The Moderating Role of Information Sharing on the Relationship between Lean Supply Chain and Supply Chain Performance: A Conceptual Framework

Susan Sabah Abdulameer[#1], Noorulsadiqin Azbiya Yaacob[#2]

[#]*School of Technology Management and Logistics, College of Business, Universiti Utara Malaysia, Kedah, Malaysia*

[1]susansabah50@gmail.com

[3]noorulsadiqin@gmail.com

***Abstract*— This study aims to propose a framework for integrating information sharing (IS) into lean supply chain (LSC) to improving supply chain performance (SCP). This paper reviewed the studies published in the supply chain and going deep in LSC and its impact on SCP and disclosure of other relevant factors that play a significant role in enhancing the relationship such as IS. Also, it developed a conceptual framework to explain the moderating role of IS. This paper confirmed from previous studies that the results of the relationship between LSC and SCP are inconclusive. In other words, several empirical studies demonstrated there is a significant and positive relationship between LSC and SCP. In contrast, other studies found there is no significant relationship. Hence, the inconsistency in the results of previous studies leads to the need for moderating variable to enhance the relationship between LSC and SCP. Thus, the results of the study indicate a crucial moderating role for IS. The main contribution in this paper focuses on bridging the gap of IS as a moderator between LSC and SCP, as well as determining the common objective of LSC and IS which is improving SCP.**

***Keywords*—** *Lean supply chain, Information sharing, Supply chain performance*

1. Introduction

Nowadays, competition has become by supply chains (SCs) rather than individual companies. In other words, the best competition is between SCs each other [1], because the supply chain management focuses on the flows of material, information and cash from suppliers to customers or vice-versa [2]. In fact, the companies are facing a series of challenges and issues in a volatile market environment and unexpected demands. Moreover, to counteract uncertainty, the companies require a suitable supply chain strategy (SCS) able to manoeuvre to exploit opportunities. Besides, the flow of materials, information and cash needs a good information system capable of information sharing (IS) among supply chain partners which represented by suppliers, manufacturers, distributors and customers to reduce the uncertainty and improve supply chain performance (SCP). Thus, the supply chain (SC) must develop a strategy that suits its products, markets and target customers [3].

The concept of lean was introduced in 1990 by Womack and his team, and it mirrors the way the Toyota Production System (TPS) works [4]. The origins of the lean come back to the TPS which focuses on eliminate or reduction waste [5] and [6]. In recent years, interest has grown in the notion of lean supply chain (LSC) in manufacturing companies [7] and [8]. This is because of its role in reducing costs, improving quality, increasing service level and delivery on time [9] and [10]. In addition, the ability to eliminate waste also led to increased attention to the LSC [10]. Also, the LSC operates well with a relatively stable demand [11], a predictable demand [12], and low products variety [8]. In addition, LSC trend towards the elimination of waste, cost reduction, physical efficiency, a high level of scheduling, zero inventory and high quality [13]. The LSC nature to work stable environments has limited the possibility of working within today's volatile and complex environment. Therefore, LSC to function properly and harmoniously, there should be information sharing with suitable quality and relevant level among the supply chain partners, as this has an essential role in improving the SCP.

The LSC has not been widely studied and documented by researchers [14] and [15]. Additionally, several empirical evidences suggest that LSC contribute to improved SCP [16] and [17]. Moreover, it has established from some previous studies that the results of the relationship between the LSC and the SCP are inconclusive. In

International Journal of Supply Chain Management
IJSCM, ISSN: 2050-7399 (Online), 2051-3771 (Print)

this respect, several empirical evidences related to the LSC demonstrated there is a significant and positive relationship between the LSC and the SCP. In contrast, other empirical evidence in the literature found that the relationship between the LSC and the SCP is not significant. Hence, the inconsistency in the results of previous studies leads to the need for moderating variable to enhance the relationship between LSC and SCP. This requires the investigation of moderator variable to provide further clarification about the nature of the relationship because the lack of consideration of moderate influences is one of the main reasons for the mixed results in those studies [18].

In fact, companies that have an interesting in the LSC are more inclined to adopt IS [19] and [20]. This is because they have the same goal of improving the SCP [17] and [15]. Besides, many studies have examined the relationship between LSC and the SCP [16] and [14]. Nonetheless, IS has not been given any consideration in their studies. Thus, there is a necessity to bridge this theoretical gap through the investigation of the IS as a moderator variable. Consequently, this research aims to encourage the companies to achieve a balance among dimensions of SCP by providing a proposed framework that integrates IS into LSC.

