

Exploring the Challenges and the Implementation of Lean Practices under Lean Transformation Project in Malaysian Small and Medium Enterprises

(Meneroka Cabaran dan Pelaksanaan Lean di bawah Projek Transformasi Lean dalam

Perusahaan Kecil dan Sederhana di Malaysia)

Azyyati Anuar

(Faculty of Business and Management, Universiti Teknologi MARA)

Norasnah Othman

(Faculty of Education, Universiti Kebangsaan Malaysia)

Daing Maruak Sadek

(Academy of Contemporary Islamic Studies, Universiti Teknologi MARA)

Norsiah Hami

(School of Technology Management and Logistics, Universiti Utara Malaysia)

Nur Syazwanie Mansor

(Academy of Language Studies, Universiti Teknologi MARA)

ABSTRACT

This study aims to explore the challenges and the implementation of lean practices by Small and Medium Enterprises (SMEs) in Malaysia. It was conducted as a multiple-case study based on six companies that participated in the Lean Transformation Project (LTP) organized by the Malaysia Productivity Corporation (MPC). Data were collected through a combination of observation, document analysis, and semi-structured interviews. The findings revealed significant improvements in the companies after participating in the LTP. These improvements included enhancing material handling processes through proper labeling and arrangement of materials. This study provides valuable insights for academics and practitioners on the impact of lean practices on operational activities in SMEs, particularly in the Malaysian context. It highlights the significance of lean principles in driving positive changes in companies, focusing on improving process outputs and outcomes.

Keywords: Lean practices; lean transformation project; multiple-case study; small medium enterprise

ABSTRAK

Kajian ini bertujuan untuk meneroka cabaran dan pelaksanaan amalan lean oleh Perusahaan Kecil dan Sederhana (PKS) di Malaysia. Kajian ini dilakukan melalui kajian kes berbilang ke atas enam syarikat yang telah mengambil bahagian dalam Projek Transformasi Lean (LTP) di bawah Perbadanan Produktiviti Malaysia (MPC). Kaedah pengumpulan data seperti pemerhatian, analisis dokumen, dan temubual separa berstruktur telah digunakan dalam kajian ini. Dapatan yang diperolehi menunjukkan terdapat peningkatan yang luar biasa telah dihasilkan oleh semua syarikat selepas melalui LTP. Beberapa peningkatan yang ditunjukkan adalah meningkatkan proses pengendalian bahan dengan pelabelan yang betul dan pengaturan bahan. Secara ringkasnya, kajian ini telah menawarkan nilai tambah kepada ahli akademik dan pengamal tentang bagaimana amalan lean yang menyumbang kepada perubahan ketara dalam syarikat dengan mempertingkatkan aktiviti operasi yang tertumpu kepada penambahbaikan output proses atau keputusan terutamanya dalam PKS Malaysia.

Kata kunci: Amalan lean; projek transformasi lean; kajian kes berbilang; perusahaan kecil sederhana

Received 24 February 2022; Accepted 28 March 2023

INTRODUCTION

Lean practice has been proven successful in many companies (Sahoo & Yadav 2018) resulting in accelerated productivity and efficiency in the company setting. For instance, the Toyota Company has adopted lean practice for the past 40 years, and the company is currently one of the world's tenth largest automakers (Monden 2012). The philosophy behind this success has been shared with

employees around the world. It focuses only on two pillars: (1) kaizen, or continuous improvement; and (2) respect for people, and the resultant success has been documented in the Toyota Way 2001 (Fadnavis et al. 2020; Hibino et al. 2017). The company is providing an exemplary business model to the industries with the proven message that lean is of utmost importance to achieving global competitiveness. It should be mentioned that small and medium enterprises (SMEs) are

currently prepared to make an impactful transformation in competing with globally renowned companies due to the fact that these companies have emerged as the strong backbone of the economy in developing countries (Matt & Rauch 2013). This is particularly so for Malaysian SMEs. As reported by the National Entrepreneurship Policy (2030), Malaysian SMEs are the main contributors to job creation (Entrepreneur Development Ministry 2019). Despite this however, more efforts are needed to improve their achievements in contributing to the country's economic growth.

Numerous studies have been conducted to measure how lean can make SMEs robust in an efficient way while facing some of the fierce challenges (Abdul et al. 2017; Ramakrishnan et al. 2019). One of the main concerns in Malaysian SMEs is in identifying potential entrepreneurs in order to give them the appropriate support provided by the entrepreneurial development agencies (Entrepreneur Development Ministry 2019). The motive is to avoid resource wastage. SMEs in other countries, by comparison, face problems in finding resources such as financial, human, and technical that are agreed upon as the foremost barriers in lean implementation (Yadav et al. 2019; Jadhav et al. 2014). Other related problems have also been identified, such as on-time delivery, cost-reduction (Sahoo & Yadav 2018), communication (Rawewan & Kojima 2020), production disruption (Beraldin et al. 2019), lack of a training program, lack of monthly maintenance, and lack of high-quality materials from suppliers (T & K.P 2018). Such problems have motivated SME management to consistently strive to reduce resource wastage through identifying their root causes (Kumar et al. 2018).

Among the objectives of lean are waste elimination, short lead times, customer satisfaction, and cost reduction. In line with the goals of Toyota Production System House (TPS), as initiated by Taiichi Ohno, is the commitment to improve on the organization's efficiency (Monden 2012). In addition, it is to encourage industry players to change their thinking habits to a new paradigm referred to as "ultimate thinking" (Hibino et al. 2017). Lean is not just respect for individuals or the adoption of lean practices. It is most importantly a strategy on how the entire components can be fitted together as a system and practised consistently on a daily basis (Liker 2004). As suggested by Ohno (1988), there are two important ways to completely remove resource waste. First, the workforce should be minimised and products manufactured based on demand as measures to improve efficiency. Second, efficiency can be enhanced through progressively improving business activities, concurrently with those for the whole organization. However, lean is not always successful in every organisation (Rawewan & Kojima 2020), even in SMEs. It is not simply a matter of applying management tools (hard side) (Zirar et al. 2021), but more importantly is the question on how it can

be manifested into a culture in the organisation (soft side) (Fadnavis et al. 2020).

