INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

www.hrmars.com
ISSN: 2222-6990

Collaborative, Planning, Forecasting and Replenishment in Orchid Supply Chain: A Conceptual Model

Mohd Rizaimy Shaharudin, Chattrarat Hotrawaisaya, Nik Ramli Nik Abdul Rashid, Supamit Srisawat, Khairul Azfar Adzahar

To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v11-i11/11289 DOI:10.6007/IJARBSS/v11-i11/11289

Received: *04* September *2021,* ***Revised:*** *30* October *2021,* ***Accepted:*** *18* October *2021*

Published Online: 01 November 2021

In-Text Citation: (Shaharudin et al., 2021)

To Cite this Article: Shaharudin, M. R., Hotrawaisaya, C., Rashid, N. R. N. A., Srisawat, S., & Adzahar, K. A. (2021). Collaborative, Planning, Forecasting and Replenishment in Orchid Supply Chain: A Conceptual Model. *International Journal of Academic Research in Business and Social Sciences*, *11*(11), 1459–1468.

Vol. 11, No. 11, 2021, Pg. 1459 – 1468

http://hrmars.com/index.php/pages/detail/IJARBSS | **JOURNAL HOMEPAGE**

INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES
www.hrmars.com
ISSN: 2222-6990

Collaborative, Planning, Forecasting and Replenishment in Orchid Supply Chain: A Conceptual Model

Mohd Rizaimy Shaharudin[1], Chattrarat Hotrawaisaya[2], Nik Ramli Nik Abdul Rashid[3], Supamit Srisawat[4], Khairul Azfar Adzahar[5]

[1]Smart Manufacturing Research Institute (SMRI) Kompleks Kejuruteraan Sultan Abdul Halim Syah, Fakulti Kejuruteraan Mekanikal, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia, [2]College of Logistics and Supply Chain, Suan Sunandha Rajabhat University, Thailand, [3]Faculty of Business and Management Universiti Teknologi MARA, Kedah, Malaysia, [4]College of Logistics and Supply Chain, Suan Sunandha Rajabhat University, Thailand, [5]Faculty of Business and Management Universiti Teknologi MARA, Kedah, Malaysia.

Email: rizaimy@uitm.edu.my, chattrarat.ho@ssru.ac.th, nikramli@uitm.edu.my, supamit.sr@ssru.ac.th, azfar938@uitm.edu.my

Abstract

This study aims to develop the extended Collaborative, Planning, Forecasting, and Replenishment model for the orchid supply chain. Orchid is a perishable item with high value and a profitable business in Thailand. The Collaborative, Planning, Forecasting and Replenishment model was found as one of the critical elements that can influence the orchid supply chain to improve the Thai exporting orchid processes and maintain Thailand's position as the world's leader in orchid exporting. Nevertheless, the nature of the orchid supply chain, which differs from other manufactured goods, is challenging in adapting the Collaborative, Planning, Forecasting, and Replenishment model to the peculiarities of perishable commodities. The study proposed an extended Collaborative, Planning, Forecasting, and Replenishment model for the orchid supply chain. The model implied that supply chain collaboration (information sharing) would impact the Collaborative, Planning, Forecasting, and Replenishment process (planning, forecasting, replenishment process), on which both constructs will lead to the supply chain visibility and eventually attain the supply chain performance. The study also incorporates performance measures using the Supply Chain Operations Reference model to measure the firm’s supply chain performance in the orchid industry and reflects a holistic approach to assess the performance in the value chain. Future research should focus on identifying new factors that might help enhance the expanded Collaborative, Planning, Forecasting, and Replenishment model for orchid and other agricultural products by considering the various perishable features of product flow in the upstream and downstream supply chains.

