

Organization Culture and Lean Implementation: A Study in Micro, Small and Medium Engineering Enterprise

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Abstract

This study investigates the organizational culture and lean readiness using the Organizational Culture Assessment Instrument (OCAI) and Lean Culture Assessment Model (LCAM) to implement lean for improving productivity in one of the Indian Micro, Small, and Medium Enterprises (MSMEs). The OCAI study results found that the organization has a family-style corporate culture and horizontal leadership. LCAM results showed that the company's score on lean readiness is very low. Further, study through interaction with key organizational personnel revealed that the day-to-day operations were cluttered and lacked direction. The diagnostic study helped identify the cultural issues and problems of the company. The implementation of lean was undertaken for 15 months, resulting in a reduced workforce and timely delivery of orders. It also generated cash through the liquidation of scraps and non-productive assets. A refreshed culture further led to sustained and improved motivation among staff with a sense of achievement.

Keywords

Lean; Organizational culture; OCAI; LCMA; Productivity.

Introduction

Lean implementation tools help organizations eliminate waste and are applied in both the manufacturing and services sectors. Lean has been successfully implemented in many organizations worldwide; however, its successful implementation is complex. Lean is used across various industries of different sizes, but there are concerns about its implementation in Micro, Small, and Medium Enterprises (MSMEs). These concerns arise due to reasons such as (i) lack of understanding of organizational culture, (ii) lack of understanding of lean culture, and (iii) critical issues of lean implementation. Culture in this context refers to both individual and collective culture within the organization.

The Government of India enacted the Micro, Small, and Medium Enterprises Development (MSMED).

Act in 2006. According to the act, the definition of micro, small, and medium enterprises is as follows:

- (i) A micro enterprise is an enterprise where the investment in plant and machinery does not exceed USD 0.03 million (approximately).
- (ii) A small enterprise is an enterprise where the investment in plant and machinery is more than USD 0.03 million (approximately) but does not exceed USD 0.60 million.
- (iii) A medium enterprise is an enterprise where the investment in plant and machinery is more than USD 0.60 million but does not exceed USD 1.20 million.

For these enterprises, investment in plant and machinery refers to the original cost of plant and machinery, excluding land and building, and the items specified by the Ministry of Small Scale Industries in its notification No. S.O.1722(E) dated October 5, 2006. MSMEs are significant in the Indian industry as they are an integral part of the Indian economy. [Deshpande \(2023\)](#) found that MSMEs contribute about 30% to the country's Gross Domestic Product (GDP) and about 45% to the country's overall exports. MSMEs employ approximately 110 million people across the country and are also an integral part of the rural economy, with more than half of the MSMEs operating in rural India.

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Lean is a philosophy that emphasizes the elimination of waste in organizational processes. This philosophy operates on the principle that “expenditure of resources for any goal other than the creation of value for the end customer is wasteful and therefore should be a target for elimination” (www.processexcellence.com). Implementing lean also helps create a culture where efficiency becomes the goal at every level in all departments.

The origin of the lean system is the Toyota Production System (TPS). Toyota’s success has drawn the attention of managers across various businesses to replicate and implement the system in their organizations (Emiliani, 2006). Although lean is used worldwide, many researchers have viewed lean from different perspectives. Some researchers see it as a thinking process for customer value, efficiency, and Total Productive System (TPS). Hopp and Spearman (2004) stated that “Lean focuses primarily on efficiency.” They equated lean with efficiency management and referred to anything that increases the efficiency of delivering products as a lean practice. Holweg (2007) and Womack and Jones (2003) proposed lean as a thinking process that delivers customer value. Lean is also related to TPS. Womack et al. (1990) described five facets of TPS as fulfillment, supplier management, customer management, product development, and management that went beyond the management of the buffering-variability trade-off in production. TPS also highlighted other aspects, such as “respect for people” (Sugimori et al., 1977); however, this aspect did not initially receive the same emphasis outside Toyota. Researchers believe that this system cannot be easily copied and imitated. Therefore, attention needs to be paid to the variables impacting lean implementation.