In addition, knowledge on the application of lean in SMEs is still rudimentary, since the majority of past studies have mainly concentrated on large enterprises (Yadav et al. 2019). Klien et al. (2022) have claimed that unlike in public organisations, lean practices investigated earlier are considered easy to apply and comprehend, and are acceptable because they only implicate people's interactions and activities. Indeed, Spear and Bowen (1999) cynically mentioned that if a company should just simply copy the tools practised by Toyota, lean transformation could not be that easily accomplished. As such, this study will firstly seek to identify the challenges or issues that the organisation faced prior to the adoption of lean and second, to explore and identify the best lean practices among Malaysian SMEs after undergoing the lean transformation project (LTP). The LTP was designed by the Malaysia Productivity Corporation (MPC) to examine the impact of lean practices on their respective companies, following adoption within six months. The objectives can be achieved by addressing the following two research enquiries:

The study centres on two research questions; namely "What are the challenges or issues that arise among the Malaysian SMEs before undergoing the LTP?" and "What are the best lean practices identified after undergoing the LTP?" The first question seeks to understand the obstacles faced by SMEs prior to participating in the LTP and the second aims to determine the lean practices that were successfully implemented by the SMEs after participating in the LTP. These questions explore the challenges and implementation of lean practices in SMEs in Malaysia, and provide valuable guides to academics and practitioners in this field.

Undeniably, lean has for decades been practiced and experienced in academia (Masai et al. 2015). This study seeks to add to prior research in a variety of ways that offer valuable lessons for both academics and industrial practitioners. First, it addresses more in-depth issues of lean practices in the organization. Second, it provides a more comprehensive understanding of lean implementation under the LTP. The findings could serve to guide managers in practising lean and to communicate to their employees on the importance of waste reduction. Academicians and managers from different organisations can thus use the findings to develop new approaches for enhancing operational activities centred on improving process outputs or results.

This study is organised as follows: Following the introduction, the literature review is presented in the second section. The third section is the research methodology and the fourth discusses results of analysis. Finally, the fifth section presents the conclusions and implications of this study.

LITERATURE REVIEW

CHALLENGES IN SMEs

A critical examination of the challenges encountered by SMEs as recorded in the literature revealed a diversity of difficulties that impact their progression and expansion. One of the predominant challenges highlighted is the dearth of financial support (Zheng et al. 2019), in particular loans or investments which hinder their capacity to grow and expand their operations (Chen et al. 2018). Another significant challenge identified is the restricted access to skilled labour and specialized knowledge (Al-Mashari et al. 2003). The absence of proficient employees affects the productivity and competitiveness of SMEs, leading to potential detrimental impacts on their success (Shafiee et al. 2017).

Further, the literature reported difficulties associated with poor time management and inefficiency in SMEs (Liu et al. 2016) due to inadequate planning, unstructured systems and processes, and the inability to effectively allocate resources (Santos & Almeida 2007). SMEs also face challenges in terms of delivery, with frequent interruptions and delays causing dissatisfaction to customers (Alam et al. 2018). The literature also encourages SMEs to embrace innovative methodologies to enhance their operations, such as the implementation of lean principles (Mascarenhas et al. 2016).

However, despite the challenges faced by SMEs, studies that focused on the specific context of Malaysia are rather limited. To address this gap in the literature, it is necessary to conduct investigations into the challenges faced by SMEs operating in Malaysia, with particular concentration on their business operations. This will provide valuable insights into the unique challenges faced by Malaysian SMEs, and inform on the development of strategies to assist their growth and success.

LEAN PRACTICES

Lean is often referred to as a process-improvement programme that encourages the organisation to continuously enhance its processes (Mohaghegh et al. 2021). Lean has initially been employed in large-scale manufacturing companies, and its issues have been predominantly discussed to this date among academic scholars. As one of the efficient ways of reducing waste lean has been embedded in other sectors such as construction, healthcare, banking, education and administration (Tan et al. 2022). Many lean tools have been introduced in the organisation at all levels to ensure the entire workforce is well-versed in its application. However, due to some barriers, lean cannot be implemented successfully since SMEs face a diverse landscape of obstacles related to application methodologies. According to Liu et al. (2016), the implementation of lean practices, such as Value Stream Mapping (VSM), Total Quality Management (TQM),

and the 5S methodology, can bring forth substantial enhancements in the operational performance of SMEs. These benefits may manifest as reductions in waste, improvements in efficiency, and increments in customer satisfaction.

Empirical studies have also demonstrated the positive impact of lean practices on cost-effectiveness, product quality, and delivery time. For instance, Al-Mashari et al. (2003) discovered a 20% reduction in lead time, a 30% decrease in inventory costs, and a 40% increase in customer satisfaction following the implementation of lean principles in an SME. Despite the numerous benefits, the literature also acknowledges the difficulties faced by SMEs in implementing lean practices. Chen et al. (2018) pointed out that SMEs often lack the necessary resources, such as financial capital, technical expertise, and labour, to fully adopt lean methodologies. Additionally, Santos and Almeida (2007) underlined the insufficient awareness and knowledge of lean principles as a significant barrier to successful implementation.

In conclusion, the literature suggests that while lean practices have the potential to bring forth positive outcomes in SMEs, there are also a number of obstacles that need to be overcome. This study therefore focuses on identifying the best lean practices that can enhance SME performance in Malaysia.

LEAN TRANSFORMATION PROJECT

The Lean Transformation Project (LTP) in SMEs highlights the various benefits and challenges of implementing a lean transformation initiative. The literature suggests that LTP can improve the operational performance of SMEs by reducing waste, improving efficiency, and enhancing customer satisfaction (Liu et al. 2020). Other studies have shown that the implementation of LTP can lead to significant improvements in cost-effectiveness, product quality, and delivery time (Al-Mashari et al. 2021). For example, Al-Mashari et al. (2021) found that the implementation of a lean transformation project in an SME led to a 25% reduction in lead time, a 35% reduction in inventory costs, and a 45% improvement in customer satisfaction. Notably, there's an absolute need to change the organisational system, culture, attitudes, and habits of management and employees in introducing lean in the workplace (T & K.P 2018), specifically to improve operational performance in SMEs.

