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Drivers of lean manufacturing practices in Sri Lankan SMEs:

A preliminary result

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1. Abstract

Small and medium scale enterprises are the backbone of the economy in developing countries. They are significant in enhancing innovation, entrepreneurship and competitiveness. Lean practices are widely adopted in SMEs to meet organizations objectives and operational superiority. The current study aims to identify drivers of lean manufacturing practices in Sri Lankan SMEs. A sample survey with 342 SMEs in the Western Province in Sri Lanka was conducted to gather data. Key drivers identified in the current study include are quality of the manufacturing products, customer demand, competitive advantage, government regulation, and inventory improvement.

2. Introduction

Green and lean manufacturing is the renewal of processes and techniques used in manufacturing to environmental friendly operations to the production process. Green manufacturing can be defined as an economically driven integrated approach to reduce and eliminate waste associated with the design and manufacture of materials and products (Thakkar & Singh, 2018). Lean and green practices minimize the negative impact on the environment caused by production practices and simultaneously it helps to enhance the ecological efficiency of the process while improving the financial performance. These practices lead to production efficiency due to low energy utilization and low water usage. Lean manufacturing processes will also lead to low raw material cost and reduces environmental costs.

Small and medium scale enterprises (SMEs) are the backbone of the economy in many developing countries. The importance of SMEs to a nation's economy has been well recognized worldwide due to its contribution to socio economic factors such as higher employment opportunities and stimulating entrepreneurship. Recent studies show that SMEs contribute for 90% of the total employment and 70% of GDP in middle- income countries. SMEs are the key aspect in building up the competitive and innovative capacity of countries (Keskin et al, 2010). SMEs are decisive in enhancing innovation, entrepreneurship and competitiveness.

In the Sri Lankan context the Government of Sri Lanka observes that SMEs are the backbone of the economy, as it accounts for 52% of the total GDP. SMEs are defined in various countries in various ways. Most commonly used measures are the total number of employee's annual turnover and total investment. The working paper is an attempt to analyze drivers of lean supply chain management practices in Sri Lanka SMEs.

3. Literature review

3.1 Definition of SMEs

In the Sri Lankan context, the SME policy framework defines SMEs based on the number of employees and annual turnover. According to the National Policy Framework for Small Medium Enterprise (SME) development; the definition provided to manufacturing and service sector SMEs is based both on the annual turnover as well as the number of employees. The annual turnover of a maximum of LKR 15 million for the Micro sector and above LKR 15 million up to LKR 250 million for Small Enterprises and LKR 250 million to LKR 750 million to indicate the Medium Enterprises. Table 1 displays the requirements based on the number of employees in each sector. Manufacturing firms that have employees ranging from 11 to 50 are defined as small firms in Sri Lanka while from 51 to 300 are defined as medium firms.

Table 1: Number of employees in each sector

Manufacturing	Service Sector
Medium 51-300	Medium 51-200
Small 11-50	Small 11-50
Micro 10 or less than 10	Micro 10 or less than 10

Source: National Policy Framework for Small Medium Enterprise (SME) Development

However, there are many arguments on this definition since some of the stakeholders such as the Department of Census and Statistics of Sri Lanka (DCSSL) employ rather different definition for their data collection and analyses.

Table 2: SME definition used by DCSSL

Economic sector	Groups	No. of persons engaged
Industry & construction	Micro	1 - 4
	Small	5 - 24
	Medium	25 - 199
	Large	200 and above
Trade	Micro	1 - 3
	Small	4 - 14
	Medium	15 - 34
	Large	35 and above
Services	Micro	1 - 4
	Small	5 - 15
	Medium	16 - 74
	Large	75 and above

Source: DCSSL

3.2 SMEs and Sri Lankan Economy

In Sri Lanka, SMEs have dominated for many decades. In 1983, SME industrial establishments accounted for 98% of the total economic establishments, whilst in 2013/14 such establishments were 98.5%.¹ In 1983, the number of employees in SMEs was 29 % of the total employment of the industrial sector. It improved to 45.7 % in 2013/14 showing a significant increase. Employment in SMEs in 2014 amounted to 633,933 which is 50% higher than the number of employed by SMEs in 2004. Furthermore, the value addition to the economy from SMEs in 2004 and 2014 were 31.6% and 31.1% respectively.

