

Review Paper:

Design an ideal supply chain strategy

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Abstract

This is a review paper to find out the best approach for the firm to design an ideal supply chain strategy that aims at gaining sustainable competitive advantages in the era of globalization today. There are various arguments about what an ideal supply chain is. That can be an efficient and responsive supply chain, a supply chain with five objectives (quality, speed, dependability, flexibility and cost), a supply chain using the lean systems approach, a Triple-A supply chain or a supply chain towards sustainability. It is found that expectations in objectives of each approach have become higher and higher over time respectively.

Among these approaches, the idea of Lee⁹ with a Triple-A supply chain proved to be more progressive than others at the aspect of alignment in the supply chain that were divided into three types (alignment of information, alignment of identities and alignment of incentives). However, in comparison with a Triple-A supply chain with the characteristic of agility, lean planning and control seems to be more suitable than agile planning and control in case of potential capacity stability and low demand uncertainty. Finally, one noticeable thing is that despite which approach, the first vital pre-requisite for a firm to achieve an ideal supply chain is an integrated supply chain.

Keywords: Ideal supply chain, Triple-A supply chain, lean supply chain, integrated supply chain, sustainability.

Introduction

Until now several approaches have been suggested to set up successful supply chains by different researchers. The purpose of this paper is to find out the best approach for firms to design an ideal supply chain strategy. An ideal supply chain is defined as a supply chain that brings firms sustainable competitive advantages containing both short-term and long-term competitive advantages.

First, various approaches or ideas in designing an ideal supply chain strategy are reviewed. They, in turn, are an efficient and responsive supply chain, a supply chain with five objectives (quality, speed, dependability, flexibility and cost), a supply chain using the lean systems approach, a Triple-A supply chain and a supply chain towards sustainability. After that, the paper analyzes the vital pre-

requisite for building up an ideal supply chain that is designing an integrated supply chain. Finally the best approach is suggested for firms to adopt towards an ideal supply chain.

Methodology

There have been different approaches for designing an ideal supply chain.

1. Design an efficient and responsive supply chain:

Fisher¹ suggested that in order to devise an ideal supply-chain strategy, companies should follow three steps. The first step is determining whether their products are functional or innovative. While the demand of functional products is predictable, companies cope with unpredictable demand for innovative products. Various aspects of demand including product life cycle, contribution margins, product variety, forecast errors, stock out rate, end-of-season markdown and lead time should be considered in realizing which type products are belong to.

For example, functional products are characterized by much longer life cycle than innovative ones (more than 2 years compared with from 3 months to 1 year)¹. The second step is that managers in the firm decide to design a supply chain towards physical efficiency or responsiveness to the market. Finally, Fisher¹ recommended that managers should use a matrix (Table 1) to discover whether there is a good match between the company's supply chain priorities and the product type so that they can formulate an ideal supply chain strategy.

Also, Fisher¹ noted that in the real world, the mismatch due to an efficient process for innovative products is more popular than that due to a responsive process for functional products. He suggested that if the company wanted to get out of the former type of mismatch, managers should make its products functional or make its supply chain responsive depending on the profitability of products.

To sum up, Fisher¹ focused on cost and speed in designing an ideal supply chain.

2. Design a supply chain with five objectives (quality, speed, dependability, flexibility and cost): Being different from the suggestion of Fisher¹, Slack et al¹³ proposed that beside speed and cost, other aspects (quality, dependability and flexibility) also play important roles in creating a successful supply chain.

In the year of 1998, Slack et al¹² emphasized on important roles of five features that consisted of quality, speed,

dependability, flexibility and cost for the operations function in gaining an operations-based advantage. After that, Slack et al¹⁵ continued to assert that in order to achieve the objective of satisfying the needs of the end customers in supply chain management, the supply chain needs to provide “appropriate products and services when they are needed, at a competitive cost”, that is directly related to these five operations performance objectives.