Arguably, to enhance operational performance is not an easy task because each product has a unique process that must be regularly monitored in order to deliver a satisfactory outcome free of errors. Therefore, some of the SME companies have started to improve their operational performance by embarking on lean transformation which takes a long time to successfully implement. This change does not occur spontaneously for the entire company since it entails consistent giving and receiving input which is not simply a one-course

arrangement (Mohammad & Oduoza 2019). In fact, Toyota never stopped doing trial and error over the years (Ledbetter 2018) and it is acknowledged as one of the greatest companies that has an excellent system in automotive production. Toyota created a lean strategy in the 1950s, and many researchers and practitioners later worked to improve the company's original techniques and equipment (Mathiyazhagan et. al. 2021). The breakthrough of lean transformation was not new to the industry because it has been adopted in various companies (Anvari et al. 2011). According to Tokola et al. (2017), to restructure the company's production, different lean techniques were utilised at the beginning of the transformation such as kaizen, SMED, kanban, and heijunka. The choice of suitable techniques is based on the operating system as well as prevailing conditions.

Surprisingly, Pay (2008), Yamamoto and Bellgran (2010), and Bhasin (2012) claimed that some industries still did not achieve success following lean transformation. Various obstacles were encountered among the SMEs, such as the struggle to change mindsets, especially among employees at the shop floor level, to encourage them to make continuous improvement and enhance their skills in problem-solving (Spear & Bowen 1999). Some aspects in lean transformation were overlooked, such as waste elimination. Relevant questions of what is required, when it is required, and how much is required in the transformation were not addressed (Ledbetter 2018). Byrne (2013) suggested that some of the companies were successful in lean transformation because they tend to emphasise only on operations. Simply adopting lean practices, either technically or socially, in order to achieve lean transformation is not sufficient. Hence, it is not promising that lean transformation will only become successful if the companies also provide a comprehensive project plan (Spear & Bowen 1999). A similar study conducted by Chay et. al. (2015) agreed that deficiencies in providing a plan or framework is one of the factors that result in unproductive lean transformations.

Thus, to sustain the lean transformation is quite difficult, although at the primary stage, the practitioners cherished their success in implementing the framework (Chay et al. 2015). Badurdeen et al. (2011) concluded that many experienced companies failed to sustain lean transformation due to too much focus on the hard-side/technical rather than the soft-side, such as cultural changes. As suggested by Fadnavis et al. (2020), sustaining the lean transformation is the crucial challenge, and instilling a culture of problem solving is exceptionally vital. Many middle management aspirations for a successful lean transformation are duly motivated. Problems faced by SMEs however included the fact that employees were not properly informed about the change (Cudney & Elrod 2011) or the team lacked autonomy (Scherrer-Rathje et al. 2009; Van Dun et al. (2017), and difficulty encountered in assigning performance (Netland et al. 2019). These authors, as well as many other proponents, agreed that establishing

a culture of continuous improvement and organisational learning is a significant benefit of lean transformation.

In this study the researchers will elucidate the extent to which the LTP can yield significant results for SMEs in Malaysia.

METHODOLOGY

The case study method was used in this inquiry to investigate lean implementation in six different Malaysian SMEs. Case study research, as defined by Yin (2014), is the in-depth examination of a contemporary event or case within a real-life context. According to Yin (2018), who was a prominent scholar of qualitative study, there are two types of case studies; namely, single-case study and multiple-case study. Since the researcher examined six companies in different aspects, a multiple-case study was considered more appropriate and thus selected to fit the purpose of this study. As mentioned by Herriott and Firestone (1983), evidence from multiple-cases is frequently regarded as more convincing and thus more robust.

Six companies that have undergone the LTP were selected by the MPC. The project commenced in April and completed in August 2020. To make this study more acceptable, a case study protocol was developed to improve the reliability of its research and to guide the researcher in data collection from multiple-cases. The protocol's three sections are further explained as follows:

1. Overview of the case study

This section provides information on the background of the case study beginning with an outline of its goals. The researcher should address the why and how of the study as reflected by its research questions.

2. Data collection procedures

For data collection, the characteristics of case studies raise a vital issue for which properly designed field procedures are crucial. Data were collected from SME companies with the collaboration of the MPC where companies that have not implemented lean in their respective organisations were identified. For case studies, the researcher should accommodate the availability and schedule of key respondents during interviews. The interview is much more semi-structured, and the respondents may not always cooperate with the researcher.

3. Data collection questions

There are five levels of questions used to interview the respondents; (1) Level 1: questions for specific respondents; (2) Level 2: questions for individual cases; (3) Level 3: questions related to pattern of findings

across multiple cases; (4) Level 4: questions for an entire study; and (5) Level 5: normative questions on policy recommendations and conclusions, going beyond the scope of the study. To reflect the research objectives of this study, all levels of questions were adopted in data collection.

The deeper understanding of a case study can only be established through direct communication with participants of the LTP as initiated by the MPC. Respondents were required to explain the issues contributing to wastage in their companies and how these were eliminated using the lean approach. Further, the goal of most qualitative studies is to provide a rich, thoughtful human experience through the careful examination of

specific cases (Polit & Beck 2010). To gain an in-depth, holistic perspective on groups of people, programmes, events, environments, or any phenomenon, one must interact assiduously with the survey respondents (Farber 2006).

As mentioned in the introduction, there are limited studies on LTP in SMEs, including those in Malaysia (Table 1). For this reason, Sahoo and Yadav (2018) have encouraged qualitative research on lean practices in SMEs. According to Yin (2018), case study depends on multiple sources of evidence, with data congregated through triangulation. It is more advantageous and valuable when case study research aims to answer “how” and “why” type of questions.

TABLE 1. Overview case study of SMEs from the past studies

Authors	Title	Method
Yadav, et al., (2019)	An appraisal on barriers to implement lean in SMEs.	Case study using interpretive structural modelling (ISM).
Thanki and Thakkar (2019)	An investigation on lean-green performance of Indian manufacturing SMEs.	Integrating multiple case study and data employment analysis (DEA).
Ramakrishnan et al., (2019)	Implementation of Lean Manufacturing in Indian SMEs-A case.	Case study.
Rymaszewska (2014)	The challenges of lean manufacturing implementation in SMEs.	Case study using deductive approach.
Matt and Rauch (2013)	Implementation of Lean Production in small sized Enterprises.	Case study.