In the current research, a conceptual framework has been developed to improve SCP by using LSC and the IS based on a theoretical perspective that includes Contingent Resource-Based View (CRBV) theory. The environmental characteristics involve complexity, uncertainty and munificence led to suggest a new theory by Brush and Artz [21] which called (CRBV). Evidently, CRBV theory combining between Resource –Based View (RBV) theory and Contingency Theory (CT) theory to limit the weaknesses of the two theories and also to help explain the SC phenomena that currently occur [22]. According to [23] this theory assumes *"*In order to maintain alignment between changing managerial perceptions of an exogenous general business environment and complex capabilities for managing the business-natural environment interface, organizations need to develop the dynamic capability of a proactive environmental strategy*"*. As applied in the present research, the CRBV theory confirms the expectation that the LSC as an independent variable and the IS as a moderator variable improves SCP, this is because of the general environment surrounding the SCs characterised by uncertainty and complexity. This requires companies to have the capabilities to deal with these conditions and achieve competitive advantages. Besides, these capabilities are the LSC, which in turn requires other capabilities and resources to help it in such a turbulent environment. Therefore, the IS chosen as a catalyst for the LSC, to improve the SCP as competitive advantages.

Given that the SC and its performance are interesting for the researchers and practitioners, the present research will be of great importance to the literature and industries. This is through studying the LSC that lead to improving SCP which includes supply chain cost (SCC), supply chain quality (SCQ), supply chain lead time (SCLT), and the moderator role of IS which consists of two dimensions quality of information sharing (QIS) and level of information sharing (LIS). Thus, present research will provide many practical managerial implications to solve the SCP problems facing by the companies. Also, this research provides for relevant key individuals, practitioners, policymakers, manufacturing industry, and related industries insight into the implementation of successful LSC.

2. Literature Review

2.1. Lean supply chain (LSC)

The most important aim of the LSC is the efficient use of resources by eliminating waste [10] or Muda [8], in its different forms [24]. Eliminating waste in the LSC means doing more with less [6]. In other words, less human effort, less space, less equipment, less inventory and less time [5]. Moreover, waste represents the largest source of losses [13]. In order to waste eliminating, companies should remove activities that do not add value. Activities that consume resources and not generates any redeeming value from the customer [25] and [4]. These activities must be eliminated in the LSC. Removing activities that do not add value and reduce waste has led to increased attention to the LSC by many scholars and practitioners in manufacturing industry e.g., [9], [8] and [13]. According to [26] the waste is divided into seven types (Overproduction, Over-processing, Motion, Waiting, Transportation, Defects and Inventory), As depicted in Figure 1.

Figure 1. The Seven Types of Waste
Source: Adopted from Melton [27]

Therefore, eliminating waste in the LSC leads to improve the SCP [28], by decreasing costs [10], improving quality, reducing lead time [5]. The motivation behind using an LSC is to reduce costs as much as possible by eliminating waste [29] and [10], to improve the efficiency of operations in the SC [30]. Minimising costs leads to the lowest price criterion [31]. The low price is a standard that is offered to the customer by the LSC, which gives the customer a sense of "value for money" [32]. Gattorna [33] said to minimise LSC costs through economies of scale which in turn reduce production costs and logistics costs. Likewise, [34] said that the LSC aims to improve value stream from suppliers to the end consumer, with the aim of reducing the cost of buffering and ensuring a fixed scheduling level to achieve competitive advantage through economies of scale. [10] noted that despite the reduction in costs in the LSC, the SC might not be flexible enough. This is because the reduction of costs can be returned to the decrease in inventory.

Meanwhile, the LSC does not need stock because inventory is one of the types of waste that the lean tries to eliminate [7]. Moreover, the LSC takes customer satisfaction into consideration. That means reducing the defects that appear in the products, which represent one of the forms of waste [35] and [10]. In other words, the LSC focuses on reducing defect products to improve their quality and thereby achieve customer satisfaction [36] and [37]. Hence, paying attention to product quality and maximizing customer satisfaction improves the SCP and enhances its competitive position. Many researchers defined the LSC, as shown in Table 1.

