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A Literature Review on the Effect of Lean and Sustainability on Quality Management Systems for SMEs

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Abstract: ***The globalized and competitive market has required constant efforts of organizations, encouraging them to develop more sophisticated strategies to achieve continuous improvement and thus satisfy the fast-changing need of customers and also to survive in the competitive market. The quality management systems (QMS) based on the ISO 9001 standard encourage organizations to adopt various forms of improvement to consistently enhance its overall performance, to better be able to meet customer and other stakeholder requirements, as well as to address their future needs and expectations. Small and medium-sized enterprises and additionally huge organizations have been compelled to include themselves in the quality development, all the time connected with the execution of the ISO 9001 standard. Lean manufacturing (LM) ensures waste elimination every aspect of manufacturing, including product design and customer relations can help provide the process improvements that are required by the ISO 9001 QMS. In recent years, sustainability as a competitive priority has entered the agenda of manufacturing organisations with an emphasis on increasing competitiveness by improving economic, environmental and social performances. So by the integration of Lean and Sustainability with ISO 9001 QMS envisages the SMEs a balanced approach thereby avoiding many priorities arising from different forums. This paper discusses a lean and sustainable integrated quality management system which may help these organizations to improve its manufacturing process, by eliminating waste and achieving competitive advantages along with quality improvement.***

Keywords: Lean manufacturing, Sustainability, Small and Medium Enterprises, ISO 9001 QMS

1. Introduction

Technical growth in manufacturing is raised by day today and the manufacturing firms are also focused on manufacturing quality products to the market. The quality standard of the product by the firms also encouraged these days. The influence of quality product is demanded by the marketers and customers for the better outlet for their product. The competitive measures in the manufacturing firms are risen due to the influence of quality management differ from each manufacturing firm environment.

Today business has to satisfy varying, multiple and conflicting requirements of the customers. Customers nowadays are not just interested in the level of quality 'intended' by the manufacturer, they are far more interested in the maintenance of the quality level and want an assurance that products that they are buying. So organisations have to set up proper Quality Management Systems (QMS) to control and monitor all stages of the production process. Customers are also demanding proof that the company is capable of supplying quality products.

Quality is a reference to a set of predetermined, well-organised actions that can be used by any organisation whether they are large, medium or small and regardless of whether they are manufacturers, suppliers or end-users. It is a method of ensuring that all of these organisations get standard products and services that satisfy their individual or collective needs. In meeting Quality, Cost, Delivery and Services, the large scale industries have kept pace with technological changes. But of lack of capital, men, knowledge and other input resources small and medium scale industries are facing stiff competition in the national and international market.

2. The Objective of The Paper

The purpose of this paper is to review the scholarly literature on the major issues facing Small and Medium Enterprises (SMEs) in India and to provide SME people with information that will enable them to improve their performance in the national and international markets. By integrating some modern technologies these firms can overcome their challenges and finally a reduction in the rate of unemployment and poverty level in the economy of the nation can be achieved. The information from the paper will enable us to investigate the causes of the challenges and methodologies to resolve those challenges.

3. Small and medium enterprises

According to Venkatesh and Muthiah [1], the role of SMEs in the industrial sector is growing rapidly and they have the potential to become a thrust area for future growth. SMEs are defined as the backbone of the economy in many countries [2]. They contribute towards balanced regional development, economic diversification, and social stability in addition to creating employment. They are widely dispersed across the country and produce a diverse range of products and services to meet the needs of the local markets, the global market and the national and international value chains. This sector is having enough potential and possibilities to accelerate industrial growth in our developing economy and well poised to support a national programme like 'Make in India'. Many SMEs in India have become impor-

tant players in large manufacturing supply chain networks and they either voluntarily or have been forced to apply quality management practices to gain and sustain competitive advantages.

3.1 Challenges facing the SMEs

Access to timely and adequate finance and the high transaction costs are crucial for the growth and development of these enterprises and are highlighted by different authors [3],[4],[5],[6]. Inappropriate internal market environment is another cause of SME failures [7]. The industry seriously faces a deficit in manpower with skills set required for manufacturing, servicing, etc. The availability of appropriate economic resources is important for business development. In addition to these, procurement for raw materials is done within local area due to their financial constraints and procurements are much smaller compared to the industry at large. Lack of power/electricity infrastructures negatively affects the productivity and profitability of SMEs [8], [9]. Usually SMEs are either located in industrial estates set up many decades ago or have come up in an unorganized manner in rural areas [10]. As far as manufacturing organizations are corcerned it is an exceptionally critical segment being the second biggest division after agribusiness [11].

