

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

A thorough search of the literature was accomplished to get the precise insight in the area of adoption of lean and sustainability of firms in general, and MSMEs in particular. The finding of the systematic literature survey helped the critical assessment of the available literature to gather the primary inputs required for this research and to emphasize the scope of the current objectives.

2.2 LITERATURE SURVEY METHODOLOGY

The methodology adopted for the literature survey and the relevant information collected are presented in the subsequent sections.

This review is performed in four stages. The first step is started by identifying the likely and sufficient databases using the appropriate keywords. The following key words "Lean manufacturing", "Lean manufacturing practices", "Lean Tools", "Lean Performances", "Sustainability", "Sustainability performances", "MSMEs" and "SMEs" are used for the search. A detailed search using these keywords stated above, individually and in combinations, was conducted in general search engines or in the advanced search options of well known Journal publishers. This list of journals mainly include Science direct, Elsevier, Taylor and Francis, Emerald Insight, Inderscience, Springer and other academic journals. Hundreds of likely papers were collected whose abstracts and conclusions were initially examined. The documents found to be relevant were carefully studied.

In the second stage, the available works of literature are arranged orderly for useful reference. Initially, the concepts of lean and sustainability were reviewed from the materials. The history of lean manufacturing with its mechanism, principles of the sustainability concepts and the sustainability performance measures were studied.

Further general review of the papers, which direct the relevance of MSMEs or SMEs, its characteristics, classification criteria, contributions and the sustainability practices in MSMEs, were given attention. The significant performance improvements with the implementation of lean were reviewed. The following sections describe information gained in the subject area from the review of the literature.

2.3 HISTORY OF LEAN MANUFACTURING

Lean manufacturing is a philosophy evolved in Japanese companies and popularized in western countries with different names. Lean has also been known as 'Toyota Production System' (TPS) as M/s Toyota Motor Company (TMC) is being recognized as the origin of lean production (Shah & Ward 2007). Lean has also been known in different titles as Just in Time (JIT), pull manufacturing and Total Quality Management (TQM) as these concepts also incorporated some of the principles of lean.

The mass production concept of the transfer lines or assembly lines, 'Henry Ford' developed the model and introduced in the automobile industry, transfigured the production system that has existed up to that. Henry Ford outlined his philosophy which was recognized as 'Ford Production system' (FPS) in 1927. This concept was later accepted in the other sectors in many countries including American companies. During the period of World War II, the increased competitiveness surged out of the mass production systems of American businesses caused fierce competition to the companies all over the world. The situation of Japanese companies also was under threat to face the competition from these American companies.

The performance of Japanese companies regarding cost was far behind the competitors from other countries due to the lack of natural resources, which forced them to import the raw materials from the other parts of the world. This state of affairs forced them to think somewhat different from the rest of the world, if they want to sustain in this fierce competition. The only solution that Japanese industries find to overcome this problem was by putting their best efforts to produce better quality goods

having a higher added value and at even lower production cost as compared to other countries.

This situation led M/s. TMC to do a thorough study of the production system of the American automobile industry and in particular FPS. Toyota adopted the Fords practices to their transfer line with a goal of cost reduction. They identified the central role of inventory and introduced the quality movements by entering the quality circle, team development, cellular manufacturing, set up time reduction and small batches. The solution and changes offered by Toyota after testing on its assembly line led to a complete reconstruction of the company and soon gave way to the introduction of an alternative and unique production system referred to as the TPS (Ohno, 1988).

The success of this new manufacturing and management practice in productivity and quality improvements in M/s TMC created a profound interest in other companies worldwide. In continuation to this, in 1980's some American manufacturers, such as Omark Industries, General Electric and Kawasaki (Lincoln, Nebraska) also have achieved success with a title World-Class manufacturing. "The Machine That Changed The World" Womack's book was a straight forward account of the history of automobile manufacturing combined with a comparative study of Japanese, American, and European automotive assembly plants with LM.

2.4 THE MECHANISM OF LEAN SYSTEM

The initial acceptance of lean model was considered fit only for the manufacturing sector. Womack et al. (1990), was the first to use the term "Lean Enterprise" and describe it as the extension of the lean manufacturing approach to outside the boundaries of the organization. The journey towards a lean culture and its implementation is based on five principles on the processes of the firm (Womack and Jones, 1996; Piercy and Rich, 2009). These five fundamental principles of lean are value, value stream, flow, pull and perfection as discussed by Womack and Jones (1996). These lean principles, which lead to a lean enterprise, are briefly explained in the following paragraphs