Table 1. Definitions of The Lean Supply Chain

Author/Year	Definitions
Rahimnia and Moghadasian [35]	*"Means eliminating seven kinds of muda and totally defining, doing more with less".*
Shahin and Jaberi [38]	*"Is a managerial and procedural strategy for recognition and removal of waste resources in order to minimize costs and moving toward productivity and advancement".*
Birhanu, Lanka [39]	*"It is which employs continuous improvement efforts which focuses on eliminating waste or non-value steps along the chain".*
Kalantari and Khoshalhan [40]	*"It is imply zero inventory"*

Table 1 highlight that most of the definition of LSC focused on the main aim of the LSC is the elimination of waste to reduce the costs that are the core of the LSC, by decreasing inventory and cancelling all activities that do not add value. Therefore, similarly the present study the LSC can be defined as the ability to eliminate waste and reduce costs by reducing inventory and eliminating activities that do not add value.

2.2. Supply Chain Performance (SCP)

In the last decade, many research has published on the theories and practices of the SC, but the SCP has not received sufficient attention. However, at present, companies face many challenges because of fierce competition not only between companies but also between SCs [14]. In addition, achieve the success and excellence of the SC in the global markets requires from the companies to develop their the SCP continuously [41]. Improving the SCP is not limited to the company individually, but any element of upstream or downstream has an essential role in improving the SCP [42]. In addition, Improving the performance of the SC does not differ in importance for companies that produce goods or provide services [43]. Therefore, it is essential to give the SCP importance the utmost in the companies. In the same time, there is no single measure representing the SCP [44] and [45].

On the other hand, Ahi and Searcy [46] found that that measuring SCP is a hard task and complex issue. In the same way, many authors have pointed out that the development and selection of measures to measure the SCP have always been a complicated matter and a continuing challenge e.g., [45]. This challenge is due to the difficulty of coordination among many organisations that comprise the SC, as well as activities within these organisations [47] and [48]. In addition to taking into account that the measures should be interrelated [49]. Moreover, as a result of dynamic changes in the SC environment, some measures are beginning to be inoperable, at this time there is a need for the SC to changeable and rebalance all parties in the chain through continuous improvement of SCP [45]. Therefore, in the current research, the emphasis has been placed on performance measures that are appropriate to the practical issues experienced by the manufacturing industries, namely SCC, SCQ, SCLT.

Nowaday, to survive in competitive environment should focus on *Cost* [31] . In fact, the complexity of today's environment requires organisations to consider several decisions, the most important of which are SCC [28] and [50]. Despite the complexity and rapid changes in the market, using the LSC can bring low cost and high profits in the manufacturing industry [51] and [52]. Also, *Quality* and meet customer goals are important decisions that are challenging for businesses in today's complex environment [28] and [53]. To achieve high SCQ and business survival should be made a lot of effort and constant attention, therefore to resist oscillation in demand [54] and [55]. The quality is one important thing to focus on in the SC [56] and [57]. In addition, *Lead Time* is one of the critical SCP metrics that relate to the customer [58]. Also, SCLT vary depending on

product diversity, production volumes, SCS, and target customers. Indeed, companies today seek to reduce lead time [59].

2.3. Relationship between LSC and SCP

Indeed, the LSC has been argued as a significant factor affecting the SCP. Nonetheless, empirical studies have revealed mixed findings. For example, [14] investigated the relationship between LSC management practices and SCP in Jordanian manufacturing companies using a sample of 305 managers. The result showed a significant positive relationship between LSC management practices and SCP. In a similar study, [17] demonstrated that internal lean practice was positively related to SCP. They investigated the relationship between internal lean practice and SCP in the manufacturing firms in Jordan. Likewise, the findings of [16] in the manufacturing industry revealed that the adoption of SC leanness leads to improve the SCP of companies.

In contrast, [60] found not significant relationship between LSC management and SCP. Similarly, [61] some partially supported findings have also been reported. The empirical evidence in the literature as above shows mostly a significant positive relationship between the LSC and SCP. Therefore, based on the arguments above and assumptions of CRBV [21] theory the following proposition is offered:

P1: *Lean Supply Chain has a relationship with Supply Chain Performance.*

2.4. Information Sharing (IS)

Information sharing (IS) is one of the most important issues that SC literature is focusing on today. Many researchers have mentioned this importance in their research e.g., [62], [63], [19], [64] and [65]. This is due to the transformation of factors of value creation into the intangible assets such as information rather than focusing on the tangible assets like financial and material assets [20].

[66] see that the importance of the IS because the SC consists of a group of participants who can better share their individual information with each other. There is an urgent need for the presence of IS to achieve success in the SC [67] and [68]. Also, the IS achieves effective communication between suppliers, manufacturers, distributors and customers. Besides, there are two directions for sharing information the first trend share information from suppliers to retailers, and the second trend of the IS from retailers to suppliers [69].