Keywords: CPFR, Orchid, Supply Chain, SCOR Model

Introduction

Thailand is one of the top ten orchid exporters in the world. Exporting orchid competition has gotten fierce recently, as the world's worth of orchids has risen, allowing newcomers to enter the orchid market while the economy has a low purchasing power parity. Excessive technology and globalization, imprecise demand planning, mistake forecasting, and poor communication, on the other hand, may have an impact on all value chain positions, resulting in out-of-stock, lead time fluctuations, and high costs and expenditures. Furthermore, aggressive competition is on the rise, particularly in perishable goods with multi-country import-export. As a result, it's critical to study the elements that influence orchid exporting to improve Thai orchid procedures and become the world's leading exporter of orchids.

The Netherlands is the world's leading orchid exporter, accounting for 39.67% of the global orchid market, followed by Thailand (28.41%), Taiwan (10%), Singapore (10%), and New Zealand (10%). (6 percent). Japan (30%), the United Kingdom (12%), Italy (10%), France (7%), and the United States (7%) are the largest importers (6 percent). The world's entire orchid cut flower commerce is dominated by Dendrobium species, with just 15% of Phalaenopsis and Cymbidium species, and Asia is the primary source of orchids for the global market (Cheamuangphan et al., 2013).

Currently, exporting orchids has become a very competitive industry due to the high worldwide value of orchids, which had spurred newcomers to enter the orchid industry and the poor purchasing power parity in the economy. Japan and Singapore are the two biggest orchid markets in Asia. In 2008, Japan's total orchid imports totaled US$ 57.4 million, making it the world's largest orchid importer. Thailand, Taiwan, New Zealand, and Malaysia are the primary sources of these imports, accounting for up to 96.5 percent of Japan's total orchid imports in 2008. Singapore imported US$ 6.5 million worth of fresh orchids in 2007, with Malaysia, Thailand, and Taiwan providing the majority of the country's imports (Singh, 2020).

According to the data, China, Japan, the United States, Italy, and India were the top five exporters of orchids. When it came to orchid exporting in Japan, the pricing has been favorable since the orchid was of excellent quality; however, the quantity, low price, and quality were highlighted in China. Thailand was one of the top 10 exporters in the world. Three to four years ago, China imported at least 70% of orchids from Thailand, resulting in a high level of competition and allowing farmers to sell orchid flowers at a higher price. In China, cutting orchid flowers and dendrobium pots was popular; however, distribution channels in China, like Pakklong Market in Bangkok, preferred middle grade and larger quantities. China imported orchids to the central market, such as Shanghai and Guangzhou. In addition, China would order orchids from Thailand throughout the year, particularly on National Day, Chinese New Year, and Chinese Middle Festival, when demand was higher and buyers were less willing to bargain. In the past, the orchid market in China was attractive to many countries, including Malaysia and Singapore, and Taiwan invested in growing orchid in China's frigid cities; nevertheless, the Thai orchid industry was distinct, with pricing competition between Thai merchants resulting in a loss (Hotrawaisaya et al., 2020).

Nonetheless, production costs had risen, and competitors had outperformed them in terms of technology and utility. As a result, it was critical to research the elements that influence orchid exporting to determine the best course of action for improving Thai exporting orchid processes while maintaining Thailand's position as the world's leader in orchid exporting. According to Hotrawaisaya et al (2014), forecast accuracy for logistics cooperation between orchid farmers and exporters produced better outcomes with fewer stock-out errors than non-logistics collaboration firms. In this regard, the Collaborative Planning, Forecasting and Replenishment (CPFR) model has yet to be established in a whole agricultural product supply chain, such as the orchid sector. Only Du et al (2009) proposed establishing a procurement model for agricultural products using a framework of the CPFR model. Considering the biological nature of agricultural raw resources and products and their seasonality and perishability, there is a need to develop an effective extended CPFR model that is used to support the orchid products characteristics (Hotrawaisaya et al., 2020).