SMEs account for at least 13 per cent of global final energy consumption annually (IEA, 2015). The usage of natural resources rises to 122.5 million tons in 2012 which was 82.5 million tons in 2002 in India (IEA, 2012). Also, the Government of India announced the "National Action Plan on Climate Change" (NAPCC), in June 2008 to reduce India's carbon intensity by 20-25% by 2020, compared to 2005 levels. Hence, there is a need for Indian SMEs to support strategies like sustainable manufacturing to tackle environmental challenges like depletion of natural resources, pollution, global warming. Sustainable manufacturing is a collection of harmless activities that helps in minimizing waste and provide a sustainable environment for society. These create an essential condition in which SMEs are compelled to redefine the operational strategies by integrating environmental aspects by being lean.

The Government of India had established “National Manufacturing Competitive Council (NMCC)” in the year of 2004 under the Ministry of Micro, Small and Medium Enterprises (MSMEs) with a vision to energize and sustain the growth of manufacturing industries. Under this program, The Ministry had conceptualized ten components out of which the first one is “Lean Manufacturing Competitive Scheme,” with the objectives of reducing waste, increasing productivity, introducing innovative practices for improving overall competitiveness, inculcating good management systems and imbibing a culture of continuous improvement.

4. Quality Management System

A quality management system (QMS) is a formalized framework that records procedures, strategies, and duties regarding accomplishing quality approaches and targets. Quality standards are incorporated in the manufacturing sectors to categorize the efficiency and product quality of the product being manufactured. This recent research area briefly explained the influence of quality standard in small and medium enterprises and improvements of a firm's performance.

Each manufacturing firms focused on improving their quality standard on their product, which attains certain strategy of production management [12]. These quality standard frameworks are developed in the manufacturing firms for enhancing the performance of larger firms rather than small manufacturing firms [13]. The quality standards in SMEs are practised to improve the global competencies and market strategy of the manufacturing firms[14].

4.1 ISO 9001

There are many benefits of implementing ISO standards. The systematic process approach allows for consistency and has helped maintain positive customer relationships. Additionally, ISO requires continuous improvement which allows to continually better the organization. Small businesses have specifically noticed that ISO certification improves their relationships, opens up more business opportunities worldwide and increases revenue with maintained customer satisfaction.

ISO hopes that it will enable SMEs to draw the maximum benefits from ISO 9001, which has become an essential tool of the world economy. So the ISO 9001:2015 QMS has been considered as a significant driver for success for SMEs in the era of global competition[15]. SMEs should be able to share in the gains in efficiency and effectiveness offered by ISO 9001.

5. Lean Manufacturing

Advanced manufacturing approaches play a major role in organizations’ responses to global competition. One of the most popular advanced manufacturing approaches is lean manufacturing [16]. Lean manufacturing is a production strategy for organizational effectiveness focusing on waste reduction and improving productivity through the application of various tools. Implementation of lean manufacturing results in less human efforts, less manufacturing space, less lead time and less waste with fewer defects.

Shah and Ward [17] defined lean production as "an integrated socio-technical system whose main objective is to eliminate waste by concurrently reducing or minimizing supplier, customer, and internal variability". The academic and the industrial community have long acknowledged lean manufacturing as the gold standard for operational management [18]. In today's globally competitive business, many organisations are struggling to enhance their performance to survive against the competition. This has challenged the organisations to look for new manufacturing strategies to move forward and lead the market [19]. To remain at the top, an organisation should adopt and implement an effective strategy to enhance its performance. Firms that adopt Lean manufacturing practices have lower inventories than a firm that do not adopt Lean manufacturing practices [20]. So, the implementation of lean manufacturing, especially in manufacturing organizations has become very popular [21].

The goal of a lean manufacturing system is doing more with less time, space and human effort while giving the customer what they want in a highly economical manner [22]. Lean has been praised for empowering employees, and it has been criticized for intensifying work and impairing the well-being of employees [23]. The lean concept aims at an optimized use of available resources to minimize waste and the creation of high-quality goods and services at the lowest possible cost with maximum customer responsiveness [17] [24] [25], [26], [27].

According to Micklewright the waste involved in having multiple systems serving the same purpose can be enormous, and this lack of organizational synergy could be the source of the rupture between the two approaches. He considers that Lean and Quality Managers in top management should work together to understand and eliminate the redundancies in the two systems. Deploying this strategic plan, which organizes the company into value streams, is the only efficient way to merge Lean practices into a QMS thus making both systems more effective and by the spirit of both Lean and ISO 9001[28]. The quality management system is one of the feasible approaches to sustainability performance. Several studies examined how sustainability challenges would be addressed by quality management principles and practices [29]. Lean manufacturing can help provide the process improvements that are required by the ISO QMS. Today competition is very increased and customers are more and more aspect for the quality in the product so that, standing with other competitors; it is needed to implement the lean manufacturing technique, because it gives a better quality of product and customer satisfaction [30].

