INTERNATIONAL JOURNAL OF INDUSTRIAL MANAGEMENT
ISSN: 2289-9286 e-ISSN: 2590-3594
VOLUME 17, NO. 2, 2023, 76 - 83
DOI: https://doi.org/10.15282/ijim.17.2.2023.9037

UNIVERSITI MALAYSIA PAHANG

RESEARCH ARTICLE

LEAN CULTURE FOR A SUCCESSFUL LEAN MANUFACTURING IMPLEMENTATION: AN EMPIRICAL EVIDENCE FROM MALAYSIAN MANUFACTURING INDUSTRY

Norhana Mohd Aripin*, Gusman Nawanir, and Suhaidah Hussain

Faculty of Industrial Management, Universiti Malaysia Pahang, 26300 Pahang, Malaysia

ABSTRACT - Although lean has gained many accomplishments, 90% of the manufacturers that implemented lean failed to sustain the implementation, and these results have led academics to consider lean culture as a soft lean approach for successful lean implementation. This research is aimed to investigate the role of lean culture for a successful lean implementation. This survey-based was a cross-sectional study with 151 final respondents from discrete manufacturers in Malaysia. The samples were selected using a cluster sampling procedure from medium and large manufacturing companies registered with the Federation of Manufacturers Malaysia (FMM). The data was analyzed using SmartPLS 4.0 software. The result showed evidence that lean manufacturing implementation is positively impacted by lean culture. This study contributes to the body of knowledge and widens the bounds of the current literature, and offers insight to the lean practitioners on lean implementation techniques to strategize the roadmap and assure continuous execution by considering the role of lean culture.

ARTICLE HISTORY

Received	:	06-02-2023
Revised	:	30-03-2023
Accepted	:	30-04-2023
Published	:	28-06-2023

KEYWORDS

Lean Implementation,
Lean Culture,
Manufacturing,
Malaysia,

1.0 INTRODUCTION

Manufacturing sectors worldwide must embrace new paradigms to improve manufacturing excellence by increasing production capabilities, productivity, quality, and flexibility (Silvestri et al., 2022). Manufacturers must innovate and improve to compete in a challenging market and use the right strategic approaches. Lean management has become inevitable to survive in the market, and it is a management approach that focuses on value-added processes and waste reduction to lower production costs (Loh & Yusof, 2020; Sisson & Elshennawy, 2015; Yadav et al., 2018). Many lean tools are available to assist firms in achieving excellence by reducing manufacturing waste (Kamble et al., 2020).

Many firms have adopted lean manufacturing to gain positive benefits. Nevertheless, sustaining the implementation is a real challenge as the improvements may eventually return to their original state (Bento & Tontini, 2019; Henrique et al., 2021). According to Grigg et al. (2020), 90% of sampled manufacturers failed to sustain lean manufacturing within ten years of its introduction or had very little chance of doing so in the future. According to experts, the failure rate for lean manufacturing adoption is over 60% in the first three years and over 92% in the first ten years (Vance, 2017). Sustenance strategies for lean implementation are critical and beneficial for manufacturers, as the effort, time, and cost invested in initiating lean implementation would have been wasted (Goodyer & Grigg, 2011).

Continuous improvement is a culture that spurs change, results in sustained lean implementation, and yields excellent manufacturing performance (Hardcopf et al., 2021; Pakdil & Leonard, 2015). Researchers and practitioners have long recognized that organizational culture is crucial for lean implementation to increase performance. Although lean has proven to provide numerous achievements, inconsistent results have caused academics to consider interactions and contextual factors of lean culture (Hardcopf et al., 2021). Hence, based on this inconsistency, this study aimed to investigate the role of lean culture for successful lean implementation.

This study will confine Malaysian manufacturing companies to medium and large-scale discrete manufacturers. Small firms will not be chosen as they are less likely to implement lean manufacturing than medium and large-scale organizations (Burawat, 2019). In addition, discrete manufacturing has implemented lean manufacturing more frequently than continuous process manufacturing. Thus, this research will only focus on discrete manufacturing, such as the metal industry, electronics assembly, and automobile assembly (Abdulmalek & Rajgopal, 2007). In summary, this study attempted to address a research gap in the role of lean culture in sustaining lean manufacturing implementation among manufacturers in Malaysia. Researchers and practitioners will benefit from the data offered using the theoretical and empirical facts presented in this study.

