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A Systematic Literature Review of Critical Success Factors and Barriers in Lean Supply Chain Management

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ABSTRACT

The objective of this study is to conduct a systematic literature review to identify the barriers and critical success factor that influence in implementation of Lean Supply Chain Management (LSCM) practices in industry. Through this systematic literature review (SLR), it is expected to identify the main gaps related to LSCM implementation in industry and discuss the relevance of research in this topic for indicating the future research direction. A SLR was developed and determined, which involved the selecting of keyword, developing of research question, searching and evaluation of literature for 53 research articles. The content of present of literature was reviewed, critically analysed and synthesised from the perspective of barrier and critical success factors that influence the implementation of LSCM. This study reveals that relationship with supplier, commitment and support by top management are the key critical success factor in lean implementation. Furthermore, the results showed that lack of management commitment and leadership, lack of training and skills, lack of system view or strategy are the barriers in lean implementation. Based on the extensive systematic review of literature, we found of the consistency data between Barriers and Critical Success Factor. This study extends previous studies on LSCM, strengthens the body of knowledge on the issue and consolidates the key LSCM activities, barriers and critical success factors associated with its implementation. The clear identification of these topics can allow researchers and practitioners to predict occasional problems and to set the right standards for the implementation of LSCM.

Keywords: Lean supply chain management; Barriers; Critical Success Factor; Systematic literature review

INTRODUCTION

There are many definitions for “Lean”. Wee and Wu (2009) concluded that the term “lean” means a series of activities or solutions to eliminate waste, improve the value added (VA) and reduce non-value added (NVA) operations. However, the word “Lean” was first used by MIT professors in the Future Car Investigation to describe Japan’s new production system that does away with mass production (Conti et al. 2006).

According to Anand and Kodali (2008), the researchers highlighted that the principle and theory of lean and its associated tool, practices, procedures and techniques can be extend to supply chain. Lean Manufacturing (LM) supports companies in order to achieve significant economic benefits by improving the quality, cost and time of operations cycle. The goal of LM is to identify and eliminate waste in the production and development of product and service, considering activities that do not provide value (Lamming, 1996). Although the principles

of LM have been originally developed by Toyota to manufacture cars, they are increasingly being used in routine processes and support functions of several business segments. (Cudney & Elrod, 2010).

The concept of lean supply chain was proposed in 1994 by Womack and Jones. Lean Supply Chain can be

defined as an application of LM principles to Supply chain to integrate the activities of all the stakeholders involved in the supply chain network and give ‘value’ to the customers by eliminating wastes (Anand & Kodali 2008). The supply chain management concept has evolved with it through the five distinct stages shown in Figure 1 below.

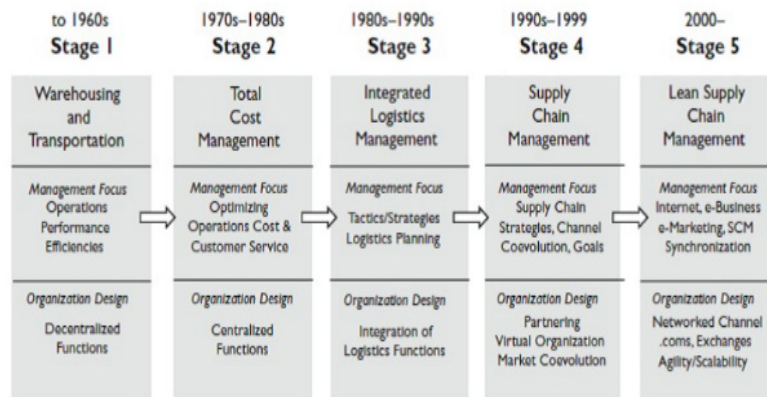


FIGURE 1. The evolution of Supply Chain Management (McKee & Ross 2009).

There is comparison between traditional supply chain versus lean supply chain. The comparison was studied by Faisal et al. 2006 in Table 2.

The Table 3 was presented the characteristics of Supply Chain Management according to Cooper and Ellram (1993).

TABLE 2. The traditional supply chain versus lean supply chain comparison by Faisal et al. 2006.

Attributes	Traditional	Lean
Market demand	Unpredictable	Predictable
Product variety	Low	Low
Product life cycle	Long	Long
Customer drivers	Cost	Cost
Profit margin	Situational	Low
Information enrichment	Very little	Desirable
Forecasting mechanism	Independent at each echelon	Algorithmic
Dominant costs	Both	Physical costs
Typical products	Standard products	Commodities
Capacity to absorb supply chain risks	Moderate	Low
Eliminate muda	Low priority	Essential
Quality	Market winner	Market qualifier
Cost	Market winner	Market winner
Network integration	Low priority	Desirable
Information decoupling	Non existent	Advantageous
Postponement	Non existent	Not required
Product conception	Producer	Producer
Measurement of quality	Product defect rate	Product defect rate
Delivery penalties	Very few	Long term contractual

TABLE 3. Characteristics of Supply Chain Management (Cooper & Ellram, 1993)

Element	Traditional Management	Supply Chain Management
Inventory management approach	Independent efforts	Joint reduction in channel inventories
Total cost approach	Minimise firm costs	Channel-wide cost efficiencies
Time horizon	Short term	Long term
Amount of information sharing and monitoring	Limited to needs of current transactions	As required for planning and monitoring purposes
Amount of co-ordination of multiple levels in the channel	Single contact for the transactions between channel pairs	Multiple contacts between levels in firms and levels of channel
Joint planning	Transaction based	On-going
Compatibility of corporate philosophies	Not relevant	Compatible at least for key relationships
Breadth of supplier base	Large to increase competition and spread risk	Small to increase co-ordination
Channel leadership	Not needed	Need for co-ordination focus
Amount of sharing of risks & rewards	Each on its own	Risks & rewards shared over longer term
Speed of operations, information and inventory flows	'Warehouse' orientation (storage, safety stock). Interrupted by barriers to flows. Localised to channel pairs	'DC' orientation (turnover speed). Interconnecting flows, JIT, Quick Response across the channel.

A supply chain is a dynamic structure that consists of technology, people, organization, information, activities and resources. The supply chain does not only apply to manufacturing firms only; it also applies to service firms, which are increasingly focusing on supply chain management to ensure that their customers receive prompt service (Alomari 2021). Activities in the supply chain turn natural commodities, raw materials and components into semi-finished and finished goods that are then delivered to end customer and distributors (Zhou & Ji 2015).

The growing emphasis on sustainability in supply chain management (SCM) has contributed to the growth of a distinct area of interest for over the last three decades: sustainable supply chain management SSCM (Pagell and Shevchenko, 2014). International business strategy has shifted in recent years. The Toyota Production System (TPS) is the benchmark utilized all through the world as the establishment for "lean" thinking. At Toyota, the TPS practices and standards expand well past the manufacturing plant dividers to incorporate the all-inclusive production network and require some urgent decisions to guarantee supply chain effectiveness (Lander and Liker 2007).

Lean principles help identify and eliminate various forms of waste in the supply chain, such as excess inventory, overproduction, transportation inefficiencies, waiting times, unnecessary motion and defects (Cruz-Machado and Leitner, 2010; Verrier et al., 2014). Lean SCM promotes the adoption of JIT principles. Since JIT implies a pull system, which also results in shorter lead times and low inventory, it serves as a base for low work

in progress, low-unit cost, higher profit, low inventory, and good quality (Wan 2006).

A value stream mapping is one of main principles of lean manufacturing. It was tested by Hellano et al. (2016) that the value stream mapping technique is beneficial and effective to identify of sustainable development indicator. According to Faulkner and Badurdeen (2014) the value stream mapping tool used in lean manufacturing has increasingly become of interest to companies to look the ascertain the effect of waste on the environment and society. One of the sub requirements of achieving a successful value stream mapping is by change the habits (Chen and Meng, 2010).