This study aims to understand the problems faced by Indian MSMEs and how the implementation of lean principles can help address and solve these problems. Using a case study of one micro enterprise, the study examines how the organization’s culture was assessed to understand its readiness for lean implementation. Based on the assessment of culture and lean readiness, a lean implementation plan was developed. To understand the organizational culture, the Organization Culture Assessment Instrument (OCAI) and Lean Culture Assessment Model (LCAM) surveys were conducted in the studied organization to implement lean management. Thus, a case study is used as a ‘test’ of the proposed methodology. This research contributes to the application and implementation of lean management principles based on organizational culture analysis. Furthermore, the study discusses the results of lean implementation 15 months after its initiation.

Background of the studied organization

- Products/services:

The studied organization is involved in designing, manufacturing, and delivering turnkey, high-quality solar thermal solutions for domestic/residential, commercial, and industrial clients. It manufactures solar water heaters and thermal solar solutions and is one of India’s leading solar water heater manufacturers. The company offers two types of solar water heaters: Flat Plate Collectors (FPC) and Evacuated Tube Collectors (ETC), including both pressurized and non-pressurized versions. The manufacturing activity primarily involves the fabrication of the inner tank, PUF (Polyurethane Foam) filling, and outer tank assembly, followed by finishing and packing.

- Brief details of the studied organization’s working environment & culture:

Based on discussions with company management and employees, a quick diagnosis of the organization was made. The quick diagnostic analysis is discussed below.

The organization is family-owned, with the Chairman, Managing Director (MD), and Directors from the family. The responsibilities of the managing team at the shop floor level were not clearly defined. The Chairman is responsible for projects that typically do not include the manufacture of solar water heaters. The shop floor operations were managed by the MD, who focused on water heaters. Part of the shop floor manpower was also used for projects. The shop floor was managed by supervisory staff who had no formal qualifications or training. Orders received were communicated verbally, as the supervisor was unable to communicate through formal means. Updates on order status were also communicated verbally. There was no formal planning of production. No records of job allocation were maintained. Scheduling would be changed based on priorities received via phone calls. Due to an unstructured way of working, workers were shifted from one machine to another, resulting in the underutilization of workers and an avoidable increase in Work in Process (WIP). This also resulted in dissatisfaction among the workers. Materials were received at random with no fixed time, and workers would be withdrawn from the shop floor for unloading the material. Similarly, dispatches were planned in a random manner, which was again done by the shop floor team. All the workers, including skilled operators, were made to do the loading and unloading work, leading to resentment among the skilled personnel. There was very low awareness about workers, material, and machine productivity across the organi-

zation. The purchase manager used to visit the market daily and was unable to devote time to shop floor priorities on many occasions. The organizational culture can thus be summarized as follows:

- (i) There was no demarcation of roles and responsibilities.
- (ii) There were no formal channels of communication.
- (iii) There was no formal planning of production activities, dispatch of finished goods, or receipt of materials.
- (iv) There was no formal feedback mechanism for customers and the sales team about product dispatch status.
- (v) There was no segregation of workers based on skills; hence, skilled resources were used for non-value-added activities.
- (vi) There was a lack of awareness about value-added and non-value-added activities.

- Issues faced by the organization

Due to the above-mentioned working environment and culture, the major issues faced by the organization were:

1. High processing time for products, leading to higher operational costs.
2. Inability to deliver products/services within the timelines committed to customers and dealers.
3. High inventory of non-moving materials, Work-In-Process (WIP), and finished products, including inner tanks, returned products, obsolete finished products, discontinued packing materials, rejected rubber parts, and other items. Unused and broken-down machinery, dies, and fixtures were also retained on the shop floor.
4. Storage space constraints due to high inventory of non-moving materials, WIP, and finished products. This further resulted in multiple handling of materials and other related problems.

To address the above-mentioned issues, the studied organization planned to implement lean management. This study presents the implementation of lean management principles and shows the results 15 months after the start of lean implementation. To implement lean, the company first planned to study the culture and lean readiness using OCAI and LCAM. Further, a diagnostic study was undertaken to determine the problems faced by the company. Based on an assessment of culture and the diagnostic study, lean implementation across the organization was planned.

The paper is organized as follows: Section : Literature review, examining organization culture, lean culture, and critical success factors for lean systems. Section : Research framework and research objectives.