1. **Value:** Value is something that the ultimate customer can determine. If there is a value that means, less waste has been created. The value actually means what, when and how does the customer want and the preferences they expect about quality, capability, and price of the product or service (Womack and Jones, 1996; Piercy and Rich, 2015)
2. **Value stream:** Value stream is the path that the product follows from the raw materials to the finished product that is required to deliver the product as specified by the customer. The three business processes involved in the value stream are problem-solving from design to launch, information management from order placing to delivery and physical transformation from raw material to the final product. The value stream consists of all the activities that are required to produce a product or service, whether they are value-added or non-value added (Womack and Jones, 1996; Seth et al., 2017).
3. **Flow:** Flow refers to ensuring the value-added activities essential to create and deliver a product or service flow without disruption. The communication and interface between the various stages of value stream occur in the flow process. The basic concept of flow is to change the perception of process-focussed efficiency to product targeted ability. In this perception, the interaction between various methods plays a significant role in the supply chain (Womack and Jones, 1996; Pannizzolo et al., 2012; Ogunbiyi, 2014).
4. **Pull:** It is considered as the driver that enables the value stream. Pull production makes the end customer responsible for initiating the production process. It works in synchronization with the value stream for satisfying the customer (Womack and Jones, 1996; Ogunbiyi, 2014).
5. **Perfection:** It is to seek improvements to the process continuously. It is the continuous investigation for identifying waste due to which the synchronized flows of production doesnot break (Womack and Jones, 1996; Ogunbiyi, 2014; Bhasin, 2012).

2.5 LEAN MANUFACTURING AND PERFORMANCE IMPROVEMENT

A number of empirical studies have been conducted on the effect of the lean approach on various performance measures such as operational, financial and marketing performances of both service and manufacturing firms. These studies include conceptual studies, case studies, and simulation studies to identify the effects. On a closer watch, it can be seen that most of the researchers have investigated the likely impacts of the lean approach on these performances (Shah and Ward, 2003) without much emphasis on the theory of this philosophy. The most of the researchers have investigated the isolated effect of lean practices on performances. Later, many researchers proposed that lean practices should be classified into and examined as a set of internally consistent groups of practices known as 'lean bundles'. It can be seen that the researchers have made efforts to group the interdependent lean practices having common characteristics to meaningful lean bundles and tried to understand effects of these bundles on performances.

2.5.1 EFFECT OF INDIVIDUAL LEAN PRACTICES ON PERFORMANCES

Flynn et al. (1995) conducted a study using the data from 42 plants of three US industries on the interactive effects of TQM, JIT and infrastructure practices. This study concluded that TQM practices and JIT practices are mutually contributing each other while common infrastructure practices provide a strong foundation for TQM and JIT practices. This study highlights the synergistic and interaction effect among TQM, JIT, and common infrastructure practices.

Powell (1995) analysed in 54 firms in the service and manufacturing sectors about the influence of 11 lean practices under Human resource management (HRM) and TQM practices on the financial performances such as profitability, sales growth and overall financial performance. The study identified a better performance of the firms, which adopted TQM practices than the firms not adopted. The study reveals that the leadership, open organization and employee empowerment as the specific practices which are contributing significantly to financial performances. These findings bring

out the importance of the social practices than technical practices for improving financial returns of the service and manufacturing organisations.

Effects on operational performances, namely customer satisfaction, employee morale, productivity, quality and delivery of manufacturing firms were analysed by Sampson and Terzioviski (1999). They have identified a significant positive effect by six practices, termed as leadership, people management, customer focus, strategic planning, information analysis, and process management coming under HRM. Correspondingly, Kaynak (2003) identified the effect of HRM practices among the TQM practices and the consequent progress on operational and financial concerts. This study was conducted among 214 firms comprising of 85% manufacturing and 15% service organisations in the US to explore the relationship between seven lean practices. The direct and indirect effects of the practices such as supplier quality management, leadership, training, employee relations, quality, data and reporting, process management, and product/service design were analysed using Structural Equation Modeling (SEM) Method.

An empirical study of lean practices conducted on 76 tile manufacturing industries in Spain by Bonavia and Marian (2006) identified a set of practices, including group technology, kanban, reduction of set-up time, development of multi-function employees and visual factory are scarcely implemented. In addition, another set of methods including standardization of operations, total productive maintenance (TPM), and quality controls have widespread usages. These findings reveal that the degree of utilization of lean practices depends on a firm's size and have a positive relationship with the operational performance.

Ghosh (2013) conducted studies in 79 manufacturing firms in India on the status of the acceptance of lean practice and their outcome on operational performances. Another outcome of this work is that about 80 percent of the organisations have implemented many dimensions of lean philosophy. The study reveals the three primary drivers of lean implementation are first-pass correct output, reduced manufacturing lead-time, and increased productivity.

A consolidated list of the studies conducted on the effect of LMPs on performances with tools used for analysis, sample size, and the type of industry where studies are conducted is shown in Table 2.1.