Continuous improvement, or kaizen, is another idea that closely related to lean manufacturing. Continuous improvement might be considered the second most important principle of lean production (Womack et al. 1990), after the removal of waste. Kaizen is an approach that emphasises small, incremental changes and continual process improvement (Agus 2012). The kaizen support includes planning, strategy development, training, management activities and acknowledgement that are necessary to guide the success of kaizen (Sandrina 2018).

Standardised work is an excellent idea, and the abbreviation of SOP, or standard operating procedure, has long been acknowledged (Schonberger 2018). These can range from standardized work instructions and design standards to standardized methods for problem solving (Hoppmann et al. 2011). This technique is being utilised in the healthcare industry to decrease inventory, build

upspace, and reduce travel and searches time (Young 2008).

In general, the lean idea in SCM focuses on enhancing quality, decreasing waste, and maximising customer value. Organisations can optimise their supply chain operations, realise cost savings, and react more quickly to changing customer and market demands by using lean principles and practises.

The effectiveness of global manufacturing strategies such as lean would not be solely dependent on the use only of suitable instruments and techniques, but rather on the relationships between top management and employees. Top management can play an important role in understanding, executing and deploying the plan efficiently in the organization. (Jadhav et al. 2014).

Berger et al. 2018 has suggested studies to analyze the impact that such practices implementation may have on the supply chain performance. The change from conventional manufacturing to lean manufacturing, and implement the lean supply chain is not an easy task (Zhou & Ji 2015). There is a gap between theory and practice that raises the question of how to reduce such distance to succeed in lean supply chain management implementation (Berger et al. 2018).

Previous studies indicate that most businesses have a reasonably strong grasp of lean ideas and theory. The majority of businesses perceive lean as cost efficiency, performance development, and elimination of waste. It was also found that the other factor are: top management shall give commitment and support (Carvalho et al.2011, Das 2017, Freytag et al. 2011, Azyan et al. 2017, Yadav et al. 2019), employee got sufficient training (Sharma et al. 2015 and Perez et al. 2010), contribution of managers (Govindan et al. 2014 and Frazzon et al. 2017) and company financial capability (Al-Shboul et al. 2017 and Gligor et al. 2015). The various factors involved in achieving effective and efficient supply chain structures that enable organisations to not only reduce costs but also improve customer satisfaction (Alomari 2021).

Furthermore, the need for increased transparency in primary supply chain management studies requires greater emphasis. Ensuring transparency by presenting methodological details is required for future research to effectively compare and synthesize primary studies via systematic literature review and contribute to knowledge development (Durach et al. 2017).

An integrated outlook is required for future studies focused on Lean Supply Chain Management, where social challenges in particular and the interrelationships of LSCM with the three dimensions need to be explored in greater depth (Martinez-Jurado & Moyano-Fuentes 2014). The state of openness in our discipline at present, the prevalence of measuring units, and divergent meanings, the existing state of openness in our profession hinders such information

creation and leads to the fact that supply chain management trails behind other disciplines in establishing its own theory base (Durach et al. 2017). According to Alomari 2021, to further promote CSF of supply chain management and CSF knowledge system should be linked to company performance. Lean implementation is also hampered by a lack of knowledge of lean benefits toward organization (Yadav et al. 2019).

There is a growth in the number of published systematic literature review articles in the supply chain management area, which are often sponsored by the publications themselves by special issues (Durach et al. 2017). Until now, most of Lean research up has focused on the Western countries and have largely ignored developing countries such as the Asia and Middle East. Study initiatives in less developed countries; more exposure to the social component of sustainability; a more general contribution on the environmental supply chain innovation issue from certain countries that have turned out to be less efficient or even inactive (Tebaldi et al. 2018). The study shall add in the comparative case studies was conducted on company implementing lean in developed countries versus developing countries to determine the application of Lean tools in company in developing economies (Alkhoraif et al. 2018).

The lean implementation requires the use of lean tools such as Kaizen, 5S, setup time reduction, cellular manufacturing, continuous flow, equipment layout, product design simplicity, and error-proof equipment (Zahraee 2016). Furthermore, Lean's current emphasis is on academia, primarily because of its roots in the academic field, but research is needed in this context, as it is now gaining interest in the industrial sector (Alkhoraif et al. 2018). The barriers are existed in implementation of lean (Jadhav et al. 2014). The barriers affect the effective implementation of lean supply chain management. Identifying the challenges that are at the root of any further obstacles and those most impacted by others would be useful for upper management to successfully implement the lean systems (Akshay et al.2018).

This can be a guide for taking appropriate action to tackle barriers in the successful implementation lean system. It is, therefore, important that researchers study the relationships among these barriers. Several literature reviews were conducted by past studies on barrier and critical success factors in lean supply chain. These included a review presented by Berger et al. 2018, Zimmermann et al. 2016, Alkhoraif et al. 2018, Durach et al. 2017, Martinez - Jurado & Moyano - Fuentes 2014, Parmar & Shah 2016, Tebaldi et al. 2018 AND Tortorella 2017 regarding systematic literature review of practices, barriers and contextual factors inherent to its implementation.

Reason for implement lean is to reduce cost, fullfill

management decision and to develop the organization (Albjorn 2011). The stage of lean implementation in a factory influences which factors are perceived as more effective than others to a small extent (Netland 2015). Thus, the objective of this study is to perform a systematic literature review to identify the barrier and critical success factor in implementation of lean supply chain management and contextual factor that influence it. Through this literature review, it is expected to identify the main gap related to lean supply chain implementation and discuss the relevance of the research in this topic, so can lead to future research directions.

METHODOLOGY

Jesson et al. 2011 define a systematic review as a review with a clear stated purpose, a question, a defined search approach, stating inclusion and exclusion criteria, producing a qualitative appraisal of articles. Systematic literature review (SLR) is a method that systematically explores current research literature to “produce a structured overview of the field” (Pickering & Byrne 2013). Systematic reviews address the issue about how primary study is carried out, how various techniques and methods suit the task, the impact of what needs to be clarified and to how primary research will fill the gaps (Gough et al. 2012). Systematic reviews search, evaluate and collate all relevant empirical evidence in order to provide a complete interpretation result of research. Although conventional SRs are typically used in social sciences and clinical research, they have found application in many subject areas for example in basic science research, engineering, environmental science, advertising, education, international development, public policy and ecology (O’Hagan et al. 2018, Gilbody 2005, Pullin & Stewart 2006 & Petticrew 2001). The importance of the guideline of systematic review of a literature base is to avoid bias and reliable assessment was carried out (Tranfield 2003).

There are two types of literature review ; traditional literature review and systematic review (Jesson et al. 2011). The literature review is a written product is a literature review; the style may varies depending on the review ‘s intent. The review will be the part of dissertation and study project and it’s also can be stand-alone review (Jesson et al. 2011).

The systematic review’s approach and presentation of are methodical and repeatable. They entail a thorough search for all relevant published and unpublished work on a topic, a systematic integration of search results, and a critical assessment of the scope, nature, and quality of evidence in connection to a specific research issue (Siddaway et al. 2018).

Information not used later in meta-analyses should be used to develop the optimal hypothesis for a systematic review. Searching through web repositories for research is required, and more than one should be consulted. It is necessary to conduct a manual search in the references of articles, editorials, reviews, and other publications. The selection of studies should be made by two investigators on an independent basis (Delgado-Rodríguez & Sillero-Arenas 2017)

The search is intended to provide an exhaustive review of the current literature, which captures all appropriate studies ensuring the research question to be answered to its fullest extent. The carefully crafted and exhaustive methodology minimizes bias and provides reliable and valid conclusions to be taken (Pannucci & Wilkins 2010). Performing an effective literature search to get the best available evidence is the basis of any evidence (McKeever 2015). However, with a wide and increasing number of published studies available, searching the literature can be challenging.