CPFR is an approach for improving corporate efficiency and performance, such as data exchange accuracy, low costs, and high profitability, and reducing supply chain unpredictability. The CPFR model has yet to be established in a complete agricultural product supply chain, such as the orchid sector. This work updates the existing CPFR model by taking into consideration the biological nature, seasonality, and perishability of the agricultural raw resources and products. Because orchid is a perishable item with high value and profit in Thailand, this study focuses on developing collaboration in the orchid supply chain, which differs from other manufactured goods due to the complex environment of adapting the CPFR model to the peculiarities of perishable commodities. As such, this study aims to develop the extended model of CPFR for the orchid supply chain. The study is structured by deliberating the literature review in the next section. Subsequently, the study discussed the methodology with findings are presented in the next section. The study ends with a conclusion in the last section of the paper.

Literature Review

Supply Chain Performance

The previous study looks at the relevance of adaptive supply chain performance in meeting the demands of today's dynamic and ever-changing market needs, as well as supply network performance improvements. Despite the abundance of publications emphasizing the need for measurement and providing methodologies and processes, they found that there is still a lack of a comprehensive system that can link strategy and performance. They proposed a performance measurement framework that can help companies identify, evaluate, and monitor the key areas. This circumstance can help them maintain their supply chain's pace and speed after determining the essential characteristics, attributes, and activities of a supply chain, as well as the performance that contributes to attrition (Georgise et al., 2012).

Regardless, there are two sorts of supply chain performance indicators: qualitative (such as customer satisfaction and product quality) and quantitative (such as cost) (such as order-to-delivery lead time, supply chain response time, flexibility, resource utilization, delivery performance, etc.). Improving supply chain efficiency involves a multi-faceted approach that considers how the firm will satisfy a wide range of consumer demands. While performance indicators may be similar, the exact performance targets for each section may be vastly different.

The features of supply chain performance may be assessed from several perspectives in this regard. The supply chain performance based on the Supply Chain Operations Reference (SCOR) model has been recognized as a good fit for measures that aren't restricted to a single firm (Leoczuk, 2016). The SCOR Model establishes a framework for evaluating supply chain efficiency in primary functional features across four distinct operation domains: source, plan, make, and deliver. There are five fundamental key performance indicators for each operational domain (KPIs) (Georgise et al., 2012).

Supply chain dependability refers to a company's ability to deliver the right product to the right place at the right time, in the proper condition and packaging, in the correct quantity, with the appropriate documentation, and to the right client. The next step is to assess supply chain responsiveness by measuring how soon a supply chain delivers items to a customer. The next metric to look at is supply chain flexibility, which is concerned with a supply chain's capacity to adapt to market changes to gain or maintain a competitive advantage. Another key measure for assessing supply network performance is supply chain expenses. Its main objective is to figure out what the costs of supply chain activities are. Finally, supply chain asset management and performance are evaluated based on their effectiveness in managing assets to enhance demand satisfaction. As a result, the research measured supply chain performance using five performance attributes: dependability, responsiveness, flexibility, cost, and asset management efficiency (Ganga & Carpinetti, 2011).

Collaboration

Collaboration is when two or more firms work together to acquire a competitive advantage that they would not achieve if they worked alone (Kubde & Bansod, 2010). Collaboration in the supply chain can take various forms, but the end aim is always the same: to create a clear, observable demand pattern that keeps the supply chain on track (Holweg et al., 2005). There are two forms of supply chain collaboration that might happen: vertical and horizontal. Customers, internal (across functions), and external (suppliers) cooperation are examples of vertical collaboration. Horizontal cooperation can take several forms, including collaboration with rivals, internal teamwork, and cooperation with non-competitors, such as sharing production capacity (Simatupang & Sridharan, 2002). Supply chain management covers a wide variety of planning and managing down-stream, transformation, and upper-stream operations, from buying through manufacturing to logistics management. It also demands good coordination and collaboration with all network participants, including suppliers, merchants, service providers, and customers. In another way, supply chain management integrates channel partners to organize sales and demand (CSCMP, 2021).