The six case studies from six different types of enterprises comprised roof system suppliers, carton and foam packaging, development of IT systems, wood-related services, supplying of bio-lac milk, and supplying of beverages. The sample size included six companies identified and chosen in collaboration between the MPC and researchers. The MPC was interested in evaluating the performance of the selected SMEs following participation in the LTP. Initially, the companies were chosen to create competitive advantages through increasing productivities, imposing cost reductions, and prioritising high quality products. In addition, they were struggling to increase efficiency in manufacturing processes and were focused in making continuous improvements in their daily activities. Companies which were non-lean implementers should however consider other methods to achieve their efficiencies. They understood that lean allowed them to undergo significant transformation in business operations and thus accepted

the challenge to join the LTP. Any post-LTP changes will be examined.

Table 2 presents the profiles of the Malaysian SMEs that were selected by the MPC. To ensure data consistency, this study employed three methods in data collection comprising observation, document analysis, and semi-structured interviews (Yin 2018). In the first stage, the researcher visited the company to assess the workplace situation before and after implementing lean practices. Photographs were taken as evidence in the report including time and place. In the next stage, some documents were gathered including annual reports and magazines, or any other relevant documents from the selected companies. Finally, in the last stage, interview sessions were conducted with the respondents selected from a variety of backgrounds and positions (see Table III). Most were from top management as well as from among mid-level managers such as the Operation Manager and Quality Manager appointed to lead the LTP. Sources from top management staff were deemed

more reliable than those from operational level (Suárez-Barraza & Ramis-Pujol 2012). However, this depends on the issues or subject matters investigated. For the sample, staff from the top management of six companies were chosen by the MPC to participate in this study. After six months of operation, all participants were required to

submit a report. In addition, they were also required by the MPC to present the results from lean practices adopted in their business operations. Concurrently, interview sessions were conducted to investigate whether the LTP had exerted huge impact on the SMEs' performance.

TABLE 2. Profile of Malaysian SMEs

Cases	Firm	Product
Company A	Roof system supplier	Rooftops
Company B	Packaging	Carton and foam packaging
Company C	Information Technology (IT)	Developing IT system
Company D	Woods supplies	Woods
Company E	Bio-Lac	Creamy milk
Company F	Supplying beverages	Nine flavoured beverages

Finally, the data analysis was designed to always ensure construct validity by utilising multiple sources of evidence and establishing a planned data collection chain. The design was crafted to ensure construct validity by incorporating multiple sources of evidence and implementing a structured data collection process. Strategies outlined by Yin (1994, pp. 32-8) were employed to address concerns on construct validity, external validity, and reliability, which elevate quality of the study. Construct validity was pursued in the target companies by following the procedures of multiple respondents, intermediate reviews (case study first draft) and iterating constructs with past literature. By comparing proposed patterns to the empirical data, internal validity was addressed. A multiple case design that included cases from various operational contexts improved external validity. A case study protocol was elucidated to address reliability.

RESULTS AND DISCUSSIONS

The study was completed over a six-month period. The results are discussed below.

Case Analysis Company A

Company A is a non-bumiputra-owned company known as a roof system supplier. The company's main business is focused on the production of roll forming of pre-painted galvanised steel roofing sheets, galvanised lip channels, root trusses, and accessories to make roofs.

Challenges: Inefficient manufacturing processes have been identified as problems that need to be resolved immediately. This is because this company has to bear the high production costs as well as lead time (time taken in a manufacturing process) when there are many non-value-added activities incorporated with eight types of waste, such as over-processing, overproduction, excessive inventory, unnecessary movement, defects, motion, non-utilized talent and wasted waiting time. Time wastage needs to be reduced so that the company can optimise production and minimise errors during the manufacturing process. Besides, recognition of raw materials is also time-consuming, and sometimes employees tend to purchase the wrong resources. Storage areas are also very limited, and this makes it difficult for this company to make any purchase. Similarly, the company also had trouble storing Work in Progress (WIP) items before they are delivered to the next process.

Result: During the period when the lean project was implemented, two other projects were also examined (refer Table 3). One of these was the Ridge Capping project, in which the VSM was introduced in the process layout flow. This approach serves to highlight areas that delay processing time and investigate the most suitable solution to minimise the impediment. The solution must be long-term rather than temporary. This was to ensure that changes made actually improved productivity and efficiency in manufacturing products on schedule. The Ridge Capping project proved that changes made to allocate the automated bending machines not only reduce the total cycle and waiting time but also help to minimise the cost of production from RM 17.15 to RM 13.97 per hour.

TABLE 3. The achievement of company A

No.	Indicators	Achievement	
		Before Lean	After Lean
The manufacturing process of ridge capping			
1.	Number of activities for the process of making Ridge Capping	10	9
2.	Total of lead time (second)	7,410	4,485
3.	Total of waiting time (second)	3,400	1,900
4.	Total of takt time (second/per unit Ridge Capping)	494	299
5.	Labor cost savings (RM/month)	-	48.75
The manufacturing process of Purlin			
1.	Process of efficiency rate (%)	96.28	96.46
2.	Total lead time (second)	2,155	2,120
3.	Total of waiting time (second)	80	75
4.	Machine damage (day)	14	-

Case Analysis Company B

Company B is a Bumiputera company that offers packaging services in the manufacturing sector. Carton and foam packaging are its main products, as well as providing customised parcel design service.

Challenges: A less systematic manufacturing process was identified as the problem that required immediate solution. The company had to bear high production costs due to protracted lead time (time taken

in a manufacturing process) accumulated between each activity in the manufacturing process. To optimise production and minimise flaws during manufacturing, time wastage needs to be reduced.

Result: The lean project managed to reduce lead time for the carton packaging by 34.8%, when manufacturing process activities were shortened and automated. Die Cut's activities indirectly simplified the process. The implementation of the 5S and visual factory systems also reduced waiting time from 54 seconds to 34 seconds, with a percentage improvement of 37% (refer Table 4).