The challenge in systematic literature review is to search grey literature. Grey literature is a vast, but difficult-to-understand collection of information. Grey literature is occur when articles are produced in print and electronic media at all levels of government, academia, business, and industry, but which is not controlled by commercial publishers, i.e., when publication is not the primary activity of the provider (Farace & Frantzen 2004). It can be search via customized Google search engines or targeted website (Godin et al. 2015).

IDENTIFYING SEARCH TERM

Standardized search terms are thesaurus and indexing terms used by electronic libraries as a simple way to categorise articles, allowing for efficient search. Individual database records may be assigned several different standardised search terms that describe the same or equivalent definition (Atkinson & Cipriani 2018). The keyword for search the online journal has been selected from Berger et al. 2018 , Alkhoraif et al. 2018 , Martinez-Jurado & Moyano-Fuentes 2014, Parmar & Shah 2016 , Tebaldi et al. 2018, Hugo & Cabrita 2015 and Tortorella 2017. The search dimension is restricted to the keywords:

1. Lean
2. Lean management
3. Lean supply chain
4. Lean supply chain management
5. Supply Chain
6. Critical success factor
7. Critical success factor in lean

8. Critical success factor in lean management
9. Systematic literature review
10. Barrier

This study adopts the classification system proposed by Durach et al. 2017 and such system involves the following six steps:

- Step 1 - defining the research question;

The systematic review is start with clear question to be answered or hypothesis to be tested (Petticrew 2001). Relevant research questions are formulated through the method of conducting quality research. The formulation of the study issue, generally

overlooked, involves close analysis of a multitude of variables which can theoretically take a considerable amount of time. The research question should include the problem or question of interest, intervention and comparator, along with the outcomes of interest (Aslam & Emmanuel 2010). A narrow research question will create a narrow and reliable search, likely leading to very few studies to base a review on, or becoming so centred that the findings are not helpful in broader research setting (Atkinson and Cipriani 2018).

- Step 2 - determining the required characteristics of primary studies;

Systematic analyses aim to be more straightforward than their narrative cousins, but they may still be skewed if the preference or focus in such primary research is impacted by the writers' preconceived ideas or sources of funding (Jorgensen et al. 2006).

- Step 3 - locating a representative sample of potentially relevant literature (Durach et al. 2017);

The restriction to locate all relevant published and unpublished studies to limit the impact of publication and other biases (Petticrew 2001).

- Step 4 - selecting the relevant literature (Durach et al. 2017);

Explicit explanation of the styles of research to be included on behalf of the researcher to restrict selection bias (Petticrew 2001).

- Step 5 - synthesizing the literature (Durach et al. 2017);

Check in systematic etiquette methods used in primary studies and investigate potential biases in those studies and sources of heterogeneity between study results (Petticrew 2001).

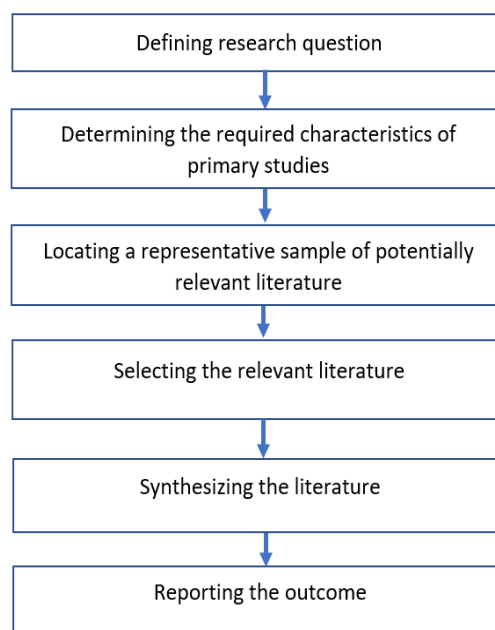


FIGURE 2. The flow diagram of literature review searching (Durach et al. 2017)

- Step 6 - reporting the outcome (Durach et al. 2017);

Focus on their conclusions on that research which are most methodologically sound (Petticrew 2001).

The flow chart can be refer to Figure 2.

Centobelli et al. (2017) applied three selection criteria to direct the focus of the research papers closer to the desired topic. Firstly, the abstracts describe about the critical success factor and/or barrier in lean supply chain management. Secondly, the content is related to the topic. Finally, it is necessary to search for related references cited in the literature but not in Scopus.

Furthermore, it is best not to restrict your search to only English-language publications. (Tawfik et al. 2019) as well as to avoid additional constraints such as publication date (Abdulla & Krishnamurthy 2016). Researcher can conduct systematic review using more than two databases on the selected subject (Abdulla & Krishnamurthy 2016). The search for articles is can be search can be searched in targeted website (Godin et al. 2015). The search of article mainly conducted using the online journal databases:

1. Sciencedirect
2. PubMed
3. Wiley Online Library
4. Emerald

Based on the Figure 3, the research article was identified from 4 websites like Sciencedirect, PubMed, Wiley Online Library, and Emerald. The result is 3672 research articles was found in Sciencedirect, 213 from PubMed, 562 from Wiley Online Library and 3000 from Emerald. The total number of articles from 4 websites is 7447. Then, all the 7447 articles were analysed by using EndNote software version 9. The duplicated paper found is 4035. The duplicated paper was removed then we got 3412 papers. We conducted the title and abstract screening on 3412 papers. 3033 articles were not selected because irrelevant and 314 were not available for full-text assess. Then we got 65 articles which is the articles are full text assess for eligibility. From 65 papers, we conduct screening again and 15 articles were found irrelevant, 1 article is duplicated and 1 paper is no full text available. In the final, we got 53 articles for qualitative synthesis.

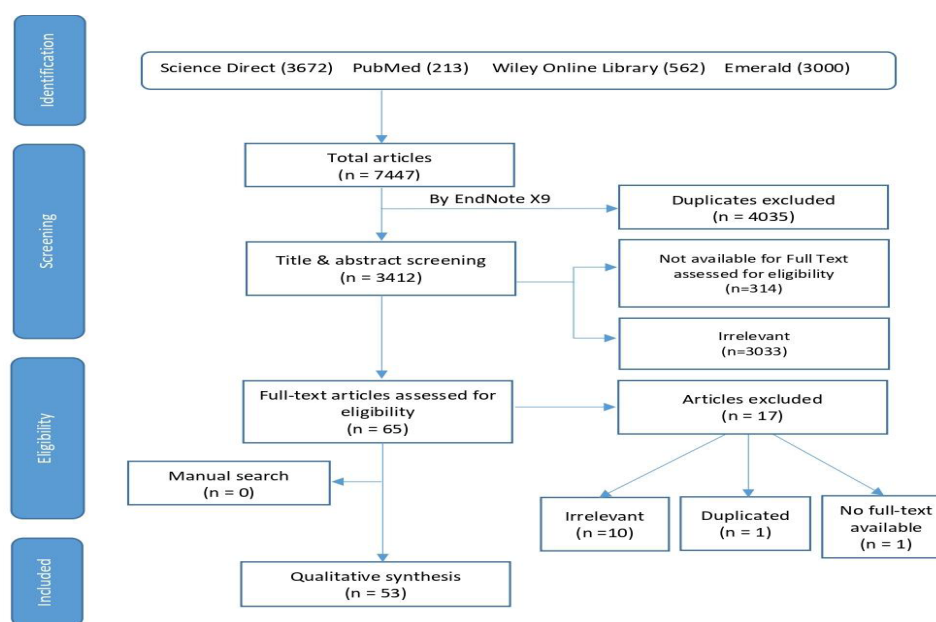


FIGURE 3. PRISMA flow diagram of studies' screening and selection (Tawfik et al. 2019)

Systematic analyses are focused on open guidelines that provide details such as the issues to be answered by the research, the demographic or survey that will be analyzed, the strategy for selecting appropriate research, and the study inclusion and exclusion criteria (Tranfield 2003). The researchers define the inclusion and exclusion criteria based on Macpherson and Holt (2007).