Section : Methodology. Section : Data analysis and findings. Section : Action plan and results of lean implementation. Section : Conclusion. Section : Limitations of the study and scope of future research.

Literature review

Research on lean philosophy has been undertaken by many scholars (Shah & Ward, 2003; Hines et al., 2004; Dahlgaard & Mi Dahlgaard-Park, 2006; Pettersen, 2009; Taylor et al., 2013). These researchers have defined and characterized lean management. Pettersen (2009) observed that “lean philosophy has diverse opinions both at a theoretical and practical level. It has also been observed that while implementing lean, organizations face many challenges. To implement lean, organizations should first identify and solve these challenges. The challenges may be identified based on variables like process, place, people, and other unique factors” (Bhasin, 2012a; 2012b; Liker & Convis, 2011).

Marodin and Saurin (2015) observed that “Lean implementation is complex, context-dependent, time-consuming and requires a substantial amount of human resources and effort.” Bhasin (2012b) found that “larger organizations perform better in a Lean environment since they consider Lean philosophy as an ideology.” Achanga et al. (2006), Nordin et al. (2012), Kull et al. (2014), and Dora et al. (2016) noted that “Small to Medium Enterprises (SMEs) may face specific problems due to lack of resources.”

Economic development also influences the implementation of Lean. Al-Najem’s (2014) study reveals different challenges in Arab countries, including “language barriers, deficiencies in worker education and skills, technology, government attention, know-how regarding Lean production, market competitiveness, and urgency for adopting Lean production.” Salem, Musharavati, Hamouda, and Al-Khalifa (2016) found that budget may not be an issue for Lean manufacturing implementation in wealthy countries. Meanwhile, El-Khalil aand Farah (2013) reported that providing the financial resources to implement lean in countries with negative growth rates in the manufacturing sector is challenging.

Lean implementation requires employee participation and commitment, as observed by Hines et al. (2011). Pakdil and Leonard (2015) advocated for a flexible culture in the organization for the successful implementation of lean. Abrahamsson and Isaksson (2012) and Elshennawy and Sisson (2015) suggest adopting a customized version of Toyota’s culture to

implement lean. However, it is argued that “there is a lack of understanding about how people and organizations function in terms of culture.” [Alvesson \(2012\)](#) observed that “culture is as significant and complex as it is difficult to understand and use appropriately.”

[Wangwacharakul, Berglund, Harlin, and Gullander \(2014\)](#) found that the dependent variables in lean implementation are operational development, continuous improvement, goal-oriented teams, cross-functional work, organizational design, and leadership. [Pakdil and Leonard \(2015\)](#) used Hofstede’s national model ([Hofstede, 1984](#)) to study the relationship between societal culture and lean processes. They found that “collectivist cultures, low uncertainty avoidance-oriented societal cultures, and low power distance-oriented cultures prevail on employee involvement and creativity at the team level. Whereas opposite cultures prevail on control and standardization.” [Bortolotti et al. \(2015\)](#) and [Kull et al. \(2014\)](#) analyzed the organizational culture of lean organizations utilizing the GLOBE model. [Bortolotti et al. \(2015\)](#) examined the concept of soft practices and proposed that lean organizations exhibit shared cultural traits, such as high levels of institutional collectivism, future orientation, humane orientation, and reduced assertiveness. [Kull et al. \(2014\)](#) conducted a study examining the relationship between hard practices and organizational culture to predict the effectiveness of lean methodologies. The recommended culture exhibits characteristics of high uncertainty avoidance, low assertiveness, low future orientation, and poor performance orientation.

[Sajan et al. \(2017\)](#) revealed that lean management practices are positively associated with sustainable performance. [Sahoo and Yadav \(2018\)](#), in the context of Indian SMEs, found that lean management practices improve operational performance by aiding in process improvement, waste minimization, and flow management. [Kumara and Shobharani \(2021\)](#) studied the role and importance of lean manufacturing tools and techniques and the challenges faced by MSMEs in the implementation of lean manufacturing. Factors to reinvigorate lean management practices were identified by [Solaimani and Rajagopalan \(2021\)](#), who also proposed points on how to improve the adoption and diffusion of lean principles and practices. [Mishra, Ashutosh, and Arghya \(2021\)](#) viewed Lean Six Sigma as a method to improve processes in manufacturing operations, quality improvements, and productivity. They also argued that there are obstacles to implementing the Lean Six Sigma approach, but the improvement in processes and outcomes of changes in culture is noteworthy and worthwhile. [Bhattacharya and Ramachandran \(2021\)](#) found that lean implemen-

tation helped reduce costs and waste, improve quality, and increase lead time. Other intangible benefits realized included improved worker performance, worker health and safety, and increased customer satisfaction.