*CORRESPONDING AUTHOR | N. M. Aripin | ✉ norhana87@gmail.com

This study aims to improve and broaden existing knowledge and theories on lean manufacturing. From a practical standpoint, the findings of this study will provide several recommendations to Malaysian lean practitioners to help them obtain a deeper understanding of lean culture in sustaining lean manufacturing implementation. This paper provided a thorough explanation of the conceptual and theoretical foundations. The quantitative data analysis and discussion were then discussed. Finally, research implications, limitations, and recommendations for further study were provided.

2.0 LITERATURE REVIEW

2.1 Resource-based View Theory (RBV)

RBV demonstrates how internal resources help to gain a competitive edge. The objective of a firm is to be a profitable organization controlled by rational decision-makers who desire stability and become more profitable than other businesses in the same market (Leiblein, 2003). Barney (1986) believes that culture may provide a long-term competitive edge if the firm culture resembles valuable, rare, non-sustainable, and imperfectly imitable resources. Lean manufacturing is regarded as a resource in the RBV theory. Lean manufacturing may have unique resources, and other businesses may outperform their rival due to its implementation (Inman & Green, 2018). Since it is embedded in the organization's structure and process, the capability is defined as a company's capacity to allocate resources to achieve the intended outcome (Amit & Schoemaker, 1993). This research views lean culture as capabilities from the perspective of RBV theory.

2.2 Lean Manufacturing Implementation

Samuel et al. (2015) identified lean manufacturing as a replication of the Japanese Toyota Production System. They are often referred to as a process improvement technique that a company may use towards excellence. Although lean manufacturing started in the automotive industry, it has now dispersed to other sectors, including services, construction, and agriculture (Durakovic et al., 2018). On a management level, lean manufacturing is a strategy to reduce waste and increase values along the whole manufacturing value chain using just-in-time, total productive maintenance, and a total quality production approach (Furlan et al., 2011).

Just In Time (JIT) is the second pillar of TPS and is widely known to improve quality, productivity, and efficiency while reducing costs (Cimorelli, 2013; Mabunda, 2019). Work-in-process inventory and unnecessary flow time delays were addressed by implementing JIT (Bevilacqua et al., 2017). Kanban is a popular method of pull system to improve the flow of materials inside the manufacturing process and between suppliers and customers (Petrillo et al., 2018). The cellular layout will increase shop floor adaptability, improve process efficiency, and reduce transportation waste (Nawanir et al., 2016). According to Dieste et al. (2019), the purpose of JIT is to move from batch manufacturing to small lot production. Quick changeover is utilized to accomplish JIT through small batch production, reducing manufacturing lead time significantly. Uniform workload, also known as heijunka, will boost operational efficiency (Bento & Tontini, 2019). Moreover, value stream mapping is a methodical way to analyze content and flow mapping (Dieste et al., 2019).

From a management standpoint, Total Quality Management (TQM) is known to achieve customer satisfaction, decrease process faults, and reduce the return of supplied items by leveraging management, employees, suppliers, and customers. TQM is a quality management system that reflects an operational approach to generating high-quality items via improving manufacturing methods (Al-Hyari, 2020; Sahoo & Yadav, 2018; Sukarma, 2000). TQM encompasses methods related to standardized work that attempt to eliminate variance in the manufacturing process (Dutta & Mandal, 2020; Iqbal et al., 2020). Poka-yoke was invented and refined as an effective quality control technique for error-proofing in manufacturing (Bose & Sengupta, 2020; Tezel et al., 2017). Quality at the source is associated with the culture of stopping and solving problems to achieve the required quality on the first attempt (Bento & Tontini, 2019). SPC refers to a framework for monitoring the process, identifying specific causes of variation, and suggesting the need for corrective steps when challenges arise (Bento & Tontini, 2019; Kamble et al., 2020). Abdallah and Alkhaldi (2019) included visual management in TQM because they expected it to improve productivity and result in quality performance.

Total Productive Maintenance (TPM) strives to offer production employees more ownership and control over the dependability of the equipment (Holgado et al., 2020; Sahoo, 2020a). Several manufacturers have started incorporating the TQM concept into the TPM strategy to reduce variability through autonomous maintenance. Maintaining equipment in the best operational condition depends on preventive maintenance (Tortorella & Fogliatto, 2017). TPM is a comprehensive maintenance strategy that encompasses the entire equipment life cycle and includes preventive and predictive maintenance (Nakajima, 2008). As part of preventive maintenance, also known as self-maintenance, technicians assign maintenance tasks to operators, such as lubrication, adjustments, and small repairs. The intention is for production workers to be in charge of basic equipment upkeep and repair (Kovács et al., 2020). Equipment deteriorates due to poor preventative maintenance, affecting product reliability, production throughput, and competitive advantage (Sukarma et al., 2014).