Table 2.1 Effect of Individual Lean Practices on Performances

Sl. No	Author	Description of Research	Tools for Analysis	Sample Size	Type of Industry
1	Flynn et al.(1995)	Effect of 9 individual LMPs on two operational performances	Hierarchical regression	42	Manufacturing
2	Powell (1995)	Effect of 11 individual LMPs on three financial performance measures	Correlation analysis	54	Service and manufacturing
3	Samson and Terziovski (1999)	Effect of 6 individual LMPs on five operational performances and 3 financial performances	OLS regression	1024	Manufacturing
4	Kaynak (2003)	Effect of 7 individual LMPs on nine operational performance measures	SEM	214	Manufacturing and service
5	Bonavia and Marin (2006)	Effect of 11 individual LMPs on four operational performance measures	Friedman's non-parametric test, Wilcoxon tests, Mantel-Haenszel common odds ratio	76	Ceramic tile manufacturing industries in Spain
6	Bonavia and Marin-Garcia (2011)	Effect of 12 individual LMPs on eight operational performance measures	ANOVA, discriminant analysis	76	Manufacturing
7	Talib et al. (2013)	Effect of 17 individual LMPs on six quality performance measures	OLS regression	172	Service Industry
8	Ghosh (2013)	Effect of 7 individual LMPs on six operational performance measures	Multiple Regression	79	Manufacturing firms from four geographical regions in India

2.5.2 EFFECT OF LEAN BUNDLES ON PERFORMANCES

In order to avoid the deceptive results from analysis of individual practice effects, researchers began to group lean practices, which were interdependent by some of the commonalities, and to identify the effect of this groups or bundles on the various

performance measures. The most important studies of this category were done by Shaw and ward (2003), Pont et al. (2008), Rahman et al. (2010), Bonavia and Marin-Garcia (2011), Agarwal et al. (2013), Furlan et al. (2011, Yang et al. (2011).

Based on a sample of 163 manufacturing organisations from four countries (United States, Japan, Italy, Germany, and the United Kingdom), Cua et al. (2001) studied the effect of three lean bundles namely, TQM, JIT, and Total productive maintenance (TPM) on manufacturing performances namely quality, on-time delivery, flexibility and cost efficiency. The major findings of this work include that organisations following the combination of the above bundle practices have higher manufacturing performances than focusing only one bundle. This study also brought out the existence of a positive relationship between LMPs and manufacturing performances. Shaw and Ward (2003) conducted a Hierarchical regression analysis by introducing four Bundles TQM, JIT, TPM, and HRM by collecting the data from 1757 US manufacturing plants to study the effect on operational performance. Table 2.2 gives a consolidated list of studies with tools used for analysis, sample size, and the type of industry where the study is conducted.

Table 2.2 Studies on Effect of Lean Bundles on Performances

Sl.No	Author	Description of Research	Tools for Analysis	Sample Size	Type of Industry
1	Sakakibara et al. (1997)	Effect of two lean bundles (Infrastructure and Quality) on seven operational performance measures	Canonical correlation analysis	41	Manufacturing
2	Cua et al. (2001)	Effect of four Bundles(TQM, JIT, TQM, Common practice) on four operational performances	Discriminant analysis	163	Manufacturing plants located in the United States, Japan, Italy, Germany, and the United Kingdom
3	Shah and Ward (2003)	Effect of four Bundles(TQM, JIT, TQM, HRM) on six operational performances	Hierarchical regression analysis	1757	Manufacturing firms from the US

Sl.No	Author	Description of Research	Tools for Analysis	Sample Size	Type of Industry
4	Pont et al. (2008)	Effect of three bundles (Jit, TQM, HRM) on six operational performance measures.	SEM	266	Manufacturing plants located in nine countries: Finland, Sweden, Germany, Japan, Korea, Austria, Italy, Spain and the United States.
5	Rahman et al. (2010)	Effect of three bundles (JIT, Waste elimination, Flow management) on four operational performance measures.	OLS regression	187	Manufacturing firms, including SMEs and large scale industries in Thailand
6	Agarwal et al. (2013)	Effect of three bundles (Operations management, Performance management, people management) on two operational performances and five financial performances	Panel data, OLS regression	152	Manufacturing
7	Furlan et al. (2011)	Effect of three bundles (JIT, TQM, HRM) on five operational performance measures	ANOVA, Tukey test, OLS regression, F test	26	Manufacturing
8	Yang et al. (2011)	Effect of three lean bundles (JIT flow, Quality management, employee involvement) on two financial performances, two marketing performance and on environmental performance measures	SEM	309	Manufacturing firms from Europe, and North/South America, Asia Pacific, and Turkey

2.5.3 EFFECT OF LEAN PRACTICES IN SME PERFORMANCES

Filho et al. (2016) surveyed to identify the degree to which LMPs are being implemented on Brazilian SMEs and to investigate the effect of these practices on operational performances using SEM technique. The study brought out that even though the Brazilian SMEs have implemented the LMPs in a fragmented manner, these practices have lead to a better operational performance. The statistical process

control, TPM and employee involvement are the three practices that are implemented in an integrated approach for Brazilian SMEs. Customer involvement, continuous flow, pulls production, set-up time reduction, supplier development and supplier feedback are the practices that are adopted by SMEs, but in a dispersed manner. Researchers have also studied the effect of LMPs on MSMEs all over the world. Table 2.3 gives a summary of these studies conducted in four different countries.