Defining the inclusion and exclusion criteria are a difficult and interactive task, as researchers must deal with multiple discussions on the subject in order to reach a consensus. As performed by Christofi et al. (2019) and Leonidou et al. (2018), the research is not limited to a specific publication period, but includes all relevant studies regardless of their publication year.

The inclusion criteria are the paper is focus on topic (Filipa & Correia Loureiro 2020) of lean implementation and lean supply chain management. The paper also focusses of the abstract (Centobelli

et al. 2017). Abstract is about lean implementation and lean supply chain management have been included. The source of paper is article type and articles included in JCR 2017 Q1, Q2 or Q3 (Filipa & Correia Loureiro 2020). There is no restriction in language and country of the published paper (Abdulla & Krishnamurthy 2016, Tawfik et al. 2019).

According to Tawfik et al. 2019, the exclusion criteria of selection of paper is the papers without full text available, papers with details not consistently extracted, duplicated, or overlapping; and abstract-only articles such as conference, editorial, previous papers, thesis and books.

CLASSIFICATION AND CODING

Once the articles have been reviewed, a system will be devised to classify the articles as shown in Table 4, which includes the following 2 elements:

TABLE 4. Method and national context

No.	Element classification		Code
1	Method	Empirical	1P
		Theoretical	2Q
		Case study	3R
		Systematic review	4S
2	National context	Developed countries	5P
		Developing countries	5Q

The lean practice was coded as P with running number in Borges et al. (2019). The performance outcomes derived due to CSFs adoption was coded with P with running number – Ansari 2018. SSCM practices for supplier selection was coded as EC, EN, and SC. EC means economic, EN means environment and SC means Social Science by Li 2019.

The detailed classification of issues on sustainability in supply chain management which is Economic was coded as E, environmental factors as GE, Social factors as S, Green as G and Sustainable as SS on Rajeev et al. 2017. The green supply chain management was coded as G with running number on Ruiz-Benitez et al. 2017.

The constructs and respective measures were coded as IP for institutional pressures, IEM as internal environmental management, CC as cooperation customer, ECO as eco design and GP as green purchasing by Vanalle et al. 2017. Research are as analysed in the research were coded as P, Q, R and S – adopted from Dauber et al. (2012). National context involved in the studies was coded as P and Q based on Silva et al. (2017).

RESULT AND DISCUSSION

Results of the literature analysis It is crucial to consider the national context, which includes both developed and developing countries. The distribution of the research according to the status of the respondents' countries is shown in Table 5. Developed countries account for the majority of studies (47.92%), while developing countries account for only 43.75% of studies.

TABLE 5. National context of articles

Code	National Context
A-1	5Q
A-2	5P
A-3	5Q
A-4	5Q
A-5	5Q
A-6	5P
A-7	5Q
A-8	5P
A-9	5P
A-10	5P, 5P
A-11	5Q
A-12	5Q
A-13	5P
A-14	5P
A-15	5P

continue ...

... cont.

A-16	5Q
A-17	5P
A-18	5P
A-19	5P
A-20	5P, 5Q
A-21	5P
A-22	5Q
A-23	5Q
A-24	5Q
A-25	5P
A-26	5Q
A-27	5Q
A-28	5Q
A-29	5Q
A-30	5Q
A-31	5P
A-32	5P, 5Q
A-33	5P
A-34	5Q
A-35	5P
A-36	5Q
A-37	5Q
A-38	5P
A-39	5Q
A-40	5Q
A-41	5P
A-42	5P, 5P
A-43	5P
A-44	5P
A-45	5P, 5Q
A-46	5Q, 5Q
A-47	5Q
A-48	5P, 5Q, 5Q
A-49	5P
A-50	5P
A-51	5P
A-52	5P, 5P
A-53	5P

TABLE 6. Presents the list of the research method.

Code	Method
A-1	3R
A-2	1P
A-3	1P
A-4	3R
A-5	1P
A-6	2Q
A-7	1P
A-8	1P
A-9	2Q
A-10	4S
A-11	1P
A-12	1P
A-13	1P
A-14	3R
A-15	3R
A-16	1P
A-17	1P
A-18	1P
A-19	3R
A-20	1P
A-21	1P
A-22	2Q
A-23	2Q
A-24	1P
A-25	1P
A-26	2Q
A-27	1P
A-28	1P
A-29	2Q
A-30	1P
A-31	4S
A-32	2Q
A-33	2Q
A-34	1P
A-35	1P
A-36	1P
A-37	2Q
A-38	2Q
A-39	3R
A-40	2Q
A-41	1P
A-42	2Q
A-43	4S
A-44	1P
A-45	1P
A-46	1P

continue ...

... cont.

A-47	1P
A-48	2Q
A-49	1P
A-50	1P
A-51	1P
A-52	1P
A-53	1P

TABLE 7. List of selected articles

Code	Authors	Year	Journal	Country of Origin (authors)
A-1	Abideen and Mohamad	2019	International Journal of Pharmaceutical and Healthcare Marketing	Malaysia
A-2	Aronsson et al.	2011	Supply Chain Management: An International Journal	Sweden and Finland
A-3	Agarwal and Sharma	2016	Competitiveness Review	India
A-4	Agus and Hajinoor	2012	International Journal of Quality & Reliability Management	Malaysia
A-5	Barber et al.	2017	Journal of Manufacturing Technology Management	Jordan
A-6	Borges et al.	2019	Journal of Health Organization and Management	Italy
A-7	Campos and Vazquez-Brust	2016	Supply Chain Management: An International Journal	Brazil
A-8	Çankaya	2020	Journal of Global Operations and Strategic Sourcing	Turkey
A-9	Carvalho et al.	2011	International Journal of Lean Six Sigma	Portugal
A-10	Khorasani et al.	2019	International Journal of Lean Six Sigma	USA and Switzerland
A-11	Das	2017	Journal of Cleaner Production	India
A-12	Das	2018	Journal of Cleaner Production	India
A-13	Dües et al.	2013	Journal of Cleaner Production	United Kingdom
A-14	Duarte and Machado	2017	International Journal of Lean Six Sigma	Portugal
A-15	Freytag et al.	2010	International Journal of Physical Distribution & Logistics Management	Denmark
A-16	Giglio et al.	2018	Journal of Manufacturing Technology Management	Brazil and Mexico
A-17	Gligor et al.	2015	Journal of Operations Management	USA
A-18	Govindan et al.	2014	Journal of Cleaner Production	Portugal
A-19	Guimarães et al.	2013	Strategic Outsourcing: An International Journal	Portugal
A-20	Hajmohammad et al.	2013	Journal of Cleaner Production	Canada and Brazil
A-21	Found and Harrison	2012	International Journal of Lean Six Sigma	United Kingdom
A-22	Hartono et al.	2015	Procedia Manufacturing	Indonesia
A-23	Frazzon et al.	2017	International Journal of Lean Six Sigma	Brazil
A-24	Jasti and Kurra	2017	International Journal of Productivity and Performance Management	India
A-25	Jin, Zhang et al.	2020	Engineering, Construction and Architectural Management	China and United Kingdom
A-26	Jabbour et al.	2014	Benchmarking: An International Journal	Brazil
A-27	Kumar et al.	2018	International Journal of Productivity and Performance Management	Jordan
A-28	Kumar et al.	2016	International Journal of Pharmaceutical and Healthcare Marketing	India

