A Pareto Analysis of Critical Success Factors of Lean Production System

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Abstract

In today's highly competitive business environment, particularly with the global business environment and enhanced market competition, the existence of businesses highly depends on their ability to improve their manufacturing strategies. There are many manufacturing strategies addressed in the literature to achieve manufacturing excellence. Out of various manufacturing strategies, the lean production system (LPS) strategy is becoming an important one regardless of the size of the industry. SMEs are continuously playing an important role in the manufacturing sector all over the world. Further, SMEs play a very important role in both the economic and industrial growth of every country, irrespective of whether developed or developing countries. SMEs are struggling to maintain their capability in meeting their day-to-day competitiveness due to the high competition in today's global market. To sustain the capability to meet the competition, the SME must be very efficient in their organization by way of reducing many wastes such as overproduction, waiting time, defects, non-value-added processing activities, excess on motion, high inventory, and transportation.

Keywords
Pareto, Global business, Lean, Success factors, production

1. Introduction
In today's highly competitive business environment, particularly with the global business environment and enhanced market competition, the existence of businesses highly depends on their ability to improve their manufacturing strategies. There are many manufacturing strategies addressed in the literature to achieve manufacturing excellence. Out of various manufacturing strategies, the lean production system (LPS) strategy is becoming an important one regardless of the size of the industry. LPS, which originated from the Toyota Production System for manufacturing automobiles (Krafcik (1988), Ohno, (1988)), has been widely accepted as a superior approach compared to the traditional mass production system (Lewis, 2020, Xu, et al. 2013).

The core of LPS is the value defined by customers. The value is created only when waste is eliminated in all processes (such as product development, production, and service delivery) and features customers want added to the product and services. LPS successfully increases production output per person and reduces the finished goods inventory and work-in-process (Seth and Gupta, (2005)). Further, the main goal of an LPS is to produce products of higher quality at the minimum possible cost and in the least time by eliminating waste (Dennis, 2007). Commonly referred wastes in LPS include overproduction, inventory, waiting time over-processing, transportation, motion, and defects (Chaple, et al. 2021).

2. Methods
LPS is made up of several tools and techniques, which are used together as continuous improvement devices to identify and eliminate waste while increasing flexibility in operations (Mathur et al. (2012)). Today's advancements in information technology and the importance of business analytics technologies are providing or expected to provide extraordinary opportunities for designing, implementing, and expanding lean operations from large-sized domestic as well as multi-national industries to SMEs (Singh and Khanduja (2010), Powell et al. (2013), Zhou (2016)).

SMEs are continuously playing an important role in the manufacturing sector all over the world. Further, SMEs play a very important role in both the economic and industrial growth of every country, irrespective of whether developed or developing countries. SMEs are struggling to maintain their capability in meeting their day-to-day competitiveness due to the high competition in today's global market. To sustain the capability to meet the competition, the SME must be very efficient in their organization by way of reducing many wastes such as overproduction, waiting time, defects, non-value-added processing activities, excess on motion, high inventory, and transportation (Melton, 2005). These wastes are categorised as the non-added value in LPS, so pushing the effective implementation of LPS in SMEs is significant. Based on the literature analysis, it is observed that very few SMEs have given importance to the LPS implementation and adopting LPS (Alaskari et al. (2016)). Chaplin, et al. (2016), Rauch et al. (2017), Gandhi et al. (2018), Yadav et a. (2019)). In general, SMEs are reluctant about the opportunity of adopting LPS and not confident about its outcome and benefits, especially by putting before them the required investments and rushing the economic results (Achanga, et al. (2006), Elbert, (2012)). Thus, Implementation of LPS in manufacturing industries, specifically in SMEs, requires supporting factors that assist the management to practice lean ideology, which are called critical success factors (CSF). With this premise, there is a great need for further research that mainly concentrates on the determination of CSF that push the industries for the effective implementation of LPS in the precise context of SMEs. Considering this, the following research questions (RQ) should be addressed appropriately:

RQ1: What are the CSFs that influence SMEs for effective implementation of LPS in SMEs

RQ2: Which are the most vital CSFs assist SMEs in establishing a lean strategy for the implementation of LPS.

To address the above research questions, this study is carried out with the objective of determination of CSF for LPS in SMEs and evaluating the most significant CSFs by applying Pareto analysis.

To determine all the possible factors which are influencing and expected to influence SMEs for effective implementation of LPS in SMEs, descriptive research on the existing literature on LPS in general and particularly lean strategy for the implementation of LPS in SMEs is carried out considering the period: 1990 to 202**1**. Based on the analysis of the existing literature, particularly from the analysis of 78 existing and relevant research studies, 32 unique factors are identified. Further, how many researchers considered each of these identified factors are computed and the same is presented in Table 1. Using the data compiled and presented in Table 1, a Pareto chart is created and the same is presented in Figure 1.

3. Results

From the Pareto chart (Figure 1) it is observed that 16 factors out of 32 factors identified from the analysis of the literature are accounted for 80 percent of the studies. These 16 CSFs are commitment and support from top management, traning and education, organizational cultural change, the involvement of all employee, shared improvement vision, effective communication. Effective leadership, Competence and expertise, Financial capabilities, understanding of lean tools and its techniques, Performance Measurement and quick feedback response, Lean consultant, Availability and Allocation of resources, teamwork, continuous improvement**,** empowerment of all employees. Further, the analysis revealed that CSFs like Top management commitment, training and education, Organizational cultural changes and involvement of all employees are the topmost significant CSFs.
This observation is expected to assist the researchers and industries people who develop an exclusive instrument to study the effect of CSFs for LPS in any SMEs.