Specifically, the quality of a product or service depends on the quality performance of each operation in the supply chain. Speed may be measured by the waiting time customers can be served or the time moving goods and services through the chain. Dependability can be shown through ‘on-time’ delivery with sufficient quantity of products and services delivered. Flexibility reflects the ability to cope with changes and disturbances. Lastly, keeping costs at a competitive level is also one of essential operations performance objectives because incurred costs derive from not only transforming inputs into outputs in each operation, but also doing business between operations in the supply chain, that are usually called as transaction costs such as costs for setting up contractual arrangements or transporting products between operations¹³.

3. Design a supply chain using the lean systems approach:

The term lean production system was first introduced in the research of Krafcik⁵. This system was characterized by keeping the minimum levels of inventory as well as assuring production process continuously to reduce cost and maintain product quality⁵. After that, this term has become more and more popular in literature of operations management. Krajewski et al⁷ defined lean systems as operations systems following the objectives of removing waste and delays from activities of a firm to maximize the firm value, and including “operations strategy, process design, quality management, constraint management, layout design, supply chain design and technology and inventory management”. Slack et al¹⁴ supported this idea when they mentioned the concept of lean synchronization with the aim of satisfying demand instantaneously, achieving perfect quality and no waste.

It is noticeable that Krajewski et al⁷ affirmed that the philosophy of lean systems was applicable not only at the process level, but also at the supply chain level. Therefore, designing a supply chain using the lean systems approach emphasizes on cost, quality, speed and dependability by getting rid of wasted time and activity. Krajewski et al⁷ suggested two supply chain considerations in lean systems that were close supplier ties in order to keep lean systems in low levels of capacity slack or inventory and small lot sizes to decrease the average inventory level, avoid overproduction or attain a uniform workload on the system.

Toyota Production System (TPS) is an example for utilizing lean systems approach. TPS pursues the aims of highest quality, lowest cost, no waste, and shortest lead

time with the supports of Just In Time (JIT) system to reduce inventory level and non-value-added activities along with Jidoka, a visual management system to always guarantee the quality of products meeting customers’ expectations within the culture of continuous improvement¹⁵. The lean systems approach proved its benefit in gaining competitive advantage for the company through the research of Sakakibara et al¹¹ when these authors found that there was a significant relationship between the combined set of JIT and infrastructure practices (quality management, work force management, manufacturing strategy, organizational characteristics, product design) and manufacturing performance that then would influence on competitive advantage at plant level positively.

However, in practice, the failure rates of lean implementation were too high because it was too hard to meet all expectations of lean synchronization, too expensive to put this approach into operation and too resource-intensive⁴. Therefore, in order to implement a lean system successfully, managers should reconsider human costs to relieve worker stress, cooperation and trust between employers and employees in the organization, reward systems, labor classifications, the existing process layouts and aspects related to inventory such as scheduling, setups, purchasing or logistics⁷.

4. Design a Triple-A supply chain: Contrary to the idea of Fisher¹, Lee⁹ found that the performance of companies’ supply chains which focused on greater speed and cost-effectiveness got worse and decreased the consumer satisfaction with product availability over the period. Thus, this declined the competitive advantages for the companies. From that Lee⁹ proposed the definition of the Triple-A supply chain.

Lee⁹ suggested that in order to create a successful supply chain, it needs to be the Triple-A supply chain that possess there organizational capabilities involving agility, adaptability and alignment (Figure 1). While agility is the quick response to temporary changes in demand or supply, adaptability means the ability to restructure the supply chain in the face of long-term changes in markets. In terms of alignment, its objective is to generate motivation for all participating partners in improving the supply chain’s performance by aligning the benefits of all the partners in the supply network.

The key difference between the suggestion of Slack et al¹³ and that of Lee⁹ in designing a supply chain is the characteristic of alignment in the supply chain. Lee⁹ proposed three types of alignment comprising alignment of information, alignment of identities such as roles, tasks plus responsibilities and alignment of incentives that contain not only gains but also risks along with costs. These three forms of alignment need to be established in a supply chain

so that activities of all partners in the supply chain benefit the entire supply chain's performance.

