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**Author**

Caldera, H, Desha, C, Dawes, L

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## **Evaluating SMEs' relationship with 'lean' and 'green' thinking when aiming for sustainable business practice**

**H.T.S. Caldera\*, C. Desha and L. Dawes**

*Queensland University of Technology (QUT), Science and Engineering Faculty, School of Earth,  
Environmental and Biological Sciences, 2-George Street, Brisbane, QLD 4001, Australia.*

*\*Corresponding author: savindi.caldera@hdr.qut.edu.au*

### **ABSTRACT**

'Sustainable business practice' is an aspiration for an increasing proportion of small to medium enterprises (SMEs) around the world, promising profitability, resilience and positive social and environmental impacts. Alongside this aspiration, 'lean thinking' has evolved as a popular business strategy for SMEs, addressing the pressing need for efficiency in production and waste reduction. In this paper, we propose that this co-evolution of ideas has resulted in missed opportunities in harnessing lean and green thinking towards achieving sustainable business practice in SMEs. We propose that a better understanding of how lean and green thinking can enable sustainable business practice will lead to more effective use of precious capital and ongoing expenditure. Focusing on 13 manufacturing SMEs in Queensland, Australia, we present several enablers for sustainable business practice, derived from a series of in-depth interviews with Chief Executive Officers and Senior Managers involved in sustainability and lean manufacturing decision-making. These comprise: integrated strategy, continuous improvement, stakeholder engagement and streamlining processes. We propose that this improved understanding of what enables sustainable business practice can be used to maximise benefits of lean and green efforts and expenditure on tools and processes. We intend that these findings will be immediately useful to SMEs seeking to leverage current and future 'lean' and 'green' practices to achieve sustainable business practice.

**Key words:** *enablers, lean and green thinking, sustainable business practice, small to medium scale enterprises*

### **INTRODUCTION**

With a significant proportion of small to medium sized enterprises (SMEs) dominating the world's economy, it is estimated that they are responsible for about 70 per cent of global environmental pollution (Revell et al., 2010, Hillary, 2000). These enterprises have significant roles to play in addressing pollution prevention and aligning their business strategy with sustainable business practice (Lawrence et al., 2006, Oliveira Neto et al., 2017). Lean thinking has emerged as a targeted business strategy to deliver better value for customers by removing non-value-adding activities and improving efficiency (Womack and Jones, 2010). Lean thinking defines eight types of waste: overproduction, waiting, transportation, defects, extra processing, inventory, motion and non-utilised talent (Ōno, 1988, Hines and Rich, 1997). Lean thinking has evolved into 'lean and green thinking' focussing on resource optimisation and promoting activities to "do more with less" (Miller et al., 2010). However it is still unclear how lean and green practices enable SMEs to achieve sustainable business

practice (Kerr, 2006). Sustainable business practice solves environmental and social issues while maintaining economic profit in organisations (Moser, 2001). Sustainable practice could be achieved through implementing a combination of lean and green tools (Caldera et al., 2017).

As with lean paradigm, eight types of waste can be found within the green paradigm: excessive water usage; excessive power usage; excessive resource usage; pollution; rubbish; greenhouse effects; eutrophication; and poor health and safety (Hines, 2009). While there is evidence of the co-existence of lean and green systems to reduce lean and green waste (King and Lenox, 2001), SMEs can position their company's lean and green actions in a matrix developed by Verrier et al. (2014) to identify best practices in their industrial consortium. A range of tools such as value stream mapping, 5S, cellular manufacturing, total productive maintenance have all shown quantitative improvements in environmental performance (Chiarini, 2014). Within this context, this study was motivated by the following research question: *"How can lean and green practices enable SMEs to achieve sustainable business practice"*. The following sections provide an analysis of literature, methodology, key findings and implications for SMEs in the manufacturing sector and further research.