[19] claim that if all partners of the SC continually share information about the sales status from the side of retailers, the delivery status from the side of suppliers and the shipping status from the side of the freight forwarder, rather than firefighting all the time, the company will be able to manage the business with greater predictability. Therefore, the IS can be defined as the effective use of modern communication tools to help the company and its partners achieve goals and improve performance by reducing uncertainty. Successful IS achieves integration, synergy, cooperation and coordination among SC members and thus improves the SCP which involves SCC, SCQ, SCLT, SCR. The IS has been studied in many dimensions, the present research will focus on two main dimensions: the QIS and the LIS which selected according to [17], [70], [71] and [72].

The QIS is one of the most critical dimensions of the IS. It is also considered a vital and effective factor for achieving integration and cooperation among SC partners [63] and [17]. In addition, the LIS is the second dimension of the IS. The concept of the LIS has received much attention from researchers [17], [70], [71] and [73] and [74]. Thus, when the company begins to share information with its partners, this may expose it to certain risks so there is a need to know the extent or level at which the company can share its information.

2.5. Relationship between IS and SCP

Previous studies have researched about the effect of IS on SCP. Most of the studies found that the implementation and adoption of IS lead to improvement in SCPs. [63] in their study conducted in India IS was reported to have a direct relationship with SC collaboration. This, in turn, leads to improved SCP. In the context of manufacturing firms, [17] found a significant relationship between level and quality IS and SCP. Likewise, Gandhi, Shaikh [19] also found that IS effect on SCP in retail firms. Similarly, but in the context of steel companies in Iran. In another study in South Korea among the manufacturing industry, Kim and Chai [64] also determined that IS has significant relationship with SCP.

They concluded a significant positive influence of IS on SCP. Also in Turkey, Sahin and Topal [65] discovered that businesses performance influenced by IS. They found significant support for the influence of IS on competitive advantage and SCR. Consequently, the empirical evidence in the literature as above generally shows a significant positive relationship between IS and SCP. Therefore, based on the arguments above and the assumption of CRBV [21] the following proposition are offered:

P2: *Information sharing has a relationship with Supply Chain Performance.*

2.6. The IS as a Moderating Variable

The IS considered as the nerve to enhance communication among SC partners [25]. In other words, [75] observed that the LIS led to improving communication among the SC members. As for the authors of the lean/agile school, they stressed that sharing information enhances the work of the LSC in responding to the demands of the troubled environment [76]. Besides, the LSC to function better and achieve satisfactory results, it should be supported by the sharing of information whose main objective is to reduce uncertainty and environmental complexity [50].

The LSC aims to reduce cost [12]. To achieve this goal, the LSC reduces inventory to reduce costs, requiring appropriate, accurate and timely information [77]. Therefore, the IS is essential at the upstream of the SC, while it is mandatory for the downstream of the SC [78] and [77]. Thus, when the IS used with the LSC the SCP will improve by reduced cost through lowered inventory levels, high quality, reduce led time [25] and [77]. Accordingly, based on the arguments above and assumptions of CRBV theory the following proposition are offered:

P3: *Information sharing moderates the relationship between lean supply chain and supply chain performance.*

The conceptual framework is proposed based on the theoretical gaps in the literature that explained above integrating IS into LSC to examine their effects on SCP. With consideration, the underpinning CRBV theory, along with these motives this is the first study has been directed towards the development of the research framework as shown in Figure 2.

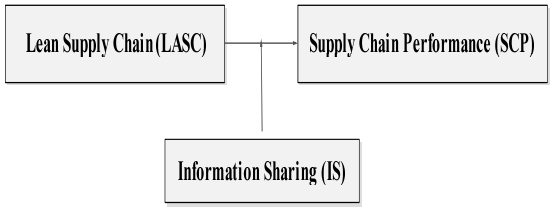

Figure 2. The conceptual framework shown the integrating of IS into LSC to improve SCP

3. Methodology

The process of developing a conceptual framework followed several stages. The first stage is to identify different variables related to SCP available in the literature. It is followed by filtering and identifying some gaps related to LSC, IS and SCP. The second stage is to conduct a comprehensive literature review by focusing on research on the LSC, IS and SCP. The third stage is to compare the results nature of previous studies on the relationship between the three variables above. It turned out that there is an inconsistency between the results. Some of these results are significant, while others are not significant. The fourth stage is the development of a proposed conceptual framework based on the identified variables. The last stage is the development of a suggested framework of suitable LSC, IS and SCP. Therefore, in this conceptual paper, authors only proposed cause-and-effect relationships which need to be tested empirically to validate the theoretical model.