The idea of Narayanan and Raman¹⁰ was similar to that of Lee⁹ when they realized that the fact of misaligned incentives due to hidden actions, hidden information or badly designed incentives, could result in "excess inventory, stock-outs, incorrect forecasts, inadequate sale efforts and poor customer service", from that the supply chain's performance would not be optimized. Thus, three types of solutions (contract based, information based, and trust based) were put forward in descending order to redesign incentives in the supply chain after the firm acknowledged the existence of incentive problems as well as its causes.

Whitten et al¹⁸ examined the Triple-A supply chain model that Lee⁹ constructed empirically based on a sample of 132 supply chain professionals from the manufacturing sector in the United States with the support in collecting data of APICS. They found that when a supply chain is agile, adaptable and aligned, its performance will be improved considerably. This leads to the improvement of marketing performance that then enhances financial performance of the organization (Figure 2). From that, the research results of Whitten et al¹⁸ proved the great significance of Lee⁹'s study. The role of the Triple-A supply chain with three capabilities (agility, adaptation and alignment) is more emphasized in the relationship with two aspects of organizational performance (marketing performance and financial performance). In particular, thanks to Triple-A supply chain strategy impacts positively on both marketing performance and financial performance of the organization; but it is in the direct relationship with marketing performance and in the indirect relationship with financial performance through marketing performance.

5. Design a supply chain towards sustainability: The definition of sustainable development first appeared in the Report of the World Commission on Environment and Development in 1987. It was defined as a development that meets "the needs of the present without compromising the ability of future generations to meet their own needs"¹⁶. According to Agenda 21, the progress towards achieving sustainable development of each country could be monitored and evaluated by measuring three dimensions (economy, society and environment)¹⁷. Together with this trend, Krajewski et al⁸ suggested that it was necessary for companies to design their supply chains towards sustainability with three elements namely financial responsibility, environmental responsibility and social responsibility.

While financial responsibility was related to financial needs of stakeholders, environmental responsibility was preserving natural resources and dealing with ecological needs of the world and social responsibility was associated with morality, ethicality and philanthropy in the society⁸.

Among these three elements, environmental and social impacts of each supply chain have been concerned more and more in recent years. When confronting environmental concerns, a closed-loop supply chain could be designed by integrating forward logistics with reverse logistics to manage products throughout their life cycles⁸. Regarding social responsibility, firms can engage in humanitarian logistics operations in which supply chain managers play a vital role in disaster relief operations and exploring ethical issues of the relationship between buyers and suppliers, of locating facilities and of managing inventories⁸.

However, a noticeable thing is that in order to build up a supply chain containing five operations performance objectives as the suggestion of Slack et al¹³, or a supply chain using the lean systems approach as the opinion of Krajewski et al⁷, or a Triple-A supply chain that Lee⁹ proposed, or a supply chain towards sustainability⁸, the first vital pre-requisite a firm needs to achieve is supply chain integration.

6. Design an integrated supply chain: Supply chain integration is considered as an enabler of supply chain management⁷. Krajewski et al⁷ defined supply chain integration as "the effective coordination of supply chain processes through the seamless flow of information up and down the supply chain". Success in supply chain integration will bring firms considerable competitive advantages because an integrated supply chain can use levers to improve the supply chain performance. In particular, the levers might be sharing data on sales and inventories between partners throughout the supply chain, creating collaboration among activities, reducing lead times that will lead to diminishing bullwhip effect and cutting pipeline inventories, lowering order lot sizes, limiting short supplies to intentional behaviors of customers when they inflate their orders after a prediction of shortage in the future, facilitating the application of lean concepts such as heijunka, standard work methods, 5S practices or total preventive maintenance (TPM) with the purpose of ensuring operational stability, implementing stable pricing programs like everyday low pricing (EDLP) to smooth the demand and forcing each member in the supply chain become more cooperative and trustworthy⁷.