The "zero defects" or "waste reduction" principle of lean management works closely with "no waste" aim of the environmental management system [31]. Eliminating wastes and defective items also mean the reduction of resource consumption and pollution, and in turns, improve the environment. ISO 9001 QMS offers committed leadership, the participation of everybody, employee training and empowerment, relationship management, customer focus, mutually beneficial supplier relationship [29]. These values are consistent with the objectives of the social dimension that assure the benefits of internal and external stakeholders. Overall the financial growth of enterprises is also improved and customer demands and need for products is also improved [32].

According to [33] lean implementation in the manufacturing sector is still in the infant stage. Indian organizations still not considered it as a quality performance improvement methodology [34]. Lean manufacturing helps in enhancing production processes and boosting up the employees' job satisfaction [35]. Today, changing customer and technological requirements also force manufacturers to develop lean capabilities [36]. As lean manufacturing is a broadly accepted philosophy in manufacturing industries, more research is required.

6. Sustainability

Sustainability as a competitive priority has entered the agenda of manufacturing companies with an emphasis on increasing competitiveness by improving economic, environmental and social performance. Although sustainability has been an important topic for the manufacturing industry, literature, as well as practical endeavours, do not provide much guidance on how the pillars of sustainability i.e. economic, environment and society as a business goal can be translated seamlessly into manufacturing strategy and into measures to improve operational performance along the triple bottom line.

The definition of Sustainability can be defined as the management, design, and improvement of the processes to impact society positively, the physical environment and the firm's economic performance [37]. One of the most recent definitions of sustainable manufacturing has been adopted here: "the ability to smartly use natural resources for manufacturing, by creating products and solutions that, thanks to new technology, regulatory measures and coherent social behaviours, can satisfy economic, environmental and social objectives, thus preserving the environment, while continuing to improve the quality of human life" [38]. One of the key points in the definition of sustainable manufacturing introduced lies in the word "smartly" and the way researchers implement "smart" or "intelligent" mechanisms to achieve sustainable manufacturing [39,40].

7. Integration of Lean and Sustainability

Lean production practice is also positively related to environmental management practices [41]. Kuei and Lu proposed a conceptual framework of quality-driven sustainability management systems by integrating quality management principles into sustainability management [42].

The current rapidly changing and highly competitive market has put organisations under great pressure towards adopting sustainable practices, in terms of keeping a healthy balance among economic, environmental and social performances. In this context, the lean and sustainable manufacturing approach, which combines lean practices focused on customers' demand, and green practices focused on reducing the environmental impact, has gained popularity. Nevertheless, lean and sustainable manufacturing is still a relatively new practice, lacking a clear and structured research definition, and of significant evidence of successful cases in the practice [43].

When sustainability was introduced with lean, the most common questions were how lean helps environment control by reducing waste of resources and energy used or economic growth for organisations that provide growth and fortune [44]. Industries familiar with lean, upgrade towards sustainability. Sustainable lean considers both worth and resource protection through initial pilots and salvos. It focuses on the long-term and concentrates on profitability, people and the planet. Waste reduction is a common advantage in lean and sustainable manufacturing. Sustainability and lean works on the same principles, the only difference being the decision making criteria. Tools of Sustainability and lean are operator involvement, single minute exchange of die, kanban, kaizens, VSM, cellular manufacturing, total quality management, total productive maintenance and continual improvement through quality circles that monitoring the effect of environment's impact [45].

Lean implementation has been accomplished through the implementation of a revised method, and ulterior Plan-Do-Check-Assess (PDCA) cycles [46]. PDCA cycles area unit sometimes performed once lean implementation to more improve the long-run state worth stream.

Das K studied the sustainable practices in manufacturing firm and organizations process in India is evaluated. Sustainable performance of the organization is examined under three-dimensional characteristics performance. His research considers five dimension factor for organizational characteristics such as performance of the environment, social performance with employee-centred, competitiveness, community centred social performance and operational performance. He examined triple bottom approach for reduction and elimination of bottom-line approach in scale. The analysis of triple bottom approach provides lean management practices offers frontier with several impediments factors. Findings of this research provide legitimation as a critical factor for critical diffusion development in the additive manufacturing sector. Further, this article stated that lean practices were striding forward approach for sustainable future development practices in an organization for broad diffusion criteria. This research stated that empirical relation needs to be implemented in an organization for economic and social aspects related to the organization. This research offers a policymaker for the utmost importance in decision making. This research fails to provide proper sustainable practices in the lean management sector. Das K in his studies integrated the applications of lean parameters to improve sustainability performances of the overall business.