The literature review suggests that there are very few studies on lean management in the context of Indian MSMEs. No studies have been undertaken to link culture with lean readiness and further implementation of lean. This study aims to fill this research gap on lean implementation in the context of Indian MSMEs. Based on the analysis of culture, this study uses the 5S tool to implement lean and shows the results of lean implementation in the context of an Indian MSME.

Research framework and research objectives

Research framework

- Organizational culture models

[Tocar \(2019\)](#) noted that there are many cultural models in the literature, such as the Hall model, the Hofstede model, and the Hampden-Turner and Trompenaars model, among others. Schien and Denison developed a model that helps us understand organizational culture at different levels, including artifacts, stated ideals, and basic assumptions. This model addresses the norms and ties between people in the organization, based on observations of what people wear and how they act. However, this may not be the most scientific way to understand lean culture. Schien’s model has a flaw in that it is not sufficient to determine how far an organization is from being lean.

Denison’s model, on the other hand, is seen as a practical model that relies on feedback from the entire organization. It helps leaders diagnose organizational issues before implementing changes. Leaders can also use this model to identify their organization’s strengths and weaknesses before devising solutions or making changes. [Denison and Mishra \(1995\)](#) stated that organizational culture can be measured and linked to organizational performance. They used four factors to measure culture: involvement, consistency, adaptability, and mission. However, one could argue that this model may not be sufficient on its own to understand lean culture, as it is important to identify factors that can affect lean implementations before attempting to make changes. Both Denison’s and Schien’s models are valuable, but understanding an organization’s culture is challenging without a method to measure culture and its effects accurately.

The Organization Culture and Assessment Instrument (OCAI) by Cameron and Quinn (1999) helps in diagnosing the organization's culture. The instrument helps identify four types of culture: hierarchy, market, clan, and adhocracy. This study has used the above parameters to describe organizational culture types.

- Lean Culture Assessment Model (LCAM)

The Lean Culture Assessment Model (LCAM) by AL-Najem and Dhakal (2012) focuses on critical enablers that help assess whether an organization's culture will support lean transformation. The researchers developed dimensions to understand the culture necessary for successfully implementing lean management. They identified four cultural dimensions: involvement, adaptability, mission, and consistency, which significantly impact the core organizational culture. Each of these dimensions helps organizations understand their attitudes toward lean. Thus, LCAM helps organizations determine how far they are from achieving a lean culture. It assesses the culture qualitatively and quantitatively by measuring specific dimensions. It directly relates to lean and helps organizations understand their culture's effectiveness in coping with lean implementation. Furthermore, it helps organizations identify the weaknesses and strengths of their culture for lean implementation.

To address the issues faced by the studied organization, as described earlier, it was decided first to study the organization's culture for lean readiness. This study used OCAI and LCMA tools to analyze the organization's culture and implement lean management.

Research objectives

The research objectives of the study are:

- To assess the prevailing culture in the organization.
- To assess the Lean readiness of the organization.
- To assess the gaps in organization culture and lean readiness.
- Based on the identified gaps, suggest and implement an appropriate lean framework and compare the results before and after the implementation of lean.

Methodology

To investigate the causes of the issues mentioned in Section s1.1.3 and the problems faced by the organization, the following actions were initiated to implement lean management principles:

- Study of layout details.
- Study of workers' deployment and cost details.
- Analysis of product, order, and planning details.
- Analysis of inventory details.
- Videography of the processes involved in manufacturing.
- Discussions with the management team and workers.
- Visits to the shop floor to assess shop floor operations.

