

UNIVERSITY OF KWAZULU-NATAL

Survey on Lean Practices in Small and Medium Manufacturing  
Enterprises in KwaZulu-Natal, a Province of South Africa

By

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## DECLARATION

I, Sanele Khuluse, hereby declare that the work presented in this dissertation is based on my own research, except where otherwise acknowledged. I have not submitted this dissertation to any other institution of higher education to obtain an academic qualification.

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## ABSTRACT

Small and Medium Enterprises (SMEs) are key contributors to the South African economy. In-order to survive the current volatile economy, SMEs need to implement new and efficient practices in the manufacturing operations. The manufacturing sector in South Africa is growing at a slower pace in comparison to other sectors due to high labour and production costs. However, implementing management system such as Lean practices creates the competitive advantage necessary for survival. This study explored the awareness of Lean practices in the SMEs in the manufacturing sector in KwaZulu-Natal. The study aimed to gauge the level of implementation of Lean practices, as well as to assess the challenges encountered while implementing Lean practices.

A quantitative research methodology was conducted in KZN's SMEs in the manufacturing sector. Data was collected using a structured questionnaire to seek the level of awareness and implementation benefits and challenges. Two-hundred and twenty respondents were chosen from a database directory. The findings of the study indicated that the majority of SMEs are aware of Lean Manufacturing in practice but do not understand the terminology lean manufacturing. The surveyed SME manufacturers believe that training is the best method of implementing Lean practices. Amongst the challenges is the technological factor which hinders the implementation of Lean manufacturing.

The study suggests that managers, including employees, be thoroughly trained on Lean practices in order to effectively implement Lean practices. This is meant to ensure that the entire business works in unison towards common goals. It was also recommends that SMEs be taken under the wing of the larger organisations which have successfully implemented Lean practices. This will not only ensure survival, but it also has added benefits of creating partnerships

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## ACRONYMS

DCC – Durban Chamber of Commerce

KZN – KwaZulu-Natal

SME – Small Medium Enterprises

JIT – Just In Time

GDP – Gross Domestic Product

SA – South Africa

IDC - Industrial Development Corporation

NDP – National Development Plan

TQM - Total Quality Management

TPS - Toyota Production System

VSM - Value Stream Mapping

TPM - Total Productive Maintenance

SPSS – Statistical Package for Social Science

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## **CHAPTER ONE**

### **OVERVIEW OF THE STUDY**

#### Introduction

The present chapter provides an introduction to a study on lean practices in Small and Medium Manufacturing Enterprises in KwaZulu-Natal (KZN), a province of South Africa. The chapter covers a brief discussion of the issues that will be discussed in detail in the subsequent chapters. The chapter also discusses the problem statement, aims and objectives of the study after which a brief literature overview and research methodology will be highlighted. This chapter concludes with the limitations of the study, thesis outline and finally chapter summary.

#### Background and motivation of the study

Due to various challenges encountered by the SME manufacturers, it is imperative to adopt methods that could improve manufacturers' competitiveness. Although the Lean practice concept originates from Japan, there is a need to conduct research in the South African SMEs context, taking into consideration South Africa's current challenges and opportunities. SMEs have been acknowledged as productive drivers of inclusive economic growth and development in South Africa and around the world. Researchers estimated that SMEs make up 91% of formalised businesses; they provide employment to about 60% of the labour force and total economic output accounts for roughly 34% of GDP in South Africa (BASA, 2015). However, according to research conducted by UNIDO (2014), the manufacturing sector in SA is growing at a slower rate as compared to other sectors and has shrunk from 19% of GDP in 1993 to 17% of GDP in 2010 (UNIDO, 2014). The drop has been attributed to high labour and production costs, while banks are also reluctant to lend money to SMEs as they are perceived as a risk.

Given this background, it is therefore clear that there is a need to conduct research in the area of Lean practices in order to raise awareness and implementation so to enhance the productivity of SME manufacturers.

#### Rational of the study

According to the National Planning Commission (2011), South African government indicated manufacturing as a key sector of economic growth in the National Development Plan (NDP) and a platform for job creation. In view of the potential that SMEs hold for the South African economy, it is essential to study what kind of support and development SMEs receive in a bid to recognize their success and potential throughout the African continent. However, focus on SMEs has mostly been on external factors that support their development, success and sustainability. Therefore, this study looks at Small and Medium Manufacturing Enterprises' internal mechanisms that can foster their success. Like SMEs in general, challenges faced by manufacturing enterprises in South Africa have been centred mostly on external forces that determine their success. However, internal factors such as management skills, skilled labour and developing relationships with customers and suppliers have received limited attention. Ensuring long term survival of businesses in South Africa is a crucial issue as it is a key driver to economic development (Neneh and Vanzyl, 2012).