Table 3: Distribution of establishments and persons engaged (non-agricultural economic Activities) - 2013/2014

No of establishment (all) (raw %)				No of persons engaged (raw %)			
Total	Industry	Trade	Service	Total	Industry	Trade	Service

¹ In 2013/14, there were 1,019,681 total economic establishments in Sri Lanka including micro (935,736), small (71,126), medium (10,405) and large (2,412) enterprises covering industry, trade and services (Department of Census and Statistics Sri Lanka, 2015b).

Micro	935736 (91.7)	236741 (25.3)	393009 (42.0)	305986 (32.7)	1338064 (44.6)	362615 (27.1)	523183 (39.1)	452266 (33.8)
SMEs	81531 (7.9)	24785 (30.4)	20709 (25.4)	36037 (44.2)	917107 (30.5)	457636 (49.9)	190758 (20.8)	268712 (29.3)
Large	2414 (0.2)	763 (31.6)	891 (36.9)	760 (31.5)	747948 (24.9)	483174 (64.6)	73299 (9.8)	192223 (25.7)
Total	1019681 (100)	261038 (25.6)	419089 (41.1)	340574 (33.4)	3003119 (100)	1221068 (40.6)	768799 (25.6)	1015054 (33.8)

Source: DCSSL (2015a)

About 8% of non-agricultural economic activities are accounted for by SMEs (Table 3). SMEs generate about 30.5% of total non-agricultural employment. Amongst the 30.5% of total SME employment (917,107), about 50% is from the industrial sector. The other two sectors, trade and service, generate 20.8% and 29.3% employment opportunities respectively. Overall, 25.6% of the total non-agricultural economic establishments are in the industrial sector, 41.1 % are in the trade sector and 33.4 % in the service sector. Meanwhile, only 30.4% of non-agricultural SMEs belong to the industrial sector. The highest numbers of SMEs are in the service sector, representing 44.2% of total SMEs.

According to DCSSL (2017), formal SME establishments are only 37% of the total industrial establishments (Table 4). The SME sector contributes to only 3.3% of employment generation. Although SMEs are more labour intensive when compared to large firms, they do not provide ‘decent and attractive’ jobs particularly for the educated and skilled labour force.

Out of the total outputs generated in the industrial sector, SMEs account for only 2.2%. Even though it is claimed that SMEs contribute to value addition, the results show that SMEs contribute to only 2.7 % of the total industrial sector value addition. When a worker in a large firm generates LKR 100 value addition, a worker in SMEs generates only LKR 81.2. Productivity of the SME sector is also low in comparison with that of large firms.

Table 4: Size of SME (formal establishments)

	All	SME*	%**
No. of establishments	5616	2083	37.1
Persons engaged	916168	30645	3.3
Employees	907974	27388	3.0

Salaries & wages (LKR)	290164302992	7775270859	2.7
Value of outputs (LKR)	3756789324119	84101875391	2.2
Value added (LKR)	1612553572452	43822415705	2.7
Salaries per person (LKR)	316715.17	253720.70	80.1
Value of output per persons (LKR)	4100546.32	2744391.43	66.9
Value added per person (LKR)	1760106.85	1430002.14	81.2

*less than 25 persons engaged, ** % out of total formal establishments.

Source: DCSSL 2017

A large proportion of these establishments and employments is found to be concentrated in three groups of industries: a) food, beverages and tobacco, b) textile, apparel and leather products, and c) non-metallic mineral products. More than 70 percent of small enterprises were to be found in these sectors in 2013 accounting to a similar percentage of employment. This pattern is almost identical to what prevailed in 1983, which depicted that SMEs in Sri Lanka experienced limited diversification in the past three decades.