2.3 Lean Culture

There is wide acceptance of the idea of culture, defined as something that exists and affects how people behave (Watkins & O’Neil, 2013). Schein (1991) presented the viewpoint on culture by defining it as a characteristic of people who display comparable conduct and attitude. Performance is impacted by organizational culture, which in turn is influenced by individual behaviour (Cheng, 1989). Lean culture in this study referred to a common way of thinking, and implementing it will significantly influence lean adaptation. Sustaining lean manufacturing depends on defining the organizational culture (Pakdil & Leonard, 2015). Lean is about changing people's attitudes and should not simply be regarded as tools and processes to reduce waste and increase value (DeSanctis et al., 2018).

Employee participation and dedication are required since sustaining a lean implementation approach demands cooperation throughout the supply chain (Bose & Sengupta, 2020; Burawat, 2019). Similarly, Hoque et al. (2020) mentioned that long-term lean implementation depends on management and staff commitment to achieving long-term benefits. Employee participation and understanding the rationale for lean implementation are critical to the effectiveness of lean tools and processes (Alhuraish et al., 2017). High staff involvement and participation level in the culture-changing process of continuous improvement are necessary for the long-term implementation of lean manufacturing (Costa et al., 2019). It is not necessary for management to make efforts to create an improvement culture; instead, employees should be driven to do so (Hines, 2010). Osman et al. (2021) reported that lean culture is evaluated based on how well teams handled lean transformation and activities.

As a first step in creating a culture of continuous improvement, *gemba* practice should be conducted. This strategy seeks improvement proposals in areas where value is created and operations are conducted (Udod et al., 2020). Finding solutions to issues and suggestions for ongoing development is an important task. The team will be motivated through these activities since it will boost their ability to communicate ideas (Loh & Lau, 2020). According to Osman et al. (2021), the extent to which improvement measures processes are based on lean philosophy is another aspect of lean culture. Hence, this evidence leads to the following hypothesis "Lean culture has a positive effect on lean manufacturing implementation." Figure 1 shows the research framework of this study.

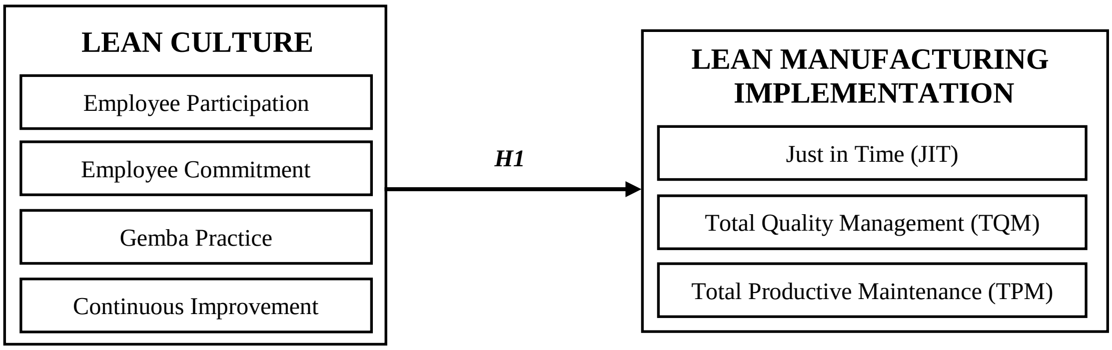

Figure 1: Research framework

3.0 METHODOLOGY

The research employed a quantitative strategy to answer the research objectives. This method was utilized to investigate the relation of the variables. This study aimed to evaluate the assumptions of a conceptual model that incorporated the correlation between variables. An assessment instrument was developed by adopting, adapting, and self-development by referring to previous studies. Different scale properties, 5-point for lean culture and 6-point for lean manufacturing implementation, were employed to minimize common method bias in the measurement scales. During the development stage, for a pre-test purpose, three academicians and two industrial practitioners were requested to evaluate the developed measurement development.