The study conducted among the food processing SMEs in Belgium, Germany, and Hungary by Dora et al. (2013) revealed that the usage of LMPs in these countries are in its early stages. SMEs in the food sector are less focused on the process improvements; their main attention was on the food safety and quality management. The analysis also underlined that the use of the LM helps to improve the operational performance, especially, productivity and quality.

Pannizolo et al. (2012) conducted a study to examine the acceptance and deployment of lean practices in Indian SMEs. The case studies in four Indian SMEs observed that all the four firms had attained significant operational benefits grouped into upstream, internal and downstream value stream performances from the implementation of LM.

Table 2.3 Studies on LMPs Effects on SMEs Performances

Sl. No	Article	Type of Study	Statistical Analysis	Sample Size	Type of Industry
1	Filho et al. (2016)	Effect of LM on operational Performance	SEM	52	SMEs in Brazil
2	Dora et al. (2013)	Effect of LM on operational performance	Descriptive Statistics	35	European Food Processing SMEs
3	Panizzolo et al. (2012)	Effect of LM on operational Performance	Case studies	4	Indian SMEs
4	Zhou (2012)	Impacts of lean on SMEs	ANOVA test	34	SMEs in U.S

2.6 SUSTAINABILITY

The concept of sustainability has come forward as a result of significant trepidation about the involuntary social, environmental, and economic consequences

of the developmental activities. 1972 Stockholm United Nations (UN) conference on the Human environment is the first international initiative to discuss the sustainability issues at the global level. In continuation to this, UN appointed a World Commission on Environment and Development (WCED) under the chairmanship of 'Gro Harlem Brundtland' who had served three terms as Prime minister of Norway. In 1987, this commission published the report, "Our Common Future" defined the term sustainable development According to this report, sustainability means, meeting the needs of current and future generations through integrating environmental protection, social advancement and economic prosperity.

According to the definition of the 'Environmental Protection Agency' (EPA 2003) in US "Sustainability creates and maintains the conditions under which humans and nature can exist in a productive harmony, that fulfill the social, economic and other requirements of the present and future generations." 'Business sustainability' is a term getting attention from the industrialists today. The Institute for Sustainability (2011) defined business sustainability as "an increase in productivity and reduction of consuming resources without compromising product or service quality, competitiveness, or profitability while helping to save the environment".

Gagnon et al. (2009) defined sustainability in the development context as "a development that allows every people globally to at least meet their basic needs, if it provides individuals in a given society equal opportunities to increase their quality of life, and if it provides future generations increasing opportunities". Further, Seliger et al. (2011) defined sustainable products and processes in the manufacturing context, as "those conserve energy and natural resources, have minimal impact upon the natural environment and society, and adhere to the core principle of considering the needs of the present without compromising the ability of future generations to meet their own needs". Sustainability deals the synchronization of all events with the natural world around us, protecting it from damages and destructions (Swarnalatha and Binu, 2016) All these definitions of sustainable development and manufacturing originated from the fundamental "Brundtland" definition.

With the help of stakeholders, manufacturing firms, including MSMEs and large companies are trying to enrich their sustainability performance by continuously improving their product and operations (Russo and Tencati, 2009). The UN General assembly (2005) recognized economic and social developments and environmental protections as the goals of the sustainable development during the World summit on Social development. As mentioned by researchers around the world, sustainability integrates economic, social and environmental goals and objective of the organisation (Koho et al., 2015; Klewitz and Hansen, 2014; Hart and Milstein, 2003; Wang et al., 2015; Gimenez et al., 2012). These three elements represents the three pillars of sustainability (Garetti.and Taisch, 2012) and are mutually dependable, reinforcing and support each other as in the long run none can exist without the others.

2.7 LEAN APPROACH IN SUSTAINABLE MANUFACTURING

Lean practices are one of the manufacturing strategies towards achieving the sustainable advantageous. The core objective of lean manufacturing is the elimination of all forms of waste and thus reducing the non-value added activities from the manufacturing processes. At the same time, material waste elimination has been identified as the most efficient and cost-effective approach to promote sustainable practices of industrial concerns. Most of the prior studies on sustainability, consider lean, just as a means for waste reduction and the consequent benefits of environmental protection. The ‘zero waste’ or ‘zero defect’ target of LM aims the optimum use of the resources by reducing the material, energy, and space and time requirements for producing an output (Florida 1996).

Lean practices improve the operational performances such as delivery time, speed, quality and flexibility and these improvements catalyse the cost reduction process (Khanchanapong et al., 2014, Bortolotti et al., 2015). Better operational performances bring prospects for the manufacturer to speedily respond to fierce competitions by producing high-quality products at reasonable costs, in a manufacturing cycle (Aguado et al., 2013). The operational cost reduction positively affects financial performances of the firms (Hofer et al. 2012). Reducing the waste in the form of scrap or rework and improving the productivity, decrease the cost of the

organization and increase the 'return on assets' and profit (Yang et al., 2011). As an example, inventory reduction, waste elimination, and reduction of the volatile organic compound (VOC) are the some of the benefits of the Just in Time (JIT) practices (Rothenberg et al., 2001). These advantages indicate the positive effect of lean on the economic and environmental sustainability performances of the firms (Nahmens and Ikuma, 2012).