A-29	Regattieri et al.	2018	The TQM Journal	Italy
A-30	Manzouri et al.	2013	International Journal of Lean Six Sigma	Malaysia
A-31	Mardani et al.	2019	Journal of Cleaner Production	USA, Denmark, Saudi Arabia & Iran
A-32	Marodin et al.	2017	Supply Chain Management: An International Journal	USA and Brazil
A-33	Martínez-Jurado and Moyano-Fuentes	2014	Journal of Cleaner Production	Spain
A-34	Nazmul Ahsan and Arif-Uz-Zaman	2014	International Journal of Productivity and Performance Management	Bangladesh
A-35	Perez et al.	2010	Supply Chain Management: An International Journal	Spain
A-36	Sharma et al.	2015	Journal of Manufacturing Technology Management	India
A-37	Raut et al.	2020	Benchmarking: An International Journal	India
A-38	Rich and Piercy	2015	International Journal of Operations & Production Management	United Kingdom
A-39	Dixit et al.	2019	International Journal of Pharmaceutical and Healthcare Marketing	India
A-40	Ruiz-Benitez et al.	2017	Journal of Cleaner Production	India
A-41	Sacristán-Díaz et al.	2020	Journal of Manufacturing Technology Management	Spain
A-42	Salonitis et al.	2019	International Journal of Lean Six Sigma	Saudi Arabia and United Kingdom
A-43	Saxby et al.	2020	The TQM Journal	United Kingdom
A-44	Stavroulaki and Davis	2010	The International Journal of Logistics Management	USA
A-45	Jayaram et al.	2014	Benchmarking: An International Journal	USA and Thailand
A-45	Jayaram et al.	2014	Benchmarking: An International Journal	USA and Thailand
A-46	Qrunfleh and Tarafdar	2013	Supply Chain Management: An International Journal	USA and United Kingdom
A-47	Tlapa et al.	2017	The TQM Journal	Brazil
A-48	Tseng et al.	2013	Journal of Cleaner Production	Taiwan, China and Philippines
A-49	Hofer et al.	2021	International Journal of Production Economics	USA
A-50	Kolawole et al.	2021	Industrial Marketing Management	United Kingdom
A-51	Zhao et al.	2021	Physica A	China
A-52	Mohaghegh et al.	2021	Journal of Cleaner Production	Germany and Italy
A-53	Garcia-Buendia	2021	CIRP Journal of Manufacturing Science and Technology	Spain

Table 7 presents the list of the 53 selected articles indicates the articles published per year. The country of origin also has been shown in the table. Interestingly, 4% of studies across the regions combined data from both developed and developing countries, indicating that developing countries require more attention, particularly in determining the factors that impede their growth. In addition, from a global perspective, a comparative analysis of the status of both countries is useful.

METHOD OF RESEARCH

According to the findings of this review article (Figure 4), the empirical method of research had the highest rank with 56%. The second rank was fall to theoretical research method with rank 51%, then followed by conceptual with rank 11%, then followed by literature review/systematic review with rank 10%. The case study research method was the lowest research method with rank 8%.

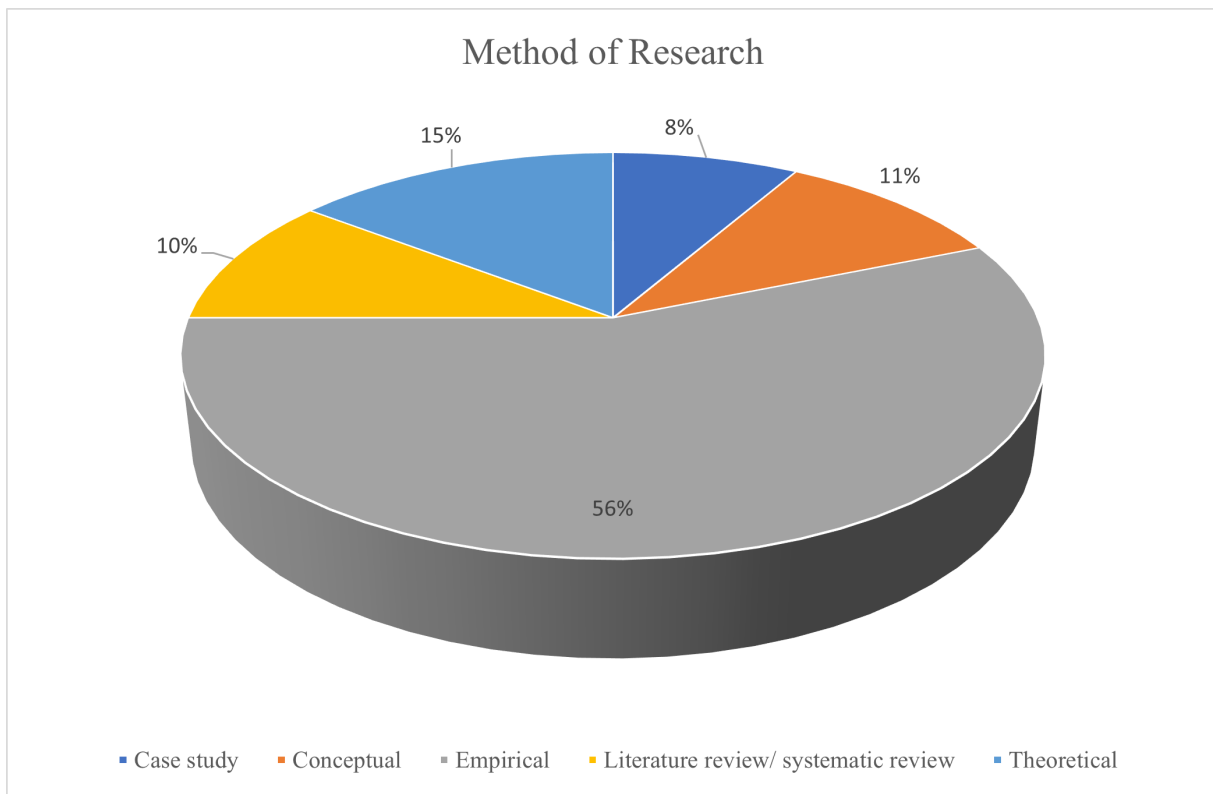


FIGURE 4. Method of research.

JOURNAL QUARTILE

The majority of papers come from a small list of journals that have been categorised within the top 37.5% of impact factor distribution featuring in Quartile 1 (Figure 5). While 35.42% of the journal featuring in Quartile 2, 14.58% in

Quartile 3 and 12.5% featuring in Quartile 4. Q1 journals have high impact factors, are read by more researchers, and receive more citations (Garfield 2006; Miranda & Garcia-Carpintero 2019). In one instance, it was discovered that Q4 journals were less cited and possibly read.

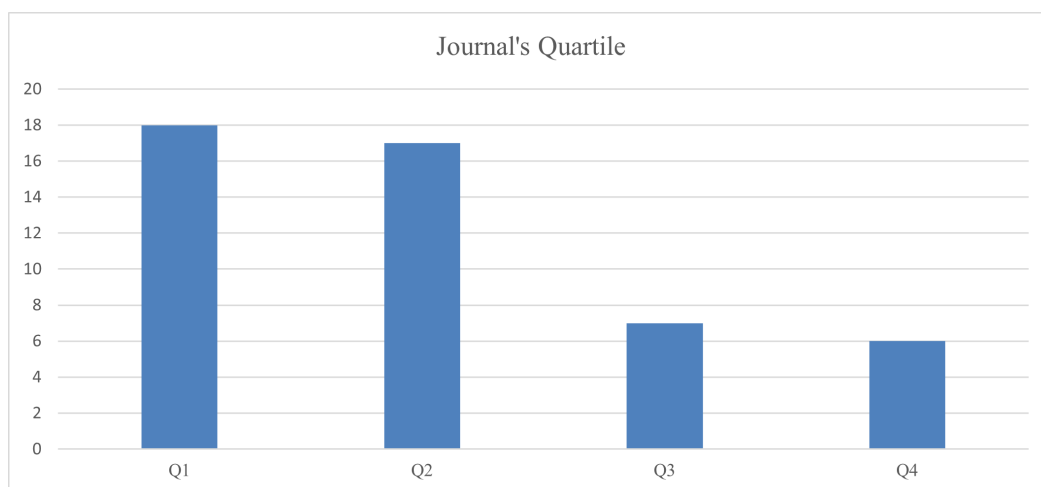


FIGURE 5. Journal quartile.