Another important feature of SMEs is geographical concentration. The majority of the SMEs in Sri Lanka are in the Western Province. SMEs in the North Western Province have developed significantly making it the second important province in terms of the number of SMEs placing the Southern Province into third place in 2013/14. However, SMEs have developed only in four provinces (Western, North Western, Southern and Central) whilst the rest of six provinces have contributed low percentages.

3.3 Lean practices in manufacturing

The key argument of lean manufacturing is to eliminate waste and reduce the cycle time to increase the profit and competitiveness of a firm by increasing the production and decreasing the cost of product (Nallusamy & Saravanan 2016). Industrial globalization and the competitive marketing environment have gifted SMEs vast opportunities for the growth and development of its sectors (Thanaki *et al.*, 2016) To increase the operational performance organizations, use lean and green techniques to identify and eliminate waste while optimizing resource utilization through continuous performance improvement (Siegel *et al.*, 2019). Lean practices are widely adopted in SMEs to meet organizations objectives and operational superiority (Garza-Reyes *et*

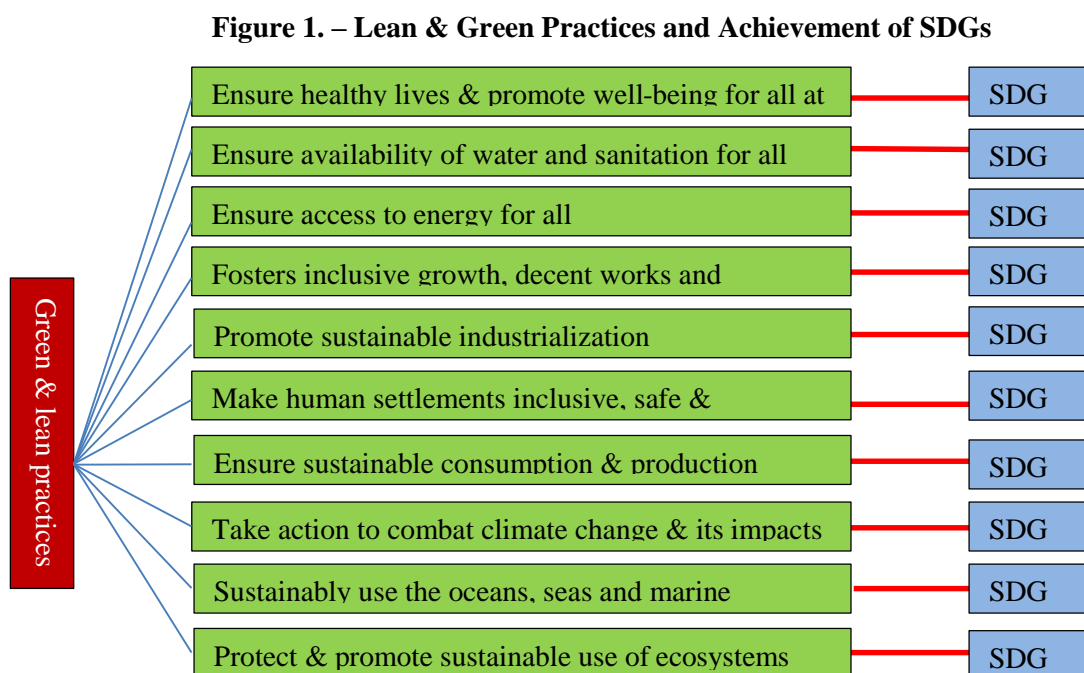
al., 2018). The concepts related with lean management are Total Quality Management (TQM) and Just-In-Time Production (JIT). TQM focuses on meeting customer requirements through continuous improvement while JIT focuses on reducing lead time, work in progress and variations occur during the process (Knol et al., 2017). However the concern for the environment has risen over the past decade and this has resulted in SMEs adopting green practices and lean operational practices in manufacturing. Green practices minimize the negative impact on the environment caused by production practices while simultaneously it helps to enhance the ecological efficiency of the process while improving profitability. Green and lean management both can work together to enhance operational performance of SMEs. To achieve sustainability in development SMEs should practice green and lean practices when considering the environmental and social issues.