The manufacturer, seller, buyer, and retailer collaborate on four activities to improve their performance in the retail industry, including strategy and planning to establish the ground rules for the collaborative relationship through product mix and placement, as well as the development of event plans for the period. The following step is connected to demand and supply management; consumer (point-of-sale) demand, and order and shipping needs across the planning horizon. The order execution process includes preparing and delivering shipments, receiving and placing items on store shelves, documenting sales transactions, and processing payments. Finally, analysis monitors planning and execution activities in collaborative networks for exception situations, calculates key performance indicators, provides insights, and changes plans for continuously improved results, all based on aggregate results.

Collaborative Planning, Forecasting, and Replenishment (CPFR) Process
The Voluntary Inter-Industry Commerce Standards (VICS) Association trademarked Collaborative Planning, Forecasting, and Replenishment (CPFR), a supply chain integration concept that promotes and facilitates cooperative operations. CPFR attempts to accomplish joint inventory management by collaboration and replenishment of items along the supply chain. Information exchanged between suppliers and retailers assists in planning and meeting customer demands thanks to a supported system of shared information. Continuous inventory and demand updates are now possible, resulting in a more efficient end-to-end supply chain process. Lowering merchandising, inventory, logistics, and transportation costs across all trade partners is how efficiency is accomplished.

A study conducted by Caridi et al (2006) on the CPFR process using a simulation tool that focused on agents in the same supply chain and found that most of them had participated in exchanging sales and order projections. The benefits of the CPFR method, according to their research, include cost, inventory and stock-out reduction, and sales reduction of trading partners in the same supply chain. Danese (2007) discovered that CPFR might be adjusted for use in a wide range of industries. The essential six aspects investigated in the seven case studies that are distinct from sectors are as follows: CPFR aims, product and market characteristics, supply network physical and relational structure, and CPFR growth stage. Chen and Lin discovered that CPFR is ineffective in general processes and lacks specific detail activities. As a result, CPFR deployment might be challenging at times (2004). The modified CPFR process model to agricultural products by Du and et al (2009) which reduced inventory variations and increased service level.

Finally, Pfeifer et al (2008) described three CPFR processes among retailers, manufacturers, and suppliers: collaborative planning, forecasting, and replenishment. The method was created for the retail business and presented in great detail for the automotive industry. Inventory reduction and improved visibility inside the supply chain are two of the key benefits of CPFR. Despite its success in the manufacturing industry, CPFR is still limited in implementing the agriculture sector. The extended CPFR necessitates process champions consumer-based forecasting in light of the distinct characteristics of agriculture products. It should assist trading partners in improving the effectiveness and efficiency of promotions by implementing strategic learning that addresses consumer needs, competitive learning, and market factors for the orchid supply chain. CFPLR should serve as a critical road map for execution across the supply chain, from warehouse to shelf. It can be used to keep plans moving forward while accounting for changes, modifications, and exceptions. The performance metrics gathered are used to inform future plan development.

Visibility
Visibility in the supply chain refers to the extent to which supply chain participants may access and communicate information critical to operations and for the expected advantages of the parties in cooperation. By exchanging information, companies may enhance their supply chain performance (Barrat & Oke, 2007). According to a study by Wei and Wang (2010), supply chain visibility is essential for enhancing supply chain performance. Furthermore,

supply chain visibility is influenced by several aspects, including learning, coordinating, and integrating (Lee et al., 2014). Another study by Holcomb et al (2011) found that increasing exposure does not necessarily translate to improved sales, revenue, or competitiveness, and just a few attributes boost the business performance.

In this sense, CPFR aspires to establish cooperative inventory management through shared visibility and product replenishment across the supply chain. Information exchanged between suppliers and retailers assists in planning and meeting customer demands thanks to a supported system of shared information. Continuous inventory and demand updates are now possible, resulting in a more efficient end-to-end supply chain process. Lowering merchandising, inventory, logistics, and transportation costs across all trade partners is how efficiency is accomplished.