RESEARCH FIELD BY SECTOR

According to the Figure 6, the manufacturing sector had the highest rank with 52%. The second rank was fall to healthcare sector with rank 15% then followed by pharmaceutical and automotive with rank 4% respectively. Furthermore, it was discovered that the manufacturing sector ranked highest among all other sectors, with results reported in the majority of published papers (Mardani 2019).

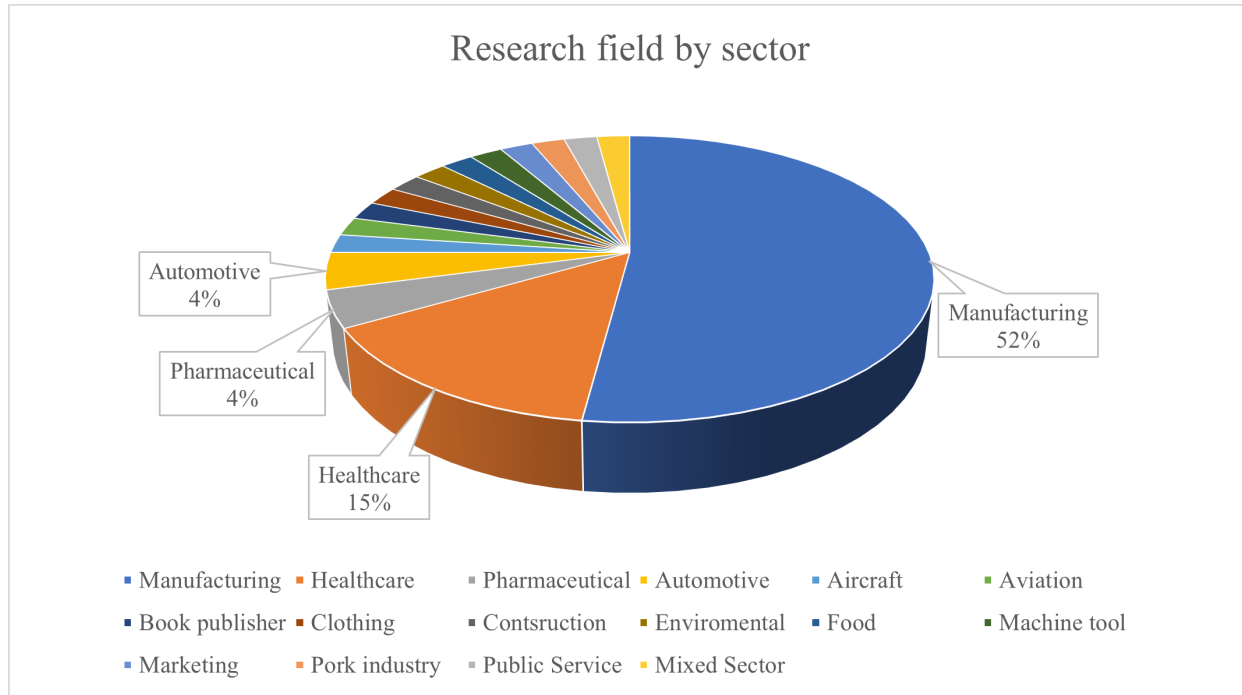


FIGURE 6. Research field by sector

BARRIERS THAT AFFECTS THE IMPLEMENTATION OF LEAN SUPPLY CHAIN

This section contains all the factors that may affect the organization to successfully implement lean supply chain management practices are assess. It is important to realize that many distinctive factors mentioned above here substantial impact on any organization attempting to implement lean supply chain management. However, understanding how these elements play a role in lean implementation in the context of lean supply chain management. Table 8 presents an overview of the barrier that affect the implementation of lean supply chain management. Table 9 an overview of the critical success factor that affect the implementation of lean supply chain management.

LACK OF COMMITMENT FROM TOP MANAGEMENT

The commitment from top management is one of the factors that affect the lean supply chain management (Manzouri et al. 2013, Sharma et al. 2015 and Jasti & Kurra (2017).

The bad management practice such as bad monitoring, lack of information exchange, lack of supervision of standardized working tools and lack of training. (Kolawole et al. 2021). Procedures and techniques also determine whether an organisation succeeds or fails. One of the most important tools for better inventory prioritising in terms of storage, handling, and cost-related inventory factors (Abideen and Mohamad. 2019).

Greater management needed together with increasing costs and high complexity to improve efficiency (Borges et al. 2019). In large organization, there is a population of executives with advanced business school diplomas who have skills and understanding of supply chain management. They need the commitment and support from senior management (Perez et al. 2010).

TABLE 8. Barrier in lean supply chain management implementation.

No.	Barrier	Abideen and Mohamad (2019)	Aronsson et al. (2011)	Borges et al. (2019)	Campos and Vázquez-Brust (2016)	Das (2017)	Gligor et al. (2015)	Guimarães et al. (2013)	Frazzon et al. (2017)	Jasti and Kurra (2017)	Singh et al. (2016)	Manzouri et al. (2013)	Marodin et al. (2017)	Martinez-Jurado and Moyano-Fuentes (2014)	Arif-Uz-Zaman and Ahsan (2014)	Perez et al. (2010)	Sharma et al. (2015)	Baliga et al. (2020)	Piercy and Rich (2015)	Dixit et al. (2019)	Moyano-Fuentes et al. (2020)	Almutairi et al. (2019)	Qrunfleh and Tarafdar (2013)	Kolawole et al. (2021)	Zhao et al. 2021	Mohaghegh et al. 2021
	Code	A-1	A-2	A-6	A-7	A-11	A-17	A-19	A-23	A-24	A-28	A-30	A-32	A-33	A-34	A-35	A-36	A-37	A-38	A-39	A-41	A-42	A-46	A-50	A-51	A-52
1	Commitment from the management.	•		•						•		•				•	•							•		
2	Employee lack of training and skills.											•					•			•				•		
3	Lack of system view or strategy.		•		•																					
4	Lack of flexibility.		•					•																		
5	Unsmooth information transfer.											•										•		•	•	•
6	Lack of planning.							•							•											
7	Low attitude.																			•						
8	Cost for implementation.			•								•														•
9	Lack of financial.								•												•					
10	Lack of organizational incentive.				•	•																				
11	Employee resistance to change in lean implementation.											•					•		•							
12	Low awareness of lean in lean implementation.											•	•													•
13	Organizational culture of the company.											•														
14	Lean customer relationship negatively moderates the effect.													•												
15	Lack of communication.																					•				

EMPLOYEE LACK OF TRAINING AND SKILLS

Lack of training is one of the reason in implementation of lean supply chain management (Sharma et al. 2015 and Dixit et al. 2019). The organization was not only hiring talented people, but also from providing proper training and innovation.

The effect of inadequate staff training is the staff is the staff conducted their duties in unprofessional manner which can generate to waste (Kolawole et al. 2021). Providing adequate tools and equipment during the implementation phase is more difficult for them (Manzouri et al. 2013).