Adoption of lean practices allows industries to fully utilize the available resources, minimizing waste thereby improving operational performance (Farias *et al.*, 2017). The impact to the environment by SMEs has drawn public attention over past decades. This has resulted in SMEs to seek environmental efficiency over operational efficiency (Farias *et al.*, 2017). Green and lean practices play a key role towards environmental efficiency. Increasing energy prices, natural resource pollution, global warming, implementation of government policies and regulations related to environmental standards has resulted in Sri Lankan small and medium scaled enterprises implementing lean and green practices to face growing competition between industries as SMEs account for more than 75% of the total number of enterprises, provide 45% of the employment and contributes to 52% of the Gross Domestic Production of Sri Lanka.

Lean practices are widely accepted and implemented in the waste minimization process through non-value-added activities. Lean management concepts are used to identify and eliminate waste in order to improve performance of organizations. Lean manufacturing enhances operational performance of the firm by increasing labor productivity, improves market performance and financial performance of the organization. Reduction in customer lead-time, reduction in cycle time and reduction in manufacturing costs are also highlighted as benefits. Adoption of lean practices help the organizations to achieve eco-efficiency by consuming low material and energy, and using renewable raw materials. During the production process utilizing 3R concept reduce, reuse and recycle techniques can be used to reduce the impact to the environment. 5S practices are also widely used by companies in their lean manufacturing practices. The 5S' which stand for

sort, straighten, shine, standardize, and sustain, focuses on waste reduction. Adoption of lean practices will provide SMEs environmental, financial, operational benefits as well as it reduces employees' health and safety risk (Ruslan et al., 2014). Adoption of both green and lean practices by SMEs will be an answer for the existing environmental degradation problems which have been caused due to the over exploitation of natural resources by humans. Implementing lean and green practices simultaneously will bring higher profits and helps to increase the performance of SMEs as well.

Lean and green practices will directly contribute to achieve several Sustainable Development Goals (SDGs) by 2030. They can be listed as follows: ensure healthy lives and promote well-being for all at all ages (SDG 3); ensure availability of water and sustainable management of water and sanitation for all (SDG 6); ensure access to affordable, reliable, sustainable and modern energy for all (SDG 7); promote inclusive and sustainable economic growth, full and productive employment and decent work for all (SDG 8); promote inclusive and sustainable industrialization and foster innovation (SDG 9); make cities and human settlements inclusive, safe, resilient and sustainable (SDG 11); ensure sustainable consumption and production patterns (SDG 12); take urgent action to combat climate change and its impacts (SDG 13); conserve and sustainably use the oceans, seas and marine resources for sustainable development (SDG 14); and protect, restore and promote sustainable use of ecosystems, sustainably manage forests, combat desertification (SDG 15).



Sources: Developed by the Authors

Identification of lean and green determinants will be important for SMEs in order to renew the processes they implement and to develop new green processes. Financial performance is a key determinant which has to be considered when adopting green and lean practices. Studies have found out that that implementation of green concepts into lean practices has improved cost performances (Wen Chiet *et al.*, 2018). Providing financial incentives to companies who are willing to implement green and lean practices is another key determinant which will bring positive results. Government policies play a key role as SMEs should adhere to the environmental policies formed by the government and develop their processes according to those legislations. Increasing awareness in green and lean practices, conducting training programs and providing education on green practices for the employees in SMEs are essential.

Customers, suppliers, environmental groups, financial institutions and other external stakeholders who are aligned with the SMEs is another determinant as they request for certified products while the suppliers are unable to conform to environmental certifications and lean management techniques yet (Yacob & Moorthy, 2012). External stakeholders as well as internal stakeholders influence the green and lean management practices of SMEs. Their knowledge, attitude, management and commitment are crucial for fruitful application of green and lean management practices. Raising public awareness is crucial as when customers request for certified products the suppliers will match with the customer specifications. Utilization of appropriate technology is a critical success factor when implementing lean management techniques in SMEs. Lean concepts facilitate organizations to reduce lead time, reduce cost while improving the quality of product which in terms increases overall performance of the company. As SMEs accounts for more industrial pollution in developing countries than large organizations this matter should be wisely addressed and necessary actions should be taken. Simultaneously some SMEs such as architectural firms, bio energy manufacturers, designing firms contribute to the greening concept than the other industries.