For example, in the 1970s and 1980s, Wal-Mart applied the EDLP policy and gained considerable advantages from this policy such as reducing the bullwhip effect as well as lowering advertising costs in comparison with its competitors³.

However, supply chain integration can be disrupted by unexpected changes in demands or supplies that were classified into external and internal disruptions⁶. The external causes may be changing the quantities of ordered items or the mix of items in an order from customers, or late deliveries and under filled shipments from suppliers; in the meanwhile, generated shortages due to machine

breakdowns or inexperienced workers, changes in designing services or products, applying order batching, introducing new services or products, doing promotions and information errors are examples of internal disruptions.

Therefore, one essential task for supply chain managers to minimize these disruptions is developing “a supply chain with a high degree of functional and organizational integration” in which “new service or product development, supplier relationship, order fulfillment and customer relationship processes, as well as their internal and external linkages, are integrated into the normal business routine”⁷. The case of Wal-Mart will be illustrated to understand how integrated its supply chain was because the supply chain of Wal-Mart has been considered as a major source of competitive advantage for this company that continued to keep the position of the biggest retailer in the world in 2014 (Table 2).

First, new service or product development process involves four stages in the following consecutive order: design, analysis, development and full launch. This process will define requirements of the supply chain and its final purpose is creating new products or services that are suitable with corporate strategy, regulatory standards, competitive capabilities and the needs of intended customers from that guaranteeing the long-term survival of the firm. In case of Wal-Mart, because it is a retailer, this process might be not emphasized compared with other processes. However, Wal-Mart started working directly with local factories to produce Wal-Mart’s private label products in the 1980s and frequently sold them at a significant discount. Surprisingly, Wal-Mart had margins from these merchandises higher than the suppliers’ branded products³.

The second process is supplier relationship process that goes through five nested stages: sourcing, design collaboration, negotiation, buying and information exchange. These stages show the ways or methods to select, monitor together with evaluate upstream suppliers, to collaborate with key suppliers in designing new products or services, to negotiate with them, to purchase products or services and to exchange operating information with them. Regarding Wal-Mart’s situation, it sourced products both locally and globally from the mid-1980s. One advantage to this firm was that most of its largest suppliers were located in the same city as its headquarters, in Bentonville, so it was much convenient for the firm to receive supports from them. In addition, Wal-Mart was very wise in negotiating with its suppliers when it “insisted on a single invoice price and did not pay for cooperative advertising, discounting or distribution”³.

In order to facilitate the information exchange between the firm and its suppliers, Wal-Mart utilized tactics such as Radio Frequency Identification and Vendor Managed Inventories. These tactics not only increased the service

level of suppliers to the firm, but also helped the firm control inventory levels and prevent pilferage⁷.

Next is the order fulfillment process. This process contains processes of customer demand planning, supply planning, production and logistics to produce and deliver products or services to customers. Demand forecasts from the process of customer demand planning is an important input to the supply planning process to create a suitable level of supply. Supply planning process shows how to manage inventories effectively and how to plan and schedule resources under the forecasted demands. From that, production process takes place in the integration with supply-facing and customer-facing processes. Lastly, logistics process considers decisions on ownership, facility location, mode selection, capacity and cross-docking when delivering products or services to customers⁷.

It is noteworthy that Wal-Mart applied concentration strategy with vertical integration in its supply chain when it assumed functions of both a retailer and a distributor, thanks to its largest private truck fleet. In particular, its truck fleet picked up products at the suppliers’ warehouses and shipped to its distribution centers before delivering these products to its stores. Interestingly, in contrast to key competitors, Wal-Mart’s stores were located “in low-rent, suburban areas” and the average distance between a distribution centre and stores was about 130 miles so that a distribution centre could serve a cluster of stores with the purpose of gaining economies of scale³. Thanks to the large fleet of private trucks, advanced information systems and the ability to locate distribution centres together with stores strategically of Wal-Mart, the technique cross-docking showed its effectiveness in reducing costs and lead times, or rising inventory turnover and accelerated cash flow for this company.