This study endeavours to explore the awareness and implementation of lean practices amongst KZN's small and medium manufacturers registered with the Durban Chamber of Commerce. According to Dahir and Powell (2013), Lean production is a powerful management philosophy that consists of a number of tools and techniques that have been developed for the industrial sector. The main focus of lean manufacturing is to eliminate waste, doing things better in half of the resources as mass production requires, providing higher quality with lesser cost (Chaple et al., 2014). Hence, the implementation of Lean principles can be seen as internal mechanisms to assure the broader success of a company. Chaple et al. (2014) discusses lean principles that minimize waste in business.

## Problem statement

South Africa's weak manufacturing sector expansion has dragged down sub-Saharan Africa growth, according to the United Nations Industrial Development Organisation report (UNIDO, 2014). Over the past 20 years, there has been constant unease about deindustrialisation in South Africa, as well as locally produced manufactured products having been increasingly replaced by imports (StatsSa, 2015). The future of manufacturing in South Africa has been questioned, in spite of a series of government involvement designed to not only halt the deindustrialisation tide, but to place the manufacturing sector back on a positive growth path (StatsSa, 2015).

An overview of the South African economy's 2013 report by the Industrial Development Corporation (IDC) demonstrated that although the manufacturing sector made up 20.9% of the country's Gross Domestic Product (GDP) in 1994, its contribution has since decreased to around 12% (IDC, 2013) . The report shows that the decreasing trend mirrors numerous challenges, though underscoring the need for government-supported interventions to stabilise the manufacturing sector whose contributions are widely recognised as being vital to sustainable growth and job creation. Thus, besides the demand-side stresses, the sector also has to deal with substantial cost pressures arising in the areas of wages, inputs and administered prices. But its competitiveness has further been undermined by other challenges such as electricity shortages, currency volatility, skills constraints and a poor rate of productivity improvement. The volatility of the rand has also added to the malaise, with the level also being considered too strong for sustained periods (IDC, 2013).

According to a report compiled by the Banking of Association South Africa (BASA, 2012), Small and Medium Enterprises in South Africa face a number of challenges such as crime and corruption, lack of appropriate technology and low production capacity (includes access to electricity), a lack of management skills and inadequate skilled labour, finance and obtaining credit, access to markets and developing relationships with customers, recognition by large companies and government bureaucracy, knowledge and support for the role that they play in economic development, as well as regulatory compliance (BASA, 2012). Given this information, this study seeks to answer the following research questions.

## Research question

The following research questions were developed:

- What is the level of awareness of Lean practices in the small and medium manufacturers in KwaZulu-Natal
  - Are the Lean practices currently being implemented in the SME business environment?
  - What are the factors affecting the implementation of Lean practices
- What are the challenges faced during the implementation of the lean practices?
- What are the potential benefits of lean practices implementation?

## Objectives of the study

The aim of this study is to assess the level of awareness and implementation of lean practices in the small and medium manufacturing businesses, as well as to assess the challenges encountered during the implementation of lean practices. In that view, the study has the following objectives.

The objectives of this study are:

- To assess the level of awareness of Lean practices within the small and medium manufacturing sector
- To assess the challenges encountered during the implementation of lean practices
- To evaluate the potential benefits of the implementation of lean practices

## Location of the study

The study was conducted in Small and Medium manufacturing Enterprises in Durban, located in KwaZulu-Natal, South Africa.

## Significance of the study

This study has both an economic and social significance. Evaluating the current lean practices will enable SME manufacturers to become aware and understand

where the SME operations need to improve, as well as to identify how they can capitalise on the benefits of implementing Lean practices. The researcher intends to transfer benefits to SME manufacturers by providing key insights to Lean practices that could be applied to achieve the benefits mentioned in this study. Further, the results could be incorporated into the SME manufacturers operations. The motivation of this study is rooted on the idea that there is evidence that Lean practices improve a company's competitiveness (Dahir and Powell, 2013).

#### Thesis outline

Chapter One: The introduction chapter provides background information to the study. The rationale for the study, the aims and objectives, were discussed in this chapter

Chapter Two: Literature Review discusses lean practices within the context of the wider business processes. On the chapter also highlights the lean tools and techniques, lean benefits and challenges faced during implementation.