Green and lean practices are defined as an integrated approach which can be used to increase financial performance, operational performance and environmental performance in organizations. There are numerous challenges when implementing green and lean practices. Lack of measurements to identify the sustainability of green and lean concepts, lack of awareness on green and lean initiatives of the top management, lack of employee engagement in organizations are some common challenges in implementing green and lean initiatives. As there are many

structural differences between SMEs and large organizations SMEs face numerous challenges in implementing these lean and green initiatives. In SME's the lack of human resources to implement lean and green projects is a factor of failure. Financial constraints in adapting to new technologies, reluctance of top management for investments of such projects, poor engagement in new product development are the major challenges in implementing green and lean concepts. These challenges can be overcome by developing and implementing a broad framework and developing a set of tools for green and lean initiatives, addressing research gaps in green and lean management is a necessity. The current paper mainly focuses on lean practices.

4. Theoretical background

The basic theorization of environmental behavior encapsulates a set of internal and external factors leading to behavioral intentions (Ajzen, 1991; 2012) which trigger anti- or pro-environmental behavior (Kollmuss & Agyeman, 2002). Hines et al. (1987), in a meta-analysis, theorized that knowledge, skills, personality and situational factors are affecting the responsible environmental behavior of people. They found that knowledge of (environmental) issues, knowledge of action strategies, locus of control, attitudes, verbal commitment, and an individual's sense of responsibility are associated with his/her responsible environmental behavior.

As Ajzen (1991, 2012) theorizes, intention is the immediate antecedent of human behavior. It also reflects on the function of three determinants; (a) attitudes towards the behavior, (b) subjective norms with respect to the behavior, and (c) perceived control over the behavior. As posited, the said three determinants can change the intentions and the changed intentions can be reflected in the individual behavior (2012). Steg and Vlek (2009) identified five important factors determining the environmental behavior of people such as (a) perceived costs and benefits, (b) moral and normative concerns, (c) affect, (d) contextual factors and (e) habits. Sawitria, et al (2015), suggested, in line with the underpinnings of the social cognitive theory, the variables such as self-efficacy, outcome expectations, goals, contextual support, and action should also be incorporated in an environmental behavior model.

In a study of university students in Brazil and Portugal, Côrtes et al., (2016) asserted that environmental concern leads to environmental attitudes, and thus it would create environmental behavior. Thus, they implied that having access to environment information, education and

environmental consciousness would predict more environmental concern of the students.

Studying the pro-environmental behaviors among different consumer groups, Park and Ha (2012) reported that green product purchasers showed significantly higher levels of cognitive attitude, affective attitude, social norm, personal norm, and recycling intention. Then cognitive attitude, social norm, and personal norm predicted recycling intention of green product purchasers when compared to green product non-purchasers. This study had considered recycling as pro-environmental behavior of consumers. Thus, attitudes and norms were considered as psychological predictors. However, challenging the acceptance of mere relationship between attitudes and behavior, Eilam and Trop (2012), suggest that; (a) the strategies required for influencing attitudes are different from those required for influencing behaviors in the case of adults, (b) the mechanisms for influencing children are different from those for adults, and (c) conventional educational approaches (ex., behavior modification) can influence human behavior more easily than they can influence attitudes.

Interestingly literature reveals, in a Sri Lankan study, Weerasiri and Zhengang (2012) found that there is no strong relationship between attitudes, awareness on environmental issues and the environmental management practices in SMEs. The environmental practices examined in the said study revolved around waste and energy practices. The findings were reported as *“attitudes appear to be remaining positive even where awareness is limited. Managers/owners who expressed rather more positive attitudes appear no more likely introduce environmental management practices for their organizations than managers/owners with less or negative attitude”* (p.16). They further conclude that *“the owners/managers of SMEs in Sri Lanka have limited awareness of business issues relating to environmental management and have not adopted management practices designed to improve their environmental performance”* (p. 22).