The final process in an integrated supply chain is customer relationship process in order “to identify, attract and build relationships with customers and to facilitate the transmission and tracking of orders”⁷. This process needs to involve marketing process that relates to e-commerce technologies, order placement process that receives overwhelming support from the Internet and customer service process that is still in the debate of finding a most appropriate way to assist customers among several options such as human service agents, automated systems, verbal robots or an off shore site.

To this process, Wal-Mart also invested a large amount of money in information systems such as a central database, store-level point-of-sale systems and a satellite network in the mid-1980s or Retail Link in the early 1990s. One special feature of Wal-Mart to build associations with customers was implementing the strategy of “store of the community” where tailored product is mix of each store according to distinct tastes of the community which the store was operating in³. These four processes need to be

integrated together with internal linkages between the firm and its employees, or external linkages among the firm, suppliers and customers.

Wal-Mart always tried to develop internal linkages with its employees by different methods. For instance, it set uniform operating standards to minimize miscommunication among traffic coordinators, truckers and employees in stores, or detailed information about store sales was shared with all employees in meetings every day, or it frequently informed store employees of the latest developments of the firm through satellite network³. External linkages were also attached special importance.

For example, Wal-Mart worked with suppliers on standardizing case sizes and labeling to guarantee the efficient movements through its distribution centres, or on price rollback campaigns to increase sales, or on supply chain strategies from short to medium to long run. Additionally it permitted its suppliers to know sales data on their respective products, thanks to Retail Link database. After that the company adopted the approach of collaborative planning, forecasting and replenishment (CPRF) and vendor-managed inventory (VMI) program with the aim of promoting the integration with its suppliers³.