The outcome of research provided sustainability criteria in different perspective for lean outcome in the manufacturing process [5]. The review of lean for sustainable integration framework provides a building framework for promoting companies to offer an integrated framework for embedding sustainable operational practices [47].

Founder of "Quality Quest Inc", wrote a reference Text book entitled "Lean ISO 9001" published in 2010 dealing with the practice of applying Lean management into ISO 9001-based QMS. He claims there is an irony in the fact that QMS and Lean are both intended to improve the production processes of the firm whereas, in reality, they are two parallel systems and governance structures driven by two different departments, resulting in wasted resources because they are not properly aligned. He considers that Lean and Quality Managers in top management should work together to understand and eliminate the redundancies in the two systems. Deploying this strategic plan, which organizes the company into value streams, is the only efficient way to merge lean practices into a QMS thus making both systems more effective and under the spirit of both Lean and ISO 9001. However, he does not describe in detail which tools or methods should be applied. He only used the 5S method to reduce the documentary system in a QMS. Another key point is the fact that approach deals with an existing QMS whereas it would be more effective to directly set up a Lean QMS before starting the certification process [28].

When operating independently, Lean processes can indeed create a fragmented business approach that damages the company's core quality process. It is smarter and faster to build a management system from scratch rather than to patch up a corrupted existing system under the umbrella of Lean Management.

8. Lean and Sustainability in SMEs

The contemporary manufacturing organizations recognize the importance of lean manufacturing as a tool to eliminate wastes, streamline processes and improve value addition. On the other hand, such organizations also focus on the development of eco-friendly products and processes. In this context, lean manufacturing concepts provide a pathway for attaining sustainable benefits.

Lean manufacturing, quality management system and sustainable management system are clear initiatives to improve effectiveness and efficiencies of organizations [47] indicate that the successes of lean transformation depends on the application of the tools and techniques and to ensure the sustainable benefit by focusing on the human resources and culture that sustains lean integration.

SMEs need to adopt integrated lean and sustainable manufacturing as this can address economic and environmental concerns together. Today's SMEs need to understand a product's life cycle considering base as increasing customer demands and global competition King [48]. The relevance of SMEs in contributing to the economy and social development is increasingly felt in the current business environment. The proper implementation of lean in SMEs can make immense advantages like improved quality, reduced lead time and reduced cost [49].

The purpose of companies implementing the ISO Quality Management System (ISO QMS) is to improve operational and financial performance, and then get competitive superiority in a climate of intense competition. More specifically, ISO 9000 QMS can generate improved products, reduced costs, more satisfied customers and better operational and financial performance. If the ISO 9000 QMS is correctly implemented and understood, as opposed to being used just as a marketing and promotional tool, there seem to be significant benefits to be derived for the organizations that do so – both internal and external [50]. Moreover, improving performance is a never-ending process and organizations should strive to achieve it to attain the optimal level of cost and profit, as well as increase customer satisfaction and goodwill, and gain potential future business.

Researchers, dealing with the effects of ISO 9001, lean and sustainable on companies mention the lack of studies in this field on SMEs and suggest research should be done on these kinds of companies considering their importance in economics. The small manufacturers are very sensitive in terms of production due to the cost and time and income of the firms. So the research will help these organisations from dealing with domestic customers and serving the local market to find a place in the international market by adopting ISO 9001 standards.

SMEs have a golden opportunity to minimize the manufacturing cost, customer lead-time and cycle time through the

application of Lean Manufacturing technologies [51]. To safeguard the interest of these manufacturers in the long run in the Indian economy, the manufacturers need to be competitive simultaneously maintaining the quality standards which could be possible with implementing lean techniques in their system. It is important to minimize and eliminate the wastes for better performance. Achanga et al. have identified several critical factors that determine the success of implementing the concept of lean manufacturing within SMEs [52].

9. Conclusion

The review on performance studies of lean implementation in manufacturing firms indicating that lean is an effective method for the betterment of the manufacturing firms. Findings from the literature prove that both lean and sustainable manufacturing systems aim at improving organizational performance and provide both operational and sustainable benefits. Also based on the studies, it has been found that integrated lean sustainable manufacturing system can be defined as a system that creates value for the customers by eliminating wastes consistently and adopting processes that are eco-friendly, economically viable and safe for the employees to produce green products that enhance the social performance.

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