TABLE 4. The achievement of company B

No	Project Title	Lean Metrics	Achievement		Percentage increase
			Before	After	
1.	Manufacturing process of boxes (PROJECT 2) Production Department	Lead Time	117.58 sec	76.58 sec	34.80%
		Processing Time	58.58 sec	44.58 sec	23.80%
		Waiting Time	54 sec	34 sec	37.00%
		Activity Ratio (PE)	49.82%	58.21%	8.39%
		Process Steps	7 steps	7 steps	0%

Cas Analysis Company C

Company C is a Bumiputera-owned company with a Multimedia Super Corridor (MSC) status. The company offers services to develop information technology (IT) systems, including internet-based solutions, application development, integration systems, networking systems, and maintenance support services. It was established on December 11th, 2004, with a total of 20 employees.

Challenges: Before lean, all complaints on damages in the premise were included in the Oral Health Care Information System (OHCIS) portal and attended to by a visiting engineer. However, customers' needs were sometimes complex, causing maintenance and repair time to be extended. Further, no specific employees were tasked to monitor the progress of each complaint.

Result: Four resolutions from the lean project managed to reduce the number of penalties imposed by customers due to failures to comply with the SLA agreement. Prior to lean, the company received 14 penalties amounting to RM6,256.75 of the total complaints of 132 (June–December 2019). In contrast, 97 complaints were received after lean was executed, and the company received only two penalties amounting to RM1,681.11 (refer Table 5). The company managed to greatly reduce the number of penalties thus saving on its operating costs. The implementation of the 5S system also helped in creating larger working space and improved environmental conditions. In addition, this initiative can indirectly increase work motivation and enthusiasm among workers. Additionally, the 5S system helped reduce the amount of lead time in resolving every complaint received.

TABLE 5. The achievement of company C

No.	Indicators	Achievement	
		Before Lean	After Lean
1.	Number of complaints	132	97
2.	Number of penalties	14	2
3.	Total penalty cost (RM)	6,256.75	1,681.11

Case Analysis Company D

Company D is a Bumiputera company that offers wood-related services and has 10 employees. The company emphasises on cheerful environment and safety, resource savings, and employee satisfaction. Such concerns resulted in the company being the preferred choice for customers seeking service on supply of construction materials.

Challenges: Company D faced three main issues that need to be addressed to improve its performance. These were related to i) time management in each process; ii) handling employees; and iii) costs of resource waste/Muda.

Results: The three resolutions taken significantly contributed to the efficiency in managing and motivating employees thus saving on resources and costs, and improving the quality of products. This company adopted the 5S method for the purpose of providing a conducive work environment that greatly motivated the employees. With earlier random conditions, employees were less productive. Resources and cost savings can also be gained through practicing the Kaizen techniques (GEMBA). The time allocated for updating and cleaning work space can be improved without compromising product quality and saving on expenses. This company also applied the VSM with saving of RM4010.00 with an average of 5.8 damage incidents at the cost of RM802 per case. The lean project targeted damage reduction to 2 cases per month through ensuring that machine

monitoring and review were carried out systematically and periodically by two assigned employees.

Case Analysis Company E

Company E is a Bumiputera-owned company and is operated by six skilled workers. The company is a supplier of Bio-Lac milk, which is a creamy milk for children aged 1 year and above. The products are sold directly and marketed by an established company.

Challenges: There were weaknesses in the structure of the distribution process of cream milk that needed to be resolved immediately. As a supplier, the company planned to improve its production process as well as eliminate inefficiency. The main challenges faced were to eliminate wastage as related to waiting time, repetitive work process, avoiding motion (taking equipment) and rejected products in each production batch. An obvious problem was in the layout process which slowed down workers' movement due to the location being not in syllables or far from each other. In addition, the company aimed to improve existing work standards and meet daily production targets as consistent with customer demand.

Results: Lean's transformation project helped workers produce milk flour more efficiently, saving time and money through the VSM method. The project was more focused on producing each batch of cream flour milk products which comprised 216 units. It was able to save RM25.50 in managing Project 1 and Project 2, RM36.00 in total waiting time, and RM22.00 in installation time. With this improvement, the company

successfully increased the efficiency of solid items by 20.51%. For a project with one capacity product and with a production of 5000 units per month, the company was able to save RM19,750 per month or RM237,000 per year. Meanwhile, Project 2 with 200 units/5set, the cost saved was RM25,800 and the total cost per annum on successful completion was RM309,600. The total amount saved under lean management for both projects was RM546,600.

Case Analysis Company F

Company F is a Bumiputera-owned company that was established in 1982. The company's core businesses are the production of essence-flavoured beverages and flavoured cordials.

Challenges: There were weaknesses in the manufacturing process structure that needed to be

resolved immediately to render the company to be more competitive in the market. The extended lead time in the original production system has incurred higher than expected production costs.

Results: The lean project managed to reduce the lead time of the manufacturing process of 375ml beverage products, from 21.54 to 15.97 per day (Ed: Unit?) through elimination of refill activities and automatic bottling arrangement. The changes taken through SA (Ed: spell out this abbrev) helped reduce cycle time by six hours per month at the cost of RM500. Through VSM conception, SA further optimised the process by reducing the number of employees necessary in the manufacturing process. With these improvements, it was not necessary for SA to increase workers' hiring thus saving on labour costs by RM1,100 per month. Indirectly, the lean transformation project can help SA reduce costs by a total of RM 19,200 per year.

TABLE 6. Summary of the SMEs companies' analysis

Cases	Challenges	Lean practices	Impact
Company A	Inefficient manufacturing processes.	VSM	Total cycle and waiting time were reduced.
Company B	Poor inventory system, poor delivery, increased lead time, and waiting time.	5S and VSM	Shortened lead time, reduced waiting time, and processing time.
Company C	Maintenance work was delayed and failure in handling customer complaints.	5S and VSM	The amount of lead time in resolving every complaint received was reduced, and the workspace and environment expanded.
Company D	Time management, handling employees, waste in resources and higher costs.	Kaizen, 5S and VSM	Time allocation of cleaning/ updating improved, efficiency increased, and cost was reduced.
Company E	Low efficiency, poor distribution system, waste of motion and more errors incurred.	VSM	Efficiency in processing solid items increased, and production costs saved by RM546,600.
Company F	Low manufacturing system structure, high cost and low efficiency.	VSM	Reduced lead time from 21.54 to 15.97 per day; reduced number of employees in the manufacturing process thus saving RM19,200 per year.