## LITERATURE REVIEW

Lean thinking, and *'lean and green thinking'* have traditionally been applied to large-sized enterprises. However, with the growing consciousness of all enterprise types about pollution prevention and improving efficiency, SMEs have gradually taken on lean and green practices. Lean and green practices aim to tackle waste issues by continuous improvement and controlling of lean and green tools. Through adopting lean and green thinking, it is increasingly understood that SMEs can improve efficiency and "make sustainability a value instead of a cost" (Garetti and Taisch, 2012). It is also becoming apparent that if SMEs are to maintain a balance between manufacturing excellence and sustainability performance, structural changes need to be applied throughout the value chain of products and services (Martínez León and Calvo-Amodio, 2017). Within this milieu, a wide variety of lean and green tools are available for SMEs that could reduce waste and improve efficiency. Table 1 presents a matrix of lean and green tools applied to each selected waste stream with the corresponding references.

Lean and green tools can be combined to create structured and holistic models for making a business sustainable to reduce costs and improve efficiency (Verrier et al., 2016). Most previous studies have examined lean tools or models focussing on one type of waste or environmental management stream. There was limited attention on how SMEs could holistically embed lean and green tools to improve sustainability performance. This study is motivated by this gap of knowledge, exploring enablers of sustainable business practice in SMEs engaged in lean and green practices.

**Table 35:** ‘Lean and green’ wastes and tools matrix

Waste types*	Tools	References
<i>Lean wastes</i>		
Overproduction	Value stream mapping, Kanban, Single Minute Exchange of Die (SMED), Pull approach, Just in time (JIT)	(Chiarini, 2014)
Defects	Autonomation / Jidoka (Machines with “human” intelligence, Pokayoke devices, Standard operations procedures (SOP)	(Djekic et al., 2014)
Waiting	Total Productive Maintenance (TPM), Takt time	(Fliedner, 2008, Chiarini, 2014, Piercy and Rich, 2015)
Transportation	Lean layout, Value stream mapping, pull system	(Ball, 2015)
Extra processing	5S, Standard operations procedures (SOP)	(Vais et al., 2006)
Inventory	Just in time (JIT), Takt time, Kanban system	(Maxwell et al., 1998, Price et al., 1994)
Motion	5S, SMED, Standard operations procedures (SOP)	(Vais et al., 2006)
Non-utilised talent	Employee engagement, quality circles	(Maxwell et al., 1998)
<i>Green wastes</i>		
Excessive water consumption	Employee engagement, SusVSM, Kaizen	(Vais et al., 2006, Folinas et al., 2014, Brown et al., 2014, Faulkner and Badurdeen, 2014)
Excessive power consumption	Employee engagement, Total Productive Maintenance (TPM), SusVSM, Kaizen, 5S, Inventory reduction, Pull approach, lean layout	(Rothenberg et al., 2001, Chiarini, 2014, Ball, 2015)
Excessive resource consumption	5S, Cellular manufacturing, Total Productive Maintenance (TPM), Buffer levels, Kaizen events	(Vais et al., 2006, Rothenberg et al., 2001, Pampanelli et al., 2014, Hong et al., 2014)
Pollution	5S, Cellular manufacturing, Total Productive Maintenance (TPM), Buffer levels	(Fliedner, 2008)

\* Selected waste types sourced from Hines (2009).

## METHODOLOGY

This study used an inductive approach to explore key enablers of sustainable business practice in SMEs. Details of this approach are provided in the following paragraphs.

### Selection of respondents

Interview participants were selected based on two criteria: 1) the participant should have been a Chief Executive Officer (CEO) or a Senior Manager who is responsible for sustainability/lean manufacturing related decision making; and 2) the participants should be from a SME in South East Queensland. The interview participants were contacted through a professional industrial body in Queensland, dedicated to improving the efficiency and competitiveness of small and medium-sized enterprises in Australia. Semi-structured interviews were used to collect data from the key informants in the SMEs. The interview participants represented the manufacturing sector including rubber, textile, electronics, marine products, industrial machinery, mulch and paint which given code names from firm A-M. Such diversity in SMEs provided a wide range of perspectives on implementing lean and green practices.

### Data collection protocol

The data collection protocol consists of a set of semi-structured interview questions which were formulated based on the findings derived from the literature review. The interview strategy was established on literature of lean and green (Rubin and Rubin 1995) which informed the interview guide and prompts to asking further questions during the interview process (Yin, 2009). In total there were 30 interviews contacts. Interviews were digitally recorded with the consent of the interview participants. In addition to the primary data collected through the interviews, an archival analysis was carried out on the firm's website, annual reports, brochures and published case studies.