Environmental sustainability performances focus on the environment by addressing the use of materials, energy and the management of pollution and waste. The lean operational performances and environmental sustainability performances are complimentary (Martínez-Jurado and Moyano-Fuentes, 2014). Adoption of TQM practices enhances the level of quality achievement, which helps organizations to improve their market acceptance (Mosey et al., 2003). This practice has significant effects in maintaining a high quality work environment, which enhances the potential for controlling the overall manufacturing operations. This situation also increases the ability to eliminate the usage of hazardous processes in manufacturing activities causing negative impact on the environment (Demeter and Matyusz, 2011).

Adoption of lean practices amplifies the intensity of responsiveness addressing new manufacturing requirements, environmental issues, economic issues, and increase the level of competency in fulfilling the social needs for establishing sustainable manufacturing environment (Vithayasrichareon et al., 2012; Yusup et al., 2015). According to Longoni et al. (2013), the lean strategy intends the respect for people, followed by continuous process improvement. Sustaining a positive reputation in the local community is an unambiguous part of the strategy-setting process within the lean organization (Piercy and Rich, 2015). As evidenced by Indian small-scale industries, lean practices attempt to empower the workers, increase the job satisfaction and create a pride of work (Jain and Malik, 2013).

Improvement in the employees working conditions is one of the mutual benefits of lean and sustainability (Piercy and Rich, 2015). Lean operations such as visual management, employee training, and work standardization, bring higher levels of

safety in a manufacturing space (Cudney et al., 2015). Thus LM is contributing towards 3BL sustainable dimensions such as economic, social and environmental benefits of manufacturing firms (Nahmens and Ikuma, 2012; Ogunbiyi et al., 2013)

2.8 AREAS OF LINKAGE BETWEEN LEAN AND SUSTAINABILITY

LM is a managerial philosophy, which consists of a set of interrelated social and technical practices (Womack et al., 1990). LM has been concentrating on the elimination of seven deadly wastes (Womack and Jones, 1996) from the manufacturing system. LM aims the reduction of material, energy, space and time requirements for manufacturing processes, which leads to environmental sustainability advantageous. (Florida 1996; Miller et al., 2010).

In addition to environmental and waste reduction, modern researchers have defined some additional scopes of integrating lean and sustainability (Oyedolapo et al., 2013; Piercy and Rich, 2015; Azevedo et al, 2012; Wang et al, 2015; Rothenberg et al, 2001; Cudney et al, 2015). Piercy and Rich, (2015) have identified more possibility of lean actions on sustainability, namely supply monitoring, transparency, workforce management, and community engagement. Firms also trying to cope up the social demands along with the environmental needs with lean practices (Murillo and Lozano, 2006). Focused on improved employees working condition, large-scale industries as well as MSMEs are adopted various lean practices (Cudney et al., 2015; Piercy and Rich, 2015). Lean practices also attempt to empower the workers, increase the job satisfaction and create a pride of work (Jain and Malik, 2013). The common areas such as health and safety management, continuous improvement, and community strategy also come under the preview of linkage between lean and sustainability. Other areas of linkage include better quality, performance improvement, cost reduction, energy minimization, transparency, value maximization and governance etc.(Azevedo et al., 2012; Piercy and Rich, 2015; Oyedolapo et al., 2013).

2.9 MICRO SMALL AND MEDIUM ENTERPRISES

MSMEs differ immeasurably because of their explicit owners, custom/culture, employees, and market conditions and so on. MSMEs are owned by single owners or

entrepreneurs and are managed with smaller resources. The majority of the companies under micro and small categories are privately owned. Some MSMEs are limited companies, which offer advantages in handling financial risks and taxes. However, the large business firms are corporate owned and managed in a well-maintained and controlled fashion. The number of the employees and availability of the resources and the market approachability are more in large firms.

Table 2.4 Comparison of Features of MSMEs and Large-Scale Firms

Sl.No	MSMEs	Large Enterprises
1	Owned by Single entrepreneur or small group	Corporate ownership / professional management
2	The equity held by founder/ family and private groups	Public investor held the equity
3	Decision-making largely by owner / CEO and some key leaders (single or dual)	Distributed decision making by organization's hierarchy
4	Organization structure is flat	Organization structure is more wide, vertical
5	Single layer and Owner is at the core	Have multiple and detailed layers of ownership
6	Capital needs to be met by leveraging personal net worth	Wide range of funding sources
7	Flexibility in operations and decision making is more	Flexibility is less in decision making
8	Low economies of scale	Higher economies of scale
9	Limited personal development opportunities	Multiple career development path and programme
10	Make use of labour-intensive technologies	Automation oriented technologies and technology management are more efficient
11	Labour cost affects productivity	Better productivity
12	Small/limited customer base	Diverse / Global markets and customers
13	Mostly informal and few formal processes. People dependent processes.	Formal structure and processes and mostly people independent.
14	Low economies of scale	Higher economies of scale