4.1 Drivers creating the need of lean adoption

Responsible corporate behaviors stem from different sources which could be related to the set of stakeholders around enterprises. Berry and Randinelli (1998) reveal that pressures from governments, employees, customers, investors, insurers, environmentalists, financial institutions, and even international trading partners drive the environmental behavior of firms. In that, they identified cost factors, regulatory demands, competitive requirements as set of ‘forces driving’ the proactive environmental behavior of enterprises. Increasing legal pressure by regulations,

laws, fines, taxes or tax-exemptions (Dornfled, 2012), legislation requirements and stakeholder pressures (Esty & Winston, 2006) and threats of non-compliance, penalties, and requirements for public disclosure (Wadhwa, 2014) have been frequently noted as pullers of green behavior in SMEs. Economic reasons such as reduction of cost by using natural energy, increase of operational efficiency by using green technology, (Manufacturing Matters, 2011), reducing the escalating costs of waste disposal (Yacob et al. 2019) and minimization of risks due to resource shortages or of risks within the supply chain (Dornfled, 2012) are among other reasons. Pulling from the market side, driving forces such as consumer demand for environmentally friendly goods and services (Yacob et al., 2019) and opportunity for building a stronger brand and brand enhancement with consumers and resultant long - term cost saving (Manufacturing Matters, 2011) have been noted in the existing literature.

5. Data and method

To investigate drivers of green practices among urban SMEs, a sample survey with 342 SMEs in the Western Province in Sri Lanka was conducted under the World Bank project namely, ‘green adoption of SMEs in Sri Lanka. From May to September, 2019 face-to-face interviews were carried out with SME owners and managers. The sample was selected randomly from the manufacturing SME list which was prepared by the research team collecting information from the Chamber of Commerce, Ministry of SME development, Department of Census and Statistics in Sri Lanka since there is no single list readily available about SMEs in Sri Lanka.

6. Results and discussion

This section first briefly explains the basic characteristics of the sampled SMEs. Then nature of lean supply chain management practices will be discussed. Finally the correlation between green practices and firm’s specific variables will be analyzed.

Type of business

Out of the total 342, majority of the sample is from the wood leather and paper based industries (20.5%). 15.2% accounts for metal and steel manufacturing businesses while clothing and textile business accounts for 14.6% of the total sample. Food and beverage and construction accounts for 14% and 10.5% respectively. Percentages of the business types are reported in Table 5.

Table 5: Major product

	Frequency	Percent
Clothing and Textiles	50	14.6
Food & Beverage	48	14.0
Metals (Includes all iron, aluminum and steel manufacturing)	52	15.2
Petroleum, Chemicals and Plastics	30	8.8
Electronics and Computers	30	8.8
Wood, Leather and Paper	70	20.5
Construction	36	10.5
Others	26	7.6
Total	342	100.0

Source: Sample survey, 2019

Lean supply chain management practices

Table 6: Lean supply chain management practices

	Frequency	Percent
SMEs adopt LSCMS	110	32.2
SMEs do not adopt LSCMS	211	61.7
Total	321	93.9
NR	21	6.1
Total	342	100.0

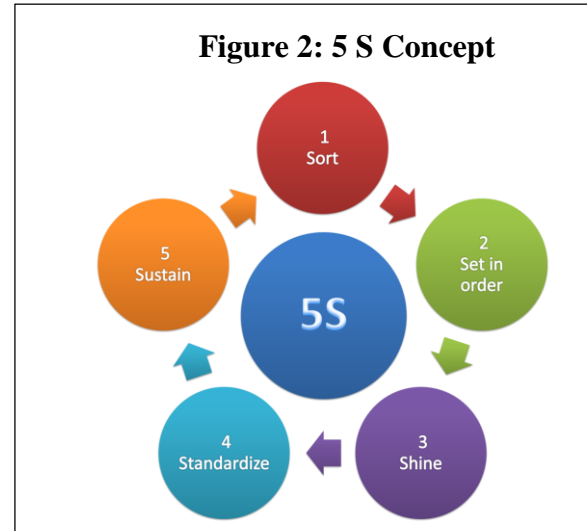
Source: *Sample survey, 2019*

Out of the total 342, majority of the 61.7% does not have lean supply chain systems in their organization while the rest 32.2% adopt lean supply chain management practices. This indicates that the majority of the manufacturing SMEs in Sri Lanka do not adopt lean practices. Percentages of adopting lean supply chain

management practices are reported in table 6.