The sample frame was the discrete manufacturing sectors in medium and large-scale industries based on the Malaysian Federation of Malaysian Manufacturers list. The organization was proposed as the unit of analysis, and the elements of the unit of analysis were middle management and top management.

Google Forms was used to collect data, as this is appropriate for respondents who live in a large geographical region and cannot be reached directly by the researcher. 1,000 questionnaires were distributed to the selected manufacturers to ensure a high response rate. 172 completed surveys were received, with a response rate of 17.2%. However, due to unrelated industrial types and the survey being answered by irrelevant respondents, 21 replies were not included further for data analysis. Finally, 151 data sets were useable, yielding an effective response rate of 15.1%.

4.0 RESEARCH FINDINGS

The PLS-SEM using the statistical software SmartPLS 4 was used to assess the hypothesized model. SmartPLS was used to investigate the causal relationships between constructs since it can give reasonable results even when there are minor outliers and the data is not skewed (Hair et al., 2017). The hypotheses were tested using a two-step approach; a measurement model to test the validity and reliability of the instruments and a structural model to test the hypothesis developed. The outer loadings, average variance extracted (AVE), and composite reliability (CR) for the measurement model were assessed. Outer loadings should be > 0.4, the AVE should be >0.5, and the CR should be >0.7 (Hair et al., 2017). From the first measurement model run, the AVE for JIT (i.e., 0.472) and LMI (i.e., 0.468) was not reaching a satisfactory level. Hence three items (i.e., JIT2, JIT3, and JIT10) with the lowest outer loading were deleted, and the reliability reached a satisfactory level with the deletion of the items. Details of the convergent validity result are depicted in Table 1.

Table 1: Convergent validity

Construct	Item Code	Measurement Item	Outer Loading	CR	AVE
Lean Culture	LC1	Our employees are committed to eliminate all types of waste (non-value-added activities) in our operations.	0.767	0.884	0.561
	LC2	Our employees are actively involved in lean activities.	0.766		
	LC3	Our employees are actively involved in continuous improvement programs.	0.772		
	LC4	*Kaizen* (i.e., every day, everywhere, and every time continuous improvement) is our culture.	0.774		
	LC5	We believe that there is no best way of doing things, but there are always better ways.	0.717		
	LC6	Our employees perform *gemba* walk as a routine activity (*Gemba* walk refers to walkabout activity performed by employees to understand the actual shop floor conditions).	0.693		
JIT	JIT1	We use *kanban* to authorize production or material movement (*Kanban* is a work signaling system such as cards, verbal signals, light flashing, electronic messages, empty containers, etc.).	0.559	0.886	0.530
	JIT4	We perform machines' setups quickly if there is a change in process requirements.	0.821		
	JIT5	Our production processes are located close together to support the smooth flow of materials.	0.770		
	JIT6	We group dissimilar machines together to process a family of parts with similar shapes or processing requirements.	0.756		
	JIT7	We level our production, in which production volume is distributed equally to have the same daily quantity of outputs.	0.755		
	JIT8	We produce different models of products daily based on the composition of monthly demand.	0.734		
	JIT9	Our suppliers deliver materials to us just as it is needed (on a just-in-time basis).	0.669		
TQM	TQM1	We have standardized work documents (e.g., SOP, work instruction, etc.) to guide workers in performing activities in the production system.	0.818	0.903	0.610
	TQM2	We standardize the works in our production line to reduce processes variation.	0.806		
	TQM3	Production processes on shop floors are monitored with statistical quality control techniques to control the process variance.	0.785		
	TQM4	We apply a human error prevention mechanism with error-proof devices (poka-yoke) in our production line.	0.787		
	TQM5	We implement an automated stopping mechanism, in which when an abnormality/irregularity happens, the process will automatically stop.	0.707		
	TQM6	We use visual control systems (e.g., andon/line-stop alarm lights, level indicators, warning signals, signboards, etc.) as a mechanism to make problems visible.	0.778		

Table 1: (cont.)