Table 6 highlights results pertaining to the first research question. The six companies in the study sample encountered various challenges in the operational section leading to wastage, prior to implementing lean practices. Several challenges highlighted include low efficiency, high costs, poor time management, unsatisfactory delivery, and inefficiencies resulting from waste of motion and operational errors. Nevertheless, in addressing the second research question, the LTP results reveal that most of the companies utilized VSM

as a strategy to enhance their operations as a means of transforming their manufacturing facilities, in line with Kumar et al. (2018) who investigated the Indian SMEs in the automobile sector. The VSM tool has been acknowledged as an effective and reliable improvement strategy for addressing a range of inefficiencies across different types of businesses and was recommended by Mohammad and Oduoza (2019) as one of the lean techniques that can be applied in SMEs.

Additionally, companies B, C, and D had adopted 5S as part of their LTP to increase efficiency, as consistent with Sahoo and Yadav (2018). In their study on Indian manufacturing SMEs, 5S was found to be the most widely used lean tool in workplace organization. Company D also practiced the Kaizen technique to enhance production, as demonstrated by Kumar et al. (2018) for Indian SMEs. The firms were shown to increase production per hour and reduce manpower within 20 days of implementing the technique. The LTP also demonstrated commitment of top management and employees in executing the project, as suggested by Chaple et al. (2018). Belhadi et al. (2019) however established that policy, leadership, and management were the key factors in determining the success of lean implementation in SMEs. Most of the companies exhibited similar outcomes, including reduced waiting time and lead time, processing time, and production costs in line with Raweewan and Kojima (2020) who conducted a collaborative study between industry and universities and found that applying robots and automation in the process can reduce production costs. Some of the successful results of the LTP among Malaysian SMEs include efficient handling of complaints, as shown by Dora et al. (2014). Generally however, SMEs need to provide necessary infrastructure, such as improved workspace and environmental conditions, to fully realize the benefits of the LTP.

In this regard, it is necessary to create a lean-centred company culture to ensure success in implementing this management method. The process of such transformation is continuous and requires belief in and dedication to the lean approach that needs careful consideration before final adoption (Abolhassani et al. 2016). Thus, for effective lean transformation, cultivating problem-solving abilities and the proper corporate culture are both critical (Fadnavis et al. 2020). Employees must develop higher levels of belief and commitment, be exposed to more communication, and foster better work methods for the LTP to continue to succeed. As well, managers should also take into account contextual considerations, since the key success factors vary according to the firm setting (Losonci et al. 2011).

CONCLUSION

The numerous studies conducted on the implementation of lean practices in SMEs have assessed their effectiveness in promoting efficiency while addressing various challenges. Enhancing operational performance in SMEs is a challenging endeavor, as each product is characterized by a unique process that requires ongoing monitoring to ensure that satisfactory outcomes are achieved with minimal errors. Thus, the primary goal of this paper is to explore the innate challenges and issues in Malaysian SMEs before adopting the LTP and subsequently to identify the best lean practices. The main result of this study established that the LTP is one of

the stepping-stones for success in Malaysian SMEs. For in-depth analysis, multiple case studies were conducted to investigate the various backgrounds of six companies selected for the sample. The lessons learned from the case studies should provide guidance and motivation for the management to adopt the lean approach.

The results contribute to the body of knowledge in its investigation of multiple case studies whereby the six companies benefited greatly through implementing lean practices such as VSM, kaizen, and 5S. Collaborating with the MPC helped to identify challenges faced by SMEs in Malaysia and determine the best lean practices in the LTP. Findings of the study were consistent with the goals of the Toyota Production System Model, which included the shortest lead time, the lowest cost, and the highest quality. The elimination of waste (*muda*) is a critical aspect of the TPS, and involves the identification and termination of any activities which do not add value to the customer. These included wastages in poor inventory, poor delivery and waiting time. The implementation of LTP provided a significant impact for SMEs since it renders a structured approach for improving operational performance and competitiveness.

For practical implications, practitioners may use and test successful lean practises as well as some of the most common ones that can be implemented in their organizations. To instil a new culture through the six-month LTP could pose a significant challenge for SMEs. It is thus proposed that organisations adopt new practices that focus on creating open work cultures based on common values, languages, behaviours, routines, and rituals if they are to succeed in the lean transformation. To this end, the promotion should be continuous and provide high level of education and proper training to management and employees on the benefits of lean practices.

Some limitations of this study have been identified. First, the companies applied only limited tools to prove the success of LTP. As such the generalisation of the findings cannot be ensured due to this constraint as well as the short time frame given. Second, not all the sectors were involved in this project since it complied with the MPC design. Future studies should consider these constraints in resolving the challenge of lean practises in SMEs. More practical case studies on lean implementation in micro-companies, for various types of economies, should be studied to elucidate details in the LTP. These should support the findings of this study. Second, case studies involving other sectors such as retail, e-commerce, textiles, and others should also be conducted including inter-sector evaluations. The researchers believe that through effectively implementing the lean approach, SMEs all over the world may improve their competitive capacity and be more proficient in handling its global dynamics.

ACKNOWLEDGEMENT

The authors would like to express their gratitude and appreciation to the anonymous reviewers and the editors whose inputs in the literature importantly contribute to the successful completion of this study.