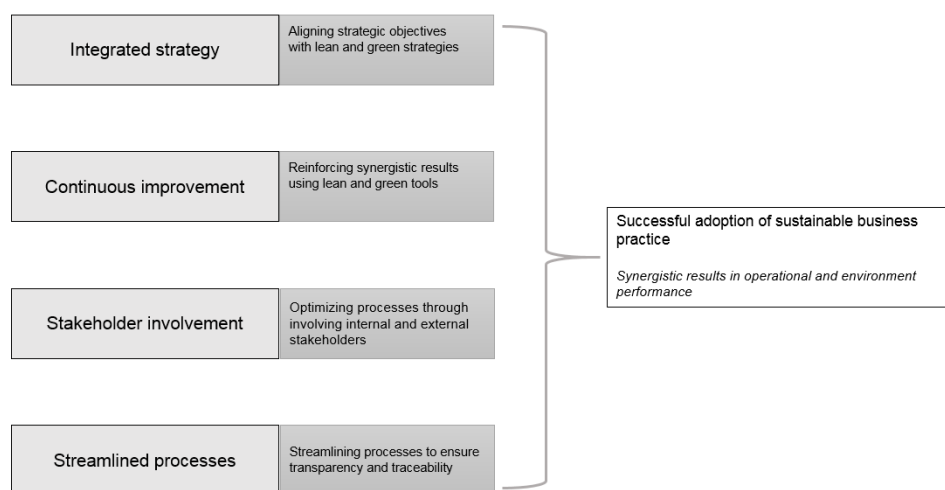
### Data analysis

The digitally recorded interviews were manually transcribed in the NVivo Pro (version 11) software, and data reduction methods were then used to analyse the information (Miles and Huberman, 1994). A thematic analysis method was applied to identify emerging themes (Braun and Clarke, 2006). A data driven inductive analysis method of In-Vivo coding was carried out using NVivo 11 software to create new nodes from emerging interview data. Axial coding then categorised data in new ways, identifying associations and links between initial codes (Savin-Baden and Major, 2013). The team of three researchers coded interview data corroborating the selective codes, emergent themes to reduce bias and validate the emergent themes (Eisenhardt, 1989, Pettigrew, 1990). Four enablers with associated considerations were presented in a model for SMEs to easily access key findings and so enable these enterprises to achieve sustainable business practice.

## FINDINGS AND DISCUSSION

This study deepened the authors' understanding of key enablers for achieving sustainable business practice in SMEs and potential opportunities for harnessing lean and green thinking to support the transition. Four major categories of enablers were identified through the

thematic analysis as shown in Figure 1, comprising: integrated strategies, continuous improvement, stakeholder involvement and streamlined processes.



**Figure 5:** Four enablers of sustainable business practice

As illustrated alongside the enablers, we propose four considerations:

1. *Aligning the organisational strategic objectives with lean and green strategies:* An integrated lean and green strategy for process excellence and improved environmental performance. These integrated strategies could be implemented through utilising consolidating the organisational processes with appropriate lean and green tools (e.g.: Kaizen events, PDCA cycle).
2. *Reinforcing synergistic results by continuous improvement using lean and green methods:* Identify overlapping areas of lean and green thinking and adopt an appropriate mix of lean and green tools for continuous improvement (e.g.: 5S, PDCA cycle, value stream mapping, ISO 14001 Environmental management system).
3. *Involving internal and external stakeholders to optimise the organisation's processes:* Considering the requirements of internal and external stakeholders in making business decisions and collective agreement on legitimate business practice through multiple communication channels (e.g.: quality circles, lean supply chain management, corporate social responsibility (CSR) activities, communication matrix in ISO 9001 Quality management system)
4. *Streamlining processes to ensure transparency and traceability:* Streamlined process through standardised methods and metrics for evaluation while using globally accepted standards and an appropriate mix of lean and green tools (e.g.: value stream mapping, sustainable-value stream mapping, lean layout, total productive maintenance)

Overall, the 13 SMEs in this study experienced positive reinforcement from lean and green operations towards sustainable business practice aspirations. Indeed, SMEs' managerial perspectives were that their lean and green approaches offered process excellence and improved environmental performance, in addition to contributing to sustainability key performance measures. We draw on these experiences in the following paragraphs to discuss factors influencing each enabling area.