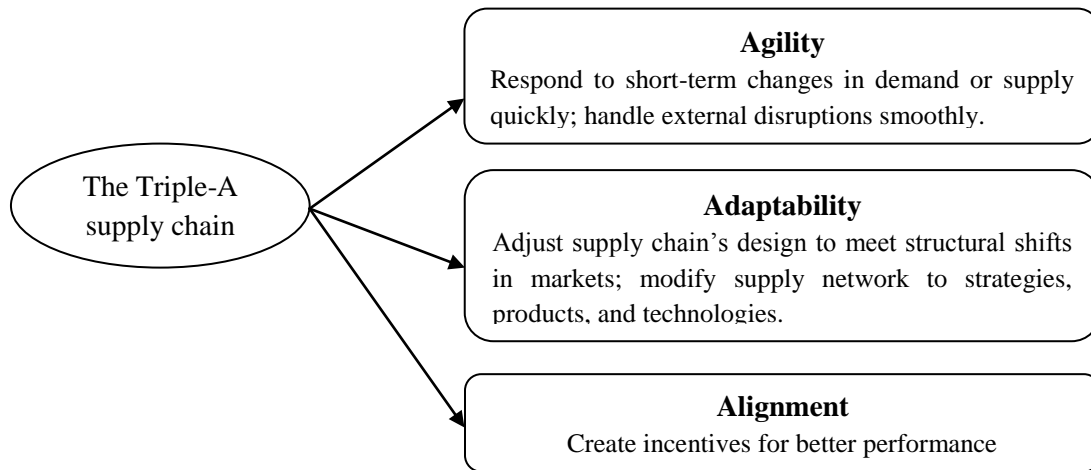


Figure 1: Characteristics of the Triple-A supply chain⁹

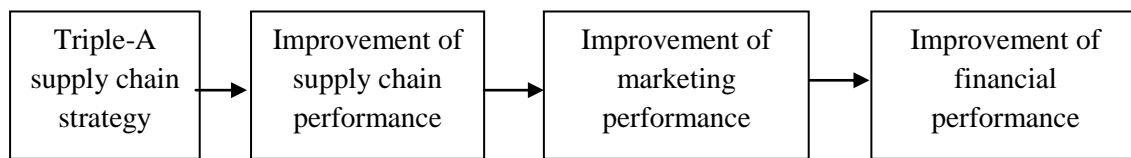


Figure 2: Impact of the Triple-A supply chain on organizational performance¹⁸

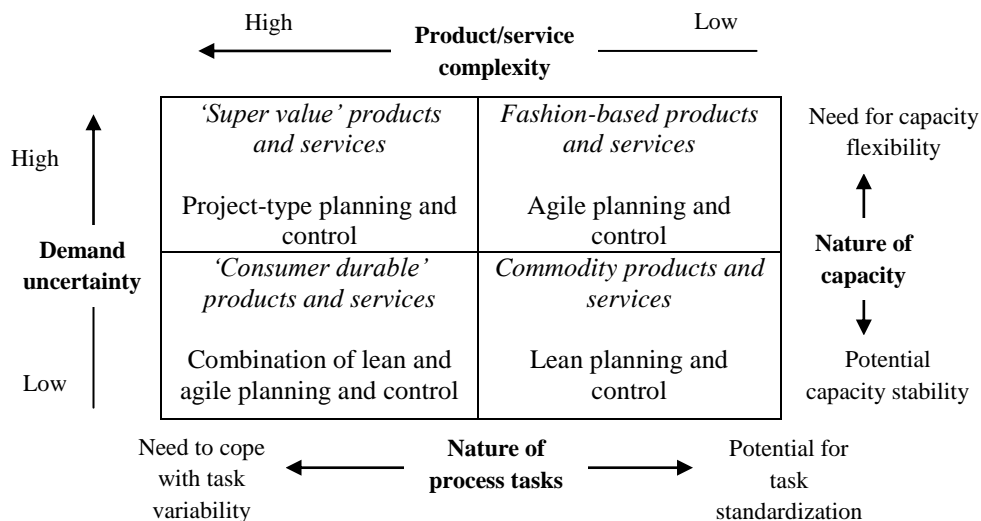


Figure 3: The degree of complexity of products/services and the uncertainty of demand influence the relative emphasis of lean or agile supply-chain principles¹⁴

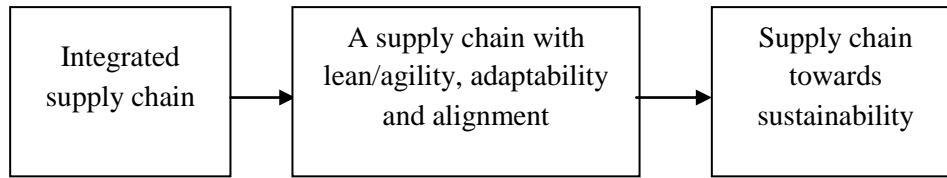


Figure 4: Associations between an integrated supply chain, a supply chain with combination between lean and Triple-A supply chains and a supply chain towards sustainability

**Table 1
Matching supply chains with Products**

	Functional Products	Innovative Products
Efficient supply chain	Match	Mismatch
Responsive supply chain	Mismatch	Match

(Source: Fisher¹)

**Table 2
The biggest retailers of 2014**

Rank	Name of company	Country
01 st	Wal-Mart Stores	United States
02 nd	CVS Caremark	United States
03 rd	Home Depot	United States
04 th	Walgreen	United States
05 th	Target	United States
06 th	Costco Wholesale	United States
07 th	Lowe's	United States
08 th	eBay	United States
09 th	Inditex	Spain
10 th	Richemont	Switzerland

(Source: Forces²)

**Table 3
A summary of different approaches to design an ideal supply chain**

Approach to design an ideal supply chain	Emphasized features
Design an efficient and responsive supply chain ¹	Cost, Speed
Design a supply chain with five objectives (<i>quality, speed, dependability, flexibility and cost</i>) ^{12,13}	Cost, Speed, Quality, Dependability, Flexibility
Design a supply chain using the lean systems approach ^{5,7,11}	Lean (No waste, Cost, Speed, Quality, Dependability)
Design a Triple-A supply chain ⁹	Agility, adaptability and alignment
Design a supply chain towards sustainability ⁸	Financial responsibility, environmental responsibility and social responsibility

Discussion

To sum up, table 3 illustrated various approaches to designing an ideal supply chain. It can be seen that each approach has its own objectives and in order to achieve an

ideal supply chain, expectations in objectives become higher and higher over time.