Discussions with the management team helped in understanding operational issues, inventory details, the operational cost of the product, and order details. Data related to customer returns, product obsolescence, obsolete packing materials, rejected materials, unused machinery, dies, and fixtures was also collected. The exercise also involved understanding the layout of machinery and processes within the design and space constraints of the building. Multiple visits to the shop floor at regular and random intervals were undertaken to understand the issues faced. Interviews were conducted with workers and supervisory staff regarding day-to-day operational challenges. Videography of all processes and machining activities was also undertaken.

Before deciding on lean implementation for improvements in the organization's operations, it was planned to understand the organization's culture and lean implementation readiness. Data for culture understanding and lean readiness was collected using standard instruments for OCAI and LCAM. The studied organization had a total strength of 42 employees (12 supervisory staff and 30 workers).

The OCAI survey was undertaken for all 42 employees, including 12 supervisory staff and 30 workers.

The LCAM survey was undertaken for the 12 supervisory staff members, as they are in a better position to respond to a questionnaire related to lean culture.

The profile of staff includes engineers and technicians, while the workers include semi-skilled and unskilled labor.

Data analysis and findings

Culture and lean readiness

Based on the data collected for OCAI and LCAM, spider charts (or radar charts) were prepared to help understand the organizational culture and lean readiness assessment. These charts are presented in Fig. 1 and Fig. 2.

The OCAI survey results were used to develop a spider chart, which is shown in Fig. 1.

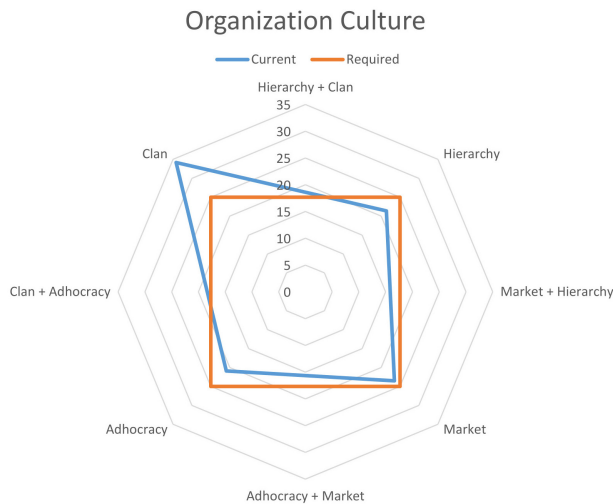


Fig. 1. Organizational culture
 Source: Developed by Authors

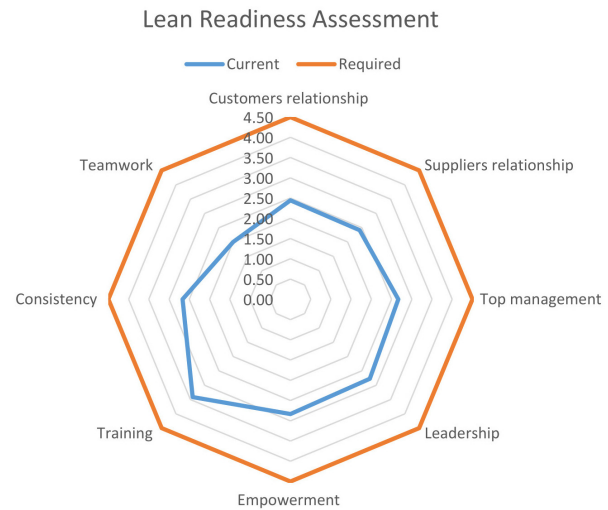


Fig. 2. Lean readiness assessment
 Source: Developed by Authors

TheOCAI diagram facilitated an understanding of the current organizational culture. The survey revealed that the studied organization possesses a family-style corporate culture, characterized by a horizontal leadership structure. However, it was also evident that the day-to-day operations appear cluttered and lack direction.

Recommendations

Based on the analysis, it was recommended to establish a hierarchy culture, develop bottom-up processes, and fill the gaps in the chain of command. This ensures that every team and department has clear long-term and short-term goals. A process was planned to implement the culture for team building, participative management, innovation strategy, etc. Brainstorming sessions were organized, providing employees with an opportunity to share ideas. Successful ideas were rewarded, and teams were encouraged to think outside the box.

LCAM survey results were utilized to develop spider charts/diagrams, which are depicted in Fig. 2.