### **Integrated strategies**

There was clear evidence to integrate lean and green strategies than implementing these strategies separately, *“Over the many years of been working in the manufacturing industry, I can genuinely say that I need to adopt integrated strategies to achieve sustainable business practice.”* (Managing Director, Firm J). The industrial practitioners expressed their strategic objectives as improving quality; eliminating wasteful practices; reducing product lead time and cost. The CEO of firm J emphasised the need to align lean and green strategies with organisational strategic objectives, and expressed, *“lean transcends green, and we need a consolidated strategy for positive outcomes in operational and environmental performance”*. Not all SMEs were able to harness the opportunities of lean and green practices due to their scattered nature of use. For example, the production manager in Firm C described how they implement kaizen events and Plan-Do-Check-Act (PDCA) cycle as targeted tools for process improvement but have not gained associated benefits in improving environmental performance the need for a more consolidated and integrated approach. Integrating lean and green strategies to harness process improvement and environmental performance is critical for the successful adoption of sustainable business practice.

### **Continuous improvement**

One of the key enablers for successful adoption of sustainable business practice is leveraging lean and green tools to continuously improve manufacturing processes. For example, the production manager of Firm B stated that, *“We start with 5S, then we have different tools, use to increase our leanness”*. The 5S tool was a commonly used among SMEs to create a clean and tidy environment, and reduce waste from spills and leaks through early detection. This tool has created a starting point for SMEs to engage in systematic waste management and disposal methods. For example, the CEO of firm I, expressed the importance of having 5S as a basic tool to advance their performance improvements and emphasised the need to raise employee awareness, *“My belief is we can’t get the basic tools right how do we get other things implemented. 5S helps to remove that sporadic nature we do things. These are basic tools that drive our team to continuously improve”*.

The use of 5S was extended to the PDCA cycle which guides SMEs to solve internal problems and continuously improve processes. The production manager in firm D expressed that *“5S is the beginning only because it starts to form a structure where people can follow. It then follows through the PDCA cycle which is the continuous improvement cycle, it allows people to plan, do, check and act”*. Continuous improvement is a powerful concept used in the majority of the SMEs with the focus on plan, do check and act. The production manager in Firm M modified this cycle to repeat PDC steps a few times and then act for better performance. PDCA cycle is a fundamental principle in ISO 9001 (quality management system) and ISO 14001 (environmental management system). These examples show clear overlap and potential integration of lean and green systems. Value stream mapping is another tool these SMEs utilised to visualise their manufacturing process and identify bottle necks, extra lead times and non-value-added activities. The production manager of Firm D stated, *“Value stream mapping is one of the exercises given to our employees, and it demonstrates to employees by really mapping out the process and looking at exactly what happens and how long it takes”*. This visualisation exercise enables SMEs to identify and act on non-value adding activities in the manufacturing process, suggesting that lean and green methods could be used to continuously improve business processes and navigate sustainability in business.

### **Stakeholder involvement**

Stakeholders are all parties interested and concerned in the business process. Internal (i.e.: employees, managers, owners) as well as external stakeholders (i.e.: suppliers, society, government, customers) are critical for the successful adoption of sustainable business practice in SMEs. Employee engagement was highlighted by the Managing Director of firm A who stated sustainable business practice is a holistic way to do business. And that it is not just driven by the middle management or operational level employees, but driven by the owner and top management. The clear evidence of SME attempts to build lean and green enterprise involved employees sharing responsibilities across all business functions. The production manager of Firm M stated how, *“the information and responsibilities that is shared among the teams is of benefit, and the joy of lean is that it is all about stakeholders across the business, making the business better. So, it ties well with our lean and green programme. That’s all about engagement.”* Another lean tool ‘Quality circles’ involves employees of all levels to review problems in business operations and propose ideas to resolve it. The industrial practitioners suggested that the benefit of these tools is also to discuss and resolve environmental and social issues.