Construct	Item Code	Measurement Item	Outer Loading	CR	AVE
TPM	TPM1	We implement preventive maintenance (i.e., planned maintenance of equipment to prevent failure) for all equipment in the production line.	0.827	0.925	0.712
	TPM2	We ensure that machines are in a high state of readiness for production at all times.	0.888		
	TPM3	We scrupulously clean workspaces (including machines and equipment) to make unusual occurrences noticeable.	0.881		
	TPM4	Our operators continuously monitor and perform minor adjustments/maintenance on their equipment.	0.773		
	TPM5	We implement predictive maintenance (i.e., a proactive measure by foreseeing the breakdown of the equipment to be maintained with early signs of failure) for all equipment in the production line.	0.869		

In assessing the empirical criteria, discriminant validity refers to how different a construct is from other constructs was conducted (Hair et al., 2017). The heterotrait-monotrait (HTMT) correlation ratio is used to assess discriminant validity. A threshold value of >0.90 indicates a lack of discriminant validity. Table 2 demonstrates that the discriminant validity obtained from the HTMT test was less than 0.900, demonstrating that all questions were distinct and did not have interchangeable meanings.

Table 2: Discriminant validity: Heterotrait-Monotrait Ratio (HTMT)

Construct	JIT	LC	TPM	TQM
JIT				
LC	0.671			
TPM	0.849	0.664		
TQM	0.817	0.554	0.878	

After assessing the measurement model, the structural model was assessed. It entails hypothesis testing on the relationships between constructs. The coefficient of determination (*R^2*) and effect size (*f^2*) was conducted in measuring the structural model. The bootstrapping method was used to test the hypothesis with 5000 bootstrap subsamples (Hair et al., 2017). The critical values for the one-tailed test were used with a t-value of 1.645 (significance level = 5%) to determine the significance level. The summary of hypothesis testing is presented in Table 3.

Table 3: Summary of hypotheses testing

Path	Std. Beta	Std. Error	p-value	Confidence Interval		Decision
				5.00%	95.00%	
Lean Culture -> LM	0.244	0.054	0.00	0.085	0.432	Supported

As shown in Table 3, the hypothesis result shows a standardized β of 0.244, a p-value of 0.000, and a confidence interval between 0.085 and 0.432. This result supported the hypothesis that lean culture positively affects lean manufacturing implementation. The R^2 values of 0.26, 0.13, and 0.02 are described as substantial, moderate, or weak, respectively. The values of R^2 for LMI were 0.375, and the R^2 value for JIT, TQM, and TPM were 0.832, 0.799 and 0.845, respectively. The evaluation of f^2 indicates how greatly the contribution of an exogenous variable to an endogenous variable (Cohen, 1992). Guidelines for assessing f^2 are values of 0.02 is small, 0.15 is medium, and 0.35 is large (Hair et al., 2017). The effect size for lean culture was large, with a value of 0.600.

5.0 RESEARCH FINDINGS

The results showed that lean culture positively impacts lean manufacturing implementation. The results support the idea put out by Henrique et al. (2021), DeSanctis et al. (2018), and Hoque et al. (2020) that lean culture has a beneficial impact on the implementation of lean manufacturing. Henrique et al. (2021) suggested a step-by-step guide to ensure the company cultivates a lean culture. The culture that encourages improvement determines using process improvement tools and techniques. There would be no organizational efficiency or operational excellence if the employees did not understand the lean culture. In addition, DeSanctis et al. (2018) reported that implementing lean is not only about the tools and techniques, but the culture of people is equally important.

Understanding the organizational culture is important in sustaining lean manufacturing (Pakdil & Leonard, 2015). Continuous improvement is a culture that pushes improvements and results in operational excellence, which is required sustained lean implementation (Mathaisel, 2005). *Gemba* walk is essential to creating a continuous improvement culture. Instead of focusing on processes and technology, lean aims to shift people's perceptions and way of thinking (DeSanctis et al., 2018). The lean manufacturing implementation method, which necessitates good relationships throughout the supply chain, demands employee commitment and engagement (Bose & Sengupta, 2020; Burawat, 2019). Similarly, Hoque et al. (2020) stated that long-term lean implementation depends on management and staff involvement to generate long-term advantages. Employee participation and understanding of the rationale behind their use are essential for the success of lean tools and procedures (Alhuraish et al., 2017).

According to (Sisson & Elshennawy, 2015), employee participation is essential for successful lean adoption. Employee engagement and lean sustainability are intricately bound. Flynn and Scott (2020) contend that lean is maintained in settings where individuals are encouraged to do so, guided by a clear understanding of lean implementation's advantages. As a result, employee participation in establishing a changing culture through continuous improvement is critical for long-term lean manufacturing implementation (Costa et al., 2019). Employees should foster a culture of lifelong learning. Employees should naturally create an organizational improvement culture without needing top management support (Hines, 2010).