Development of Theoretical Framework

The extended model for the orchid supply chain is based on the CPFR in the retail sector with detailed modification from the automotive industry to achieve significant benefits in the supply chain. The CPFR processes include planning, forecasting, and replenishment. However, the past literature was inconsistent in explaining the CPFR steps and processes. Moreover, the existing CPFR model lacks support for the orchid products supply chain because the characteristics of the products are different from the other manufactured products.

The expanded CPFR model combines data and information exchange in supply chain operations such as order planning, inventory management, manufacturing, transportation, delivery, and cooperation in supply chain activities utilizing information technology. All stakeholders in the orchid supply chain should agree to participate in a crucial supply chain procedure in this context. They need to improve mutual efficiency and satisfy end customers by exchanging dynamic information, focusing on common goals and metrics, and remaining dedicated to the CPFR process. In this case, they should realize that this cooperation will necessitate several business procedures and technical and organizational changes. They should devote the resources necessary to implement these changes to effective collaboration and fulfill mutual goals. Out-of-stocks should be reduced, sales should be increased, business transaction costs should be reduced, capital efficiency (particularly in inventory) should be improved, and trade partner connections should be made easier. The combined business strategy, sales projection, and order forecast are all examples of collaboration points (Kubde & Bansod, 2010).

Furthermore, a previous study also revealed that vast information sharing and cooperative decision-making in CPFR processes could improve visibility in the supply chain. The importance of visibility in ensuring product flow cannot be overstated, as today's consumers want items of the highest quality and freshness worth possible (Lekstutis & Rajah, 2020). This is especially true for orchids, where the requirement to capture every point that a product passes on its journey to the shelf is necessitated by the strict inspections and procedures implemented by trading companies in the business.

Generally, firms will be able to identify any gaps, strengths, and areas for improvement by enhanced the supply chain visibility. With this ability, firms are expected to improved their supply chain performance through enhancing the reliability and lower cost of managing the supply chain. Therefore, improving supply chain performance may necessitate a multi-faceted approach that considers how the company will meet a variety of consumer expectations.