4. Conclusion

The current research proposed a unique conceptual framework and different from all the mentioned studies in its contribution. In a more specific way, the main contribution in the present research introducing the IS as a moderator variable. Previous empirical studies have suggested that integrating between LSC and IS in SCs will improve SCP. The current conceptual framework provides for the SC management practitioners and academicians insight into the implementation of successful LSC. This research will help practitioners and concerned individuals to recognise significant factors that have been proven to either cause an obstacle or an improvement of SCC, SCQ and SCLT. Besides, the present research contributes to the body of knowledge including (CRBV) theory. In addition, the future works agenda of the authors is to conduct an empirical study of this conceptual framework proposed in the manufacturing industry.

References

[1] Saleheen, F., M.M. Habib, and Z. Hanafi, “An empirical study on supply chain management performance measurement through AHP”, International Journal of Supply Chain Management, Vol. 7, No. 6, pp. 349-356, 2018.

[2] Wibowo, M.A. and M.N. Sholeh, “The Analysis of Supply Chain Performance Measurement at Construction Project”, Procedia Engineering, Vol. 125, No. pp. 25-31, 2015.

[3] Hallavo, V., “Superior performance through supply chain fit: a synthesis”, Supply Chain Management: An International Journal, Vol. 20, No. 1, pp. 71-82, 2015.

[4] Womack, J.P., D.T. Jones, and D. Roos, Machine that Changed the World, Simon and Schuster, New York, 1990.

[5] Brito, M.F., et al., “Improving the Production Performance and Ergonomic Aspects Using

Lean and Agile Concepts", The Open Cybernetics & Systemics Journal, Vol. 12, No. 1, pp. 122-135, 2018.
[6] Christopher, M., "The Agile Supply Chain: Competing in Volatile Markets", Industrial Marketing Management, Vol. 29, No. 1, pp. 37-44, 2000.
[7] Omar, M.K. and R.M. Sim, "Improving Supply Chain Performance Using Lean and Agility Concepts", International Conference on Information, Operations Management and Statistics (ICIOMS2013), Kuala Lumpur, Malaysia,, pp. 1-5, 2013.
[8] Soni, G. and R. Kodali, "Performance value analysis for the justification of the leagile supply chain", International Journal of Business Performance Management, Vol. 11, No. 1-2, pp. 96-133, 2009.
[9] Afonso, H. and M.d.R. Cabrita, "Developing a Lean Supply Chain Performance Framework in a SME: A Perspective Based on the Balanced Scorecard", Procedia Engineering, Vol. 131, No. pp. 270-279, 2015.
[10] Shahin, A., et al., "A new approach for estimating leagile decoupling point using data envelopment analysis", Assembly Automation, Vol. 36, No. 3, pp. 233-245, 2016.
[11] Aitken, J., M. Christopher, and D. Towill, "Understanding, Implementing and Exploiting Agility and Leanness", International Journal of Logistics Research and Applications, Vol. 5, No. 1, pp. 59-74, 2002.
[12] Agarwal, A., R. Shankar, and M.K. Tiwari, "Modeling the metrics of lean, agile and leagile supply chain: An ANP-based approach", European Journal of Operational Research, Vol. 173, No. 1, pp. 211-225, 2006.
[13] Trojahn, S., "Logistics Strategies for Resource Supply Chains", Transport and Telecommunication Journa, Vol. 19, No. 3, pp. 244, 2018.
[14] Nimeh, H.A., A.B. Abdallah, and R. Sweis, "Lean Supply Chain Management Practices and Performance: Empirical Evidence from Manufacturing Companies", International Journal of Supply Chain Management, Vol. 7, No. 1, pp. 1-15, 2018.
[15] Tortorella, G.L., et al., "Lean supply chain: Empirical research on practices and performance", Proceedings of the International Conference on Industrial Engineering and Operations Management, pp. 108-119, 2017.
[16] Abdollah, M.P. and S.J.I. Fard, "An Analysis of the Relationship Between Supply Chain Agility and Leanness and Supply Chain Performance in the Industrial Plants of Hormozgan Province", International Business Management, Vol. 10, No. 8, pp. 1461-1466, 2016.
[17] Al-Shboul, M.d.A.R., et al., "The effect of supply chain management practices on supply chain and manufacturing firms' performance", Journal of Manufacturing Technology Management, Vol. 28, No. 5, pp. 577-609, 2017.
[18] Dawson, J.F., "Moderation in Management Research: What, Why, When, and How", Journal of Business and Psychology, Vol. 29, No. 1, pp. 1-19, 2014.
[19] Gandhi, A.V., A. Shaikh, and P.A. Sheorey, "Impact of supply chain management practices on firm performance: Empirical evidence from a developing country", International Journal of Retail & Distribution Management, Vol. 45, No. 4, pp. 366-384, 2017.
[20] Koçoğlu, İ., et al., "The effect of supply chain integration on information sharing:Enhancing the supply chain performance", Procedia - Social and Behavioral Sciences, Vol. 24, No. pp. 1630-1649, 2011.
[21] Brush, T.H. and K.W. Artz, "Toward a contingent resource-based theory: the impact of information asymmetry on the value of capabilities in veterinary medicine", Strategic Management Journal, Vol. 20, No. 3, pp. 223-250, 1999.
[22] Brandon-Jones, E., et al., "A Contingent Resource-Based Perspective of Supply Chain Resilience and Robustness", Journal of Supply Chain Management, Vol. 50, No. 3, pp. 55-73, 2014.
[23] Aragón-Correa, J.A. and S. Sharma, "A Contingent Resource-Based View of Proactive Corporate Environmental Strategy", Academy of Management Review, Vol. 28, No. 1, pp. 71-88, 2003.
[24] Goldsby, T.J., S.E. Griffis, and A.S. Roath, "MODELING LEAN, AGILE, AND LEAGILE SUPPLY CHAIN STRATEGIES", Journal of Business Logistics, Vol. 27, No. 1, pp. 57-80, 2006.
[25] Banerjee, A., "Information technology enabled process re-engineering for supply chain leagility", International Journal of Information Technology and Management, Vol. 14, No. 1, pp. 60-75, 2015.
[26] Ohno, T., Toyota Production System: Beyond Large-Scale Production, Taylor & Francis, 1988.
[27] Melton, T., "The Benefits of Lean Manufacturing: What Lean Thinking has to Offer the Process Industries", Chemical Engineering Research and Design, Vol. 83, No. 6, pp. 662-673, 2005.
[28] Galankashi, M.R. and S.A. Helmi, "Assessment of hybrid Lean-Agile (Leagile)

