational activities delayed in the system until receiving the order from the customer rather than processing it into finished products and then waiting for them to get ordered (Virmani & Saha, 2018).

## Methods

### Aim and Objectives of the Study

#### Aim

The main aim of this research is to analyze lean and agile strategies usage in supply chain, and outline characteristics, benefits, and markets that are suitable to implement these strategies. It will also highlight the leagile, the hybrid of lean and agile strategies.

### *Research Objectives*

1. To analyze lean and agile strategies usage in supply chain.
2. To identify the characteristics, benefits, and markets that are suitable to implement lean and agile strategies.
3. To identify and highlight the usage of both the strategies called as leagile, the hybrid of lean and agile strategies.

This section presents a description of the research process followed in this research and how the data was collected to identify papers relevant for this study. As the first step the research questions addressed by this study are:

RQ1. What is the usage of lean and agile supply chain strategies in any companies supply chain?

RQ2. What are the characteristics, benefits, and markets that are suitable to implement lean and agile strategies?

RQ3. What is the usage of both the strategies called leagile, the hybrid of lean and agile strategies?

The followed step was to define the inclusion/exclusion criteria: (1) Search limitations to papers, (2) considering only papers written in English language, and (3) Exclusion of papers not accessible as full text.

For the next step, data collection, the keywords used were defined as: *Agile; Leagile; Lean; Strategy; Supply chain*. Then used to search them in online journals databases and scholarly databases (Emerald insights, Taylor & Francis Group) and Google Scholar. The keywords should be found in the paper title, paper keywords and/or paper abstracts. Then the papers were read to assess their relevance and contribution to the present study, and as a final step the discussion of the findings for the future work.

## **Discussion**

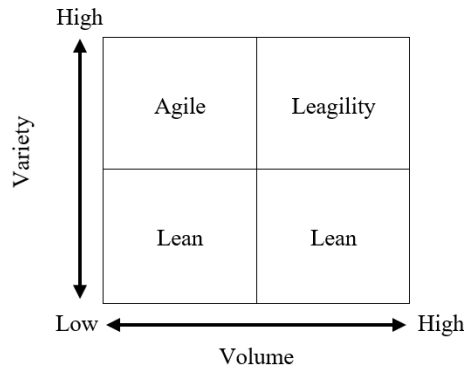
The initial step in selecting/ enhancing the supply chain strategies is to classify the product type that the firm provides. The product types are divided into two categories; they are functional and innovative products (Daneshvar et al., 2020). Also, a hybrid product combines functional and innovative products (Celikkol et al., 2021).

**Functional products:** The market for functional products tends to be stable, and forecasting the demand can be done accurately. It has a long product life cycle where the design of the products changes incrementally (Gilaninia et al., 2011), and it has a low profit margin (Ambe, 2012). Making it predictable and well-defined processes for manufacturing and product design. Therefore, establishing a long-term relationship with its suppliers is helpful for the manufacturers for just-in-time delivery, high-quality materials, and quantity discount that can reduce costs. The LSC characteristics fit the need for functional products (Gilaninia et al., 2011). Functional products example: basic foods, basic clothing, gas and oil (Baras et al., 2014).

**Innovative products:** Unlike functional products, innovative product design and production processes are more complex. It starts by targeting narrow customer expectations and fulfilling the niche need (Celikkol et al., 2021). Moreover, sometimes it satisfies customers' needs that are yet to articulate. It usually has a premium price, which could increase the profit (Gilaninia et al., 2011). It has a high-profit margin, a short product life cycle and greater variety, leading to increased unpredictability (Ambe, 2012). When an innovative product launches in the market and become successful, the demand grows, and competitors emerge, leading the innovative products to become standard products where quality and cost are dominant characteristics. Consequently, this constantly forces the original manufacturer to interact with customers to develop new ideas to drive steady the stream of new and enhanced product types (Gilaninia et al., 2011).

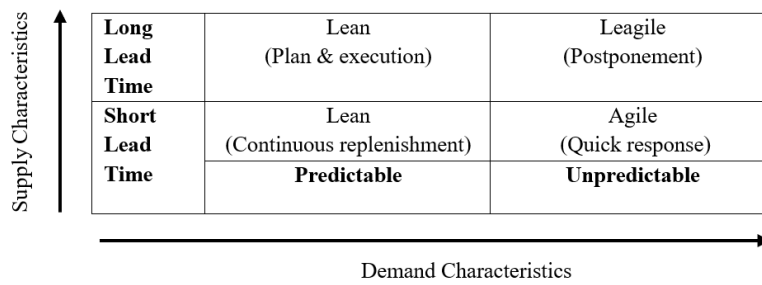
**Hybrid products:** a complex product made of a combination of functional and innovative components (Gilaninia et al., 2011). It has a long product life cycle with some innovation. The manufacturer can adopt either LSC or ASC. It will depend on which part the manufacturer will manufacture or from whom will source the part and under what conditions (Celikkol et al., 2021).