According to Sahoo (2020b), Manufacturers should encourage a culture of empowerment and openness to suggestions for continuous improvement, as well as push organizational efforts toward lean. According to Goodyer and Grigg (2011), a *"living the lean lifestyle"* culture must be established, and everyone in the business must take ownership of it to enable long-term lean implementation. As a first step in creating a culture of continuous improvement, *gemba* is advocated. This approach looks for opportunities to create value and make changes; as a result, it will provide employees more freedom to express their ideas and, as a result, increase their motivation (Loh & Lau, 2019; Udod et al., 2020).

6.0 CONCLUSIONS AND IMPLICATIONS

The research makes several important contributions to the fields of academicians and practitioners. By carefully examining the effects of lean culture on lean manufacturing implementation based on RBV theory, this study aimed to advance knowledge to the body of knowledge. This idea seeks to achieve a competitive edge using valuable, rare, inimitable, and non-substitute resources and capabilities (Barney et al., 2001). The study's findings provide practitioners with practical recommendations. The study has implications for management practice as well. The current study's findings may provide recommendations to assist lean practitioners in better understanding and preparing for the difficulty of sustaining lean manufacturing implementation through lean culture. Lean implementation is well understood and has shown to be important for firms to thrive in today's market (Kamble et al., 2020). It boosts production efficiency scientifically by increasing customer value-adding activities and decreasing operational waste. The findings of this study will assist lean manufacturing practitioners in identifying the strategies required to sustain the approach.

The limitation of this study was discovered during the research process. These limitations must be addressed for future researchers. The study was cross-sectional. As a result, longitudinal settings should be explored in future research. Future studies may examine the existing model in additional industries and nations, as well as through cross-country comparisons, to strengthen the generalizability of the findings. The fact that this study exclusively considers quantitative data is the next limitation. Despite this study's lack of detailed results, the quantitative data can draw broad inferences. Future studies should employ a qualitative methodology to increase the depth and breadth of the finding.

7.0 REFERENCES

Abdallah, A. B., & Alkhaldi, R. Z. (2019). Lean bundles in health care: A scoping review. *Journal of health organization and management, 33*(4), 488-510.

Abdulmalek, F. A., & Rajgopal, J. (2007). Analyzing the benefits of lean manufacturing and value stream mapping via simulation: A process sector case study. *International Journal of Production Economics, 107*(1), 223-236.

Al-Hyari, K. (2020). Lean bundles within Jordanian manufacturing SMEs and their effect on business performance. *Problems and Perspectives in Management, 18*, 302-315.

Alhuraish, I., Robledo, C., & Kobi, A. (2017). A comparative exploration of lean manufacturing and six sigma in terms of their critical success factors. *Journal of cleaner production*, 164, 325-337.

Amit, R., & Schoemaker, P. (1993). Strategic Assets and Organizational Rent. *Strategic management journal, 14*, 33-46.

Barney, J. (1986). Organizational culture: Can it be a source of sustained competitive advantage? *Academy of Management Review, 11*(3), 656-665.

Barney, J., Wright, M., & Ketchen, D. J. (2001). The resource-based view of the firm: Ten years after 1991. *Journal of management, 27*, 625-641.

Bento, G., & Tontini, G. (2019). Maturity of lean practices in Brazilian manufacturing companies. *Total Quality Management & Business Excellence, 30*, 1-15.

Bevilacqua, M., Ciarapica, F. E., & De Sanctis, I. (2017). Lean practices implementation and their relationships with operational responsiveness and company performance: An Italian study. *International Journal of Production Research, 55*(3), 769-794.

Bose, P., & Sengupta, G. (2020). Relevance of lean manufacturing for MSME sector. *International Journal of Management IT and Engineering*, 10(5), 113-126.

Burawat, P. (2019). The relationships among transformational leadership, sustainable leadership, lean manufacturing and sustainability performance in Thai SMEs manufacturing industry. *International Journal of Quality & Reliability Management,* 36(6), 1014-1036. https://doi.org/10.1108/IJQRM-09-2017-0178

Cheng, Y. C. (1989). Organizational Culture: Development of a Theoretical Framework for Organizational Research. *Chinese University Education Journal*, 17(2), 128-47.

Cimorelli, S. (2013). *Kanban for the supply chain: Fundamental practices for manufacturing management*. CRC Press.