This paper supports the idea of Lee⁹ who suggested building up a Triple-A supply chain because this approach

was more progressive than others at the aspect of alignment in the supply chain. In 2006, supply chain managers of Wal-Mart faced serious difficulties related to inventory when the firm could not reach the aim of “holding inventory growth to half the level of sales growth” although its supply chain was agile and adaptable³. Therefore, at this time, Wal-Mart should check whether incentive problems existed in its supply chain.

Another illustration for nonalignment is Cisco’s situation in 2001. Regardless of having an agile and adaptable supply chain, Cisco still faced inventory problems because of independent relationship between the production level of contractors with the demand for Cisco’s products that was the result of the misalignment of interests between Cisco and its contractors⁹. Thus, it is essential to combine three characteristics (agility, adaptability and alignment) to reach to an ideal supply chain.

In addition, advantages of designing a supply chain using the lean systems approach are undeniable through the success of Toyota Motor Corporation. While this approach goes towards lean supply chains, the approach of the Triple-A supply chain calls attention to agile supply chains. Slack et al¹⁴ proposed that implementing lean or agile supply chains would depend on the complexity of product or service, the nature of capacity, the nature of process tasks and the level of demand uncertainty (Figure 3). Figure 3 shows that agile planning and control should be done when the supply chain needs to obtain capacity flexibility and the demand uncertainty is high and it is appropriate to fashion-based products and services. In the meanwhile, lean planning and control is more suitable for commodity products and services with potential capacity stability and low demand uncertainty.

It is interesting that it is possible to combine lean and agile planning and control for ‘consumer durable’ products and services when the firm needs to cope with task variability, high product/service complexity but preserves capacity stability and faces low demand uncertainty. However, the disadvantage of designing lean supply chains is ignoring adaptability and alignment in its objectives. This might be the main reason why failures for companies applying lean supply chains occurred. For instance, in 2002, because Toyota did not adapt its distribution system to the product, the company incurred losses from the product’s failure with stock-outs in Northern California, but excess inventory in the Southeast⁹.

Therefore, this paper recommends the combination between the approach of designing a supply chain using the lean systems approach and that of designing a Triple-A supply chain. It means that an ideal supply chain should contain three characteristics: *lean or agility*, *adaptability*, along with *alignment*. This supply chain design would help to improve not only manufacturing performance as the study of Sakakibara et al¹¹ but also financial performance and marketing performance as the research results of

Whitten et al.¹⁸ From that it would lead to competitive advantages in both the short term and the long term for the company.

Finally, a relationship between an integrated supply chain, a supply chain with lean/agility, adaptability and alignment and a supply chain towards sustainability is proposed as the illustration of the figure 4. It can be seen that a supply chain with three characteristics (lean/agility, adaptability and alignment) will be an ideal supply chain that is developed from an integrated supply chain and facilitate establishment of a supply chain towards sustainability.

Conclusion

This paper presents various approaches to designing an ideal supply chain strategy. Despite which approach, an integrated supply chain will be the necessary condition for an ideal supply chain. Therefore, the paper analyzes the structure of an integrated supply chain with the case of Wal-Mart as an illustration to confirm that the more integrated a supply chain is, the greater improvement the supply chain performance secures. Lastly, it is recommended that if a firm wishes to create a successful supply chain that boosts both short-term and long-term competitive advantages, it should design its supply chains towards a supply chain with three capabilities including lean/agility, adaptability and alignment.

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