Market expectation is one of the decision parameters for firms to decide which supply chain strategy to follow. Lean and agile supply chains differ in response to market expectations (Celikkol et al., 2021).



**Figure 3.** Strategic placement of lean and agile based on production criterion (Nandy & Habib, 2022)

As the above figure shows, when a firm offers fewer product varieties and low volume, LSC is the appropriate strategy to implement. Firm that offers large scale of product varieties in small volume has to adopt the ASC to keep aligning with the changing demand of the customers. When a firm produces a few products and large production scale, adopting the LSC is appropriate. Finally, offering a wide product variety in a large volume, the firm can adopt leagile strategy (Nandy & Habib, 2022).



**Figure 4.** Strategic placement of lean and agile based on demand supply characteristics (Nandy & Habib, 2022)

When the market is stable with a short lead time, the firms adopt the lean approach to replenish the empty shelves continuously. Once more, when the market is stable and customers are willing to wait for the products longer, the lean mechanism is suitable. On the contrary, when the demand frequently fluctuates with a short lead time, firms follow ASC. On the other hand, when it is hard to predict (unpredictable) the demand with a long lead time, it is appropriate for the firms to adopt the leagile strategy to run the supply chain effectively (Nandy & Habib, 2022).

The below table shows comprehensive decision drivers to help in determining the supply chain strategies (Ambe, 2014).

**Table 1.** Decision drivers (Ambe, 2014; Nandy & Habib, 2022)

Supply chain instrument	Elements of supply chain instruments	Lean supply chain	Agile supply chain
Product characteristics	Product type	Functional product	Innovative product
	Lead time of the order	Long	Short
	Demand forecast	Predictable	Unpredictable
	Product variety	Low	High
	Product life cycle	Long	Short
	Profit margin	Low	High

Manufacturing characteristics	Market segment	Serve the existing market segment	Come up with new products to enter new markets
	Manufacturing approach	Push System	Pull System
	Manufacturing strategies	MTS	ATO, MTO, ETO
	Production process	Mass production (Standardised product)	Customised products
Supply chain's decision drivers	Production	- Few central factories - Low excess capacity - Narrow focus	- Multiple small factories - Excess capacity - Flexible manufacturing
	Location	Few central locations	Many locations
	Inventory	Level of inventory is low	Level of inventory is high
	Pricing	Based on volume	Based on margins
	Transportation	- Large and few shipments - Use cheap and slow mode of transport	- Shipment is done frequently - Use flexible and fast mode of transport
	Sourcing	The criteria of supplier's selection are based on low prices	The criteria of supplier's selection are based on high service level

## Conclusion

The firms must study the market environment and apply a suitable supply chain strategy to survive. Two prominent and well-known strategies have been discussed, which are lean and agile supply chain strategies. The hybrid of these two strategies is called leagile. LSC concept is associated with cost reduction through eliminating the non-value-added activities within the chain. The ASC concept is associated with a quick response to the volatile market demand and leagility concept that helps firms exploit market opportunities better than adopting only one supply chain strategy. Firms must understand and categorise their product type and target market and choose the suitable supply chain strategy. Choosing the best supply chain strategy requires various aspects to consider. The paper discussed product classification, production criteria, and demand characteristics. The supply chain drivers have been outlined, which are product characteristics such as type, variety, profit margin and life cycle, manufacturing characteristics such as market segment, approach (push and pull), and techniques (MTS, MTO, ATO, and ETO) and decision drivers such as location, inventory, pricing, transportation and sourcing.

## Limitations

- The time factor is very important because it affects the quality of the research. In this study, the researcher encountered a problem about the time, as the time was very short, and the researcher was unable to collect a lot of information from different sources.
- Inherent limitations associated with any single study provide avenues for future research. This paper uses a qualitative approach. Therefore, one direction consists of empirically testing the generalizability of the proposed findings. Further research using a quantitative approach to study would be desirable regarding companies making use of lean and agile supply chain strategies or even leagile strategies.

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