supply chain strategies", Journal of Manufacturing Technology Management, Vol. 27, No. 4, pp. 470-482, 2016.
[29] Qi, Y., K.K. Boyer, and X. Zhao, "Supply Chain Strategy, Product Characteristics, and Performance Impact: Evidence from Chinese Manufacturers*", Decision Sciences, Vol. 40, No. 4, pp. 667-695, 2009.
[30] Jia, H.M., K.C. Yu, and J.C. Zhang, "A Study on Leagile Supply Chain Model and Performance Evaluation System Based on Lean Agile Theory", Applied Mechanics and Materials, Vol. 635-637, No. pp. 1771-1775, 2014.
[31] Christopher, M. and J. Gattorna, "Supply chain cost management and value-based pricing", Industrial Marketing Management, Vol. 34, No. 2, pp. 115-121, 2005.
[32] Naim, M. and J. Barlow, "An innovative supply chain strategy for customized housing", Construction Management and Economics, Vol. 21, No. 6, pp. 593-602, 2003.
[33] Gattorna, J., Living supply chains: how to mobilize the enterprise around delivering what your customers want, Pearson Education, 2006.
[34] Roh, J., P. Hong, and H. Min, "Implementation of a responsive supply chain strategy in global complexity: The case of manufacturing firms", International Journal of Production Economics, Vol. 147, No. pp. 198-210, 2014.
[35] Rahimnia, F. and M. Moghadasian, "Supply chain leagility in professional services: how to apply decoupling point concept in healthcare delivery system", Supply Chain Management: An International Journal, Vol. 15, No. 1, pp. 80-91, 2010.
[36] Halawa, F., et al., "The Implementation of Hybrid MTS\MTO as a Promoter to Lean-Agile: A Simulation Case Study for Miba Sinter Slovakia", IIE Annual Conference. Proceedings, Institute of Industrial and Systems Engineers (IISE), pp. 1006-1011, 2017.
[37] Virmani, N., R. Saha, and R. Sahai, "Evaluation of Leagile Criteria Using DEMATEL Approach", International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering, Vol. 11, No. pp. 1020-1025, 2017.
[38] Shahin, A. and R. Jaberi, "Designing an integrative model of leagile production and analyzing its influence on the quality of auto parts based on Six Sigma approach with a case study in a manufacturing company", International Journal of Lean Six Sigma, Vol. 2, No. 3, pp. 215-240, 2011.
[39] Birhanu, D., K. Lanka, and A.N. Rao, "A Survey of Classifications in Supply Chain Strategies", Procedia Engineering, Vol. 97, No. pp. 2289-2297, 2014.
[40] Kalantari, T. and F. Khoshalhan, "Readiness assessment of leagility supply chain based on fuzzy cognitive maps and interpretive structural modeling: a case study", Journal of Business & Industrial Marketing, Vol. 33, No. 4, pp. 442-456, 2018.
[41] Acar, A.Z. and M.B. Uzunlar, "The Effects of Process Development and Information Technology on Time-based Supply Chain Performance", Procedia - Social and Behavioral Sciences, Vol. 150, No. pp. 744-753, 2014.
[42] Cai, J., et al., "Improving supply chain performance management: A systematic approach to analyzing iterative KPI accomplishment", Decision Support Systems, Vol. 46, No. 2, pp. 512-521, 2009.
[43] Basu, G., et al., "The impact of supply chain management practices on the performance of private universities in Malaysia", International Journal of Supply Chain Management, Vol. 6, No. 3, pp. 22-35, 2017.
[44] Saleheen, F., M.M. Habib, and Z. Hanafi, "Supply chain performance measurement model: A literature review", International Journal of Supply Chain Management, Vol. 7, No. 3, pp. 70-78, 2018.
[45] Anand, N. and N. Grover, "Measuring retail supply chain performance: Theoretical model using key performance indicators (KPIs)", Benchmarking: An International Journal, Vol. 22, No. 1, pp. 135-166, 2015.
[46] Ahi, P. and C. Searcy, "Measuring social issues in sustainable supply chains", Measuring Business Excellence, Vol. 19, No. 1, pp. 33-45, 2015.
[47] Alam, A., et al., "The mediating effect of logistics integration on supply chain performance: A multi-country study", The International Journal of Logistics Management, Vol. 25, No. 3, pp. 553-580, 2014.
[48] Dweekat, A.J., G. Hwang, and J. Park, "A supply chain performance measurement approach using the internet of things: Toward more practical SCPMS", Industrial Management & Data Systems, Vol. 117, No. 2, pp. 267-286, 2017.
[49] Basu, R., "New criteria of performance management: A transition from enterprise to collaborative supply chain", Measuring Business Excellence, Vol. 5, No. 4, pp. 7-12, 2001.
[50] Kisperska-Moron, D. and J. de Haan, "Improving supply chain performance to satisfy final customers: "Leagile" experiences