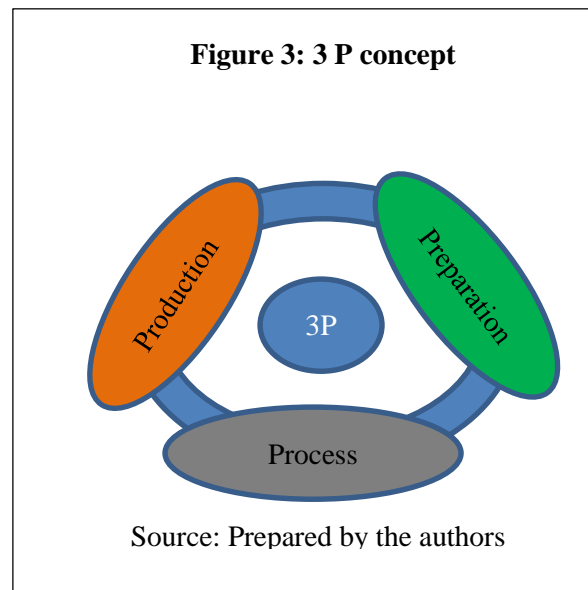
As highlighted in the literature review, companies widely use 5S lean management practices. However, the results of the sample survey among SMIs in the Western Province show that only 20.2% of the firms adopt the 5S lean supply chain management method, while the rest 79.8% does not apply 5S method in their organizations.

Table 7: Adoption of 5S lean management method - Sort, Shine, Set in order, Standardize, and Sustain		
	Frequency	Percent
Adopt 5S	69	20.2
Do not adopt 5S	273	79.8
Total	342	100.0
Source: Sample survey, 2019		



Out of the total 342, 42.1% of the sample does apply 3P (Production, Preparation, and Process) while the rest 57.9% adopt 3P practices. Percentages of adopting 3P lean supply chain management practices are reported in table 8.

Table 8: lean practices adopted-3P (Production, Preparation, Process)		
	Frequency	Percent
Adopt 3P	144	42.1
Do not adopt 3P	198	57.9
Total	342	100.0
Source: Sample survey, 2019		



Another lean supply chain management method is the Total Productivity Maintenance Practice. Out of the total 342, the minority of the sample 9.1% adopts Total Productive Maintenance practices while 90.9% do not practice these total productive maintenance practices. The figures are shown in Table 9.

Table 9: Lean practices adopted-TPM (Total Productive Maintenance)

	Frequency	Percent
Lean practices adopt-TPM (Total Productive Maintenance)	31	9.1
Do not adopt-TPM (Total Productive Maintenance)	311	90.9
Total	342	100.0

Source: Sample survey, 2019

Out of the total 342, Six sigma processes are adopted by only 2% of the sample while 98% doesn't apply Six Sigma processes.

Table 10: lean practices adopted-Six Sigma

	Frequency	Percent
lean practices adopted-Six Sigma	7	2.0
Do not adopt-Six Sigma	335	98.0
Total	342	100.0

Source: Sample survey, 2019

Just-In-Time (JIT) is another lean supply management method. The results of the study show that Just in Time (JIT) production practices are adopted by the majority of the sample. Figures are given in Table 10.

Table 11: lean practices adopted-Just-in-Time Production

	Frequency	Percent
Lean practices adopted-Just-in-Time Production	211	61.7
Do not adopt Just-In-Time Production practices	131	38.3
Total	342	100.0

Source: Sample survey, 2019

Value stream mapping (VSM) is a lean manufacturing tool that seeks to map manufacturing production processes throughout the supply chain, highlighting the flows of product and information and identifying delays and non-value adding processes. Out of the total 342 SMEs, Value Stream mapping (VSM) is practiced by 9.4% while the rest 90.6% do not practice Value Stream Mapping.