In MSMEs, decision-making is done by the owner itself or by the key person in charge, and the organizational structure is flat (Singh et al. 2010). As the formal organizational structure is not there in MSMEs, it is accessible to decision making, and the operational flexibility is more compared to large enterprises (Floyd and McManus

2005). In large enterprises, there exists an organizational hierarchy to take the decisions, and the organization structure is vertical with multiple layers. This situation reduces the flexibility in decision making in large enterprises. MSMEs are raising funds for day to day operations and other development activities on the influence personal net worth. MSMEs are free from bureaucracy and controlled by a self-active and motivated management and employees through a small communication network (O' Regan and Ghobadian, 2002). However, the lack of expertise, time, money and managerial and technical support are the drawbacks of MSMEs in general (Singh et al., 2008). A comparison of MSMEs and Large enterprise is tabulated in Table 2.4.

2.10 CLASSIFICATION OF MSMEs

MSMEs are present in all the contries of the world. However, MSMEs are classified differently in different nations. The abbreviation "SME" is used in the European Union and by international organizations such as the World Bank, the United Nations and the World Trade Organization (WTO). According to European Commission (2005), "SMEs are the firms employing fewer than 250 persons and an annual turnover not exceeding 50 million Euros, and the annual balance shall total not exceed 43 million Euro".

In UK, in the beginning of 2014, 99.3% of the private sector businesses were SMEs. SMEs in the UK are classified based on two out of three criteria; it has a turnover of a less than 25million pounds, it has fewer than 250 employees, it has gross assets of less than 12.5 million pounds (Department for business innovation & skills, 2012). In the US, Small and Medium manufacturers referred to SMMs are defined as the enterprises with less than 500 employees and has an annual gross sale under 100 million dollars (Hu et al., 2015).

In African countries, SMEs are classified differently. In South Africa, less than 200 full time paid employees and an annual turnover of fewer than 51 million Rands (Urban and Naidoo, 2012) characterizes SMEs. In Kenya, the firms are known as MSMEs. Microenterprises are those with a number of employees up to 10, small enterprises with 10 to 50 employees and medium businesses with 50 to 100

employees. In Egypt, around 85 percent of the enterprises are classified as small-sized with employing less than 20 workers, which indicates the most of the firms in Egypt are micro or small enterprises (El-said et al., 2014). Around 2.5 Million SMEs are employing 75% of the total workforce and 99 % of non-agricultural private sector establishments.

In Asian countries, Bangladesh classified SMEs based on Fixed Asset and Employed Manpower. In Singapore, SMEs are businesses with the annual sales turnover of not more than \$100 million or employing no more than 200 staff. However, in China, SMEs are defined very differently and also varies slightly from time to time. The Ministry of Industry and Information Technology (MIIT) of China amended the SME criteria in 2011. According to this amendment, in China, small industries are those having numbers of employees less than 300 and total annual sales less than 20 million RMB while medium sectors are those having no of employees between 300 to 1000 and annual sales 20 to 400 RMBS.

Table 2.5 Classification Criteria of MSMEs in India

Class/Category	Manufacturing	Service
Micro Enterprises	Investment up to Rs.25 lakhs	Investment up to Rs.10 lakhs
Small Enterprises	Investment above Rs.25 lakh and up to Rs.5 crore	Investment above Rs.10 lakh and up to Rs.2 crore
Medium Enterprises	Investment above Rs.5 crore and up to Rs.10 crore	Investment above Rs.2 crore and up to Rs. 5 crore

In India, the classification of firms is based on the investment in plant and machinery as defined according to the Act ‘Micro, Small and Medium Enterprise Development (MSMED) Act -2006’. Enterprises are classified broadly into (i) Enterprises engaged in the production of goods about any industry and (ii) Enterprises engaged in providing/rendering services. The grouping into Micro, Small and Medium firms in the service and manufacturing sectors are shown in Table 2.5. The manufacturing and service enterprises have been further classified into micro, small and medium based on investment in plant and machinery and in equipment respectively. As per the section 7 of the Act, a manufacturing organization is classified

as medium-sized enterprise if the investment in plant and machinery is between 50–100 million Indian Rupees, microenterprise if the investment is a maximum of 2.5 million Indian Rupees and small enterprise if the investment is between 2.5 and 50 million Indian Rupees

2.11 CONTRIBUTIONS OF MSMES

World over, MSMEs or SMEs are contributing significantly to the industrial economy as well as to the economic growth through innovation, higher production volume and employment generation (Hu et al., 2015; Bhamu and Sangwan, 2014). The contributions from these firms for the economic and social developments of various countries cannot be neglected as the majority of industrial firms in these countries are under this category.

Over 99 percent of companies as well as business accounts for SMEs in the US and the majority of the countries in Europe and Asia (The Economist, 2010; Business, Innovation and Skills, 2010). In Europe, SMEs employ about two-thirds of a workforce and generate a significant share of new jobs. The contributions of SMEs in different countries from the various continents, recorded under the heads of the percentage of manufacturing output, employment, export and GDP are shown in Table 2.6.