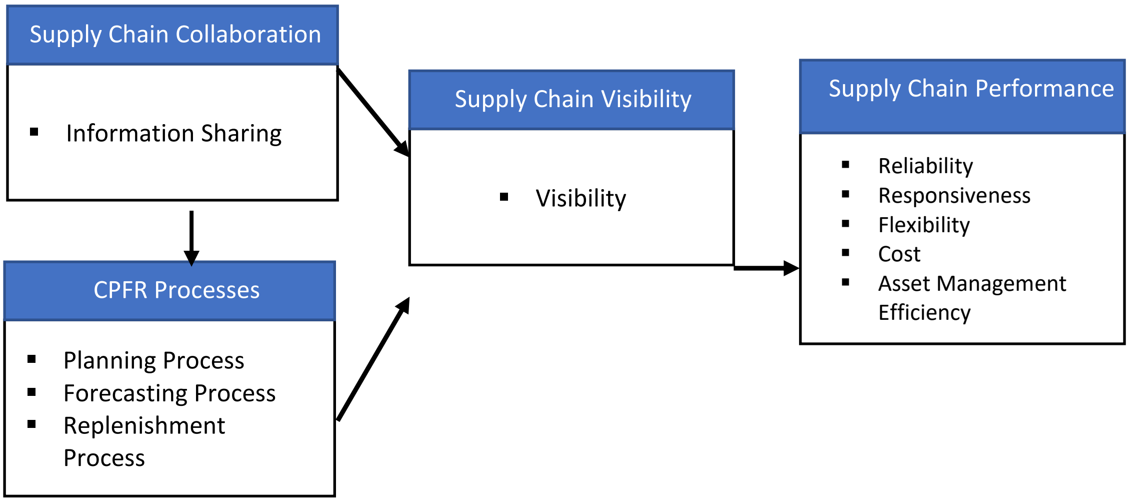

Figure 1. Extended CPFR Model

As shown in Figure 1, the proposed extended CPFR model for orchid supply chain signified that supply chain collaboration (information sharing) impacted the CPFR process (planning, forecasting, replenishment process), on which both constructs influenced the supply chain visibility and eventually affected the supply chain performance (reliability, responsiveness, flexibility, cost, asset management efficiency). Through the lens of Relational View Theory (RBT), partnering in supply chain collaboration allow firms to obtain the significant resources and capabilities which they may otherwise absence in their own organization (Lee et al., 2014). Nevertheless, the relational effects can only be materialized if the partners adequately matched with the systems and cultures that can support for the collaborated works (Buono & Bowditch, 1989). In this context, RBT provides the underpinning explanation that through the effects of partnerships, both parties are able to grasp the benefits of combining, exchanging and investing in the assets, knowledge, and resources or capabilities for synergistic and effective management of the collaborative action (Dyer & Singh, 1998). As a consequent, the collaboration in supply chain can improve the CPFR process and supply chain visibility to increase the firm's supply chain performance.

Research Propositions

Firms' collaboration through information sharing can increase the efficiency and performance of business such as accuracy data interchange, low costs and high profits, and reduce uncertainty along the supply chain (Zailani et al., 2015). Better visibility can be achieved through the CPFR process and information sharing which consequently impacts the supply chain performance (Lee et al. 2014). Thus, this study hypothesizes that:

Proposition 1: Supply chain collaboration (information sharing) positively influences CPFR process (planning, forecasting, replenishment).

Proposition 2: Supply chain collaboration (information sharing) positively influences supply chain visibility (visibility).

Proposition 3: CPFR process (planning, forecasting, replenishment) positively influences supply chain visibility (visibility).

Proposition 4: Supply chain visibility (visibility) positively influences supply chain performance (reliability, responsiveness, flexibility, cost, asset management efficiency).

Conclusions

The study proposed an extended CPFR model for the orchid supply chain. By using the foundation of RBT, the study conceptualized that supply chain collaboration (information sharing) affected the CPFR process (planning, forecasting, replenishment process). The supply chain collaboration (information sharing) and CPFR process (planning, forecasting, replenishment process) lead to supply chain visibility and influences supply chain performance. The RBT clarifies that the firm's superior in information sharing can support firms to secure significant resources and capabilities to carry out the CPFR processes. In addition, the effect of the firm's information sharing and CPFR processes can stimulate the firm's visibility for better cooperative inventory management and forecast with the orchid farmers and attain the greater supply chain performance.

The researcher focuses on procedures and supply chain; orchid is a perishable good because orchid has value and high profit in Thailand. Although the CPFR model can develop the orchid supply chain, perishable goods characteristics are challenging to match the existing CPFR model. In addition, the available CPFR reference model is designed to fit many scenarios, but not in the context of logistics activities such as transportation, warehouse, or material handling as a primary role, which are extremely important in the orchid supply chain. Therefore, this study has proposed an extended model of CPFR in the orchid supply chain. Through collaboration in the supply chain, a better CPFR process and supply chain visibility can be achieved to increase the firm's supply chain performance. Since improving supply chain performance require a multi-dimensional construct, this study incorporates performance measures using the SCOR reference model to measure the firm's supply chain performance in the orchid industry.

The study's findings indicated that the CPFR model has yet to be established in a complete supply chain of agricultural products, such as the orchid sector. The study revises the existing restricted CPFR reference model by considering the characteristics of orchid biological nature, seasonality, and perishable features of agricultural raw resources and outputs. Future research should focus on identifying new factors that might help enhance the expanded CPFR model for orchids and other agricultural products by considering the various perishable features of product flow in the upstream and downstream supply chains.