Cohen, J. (1992). Quantitative methods in psychology: A power primer. *Psychol. Bull*., 112, 1155-1159.

Costa, F., Lispi, L., Staudacher, A. P., Rossini, M., Kundu, K., & Cifone, F. D. (2019). How to foster Sustainable Continuous Improvement: A cause-effect relations map of Lean soft practices. *Operations Research Perspectives,* 6, 100091.

DeSanctis, I., Ordieres Mere, J. B., Bevilacqua, M., & Ciarapica, F. E. (2018). The moderating effects of corporate and national factors on lean projects barriers: a cross-national study. *Production Planning & Control,* 29(12), 972-991.

Dieste, M., Panizzolo, R., Garza-Reyes, J. A., & Anosike, A. (2019). The relationship between lean and environmental performance: Practices and measures. *Journal of Cleaner Production,* 224, 120-131.

Durakovic, B., Demir, R., Abat, K., & Emek, C. (2018). Lean manufacturing: Trends and implementation issues. *Periodicals of Engineering and Natural Sciences,* 6, 130-139.

Dutta, S., & Mandal, B. C. (2020). Impact of Lean Manufacturing in Business Excellence. *American Journal of Business and Management Research*, 1(1), 1-10.

Flynn, & Scott, S. D. (2020). Understanding Determinants of Sustainability Through a Realist Investigation of a Large-Scale Quality Improvement Initiative (Lean): A Refined Program Theory. *Journal of Nursing Scholarship,* 52(1), 65-74.

Furlan, A., Vinelli, A., & Pont, G. (2011). Complementarity and lean manufacturing bundles: An empirical analysis. *International Journal of Operations & Production Management,* 31, 835-850.

Goodyer, J., Grigg, N. and Murti, Y. (2011), "Sustaining lean manufacturing in New Zealand organisations," Report prepared for NZTE, Massey University.

Grigg, N., Goodyer, J. E., & Frater, T. G. (2020). Sustaining lean in SMEs: Key findings from a 10-year study involving New Zealand manufacturers. *Total Quality Management & Business Excellence,* 31(5-6), 609-622.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2017). *Advanced issues in partial least squares structural equation modeling*. SAGE publications.

Hardcopf, R., Liu, G., & Shah, R. (2021). Lean production and operational performance: The influence of organizational culture. *International Journal of Production Economics*, 235, 108060.

Henrique, D. B., Filho, M. G., Marodin, G., Jabbour, A. B. L. d. S., & Chiappetta Jabbour, C. J. (2021). A framework to assess sustaining continuous improvement in lean healthcare. *International Journal of Production Research,* 59(10), 2885-2904.

Hines, P. (2010). How to create and sustain a lean culture. *Development and learning in organizations: An International Journal,* 24(6), 28-32

Holgado, M., Macchi, M., & Evans, S. (2020). Exploring the impacts and contributions of maintenance function for sustainable manufacturing. *International journal of production research*, 58(23), 7292-7310.

Hoque, I., Hasle, P., & Maalouf, M. M. (2020). Lean meeting buyer's expectations, enhanced supplier productivity and compliance capabilities in garment industry. *International Journal of Productivity and Performance Management,* 69(7), 1475-1494.

Inman, R. A., & Green, K. W. (2018). Lean and green combine to impact environmental and operational performance. *International journal of production research*, 56(14), 4802-4818.

Iqbal, T., Jajja, M. S. S., Bhutta, M. K., & Qureshi, S. N. (2020). Lean and agile manufacturing: complementary or competing capabilities? *Journal of manufacturing technology management*. 31(4), 749-774.

Kamble, S., Gunasekaran, A., & Dhone, N. C. (2020). Industry 4.0 and lean manufacturing practices for sustainable organisational performance in Indian manufacturing companies. *International Journal of Production Research,* 58(5), 1319-1337.

Kovács, T., Kő, A., & Demeter, K. (2020). Measuring the impact of lean practices on manufacturing performance–case study from the process industry. *International Journal of Lean six sigma*, 11(6), 1193-1218.

Leiblein, M. J. (2003). The choice of organizational governance form and performance: Predictions from transaction cost, resource-based, and real options theories. *Journal of management*, 29(6), 937-961.

Loh, K. L., & Mohd Yusof, S. (2020). Blue ocean leadership activities improve firm performance. *International Journal of Lean Six Sigma*, 11(2), 359-375.