Table 2.6 Contributions of MSMEs in Different Countries

Country	Share of Total			
	Output %	Employment %	Export%	GDP %
USA	-	53	-	40
UK	44	-	38	35
Japan	52	72	13	-
Taiwan	81	79	48	-
Singapore	32	58	16	25
Korea	33	51	40	-
Malaysia	13	17	15	35
Indonesia	36	45	15	-
India	40	45	40	8

In South Africa, SMEs are inevitably synchronized to economic development and the employment and social development of the country (Davies, 2001; Urban and Naidoo, 2012). The SME segment has grown as a very effervescent and active sector of the Indian economy in the last five decades (MSME, 2012). This sector is playing a crucial role in the industrialization of under developed areas, assuring equal sharing of national income and capital, thereby the socioeconomic development of the country. Indian SMEs account for 95 percent of the total industrial units, 45 percent of industrialized output, 40 percent of entire exports, and the primary provider of employment opportunities for the country (Singh et al., 2008; MSME, 2012).

2.12 LEAN IMPLEMENTATION IN MSMEs

Different authors have investigated and reported the use of lean tools that are suited for MSMEs (Gunasekaran and Lyu, 1997; Lee, 1997; Kumar et al., 2006 ; Rose et al., 2013, Sohal and Naylor, 1992; Lee, 1997; Abdul-Nour et al., 1998; Roth and Franchetti,2010). But there is a shortage of research focusing on Lean in MSMEs compared to large enterprises. The general inference from these studies is that SMEs are more selective than large enterprises, in the adoption of lean tools that to be implemented (Hu et al., 2015).

SMEs have been selecting inexpensive and straightforward lean tools due to the financial, time and technical constraints (Mathur et al., 2012). Value Stream Mapping, Kanban and 5S/6S workplace organization, standardised work and TPM are fairly popular tools and are frequently discussed in the SME lean literature (Hu et al., 2015). Some of the lean tools, which are very predominantly used in large enterprises, is not popular in SMEs (Bhasin, 2012). The most dominant areas of lean implementation in SMEs is internal production or operations with a principal objective of waste reduction on the shop-floor.

The criteria for assessing the impact of lean in SMEs are efficiency factors such as waste reduction, cost reduction, quality and productivity improvement and effectiveness factors such as organizational culture, employee empowerment and employee motivation, interest and ability (Hu et al., 2015). Various studies have

identified that, employee involvement and participation (Ramaswamy et al., 2002; Kumar et al., 2006; Panizzolo et al., 2012), top management support and commitment (Panizzolo et al., 2012; Rose et al., 2014; Timans et al., 2012), training and education (Timans et al., 2012; Dora et al., 2013) and organisational culture change (Timans et al., 2012; Dora et al., 2013; Ravikumar et al., 2013) are recognised as crucial Critical Success Factors (CSFs) for the implementation of Lean in SMEs. Financial capability (Achanga et al., 2006; Ravikumar et al., 2013) Supply chain integration (Rose et al., 2014; Timans et al., 2012), Personal experience (Timans et al., 2012) and other Technical factors are found to some of the CSFs.

Table 2.7 Success and Failure Factors of Lean Implementation

Sl.No	Supporting factors	Hindering factors
1	Management commitment	Reliability of one person management
2	Quick decision-making process	Intuitive rather than analytical decision making
3	Faster communication with employees , suppliers	Employee absenteeism
4	Greater flexibility	Fluctuation in raw material availability and prices
5	Business strategy based on customer demand	High rejection rate
6	More authority and power to employees	Shortage of skilled employees
7	An innovative environment	Inadequate financial resources
8	Support to change initiatives	Insufficient time and cash flow management
9	Shop floor commitment and employee trust	Reliance upon outdated, labour-intensive technologies and traditional management practices
10	Linking lean into business strategy	Inadequate education and training of entrepreneurs

Table 2.7. shows the supporting and hindering factors of lean implementation in SMEs (Pannizzolo et al., 2012; Upadhye et al., 2013; Rymaszewska 2014; Ramadas et al, 2016). There are different opinions about the capability of SMEs to adopt lean practices based on their organizational characteristics. Seitz (2003) argued that SMEs are more capable to easily adopt lean practices due to their supportive characteristics to the espousal towards lean. Faster communication, quick decision making, greater flexibility in decisions, more responsive to customer needs are the some of the

positive, supportive factors of for easy adoption of lean manufacturing by MSMEs (Floyd and McManus 2005). Unified organizational culture, employee empowerment, centralized power and innovative environment are the favourable circumstances to lean adoption in SMEs (Deros et al. 2006, Seitz 2003; Rymaszewska 2014).

There are some organizational characteristics of SMEs which obstructs and delays the approval and acceptance of lean practices in them. Lack of resources, particularly, fund and skilled workforce, fluctuation in raw material availability in regular price, inadequate cash flow are some of the characteristics of SMEs, those act as obstructs to learn adoption (Pannizzolo et al., 2012; Rymaszewska 2014; Mathur et al., 2012).