Dora & Gellynck 2015 was discovered that training is critical to the successful implementation of lean manufacturing. On the surface, training as a determining factor appears to be a success element for organizations participated in lean training programmes.

LACK OF SYSTEM VIEW OR STRATEGY

While previous research has looked into various supply chain strategies and their effects on firm performance, it hasn't provided any theoretical or empirical guidance on how supply chain practises can be used to more effectively deploy supply chain strategies and increase their impact on supply chain responsiveness (Qrunfleh and Tarafdar, 2013).

Lean supply chain management can be done if a systems approach is applied together with a strategic orientation, with supply chain members cooperating to coordinate and converge operational and strategic capabilities into an united whole (Aronsson et al. 2011).

Empowerment programmes and training are critical for improving the company's management systems, such as quality management, environmental management, and lean manufacturing, among others (Campos and Varquez-Brust, 2016).

LACK OF FLEXIBILITY

The lack of flexibility was one of barrier and flexibility was needed in a long term relationship that challenges the trust levels with others (Guimarães et al.2013 and Aronsson et. al. 2011). The lean approach is currently being utilised in organizations with the goal of improving production planning and reducing waste.

UNSMOOTH INFORMATION TRANSFER

In other research, a reluctance to share information has been identified as a significant hurdle to using SCM (Manzouri et al. 2013; Ab Rahman et al. 2011).

The information exchange needs more improvement. The "bullwhip effect" can be significantly reduced by timely communication of essential information throughout the supply chain (Almutairi et al. 2019).

LACK OF PLANNING FOR LEAN IMPLEMENTATION

Strategic planning is a critical for success in a volatile and global market (Singh et al. 2016). Poor supply chain operations may be caused by a lack of strategic planning, collaboration, and capacity planning (Gupta and Ramesh, 2015). Process planning increases the overall supply chain's responsiveness and agility (Singh et al. 2016).

According to a review of lean implementation research, it can be used to become more profitable and competitive by reducing lead times and inventories while also lowering operating costs. However, most lean implementation projects fail due to insufficient lean strategic plans (Sharma et al. 2015).

COST FOR IMPLEMENTATION

Such findings are also seen in a recent report in the literature of Campos and Varquez-Brust, 2016) which is cost savings for the focal company in the implementation of lean practices.

Because the end customer nowadays puts pressure on the retailer to lower prices, supply costs must be cut to meet end customer demands. As a result, cost savings must be passed on from raw material and component suppliers to the manufacturer, distributor, wholesaler, and retailer. This implies that the entire supply chain must be involved in lowering the end price. Because suppliers and customers are in the same boat in terms of wanting to meet end customer needs, all cost-cutting and waste-reduction tools and approaches should be used by all suppliers and consumers (Manzouri et al. 2013). To successfully implement lean, organization shall carry out low-cost production and obtain external funding (Zhang et al. 2017).

LACK OF ORGANIZATIONAL INCENTIVE

Despite the dominance of lean perspectives in operations and the lack of organisational incentives and spaces for sharing knowledge and developing in the lean areas (Varquez-Brust and Campos 2016).

LACK OF FINANCIAL

According to Gligor et al. (2015), supply chain agility was discovered to have a positive impact on the firm's financial results by increasing customer and cost. However, no correlation between supply chain agility and financial performance was discovered.

To improve supply chain performance while lowering costs, more attention and work must be paid to a number of important issues, including employee and customer training, tracking and visibility of medicines, waste management, HR practises, risk management, and cold chain management (Dixit et al. 2019). Researchers and consultants have proposed a number of critical success factors to help companies implement lean and avoid costly failures (Netland 2015). In today's enterprise financial management, finding an innovative and forward-thinking financial management strategy has become an urgent problem to be solve (Lande et al. 2016).

EMPLOYEE RESISTANCE TO CHANGE IN LEAN IMPLEMENTATION

Human resistance has been identified by many other researchers as a significant barrier to implementing lean supply chain management (AlManei 2017, Sharma et al. 2015, Manzouri et al. 2013, Giunipero 2012, Wong and Wong 2011). Employee attitudes/resistance to change, while slightly higher in medium and large organisations, is still a significant factor in small businesses (Bhasin 2012).

Employees resisted lean because they believed it would increase their workload rather than help them work more efficiently (Wong and Wong 2011). Companies undergo many changes as a result of implementing new systems, but people dislike to change. They prefer to stick to their old methods and equipment, so they are resistant to new systems and methods. Employee resistance can cause new systems to fail because all activities are carried out by people (Manzouri et al. 2013).

Piercy and Rich (2015) found that any change initiative will face to resistance, but in each case, the company worked diligently to overcome obstacles in order to achieve lean and sustainable improvements.

LOW AWARENESS OF LEAN IN LEAN IMPLEMENTATION

Due to a lack of awareness and an ineffective implementation approach, many organisations have struggled to implement lean supply chain management (Marodin et al. 2017).

The managers need to continuously modify common capabilities in lean management practises) and create higher-order capabilities in order to keep the sustainability (Mohaghegh et al. 2021).

According research conducted by Manzouri et al. 2013, 14 percent of non-lean companies need to implement lean manufacturing immediately. Market competition and uncertainty have been identified as significant barriers to lean organisations implementing lean supply chain.

ORGANIZATIONAL CULTURE OF THE COMPANY IN LEAN IMPLEMENTATION

Company culture was mentioned by lean organizations as one of important barriers by Manzouri et al. (2013). The maturity of operations processes, the maturity of the upstream and downstream supply chain, and the disposition of employees cultivated through organisational culture are all likely to play a role in revealing new insights into these types of relationships (Das 2018).

LACK OF COMMUNICATION IN LEAN IMPLEMENTATION

Lean implementation is also hampered by a lack of communication between different levels of the organisation (Zhang et al. 2017, Yadav et al. 2019). Communication can be improved by exchanging information between the different departments/parties involved to improve purchase of the correct item, to reduce time of delivery and minimize the cost of distribution (Haffar et al. 2013).

The procurement process has become dysfunctional due to a breakdown in effective communication between different departments/parties. One of the most significant obstacles to lean implementation is a lack of communication (Grove et al. 2010)

TABLE 9. Critical Success Factor in lean supply chain management implementation.

No.	Critical Success Factor	Sharma et al. (2015)	Agus and Hajinoor (2012)	Al-Shboul et al. (2017)	Çankaya (2020)	Carvalho et al. (2011)	Das (2017)	Freytag et al. (2011)	Gligor et al. (2015)	Govindan et al. (2014)	Frazzon et al. (2017)	Marodin et al. (2017)	Perez et al. (2010)	Qrunfleh and Tarafdar (2013)	Piercy and Rich (2015)	Moyano-Fuentes et al. (2020)	Almutairi et al. (2019)	Saxby et al. (2020)	Stavrulaki and Davis (2010)	Hofer et al. (2021)
	Code	A-3	A-4	A-5	A-8	A-9	A-11	A-15	A-17	A-18	A-23	A-32	A-35	A-46	A-38	A-41	A-42	A-43	A-44	A-49
1	Relationship with supplier			•								•		•		•		•	•	•
2	Top management gives commitment and support in lean implementation.					•	•	•					•		•					
3	Effort in lean implementation						•	•									•			
4	Training and education for the employee for lean implementation.	•											•							
5	Management leadership in lean implementation.									•	•									
6	Financial capability of company in lean implementation.			•					•											
7	Performance measurement in lean implementation.					•														
8	Lean awareness		•																	
9	Continuous improvement		•																	
10	Adequate support from middle level managers						•													
11	Supply chain strategies				•															
12	Contribution of managers				•															
13	Strategic plan in lean implementation														•					
14	Flexibility with partners			•																
15	Customer relationship			•																

CRITICAL SUCCESS FACTOR THAT AFFECTS THE IMPLEMENTATION OF LEAN SUPPLY CHAIN

RELATIONSHIP WITH SUPPLIER

The challenges that exist in each supply chain is leagility, agility and supplier relationship (Stavrulaki and Davis, 2010). The organization shall improve the supply chain performance by practices and mediate the interaction between supply chain strategy and supply chain responsiveness (Qrunfleh and Tarafdar 2013).