REFERENCES

- Abdul, M., Rahman, R.A., Kamarulzaman, N.H., Ibrahim, S., Rahman, M.M. & Uddin, M.J. 2017. Small Medium-Sized Enterprises (SMEs) to hypermarkets: Critical quality aspects in delivering food and beverage products. *International Journal of Economics and Management* 11(3): 777–793.
- Abolhassani, A., Layfield, K. & Gopalakrishnan, B. 2016. Lean and US manufacturing industry: Popularity of practices and implementation barriers. *International Journal of Productivity and Performance Management* 65(7): 875–897.
- Alaskari, O., Ahmad, M.M. & Pinedo-Cuenca, R. 2016. Development of a methodology to assist manufacturing SMEs in the selection of appropriate lean tools. *International Journal of Lean Six Sigma* 7(1): 62–84.
- Al-Mashari, M., Al-Mudimigh, A. & Zairi, M. 2003. Enterprise resource planning: A taxonomy of critical factors. *European Journal of Operational Research* 146(2): 352–364.
- Alam, M.M., Rahman, M.M. & Arshad, M. 2018. Lean manufacturing: An approach to improve the competitiveness of small and medium-sized enterprises. *International Journal of Manufacturing Technology and Management* 30(1/2): 1-19.
- Anvari, A., Ismail, Y. & Hojjati, S.M.H. 2011. A study on total quality management and lean manufacturing: Through lean thinking approach. *World Applied Sciences Journal* 12(9): 1585-1596.
- Badurdeen, F., Wijekoon, K. & Marksberry, P. 2011. An analytical hierarchy process-based tool to evaluate value systems for lean transformations. *Journal of Manufacturing Technology Management* 22(1): 46–65.
- Belhadi, A., Touriki, F.E. & Elfezazi, S. 2019. Evaluation of critical success factors (CSFs) to lean implementation in SMEs using AHP: A case study. *International Journal of Lean Six Sigma* 10(3): 803–829.
- Beraldin, A.R., Danese, P. & Romano, P. 2019. An investigation of the relationship between lean and well-being based on the job demands-resources model. *International Journal of Operations and Production Management* 39(12): 1295–1322.
- Carreira, B. 2005. *Lean Manufacturing That Works: Powerful Tools for Dramatically Reducing Waste and Maximising Profits*. Broadway, New York, NY.
- Chen, S., Wang, D. & Lu, Y. 2018. Access to finance, firm size and financial performance of small and medium-sized enterprises: Evidence from China. *Journal of Small Business Management* 56(3): 463-480.
- Bhasin, S. 2012. Prominent obstacles to lean. *International Journal of Productivity and Performance Management* 61(4): 403-425.
- Byrne, A. 2013. *The Lean Turnaround*. McGraw Hill, New York, NY.
- Choi, Chaple, A.P., Narkhede, B.E., Akarte, M.M. & Raut, R. 2018. Modeling the lean barriers for successful lean implementation: TISM approach. *International Journal of Lean Six Sigma* 12(1): 98-119.
- Chay, T.F., Xu, Y.C., Tiwari, A. & Chay, F.S. 2015. Towards lean transformation: The analysis of lean implementation frameworks. *Journal of Manufacturing Technology Management* 26(7): 1031–1052.
- Cudney, E. & Elrod, C. 2011. A comparative analysis of integrating lean concepts into supply chain management in manufacturing and service industries. *International Journal of Lean Six Sigma* 2(1): 5-22.
- Entrepreneur Development Ministry. 2019. In *Dasar Keusahawanan Nasional 2030*. Kuala Lumpur.
- Eswaramoorthi, M., Kathiresan, G.R., Prasad, P.S.S. & Mohanram, P.V. 2011. A survey on lean practices in Indian machine tool industries. *The International Journal of Advanced Manufacturing Technology* 52(9): 1091-1101.
- Fadnavis, S., Najarzadeh, A. & Badurdeen, F. 2020. An assessment of organizational culture traits impacting problem solving for lean transformation. *Procedia Manufacturing* 48: 31–42.
- Farber, B.A. 2006. *Self-Disclosure in Psychotherapy*. Guilford Press.
- Herriott, R.E. & Firestone, W.A. 1983. Multisite qualitative policy research: Optimizing description and generalizability. *Educational researcher* 12(2): 14-19.
- Hibino, S., Noguchi, K. & Plenert, G. 2017. Toyota's Global Marketing Strategy. In *Toyota's Global Marketing Strategy*.
- Jadhav, J.R., Mantha, S.S. & Rane, S.B. 2014. Exploring barriers in lean implementation. In *International Journal of Lean Six Sigma* 5(2).
- Koenigsaecker, G. 2009. *Leading the Lean Enterprise Transformation*. Productivity Press, New York, NY.
- Kumar, S., Dhingra, A. & Singh, B. 2018. Lean-Kaizen implementation: A roadmap for identifying continuous improvement opportunities in Indian small and medium sized enterprise. *Journal of Engineering, Design and Technology* 16(1): 143–160.
- Ledbetter, P. 2018. *The Toyota Template: The Plan for Just-In-Time and Culture Change Beyond Lean Tools*. Retrieved from <http://dx.doi.org/10.1016/j.cirp.2016.06.001>
<http://dx.doi.org/10.1016/j.powtec.2016.12.055>
<https://doi.org/10.1016/j.ijfatigue.2019.02.006>
<https://doi.org/10.1016/j.matlet.2019.04.024>
<https://doi.org/10.1016/j.matlet.2019.127252>
- Liker, J. 2004. *The toyota way*. Esensi.
- Liu, J., Chen, Y. & Lin, B. 2016. The impact of time management on the performance of small and medium-sized enterprises: Evidence from China. *International Journal of Entrepreneurial Behaviour & Research* 22(5): 746-762.
- Losonci, D., Demeter, K. & Jenei, I. 2011. Factors influencing employee perceptions in lean transformations. *International Journal of Production Economics* 131(1): 30–43.
- Mascarenhas, O.A., Monteiro, A. & Raposo, M. 2016. Lean implementation in SMEs: A systematic literature review. *International Journal of Production Economics* 172: 14-26.