Table 1: Identified unique factors influencing/expected to influence LPS in SMEs

No	Factor	Number of Researchers considered in their study
1	Commitment and support from top Management	54
2	Training and education	48
3	Organization Cultural Change	36
4	The involvement of all employees	34
5	Shared improvement vision	30
6	Effective Communication	30
7	Effective Leadership	28

8	Competence and expertise	25
9	Financial capabilities	25
10	Understanding of lean tools and its techniques	22
11	Performance Measurement and quick feedback response	21
12	Lean consultant	15
13	Availability and Allocation of resources	14
14	Teamwork	14
15	Continuous improvement	12
16	Empowerment of all employees	11
17	Focus Customer	11
18	incentives and Rewards	11
19	Strong relationships with suppliers and customer	11
20	Standardization and capitalization of best practices	9
21	Link quality initiatives to customer, supplier, and business	9
22	Motivation of employee	8
23	Proper Methodology of Lean Implementation	7
24	Organisation infrastructure and facilities layout configuration	7
25	Involvement of supplier and customer	6
26	Project Management Skill	6
27	Appropriate selection of Lean perimeter	5
28	Ergonomic improvement	4
29	Quality management	3
30	Cost Reduction	2
31	Reduced lead time	2
32	Sufficient market knowledge	2

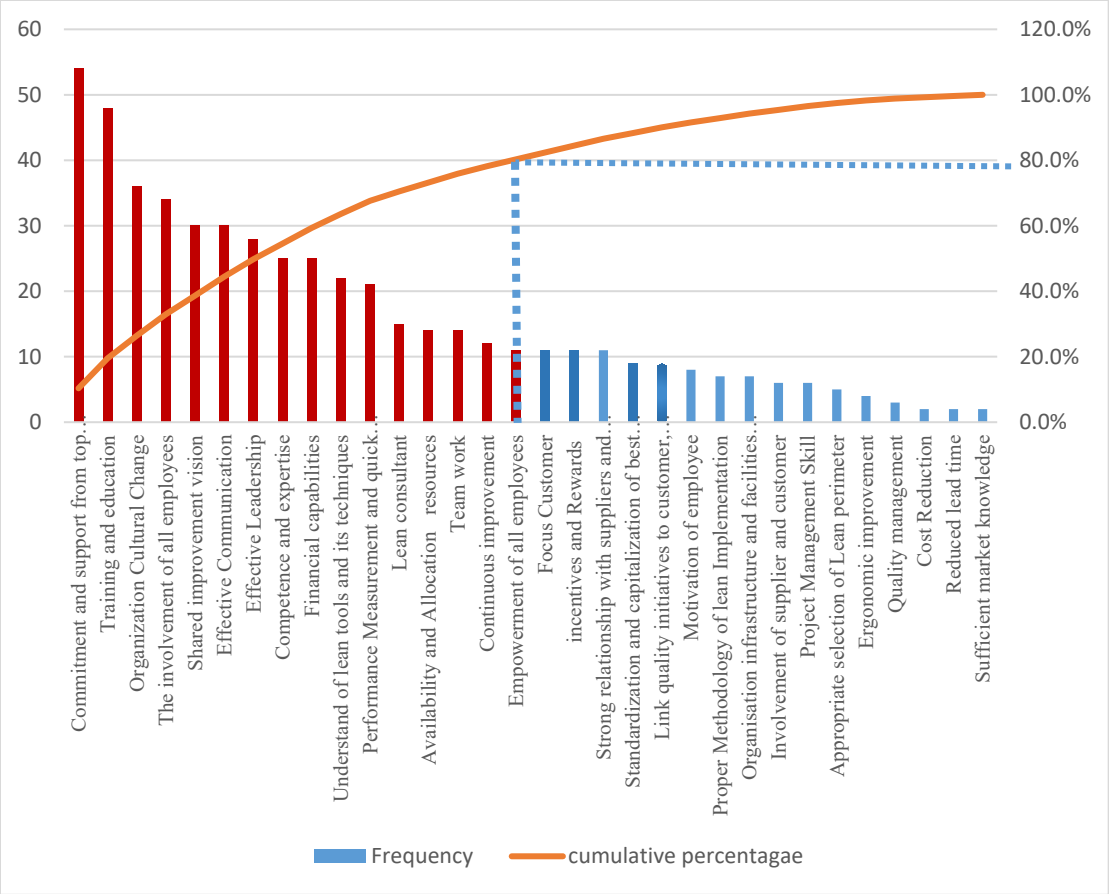

Figure 1: A Pareto Chart, considering the data given in Table 1.

Conclusions

SMEs play a very important role in both the economic and industrial growth of every country, irrespective of whether developed or developing countries. SMEs are struggling to maintain their capability in meeting their day-to-day competitiveness due to the high competition in today's global market. To sustain the capability to meet the competition, the SME must be very efficient in their organization by way of reducing many wastes such as overproduction, waiting time, defects, non-value-added processing activities, excess on motion, high inventory, and transportation.

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Biography

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