External stakeholders like government, society and in particular customers have a critical role in enabling SMEs to achieve sustainable business practice. The Managing Director of Firm D highlighted how supplier ethical and environmental responsibility provided sustainably sourced material for their production. They only purchase from suppliers who can supply them with sustainable material which is a good evidence of involving suppliers in sustainable business practice. Societal involvement was claimed by the Managing Director of firm K to influence his firm’s ethical and environmental business practice. For example: *“There is an expectation from the community these days. That is if you’re in business or even you’re a private individual you are not damaging the environment through human activity”*. These societal expectations have influenced Firm I to engage in both sustainable business practice and corporate social responsibility (CSR) activities of cleaning marine environment while engaging with the people in the neighbourhood. Customer demand for improved levels of quality and resource efficiency in product manufacturing practices. For example, the Managing Director in Firm H stated, *“We got some of our customers to do quality audits, and part of their quality accreditation or green credentials. If we don’t reach the standards, they won’t continue to use us as the supplier”*. This clear example of Firm B responding to customer needs and incorporating customer requirements for the manufactured products. For these purposes, effective communication through multiple channels (e.g.: phone, email, site visits and meetings) is critical. Production manager of Firm D highlighted the importance of creating a communication matrix with details of what should be communicated to whom, under their ISO 9001-Quality Management System. Some SMEs (Firm G, H and I) were engaged with government organisations to get expert advice and financial support in implementing clean technology projects such as getting solar power. Engaging internal and external stakeholders is clearly a critical enabler to achieve sustainable business practice.

### **Streamlined processes**

Lean and green approach is a pragmatic approach to streamline organisational processes. The production manager of Firm D emphasised that, *“If lean and green thinking is shared and communicated, SMEs believe it is an incredibly powerful approach to streamline our business process, in essence the business could turn around from being reactive to proactive, for me that is a paradigm shift in business”*.



Lean and green tools facilitate the streamlining of business processes by adhering to the globally accepted methods and standards. Some of these tools help to collect, analyse environmental management data on energy, solid waste, carbon footprint, chemical waste. For example, the Managing Director of Company A explained how adopting the extended version of Value Stream Mapping (VSM) which is the Sustainable Value Stream Mapping (Sus-VSM) tool to visualise the production flow have significantly reduced their energy peak and total energy consumption with zero capital expenditure and without compromising product quality. VSM principles were used in the process of identifying bottlenecks and areas of excessive usage of electricity. This reduction of energy has also caused a significant reduction in emissions. One SME (Firm D) re-thought the sequencing and placement of machinery to reduce unnecessary employee motion and energy consumption using lean layout tool. Lean layout is another tool which could be utilised integrated with energy reduction actions. Using tools like Total Productive Maintenance (TPM) facilitate the SMEs to properly maintain machinery, reduce oil leakages, dust and chemical fumes. The Managing Director of Firm H emphasised maintaining machinery and replacing old machines with efficient machines to reduce energy consumption.

## CONCLUSION

The findings of this study provide a rich, phenomenological understanding of how lean and green thinking contributed towards the studied SMEs' journeys in achieving sustainable business practice. The authors identified four enablers for the successful implementation of sustainable business practice. These comprise: integrated strategy, continuous improvement, stakeholder engagement and streamlining processes.

This study contributes to existing knowledge by conceptualising a model depicting enablers and associated considerations. These considerations emphasise: aligning the organisational strategic objectives with lean and green strategies; reinforcing synergistic results by continuous improvement using lean and green methods; involving internal and external stakeholders to optimise the organisation's processes; and streamlining processes to ensure transparency and traceability.

It is concluded that SMEs have the capacity to improve their sustainable business practice through judiciously and holistically embedding lean thinking and green thinking tools. We propose that this improved understanding of what enables sustainable business practice can be used to maximise benefits of lean and green thinking efforts and minimise expenditure on tools and processes.

This integration of lean thinking and sustainable business practice demands deeper exploration, and therefore future research should be carried out to explore what constitutes sustainable business practice and how lean and green tools could contribute to optimise sustainable business practice while making recommendations on appropriate usage of targeted lean and green tools.

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