References

Barratt, M., & Oke, A. (2007). Antecedents of supply chain visibility in retail supply chains: A resource-based theory perspective. Journal of Operations Management, 25, 1217–1233.

Buono, A., & Bowditch, J. L. (1989). The human side of merges and acquisitions: Managing collisions between people, cultures and organizations. San Francisco, CA: Jossey Bass.

Cheamuangphan, A., Panmanee, C., & Tanusuchat, R. (2013). Value Chain Analysis for Orchid Cut Flower Business in Chiang Mai. Business and Information, July 7–9.

CSCMP. (2021). Council of Supply Chain Management Professionals. Retrieved from https://cscmp.org/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms.aspx

Dyer, J. H., & Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. Academy of Management Review, 23, 660–679.

Ganga, G. M. D., & Carpinetti, L. C. R. (2011). A fuzzy logic approach to supply chain performance

Management. International Journal of Production Economics, 134, 177–187.

Georgise, F. -B., Thoben, K. -D., & Seifert, M. (2012). Adapting the SCOR Model to Suit the Different Scenarios: A Literature Review & Research Agenda. International Journal of Business and Management, 7(6), 2-17.

Holcomb, M. C., Ponomarov, S. Y., & Manrodt, K. B. (2011). The relationship of supply chain visibility to firm performance. Supply Chain Forum: International Journal, 12, 32–45.

Holweg, M., Disney, S., Holmstrom, J., & Smaros, J. (2005). Supply chain collaboration making sense of the strategy continuum. European Management Journal, 23, 170-181.

Hotrawaisaya, C., Chandraprakaikul, W., & Suthikarnarunai, N. (2014). The Logistics Collaboration in Supply Chain of Orchid Industry In Thailand. Review of Integrrative Business and Economics Research, 3(1), 147-156.

Hotrawaisaya, C., Srisawat, S., & Shaharudin, M. R. (2020). Development of Collaborative Forecasting Planning Logistics and Replenishment Model for Orchid Supply Chain in the Great Bangkok Metropolitan, Thailand. PalArch's Journal of Archaeology of Egypt/Egyptology, 17(4), 3026-3049.

Kubde, R. A., & Bansod, S. V. (2010). Collaborative Planning Forecasting and Replenishment Initiatives: A State of Art. Asian Journal of Industrial Engineering, 2, 89-104.

Lee, H., Kim, M. S., & Kim, K. K. (2014). Interorganizational information systems visibility and supply chain performance. International Journal of Information Management. 34(2), 285-295.

Lekstutis, M., & Rajah, S. (2020). Enabling Visibility Across the Agricultural Industry. Supply Chain Brain. Retrieved from https://www.supplychainbrain.com/blogs/1-think-tank/post/31043-enabling-visibility-across-the-agricultural-supply-chain.

Leończuk, D. (2016). Categories of supply chain performance indicators: an overview of approaches. Business, Management and Education, 14(1): 103–115.

Prabir, J. (2007). An Investigation into Indian Apparel and Textile Supply Chain Networks. Unpublished PhD Dissertation (Nottingham Trent University, UK).

Simatupang, T. M., & Sridharan, R. (2002). The collaborative supply chain. The International Journal of Logistics Management, 13(1), 15-30.

Singh, S. (2020). Orchids: An Emerging Floriculture Enterprise in India and its Scope in Himachal Pradesh. Indian Journal of Hill Farming. Special Issue 2020 , 152-159.

Wei, H.-L., & Wang, E. T. G. (2010). The strategic value of supply chain visibility: Increasing the ability to reconfigure. European Journal of Information Systems, 19, 238–249.

Zailani, S., Shaharudin, M. R., & Saw, B. (2015). Impact of kaizen on firm's competitive advantage in a Japanese owned company in Malaysia. International Journal of Productivity and Quality Management, 16(2), 183-210.