Mabunda, R. (2019). Evaluating Lean Implementation Success in Small and Medium Manufacturing Enterprises. University of Johannesburg (South Africa).

Mathaisel, D. F. (2005). A lean architecture for transforming the aerospace maintenance, repair and overhaul (MRO) enterprise. *International Journal of Productivity and Performance Management*, 54(8), 623-644.

Nakajima, M. (2008). The new development of material flow cost accounting (MFCA): MFCA analysis in power company and comparison between MFCA and TPM (total productive maintenance). *Kansai University review of business and commerce* 10, 57-86.

Nawanir, G., Lim, K. T., & Othman, S. N. (2016). Lean manufacturing practices in Indonesian manufacturing firms: are there business performance effects? *International Journal of Lean Six Sigma*, 7(2), 149-170.

Osman, A. A., Nordin, N., & Abd Rahman, M. F. (2021). Measuring Lean Culture: Designing a Research Instrument. *Journal of Modern Manufacturing Systems and Technology, 5*(1), 7-17.

Pakdil, F., & Leonard, K. M. (2015). The effect of organizational culture on implementing and sustaining lean processes. *Journal of manufacturing technology management*, 26(5), 725-743.

Petrillo, A., De Felice, F., & Zomparelli, F. (2018). Performance measurement for world-class manufacturing: a model for the Italian automotive industry. *Total Quality Management & Business Excellence,* 30(7-8), 908-935.

Sahoo, S. (2020). Lean manufacturing practices and performance: the role of social and technical factors. *International Journal of Quality & Reliability Management*, 37(5), 732-754.

Sahoo, S. (2020). Assessing lean implementation and benefits within Indian automotive component manufacturing SMEs. *Benchmarking: An International Journal*, 27(3), 1042-1084.

Sahoo, S., & Yadav, S. (2018). Lean production practices and bundles: a comparative analysis. *International Journal of Lean Six Sigma*, 9(3), 374-398.

Samuel, D., Found, P., & Williams, S. J. (2015). How did the publication of the book The Machine That Changed the World change management thinking? Exploring 25 years of lean literature. *International Journal of Operations & Production Management*, 35(10), 1386-1407.

Schein, E. H. (1991). What is culture. *Newbury Park, CA: Sage Publications*, 243-253.

Silvestri, L., Gallo, T., Silvestri, C., & Falcone, D. (2022, March). Integration of Lean Manufacturing in Industry 4.0: An overview of tools and applications. In 2022 2nd International Conference on Innovative Research in Applied Science, Engineering and Technology (IRASET) (pp. 1-5). IEEE.

Sisson, J., & Elshennawy, A. (2015). Achieving success with Lean: An analysis of key factors in Lean transformation at Toyota and beyond. *International Journal of Lean Six Sigma*, 6(3), 263-280.

Sukarma, L. (2000). A model for guiding and measuring company performance towards achieving manufacturing excellence. University of Wollongong.

Sukarma, L., Azmi, H., & Abdullah, N. L. (2014). The impact of world class manufacturing practices on company performance: a critical review. *Applied Mechanics and Materials,* 564, 727-732.

Tezel, A., Koskela, L., & Aziz, Z. (2017). Lean thinking in the highways construction sector: motivation, implementation and barriers. *Production Planning & Control*, 29, 1-23.

Tortorella, G., & Fogliatto, F. (2017). Implementation of lean manufacturing and situational leadership styles: An empirical study. *Leadership & Organization Development Journal*, 38(7), 946-968

Udod, S. A., Duchscher, J. B., Goodridge, D., Rotter, T., McGrath, P., & Hewitt, A. D. (2020). Nurse managers implementing the lean management system: A qualitative study in Western Canada. *Journal of Nursing Management*, 28(2), 221-228.

Vance, G. A. (2017). *Leader behaviors for sustaining the implementation of lean methodologies in multi-national companies: A qualitative case study*. Liberty University.

Watkins, K. E., & O'Neil, J. (2013). The dimensions of the learning organization questionnaire (the DLOQ) a nontechnical manual. *Advances in Developing Human Resources,* 15(2), 133-147.

Yadav, V., Jain, R., Mittal, M. L., Panwar, A., & Sharma, M. K. (2019). An appraisal on barriers to implement lean in SMEs. *Journal of Manufacturing Technology Management*, 30(1), 195-212.