The LCAM results indicated that the company scored poorly on the Lean Readiness Survey, particularly in the area of teamwork.

Taking into account the findings from both theOCAI and LCAM results, along with the study of organizational culture and the issues faced by the organization, a lean implementation framework was devised. The objectives for lean implementation included enhancing quality, reducing costs, improving delivery times, and fostering teamwork among employees. It was observed that the organization's

culture was predominantly owner-driven. Hence, to tackle the challenges encountered by the organization, it was recommended to transition towards a leadership-driven organizational culture.

Operations related analysis

A detailed analysis of the functioning of the organization was carried out. The following paragraph shows the detailed analysis.

• Production planning

The production planning analysis indicated that there were frequent changes (daily changes) in production schedules. It was observed that the planning was not done based on work content or a pre-determined tabulated schedule of customer commitments. It resulted in frequent changes in production schedules, which led to the underutilization of manpower and an unplanned pileup of WIP inventory. Therefore, there were frequent complaints of missed delivery commitments.

• Minimum inventory

It was observed that there is no minimum stock level defined for inner tanks and fast-moving finished products. This resulted in delays in starting production from scratch. There was no reorder quantity specified for raw materials and bought-out components, which resulted in holding up process activity and dispatch to customers.

• Material handling

The sheets for the inner tank were cut to the required sizes in-house from the coils. Since the facility lacked adequate material handling equipment, it

required 6–7 workers for this activity; normally, in a similar industry, this activity requires only two persons. The cut-to-size sheets were placed on top of each other, leading to retrieval issues before they were used for fabrication. Non-moving materials and unused machinery on the shop floor led to the blocking of alleys meant for material movement. It led to a longer circuitous route for material movement. It also resulted in frequent avoidable shifting of materials from one storage location to another, wasting precious man-hours. Packing material was stored on the second floor and was randomly picked up depending on the requirement. This not only delayed the packing but also meant the withdrawal of assigned manpower from other activities.

- Material receipts and dispatches

It was observed that there were no fixed timings for material receipts and dispatches, resulting in frequent shifts in manpower. This led to delays in production-related activities and reduced manpower utilization.

- Non-moving materials and machinery

This had a major impact on space availability and material movement, affecting the overall productivity of manpower. The data collected was analyzed to determine the reasons for high levels of non-moving inventory and unused machinery, spares, dies, and fixtures. The main reason for the non-moving inner tanks was that they had different coatings (paint), which were used for research and development purposes. It was discontinued due to customer feedback. Therefore, the inner tanks were retained on the second floor, and ultimately, they became non-moving stock. Some inner tanks were retained in the stock by oversight due to issues with accessing them. Customer-returned tanks that were examined and found to have no or minimal rectifiable defects were retained to be used as replacements for customers who were offered a five-year warranty. Thus, all these inner tanks and finished tanks were shifted to the second floor to be used as replacements, but many were left unused due to replacements being given from newer stock due to customer insistence. There was also some finished tank stock, the production of which was discontinued and retained by oversight.

Unused packing material was related to the company's earlier contract manufacturing activities, which had since been discontinued. The reasons for non-moving supplies of bought-out components were bad quality, incorrect specifications, or changes in specifications by the company. Some machines were redundant because of changes in process or outsourcing of products by the company. Some of the dies

and fixtures were also redundant due to outsourcing, changes in the diameter of evacuated tubes, or changes in the pitch of these tubes. Empty PUF drums were lying at the premises due to the inadequate quantity of truckloads to clear these drum.

- Layout changes

It was observed that the existing layout had unused machinery placed in sequence. The machines related to sequential processes were placed on different floors, resulting in avoidable man and material movements. Non-moving material and other material were placed in different locations randomly, resulting in higher retrieval time. It was occupying usable space. There was no demarcated space for Raw Materials, WIP, and Finished Goods.

As mentioned earlier, the analysis of culture and analysis of operations-related issues suggested that the organization needs to develop a market-driven culture. The decision to implement lean management was taken to tackle the operations-related issues and to help the organization develop a market-driven culture.