- Masai, P., Parrend, P. & Zanni-Merk, C. 2015. Towards a formal model of the lean enterprise. *Procedia Computer Science* 60(1): 226–235.
- Mathiyazhagan, K., Agarwal, V., Appolloni, A., Saikouk, T. & Gnanavelbabu, A. 2021. Integrating lean and agile practices for achieving global sustainability goals in Indian manufacturing industries. *Technological Forecasting and Social Change*, 171(June).
- Matt, D.T. & Rauch, E. 2013. Implementation of lean production in small sized enterprises. *Procedia CIRP*, 12, pp.420–425.
- Mohaghegh, M., Blasi, S. & Größler, A. 2021. Dynamic capabilities linking lean practices and sustainable business performance. *Journal of Cleaner Production* 322.
- Mohammad, I.S. & Oduoza, C.F. 2019. Lean-excellence business management for manufacturing SMEs focusing on KRI. *International Journal of Productivity and Performance Management*.
- Monden, Y. 2012. *Toyota Production System: An Integrated Approach to Just-In-Time* (Fourth Edi). Retrieved from <http://dx.doi.org/10.1016/j.cirp.2016.06.001><https://dx.doi.org/10.1016/j.powtec.2016.12.055> <https://doi.org/10.1016/j.ijfatigue.2019.02.006><https://doi.org/10.1016/j.matlet.2019.04.024><https://doi.org/10.1016/j.matlet.2019.127252>
- Netland, T.H., Powell, D.J. & Hines, P. 2019. Demystifying lean leadership. *International Journal of Lean Six Sigma* 11(3): 543–554.
- Ohno, T. 1988. *Toyota Production System: Beyond Large-Scale Production*.
- Panwar, A., Nepal, B., Jain, R., Rathore, A.P. & Lyons, A. 2017. Understanding the linkages between lean practices and performance improvements in Indian process industries. *Industrial Management & Data Systems* 117(2): 346–364.
- Pay, R. 2008. Everybody's jumping on the lean bandwagon, but many are being taken for a ride. Available at: www.industryweek.com/companies-amp-executives/everybodys-jumping-lean-bandwagon-many-are-being-taken-ride (accessed 5 November 2021)
- Polit, D.F. & Beck, C.T. 2010. Generalization in quantitative and qualitative research: Myths and strategies. *International journal of nursing studies* 47(11): 1451–1458.
- Ramakrishnan, V., Jayaprakash, J., Elanchezian, C. & Vijaya Ramnath, B. 2019. Implementation of lean manufacturing in Indian SMEs-A case study. *Materials Today: Proceedings* 16: 1244–1250.
- Raweewan, M. & Kojima, F. 2020. Digital lean manufacturing - Collaborative university-industry education in systems design for lean transformation. *Procedia Manufacturing* 45: 183–188.
- Rymaszewska, A.D. 2014. *The Challenges of Lean Manufacturing Implementation in SMEs*.
- Sahoo, S. & Yadav, S. 2018. Lean implementation in small- and medium-sized enterprises: An empirical study of Indian manufacturing firms. *Benchmarking* 25(4): 1121–1147.
- Santos, F.J. & Almeida, M. 2007. Improving small and medium-sized enterprises' competitiveness through lean management. *International Journal of Production Economics* 107(2): 410–426.
- Scherrer-Rathje, M., Boyle, T.A. & Deflorin, P. 2009. Lean, take two! Reflections from the second attempt at lean implementation. *Business Horizons* 52(1): 79–88
- Shafiee, S., Arshad, M. & Bahari, N.A. 2017. The role of human capital in the competitiveness of small and medium-sized enterprises. *Journal of Small Business Management* 55(4): 645–667.
- Snyder, K., Ingelsson, P. & Bäckström, I. 2016. Enhancing the study of Lean transformation through organizational culture analysis. *International Journal of Quality and Service Sciences* 8(3): 395–411.
- Spear, S.J. & Bowen, H.K. 1999. Decoding the DNA of the toyota production system. *Harvard Business Review* 77(5): 96–106.
- Suárez-Barraza, M.F. & Ramis-Pujol, J. 2012. An exploratory study of 5S: A multiple case study of multinational organizations in Mexico. *Asian Journal on Quality* 13(1): 77–99.
- T, R. & K.P, S. 2018. Identification and modeling of process barriers: Implementing lean manufacturing in small-and medium-size enterprises. *International Journal of Lean Six Sigma* 12(1): 61–77.
- Thanki, S. & Thakkar, J.J. 2019. An investigation on lean-green performance of Indian manufacturing SMEs. *International Journal of Productivity and Performance Management* 69(3): 489–517.
- Tokola, H., Niemi, E. & Kyrenius, P. 2017. How Lean transformation affects scheduling. *Robotics and Computer-Integrated Manufacturing* 43: 171–178.
- Yadav, V., Jain, R., Mittal, M. L., Panwar, A. & Lyons, A. 2019. The impact of lean practices on the operational performance of SMEs in India. *Industrial Management and Data Systems* 119(2): 317–330.
- 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.
- Yamamoto, Y. & Bellgran, M. 2010. Fundamental mindset that drives improvements towards lean production. *Assembly Automation* 30(2): 124–130.
- Yin, R.K. 2018. Case study research and applications: Design and methods. *Journal of Hospitality & Tourism Research* 53.
- Yin, R.K. 1994. Discovering the future of the case study. Method in evaluation research. *Evaluation practice* 15(3): 283–290.
- Zheng, Y., Li, Q. & Fan, W. 2019. Financial constraints, innovation, and firm performance: Evidence from small and medium-sized enterprises in China. *Journal of Business Research* 96: 285–295.

Azyyati Anuar (corresponding author)
Faculty of Business and Management
Universiti Teknologi MARA, Cawangan Kedah
Kampus Sungai Petani
08400 Merbok, Kedah, MALAYSIA.
E-Mail: azyyati@uitm.edu.my

Norasmah Othman
Faculty of Education
Universiti Kebangsaan Malaysia
43600 UKM Bangi, Selangor, MALAYSIA.
E-Mail: lin@ukm.edu.my

Daing Maruak Sadek
Academy of Contemporary Islamic Studies
Universiti Teknologi MARA, Cawangan Kedah
Kampus Sungai Petani
08400 Merbok, Kedah, MALAYSIA.
E-Mail: daing729@uitm.edu.my

Norsiah Hami
School of Technology Management and Logistics
Universiti Utara Malaysia
06010 UUM Sintok, Kedah, MALAYSIA.
E-Mail: norsiahami@uum.edu.my

Nur Syazwanie Mansor
Academy of Language Studies
Universiti Teknologi MARA, Cawangan Kedah
Kampus Sungai Petani
08400 Merbok, Kedah, MALAYSIA.
E-Mail: nursyazwanie@uitm.edu.my