Another option is for the organization plan to form a strategic supplier partnership (Al-Shboul et al. 2017). Lean supplier relationships help to moderate the impact of lean shop floor methods on quality (Marodin et al. 2017). The relationship between customers and suppliers in implementing lean at the internal level has an impact on the efficiency of Relationships with suppliers imply that suppliers do and possibly should take into account the inventory management strategies of their most significant customers when developing their own inventory strategies. The requirement that suppliers comprehend their largest clients' overarching objectives for inventory leanness (Hofer et al. 2021).

COMMITMENT FROM TOP MANAGEMENT

Most lean implementation projects fail due to lack of management support (Sharma et al. 2015, Zhang et al. 2017). The top management shall give commitment and support in lean implementation (Carvalho et al. 2011, Das 2017, Freytag et al. 2011). The senior management commitment and support was needed in lean supply chain. There is educated and competent staff that can understanding of supply chain management in large companies (Perez et al. 2010).

EFFORT IN LEAN IMPLEMENTATION

Managers will be able to suggest which aspects of supply chain management require more attention from top management and where more resources should be allocated for satisfactory implementation and performance outcomes based on the status of supply chain management practises followed and the performance outcome on different aspects of supply chain management (Das 2017).

To achieve significant improvements in supply chain management performance, the organisation must be prepared in advance to successfully implement lean (Almutairi et al. 2019).

TRAINING AND EDUCATION FOR THE EMPLOYEE FOR LEAN IMPLEMENTATION

According to a review of lean implementation research, one of the reasons for such failure in lean implementation is include an insufficient training (Sharma et al.2015, Zhang et al. 2017).

To assess this dimension, an investigation was conducted into the level of employee involvement in the company's quality management policy as well as the company's training plan. Human capital development and employee involvement in the company's improvement strategy are frequently linked (Perez et al. 2010).

Another reason to be optimistic about improving this aspect is the capacity of the training policies implemented by companies in this sector: all companies have a training programme in place that covers more than 90% of operational personnel and more than 60% of intermediate level personnel (Perez et al. 2010).

MANAGEMENT LEADERSHIP IN LEAN IMPLEMENTATION

The study by Govindan et al. (2014) is a significant contribution for managers. It provides information on the types of lean practises that have a big impact on supply

chain sustainability. It is easier for businesses to choose the set of practises that should be used to improve social, economic, and environmental sustainability when they have this information. This is followed by methodology, understanding and implementation as well as humans, culture and competencies. Then comes as funding, communication and technique along with suppliers, market and customers (Belhadi et al. 2018).

In this way, Frazzon et al. (2017) findings show how well lean SCM practises can perform in various productive scenarios. The managers must understand that if certain levels of production stability are not in place, lean supply chain management practises must be approached with caution. However, once these issues with stability are addressed, these inventory strategies can provide greater benefits.

FINANCIAL CAPABILITY OF COMPANY IN LEAN IMPLEMENTATION

According to Al-Shboul et al. (2017), the implementation of quality management, customer focus, and supplier collaboration have positive significant relationships. These practises result in significant increases in both market share and financial performance.

The results of Gligor et al. (2015) .'s study provide a better understanding of how firm supply chain agility affects financial performance. This is a significant theoretical contribution with management implications. Financial performance will be better than when environmental majesty, dynamism, and complexity are lower.

The other critical success factor for lean implementation is the performance measurement in lean implementation (Carvalho et al. 2011). The lean awareness and continuous improvement also needed in lean supply chain management implementation (Agus and Hajinoor, 2012).

The middle level managers shall provide adequate support to the staff (Das, 2017) and also give contribution to managers and plan for supply chain strategies (Çankaya, 2020 and Piercy and Rich, 2015). Flexibility with partners and customer relationship also critical success factor for lean implementation (Al-Shboul et al. 2017).

OVERVIEW OF BARRIERS AND CRITICAL SUCCESS FACTORS FOR LEAN SUPPLY CHAIN MANAGEMENT

After reviewing the Critical Success Factor (CSF) to implementing lean supply chain management in the organization and the Barrier for its success, we observe that there is a consistency among them, which confirms

the validity of what we have achieved in our research. The consistency data gives the organization a clear view of what to do and what to avoid during adopt lean methodology (Ayoub et al. 2019).

TABLE 10. The consistency among Barriers and Critical Success Factor for implementation lean supply chain management in organization.

Critical Success Factor	Barrier
Commitment and support from top management	Commitment from the management
Lean awareness	Low awareness
Strategic plan	Lack of planning
Training and education for the employee	Employee lack of training and skills
Financial capability of company	Lack of financial

CONCLUSION

In this study, we highlighted the main organizational and managerial features of the organization and the need to adopt a lean methodology in the management of these organization, as well as the main obstacles to the application of this methodology and the critical success factors of its implementation.

The objective of this study is to conduct a systematic literature review to identify the barriers and critical success factor that influence in implementation of Lean Supply Chain Management (LSCM) practices in industry.

Through this systematic literature review, it is expected to identify the main gaps related to LSCM implementation in industry and discuss the relevance of research in this topic for indicating the future research direction.

The results reveals that “relationship with supplier” was the top critical success factor. Then following by “commitment and support by top management”, “effort in lean implementation”, “training and education” and “management leadership” as the key of critical success factor in lean implementation in any organization.

Furthermore, the results showed that “lack of management commitment and leadership”, “lack of training and skills”, “lack of system view or strategy” “lack of flexibility” and “reluctant to exchange information” are the most critical barriers hence these should be considered as the foundation of any lean implementation project in any organization.

The study also suggested that employees should have a basic understanding of lean and its benefits from the start in order for them to participate actively. Furthermore,

commitment from the top management was found to be a dominating factor in organization.

The originality in this work is the identification of critical success factor and barrier for lean implementation in the supply chain management. The Critical Success Factor and Barrier identified were consistent from the selected papers.

Based on the extensive systematic review of literature, we found of the consistency data between Barriers and Critical Success Factor. This study extends previous studies on LSCM, strengthens the body of knowledge on the issue and consolidates the key LSCM activities, barriers and critical success factors associated with its implementation. The clear identification of these topics can allow researchers and practitioners to predict occasional problems and to set the right standards for the implementation of the LSCM.

The limitation of this study was identified. The priority wise significance order of identified categories of CSFs and barrier for lean implementation showed that commitment and support from top management and training posses the highest importance thus the top management should focus on this category of CSFs and Barrier on a priority basis to establish their lean programs in their organization.

Future research should focus on ways for the organisation to strengthen its Lean culture for all employees, as management commitment and employee training and skills are critical to the success of lean supply chain management. The future research also shall compare the gap analysis between the CSF and Barrier between theoretically and actual practice in the large and medium and small industry. In another context, the diversity of organisation business sectors necessitates a diversity of approaches and Lean tools for each industry sector. This can be used to strengthen the theoretical foundation and give practitioners direction.

The study has gathered a list of 15 CSFs of lean implementation in industry grouped into five categories. The implication of this study is the identified categories and CSFs and Barrier will enrich the knowledge by enhancing the understanding of the factors that affect the success of lean implementation in the industry. The prioritize category can help the industry to focus the top CSF and Barrier to ensure their lean program is successful. This finding also will aid researchers and practitioners in developing a model for implementing lean methodology in organisations based on the CSFs and Barriers .

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DECLARATION OF COMPETING INTEREST

None

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