Table 12: Lean practices adopted-VSM (Value Stream Mapping)

	Frequency	Percent
Lean practices adopted-VSM (Value Stream Mapping)	32	9.4
Do not adopt VSM	310	90.6
Total	342	100.0

Source: Sample survey, 2019

According to the results of the sample survey mostly common lean practices in SMEs are Just-In-Time production and 3P production. As shown in the above tables highest percentages are recorded for 3P production and Just-In-Time Production.

Out of total 342, major wastes targeted in lean supply chain management systems were defects. According to the results defects 64% of defects, 22.8% waiting, 2% unnecessary transportation, 8.5% of excess inventory problems, 2.3% long lead time, 7.9% over production and 1.8% of over processing problems respectively.

Table 13: Major wastes in lean supply chain management system

Wastes targeted	Frequency	Percent
Defects	219	64.0
Waiting	78	22.8
Excess inventory	29	8.5
Over Production	27	7.9
Movement (unnecessary transportation)	8	2.3
Long lead time	8	2.3
Over processing	6	1.8

Source: Sample survey, 2019

The study further examines the external stakeholders that work with lean initiatives. According to the results the highest percentages obtained from external parties are suppliers and customers. SMEs mostly conduct lean practices with their suppliers and customers.

Out of total 342, suppliers and customers are the most common external parties who work on lean initiatives. According to the results 88% of customers, 79.5% of suppliers, 34.2% of competitors, 20.8% of transportation companies, 8.2% of consultants and 3.8% of technology companies are the key external stakeholders that are involved in lean practices.

Table 14: External stakeholders involved in management practices

Stakeholders	Frequency	Percent
Customers	301	88.0
Suppliers	272	79.5
Competitors	117	34.2
Government agencies	85	24.9
Transportation companies	71	20.8
Consultants	28	8.2
Technology companies	13	3.8

Source: Sample survey, 2019

Essential drivers associated with lean supply management practices can be grouped into two, namely external drivers and internal drivers. There are two main external drivers: stakeholders and tangibility of the business sector of the SMEs. The key stakeholders include governments, customers, suppliers, communities, and competitors. Tangibility which refers to products and services offered by SMEs, has a great effect on adoption of green practices; greater the tangibility of the sector, more the SMEs will introduce the environmental practices in their system (Uhlener et al. 2012). Meanwhile, internal drivers consist of employees, organization culture, brand image and reputation, competitive advantage and strategic intent, environment management capability, and size of the firm.

Driving factors that lead to adaptation of lean supply management practices can be summarized as follows in Table 15.

Table 15: Driving factors associated with lean management practices

Driving factors	Frequency	Percent
Improved quality of the manufactured product	292	85.4
Customers demand for shorter (lead) times (either in production or transportation)	187	54.7
Pressure to achieve competitive advantage in price and service	180	52.6
Customers demand for production flexibility	175	51.2
Pressure to efficiently consume resources contributing to	123	36.0

supply chain “capacity surplus” reduction		
Obligation to government regulations	63	18.4
Pressure to achieve significantly improved inventory turns	45	13.2

Source: Sample survey, 2019

According to the results of the survey 85.4% of the respondents mentioned that improvement of the quality of the product is the characteristic which drives the SMEs towards applying lean manufacturing practices.

The study further finds that apart from drivers, there are certain barriers & constraints too in the implementation of lean supply management practices in SMEs like the dearth of time, lack of financial resources, and the perception of nil impact on the environment, low environmental awareness, weaker governmental regulation and culture too.

7. Conclusion

Key drivers identified in the current study include quality of the manufacturing products, customer demand, competitive advantage, government regulation, and inventory improvement. Various external and internal stakeholders influence on the adaptation of lean supply chain management practices.

This working paper contributes to the knowledge base of lean and green research by providing a comprehensive list of crucial drivers of lean supply management practices in SMEs context in a developing country.

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