Suggested actions and results of its implementation

Suggested actions

The organization initiated the implementation of lean management practices company-wide and recommended the following actions:

Production planning

Daily production meetings were scheduled at 10:00 AM with shop-floor personnel. Supermarket planning and scheduling were suggested based on the sales data of finished goods for the past 36 months. An updated Excel sheet containing all order details reflected the order status daily. Dispatch dates were committed based on material availability and existing schedules, communicated to the sales team. Material availability issues were highlighted during meetings to prevent surprises. Minimum quantities of raw material for inner tanks and finished tanks were maintained. Video recordings were analyzed to determine the Standard Time required for fast-moving products. Production was monitored to process a group of products within a clear understanding of the required time, ensuring minimal WIP and same-day finishing for processed material, facilitating dispatch.

Material handling

The activity of cutting coils to required sheet sizes was halted, and cut-to-size sheets were procured from vendors. Vertical storage racks were fabricated in-house to store sheets of different sizes, allowing for easy retrieval. Dedicated areas were marked for storage of Raw Materials (RM), Work-in-Progress (WIP), and Finished Goods.

Minimum inventory

The inventory policy was updated to include minimum inventory levels for raw materials, bought-out components, inner tanks, and finished goods. Minimum ordering quantities were established based on price, availability, and transportation costs. Non-moving materials, Finished Goods, packing material, and WIP were salvaged and scrapped as required, increasing storage space by 30%.

Material receipts and dispatches

Fixed timings for material receipts (before 11 AM) and dispatches (after 4 PM) were communicated to stakeholders, reducing disruptions to production-related activities.

Non-moving materials, machines, dies, and fixtures

Non-moving tanks were added to the order tracking sheet to utilize them for new orders wherever feasible. Coated inner tanks and other non-moving tanks were sent for powder coating to be used in normal production, and unusable tanks were scrapped. Tanks from customer returns were planned to be used as demo units or scrapped. Old discontinued tanks were checked and sold at discounts without warranty. Non-moving or rejected components were sold as scrap, and materials with different specifications were sold at a discount. Broken-down machines were scrapped and sold off, while dies and fixtures were offered to subcontractors at nominal prices.

Layout changes

Machines for sequential processes were placed on the same floor, and unused machinery was scrapped. This ensured efficient movement of men and materials in a straight line or U-pattern, avoiding unnecessary movements. Non-moving materials were disposed of or relocated from the active shop floor area. Storage locations were allocated for raw materials, WIP, and finished goods, facilitating easier retrieval. The new

layout was prepared based on lean "One Piece Flow," resulting in a 35% space savings.

Results

As previously mentioned, based on the findings from OCAI and LCMA, the decision to implement lean management was made to address the organization's challenges. Over a span of 15 months, the implementation yielded several benefits:

- (i) Manpower was reduced from 42 to 22 persons.
- (ii) Realistic and adhered-to timelines were established for commitments to customers and dealers.
- (iii) A total of 117 non-moving inner tanks were utilized in normal production or scrapped.
- (iv) 58 obsolete finished tanks were liquidated from stock.
- (v) Non-moving packing material, components, machinery, dies, and fixtures were disposed of or scrapped, finding suitable buyers to maximize value.
- (vi) A revitalized culture fostered sustained and improved motivation among supervisory staff and workers, instilling a sense of achievement.

Conclusions

This study provides a comprehensive examination of the application of lean management principles in an Indian engineering micro-enterprise. Analysis using OCAI indicates a clan culture influenced by ownership, leading to various organizational challenges. LCMA research highlights culture-related barriers to lean implementation within the organization. Building on insights from OCAI and LCMA, lean management initiatives were strategically planned and implemented throughout the organization. The results demonstrate significant improvements in addressing the company's challenges, indicating a transition from an ownership-driven culture to a professional, market-oriented one.

Limitations of study and scope of future research

This study focuses on a single Indian MSME, specifically a Micro Enterprise operating in the engineering sector. Further studies could be conducted within the Indian MSME context, either within the engineering sector or across other sectors. Comparisons between

results within the same sector and across different sectors could contribute to developing a model for lean implementation in Indian MSMEs. Additionally, research could be conducted to investigate the relationship between organizational culture and lean framework selection using the Lean Readiness Assessment Model (LCAM) in Indian MSMEs. Furthermore, exploring the significant roles of culture and leadership in the lean transformation journey is recommended.

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