2.13 INTEGRATION OF LEAN AND SUSTAINABILITY IN MSMEs

MSMEs all over the world are contributing significantly to the industrial economy through economic growth, innovation, and employment generation. MSME segment has grown as a very effervescent and active sector of the Indian economy in the last five decades (MSME, 2012). This sector has been playing a crucial role in the industrialisation of underdeveloped areas, assuring equal sharing of national income and capital and thereby the socio-economic development of the country.(Singh et al., 2008; MSME, 2012).

With the help of stakeholders, manufacturing firms, including MSMEs are trying to enliven their sustainability performance by modifying their product and operations (Russo and Tencati, 2009). Recent studies have shown a positive link between environmental performance and financial performance of the small firms (Clemens, 2006; Murillo and Lozano, 2006; Russo and Tencati, 2009). MSMEs are trying to improve their environmental performances within their resource limitations. (Johansson and Winroth, 2010; Lepoutre and Heene, 2006). MSMEs are also trying to cope up the social demands also with the environmental demands and their implementation practices (Murillo and Lozano, 2006).

According to Longoni et al. (2013), the lean strategy intends the respect for people, followed by continuous process improvement. Sustaining a positive reputation in the local community is an unambiguous part of the strategy-setting process within the lean organisation (Piercy and Rich, 2015). The common areas such as health and safety management, continuous improvement, and community strategy are integrated into the preview of linkage between lean and sustainability. Similarly, many areas of linkage between lean and sustainability can be identified according to primary concerns and objectives. Other areas of linkage include better quality, performance improvement, cost reduction, energy minimisation, etc. (Azevedo et al., 2012).

2.14 LEAN AND SUSTAINABILITY STUDIES INDIAN MSMEs

The status of implementation and awareness of lean philosophy in Indian industries are not so clear and encouraging. (Thanki and Thakkar., 2014; Saboo et al. 2014; MSME, 2013). In a recent study by Filhoa et al. (2016) have pointed out that, in BRIC countries which refers to countries of Brazil, Russia, India and China, which all are deemed to be the similar stage of emerging economies; a very little studies have been reported in the SMEs about the lean performances. Similarly, Thurer et al. (2013) have mentioned the necessity of more researchers on SMEs in BRIC countries as the countries moving together as advanced economic reforms.

The development of sustainable MSMEs becomes an important step to strengthen and sustain Indian economy (MSME, 2013). Govt. of India has implemented lean manufacturing competitiveness improvement scheme for MSMEs and looking forward the sustainable growth of them. However, Indian MSMEs have been consistently performing on crucial parameters such as production, employment and role in the global market (MSME, 2012). As evidenced by Indian MSMEs, lean practices attempt to empower the workers, increase the job satisfaction and create a pride of work (Jain and Malik, 2013). These firms have shown consistent growth rate, both under a protected economy and an open economy and they are of vital importance to the future economic growth of the Indian community, as well as the international market (MSME 2012). To sustain this role, they need support in defining their specific

managerial needs and in finding the right approach to respond to them (Dangayach and Deshmukh, 2005).

2.15 CONCLUSION

This chapter highlights the review of the literature related to lean manufacturing and sustainability. In this review, the development stages, the basic principles, relevance and the possibilities of integration of both these concepts in the manufacturing locale are examined. The characteristics of MSMEs were also explained. The importance of MSMEs in the various economies in the world with their own limitations is substantiated by this review. The review on performance studies of lean implementation in manufacturing firms clearly indicating that lean is an effective method for the betterment of the manufacturing firms.

The changes in the regulations along with the high assertion from multiple stakeholders, forced manufacturers to pursue the sustainable manufacturing practices. The latest researches have accepted that lean practices have a considerable effect on the continuous performance improvement achievements in manufacturing sectors (Yusup et al., 2015). In unison, researchers have started to integrate the lean principles into the sustainability aspects of the manufacturing. However, lean implementation has been mainly concentrated in large and multinational firms, and there is only less effort for implementation of lean in MSMEs is concerned.

It is already recognized that MSMEs are the most important element playing a significant role in the economic and social development of the most of the economies in the world. MSMEs have strengths and weaknesses to perform well in the competitive business world. They are considered as the base but not as the miniature of large size organization (Islam & Karim 2011; Antony et al., 2005). Hence, the tuning of the competitive advantages of the MSMEs into sustainable growth, will promote whole industrial world to contribute socially, economically and environmentally for the present and future generations

It is observed that the lean performance studies are primarily focused on operational performances and have no attention in the sustainable direction. The review also brought about the significance of sustainable growth and performance of the manufacturing MSMEs. This review established the shortage of studies in the integration of lean and sustainability concepts in the manufacturing firms and especially in MSMEs. It is also observed that there is not much literature formulating the model linking lean and sustainability performances using the SEM approach. So this review gives the clear research gap indicating the necessity of the study in the direction of lean effects on sustainability performance and the possibilities of integration of both these concepts in MSMEs.