of a polish distributor", International Journal of Production Economics, Vol. 133, No. 1, pp. 127-134, 2011.
[51] Christopher, M., Logistics & supply chain management, Pearson UK, 2011.
[52] Ismail, H.S. and H. Sharifi, "A balanced approach to building agile supply chains", International Journal of Physical Distribution & Logistics Management, Vol. 36, No. 6, pp. 431-444, 2006.
[53] Matawale, C.R., S. Datta, and S.S. Mahapatra, "A fuzzy embedded leagility assessment module in supply chain", Benchmarking: An International Journal, Vol. 23, No. 7, pp. 1937-1982, 2016.
[54] Basu, G., J. Jeyasingam, and M.M. Habib, "Education supply chain management model to achieve sustainability in private Universities in Malaysia: A review", International Journal of Supply Chain Management, Vol. 5, No. 4, pp. 24-37, 2016.
[55] Matawale, C.R., S. Datta, and S.S. Mahapatra, "Interrelationship of capabilities/enablers for lean, agile and leagile manufacturing: an ISM approach", International Journal of Process Management and Benchmarking, Vol. 3, No. 3, pp. 290-313, 2013.
[56] Drake, P.R., D. Myung Lee, and M. Hussain, "The lean and agile purchasing portfolio model", Supply Chain Management: An International Journal, Vol. 18, No. 1, pp. 3-20, 2013.
[57] Potter, A., D.R. Towill, and M. Christopher, "Evolution of the migratory supply chain model", Supply Chain Management: An International Journal, Vol. 20, No. 6, pp. 603-612, 2015.
[58] Qin, W., et al., "An assessment model for RFID impacts on prevention and visibility of inventory inaccuracy presence", Advanced Engineering Informatics, Vol. 34, No. pp. 70-79, 2017.
[59] de Treville, S., R.D. Shapiro, and A.-P. Hameri, "From supply chain to demand chain: the role of lead time reduction in improving demand chain performance", Journal of Operations Management, Vol. 21, No. 6, pp. 613-627, 2004.
[60] Kusmantini, T., et al., "Strategic consensus between functions and the role of supply chain technology as moderator", Journal of Industrial Engineering and Management, Vol. 11, No. 4, pp. 735-748, 2018.
[61] Sohel Rana, S.M., et al., "Drivers of retail supply chain efficiency: Moderating effect of lean strategy", International Journal of Supply Chain Management, Vol. 5, No. 1, pp. 52-62, 2016.
[62] Afranie, S.B., A.H.M.M. Islam, and M.M. Habib, "Sustainability performance of the retail business and supply chain collaboration-UK perspective: A literature review", International Journal of Supply Chain Management, Vol. 8, No. 3, pp. 838-845, 2019.
[63] Afshan, N., S. Chatterjee, and P. Chhetri, "Impact of information technology and relational aspect on supply chain collaboration leading to financial performance: A study in Indian context", Benchmarking: An International Journal, Vol. 25, No. 7, pp. 2496-2511, 2018.
[64] Kim, M. and S. Chai, "The impact of supplier innovativeness, information sharing and strategic sourcing on improving supply chain agility: Global supply chain perspective", International Journal of Production Economics, Vol. 187, No. pp. 42-52, 2017.
[65] Sahin, H. and B. Topal, "Examination of effect of information sharing on businesses performance in the supply chain process", International Journal of Production Research, Vol. No. pp. 1-14, 2018.
[66] Hsu, L.-L., et al., "The impacts of supply chain management systems on information sharing and integrated-performance", Human Systems Management, Vol. No. pp. 101-121, 2009.
[67] Pooe, D., C. Mafini, and V.W. Loury-Okoumba, "The influence of information sharing, supplier trust and supplier synergy on supplier performance : the case of small and medium enterprises : original research", Journal of Transport and Supply Chain Management, Vol. 9, No. 1, pp. 1-11, 2015.
[68] Sezen, B., "Relative effects of design, integration and information sharing on supply chain performance", Supply Chain Management: An International Journal, Vol. 13, No. 3, pp. 233-240, 2008.
[69] Zelbst, P.J., et al., "RFID utilization and information sharing: the impact on supply chain performance", Journal of Business & Industrial Marketing, Vol. 25, No. 8, pp. 582-589, 2010.
[70] Ibrahim, S.E. and O. Ogunyemi, "The effect of linkages and information sharing on supply chain and export performance: An empirical study of Egyptian textile manufacturers", Journal of Manufacturing Technology Management, Vol. 23, No. 4, pp. 441-463, 2012.
[71] Li, S. and B. Lin, "Accessing information sharing and information quality in supply chain management", Decision Support Systems, Vol. 42, No. 3, pp. 1641-1656, 2006.
[72] Li, S., et al., "The impact of supply chain management practices on competitive advantage and organizational performance", Omega, Vol. 34, No. 2, pp. 107-124, 2006.

[73] Sundram, V.P.K., V.G.R. Chandran, and M.A. Bhatti, "Supply chain practices and performance: the indirect effects of supply chain integration", Benchmarking: An International Journal, Vol. 23, No. 6, pp. 1445-1471, 2016.
[74] Wu, I.-L., C.-H. Chuang, and C.-H. Hsu, "Information sharing and collaborative behaviors in enabling supply chain performance: A social exchange perspective", International Journal of Production Economics, Vol. 148, No. pp. 122-132, 2014.
[75] Acharyulu, G., "Supply chain management practices in printing industry", Operations and Supply Chain Management, Vol. 7, No. 2, pp. 39-45, 2014.
[76] Basnet, C. and S. Seuring, "Demand-oriented Supply Chain Strategies–A Review of the Literature", Operations and Supply Chain Management: An International Journal, Vol. 9, No. 2, pp. 73 - 89 2016.
[77] Mason-Jones, R., B. Naylor, and D.R. Towill, "Engineering the leagile supply chain", International Journal of Agile Management Systems, Vol. 2, No. 1, pp. 54-61, 2000.
[78] Christopher, M. and D.R. Towill, "Supply chain migration from lean and functional to agile and customised", Supply Chain Management: An International Journal, Vol. 5, No. 4, pp. 206-213, 2000.