Chapter Three: Research Methodology – In this chapter, the researcher looks at the techniques for statistical sampling from real world populations. The rationale for the chosen methodology is also highlighted.

Chapter Four: Data Analysis – This chapter focuses on the results gathered for analysis and the data are analysed in relation to the problem statement and research questions as outlined in the first chapter.

Chapter Five: Discussion of the Findings – This chapter discusses additional observation gathered during the course of the research that goes beyond the results described in the previous chapter.

Chapter Six: Recommendations and Conclusion – The chapter concludes the study by highlighting the main arguments emanating from the study. Based on the results of the study, recommendations will be made. Limitations of the study as well as areas for further research will be highlighted.

## Summary

This chapter discussed the background information to awareness of Lean manufacturing in SMEs; the rationale and the problem statement, including the benefits and challenges identified that is aimed to be achieved by the researcher. Thereafter the researcher presented research questions and study objectives, justification of this study and the targeted population that the study aims to benefit and how it will benefit the target population.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

The previous chapter background information of the study, the objections and rationale of study. The purpose of this literature review is to summarise various areas around lean and SMEs. This chapter provides a broad definition of the subject of Lean and its origins. The tools and benefits are of Lean are presented.

#### 2.2 Lean

In today's market, companies are facing intense competition, which creates a need for companies to improve their strategies in order to be able to gain competitive advantage.

*"Lean production supplies the customer with exactly what the customer wants when the customer wants it, without waste, through continuous improvement"* (Render, 2005). Newman (2001) defines Lean simply as a production approach to minimizing inventory and managing operations. Lean is based on reducing waste and waste could be anything besides minimum inventory, materials, effort, time and more. If it does not add value, Sanders (2012) classifies it as waste. Branch (2009) concurs that excess inventory and additional management time represent waste and add no value to the product. From the customers' viewpoint, value could be anything that is worth paying for. Jacobs and Chase (2010) and Sanders (2012) are of the view that Lean Production is an integrated set of activities designed to achieve production using minimal inventories of raw materials, work-in-process, and finished goods and they further state that Lean production involves developing an efficiently coordinated system that makes it possible to produce the exact products desired and deliver them in the right quantities to where they are needed just in time. In that view, nothing should be manufactured until it is needed and a need is created by the demand for the product (Render, 2005; Newman, 2001; Chase, 2010, Saunders 2012). However Lean production is not just one element of the Lean system, which is a frequent misunderstanding, it is part of

three elements that work together to create a complete Lean system (Sanders, 2012). Lean Production focuses on the operation and delivery. Total Quality Management (TQM) focuses on eliminating defects and finally, respect for people considers the most important resource and their involvement in the central Lean viewpoint. Weele (2005) states "*Lean management is a philosophy concerning how to run a manufacturing organization, which entails all aspects of the business system in general and design, manufacturing and supply management in particular*". Based on the descriptions provided by these authors, Lean production is a competitive practice that reduces costs, improves environment and quality of the products. Sood (2010) believes that anything that does not add value to the production system should be eliminated. The foundations of wastes are all interlinked and by removing one waste can lead to eradicating all the other wastes.

### 2.3. Origins of Lean

According to Bhasin (2012), Henry Ford (year) created the philosophy of Lean manufacturing. His philosophy was the continuous flow; production principles were exceptionally strict such that every phase of the production process was closely fitted with the next phase flawlessly. This philosophy brought about a minor waste. Ford's philosophy was not very elastic, their assembly lines manufacturing produced identical products repetitively and this process rejected any variations or modifications to the final product. A Model T assembly line produced only the Model T. Ford also concentrated on a push process more than the pull process as a result, there was excess inventory leading to waste. "*By maximizing the use of multi-skilled employees, the company was able to flatten their management structure and focus resources in a flexible manner*" (Rouse, 2014). Different manufacturers started to implement Ford's philosophy but came to the realization that this system was inelastic. Ohno of Toyota then invented the Toyota Production System (TPS), which aimed at maximizing efficiency. It modified the Ford philosophy by using the just-in-time manufacturing methods (Ohno, 1978). Jones and Womack (2013) noted that Toyota used this process successfully and as a result, it eventually emerged as one of the most profitable manufacturing companies in the world.

According to Ohno (1978) the main objectives of the Toyota Production System was to identify and reduce wasteful activities in manufacturing processes through education and involvement of the workforce in order to better serve customers. Ohno's viewpoint concentrated on reducing waste in the production system, investing in employees who are part of this production system, minimizing inventory and enhancing productivity.

The TPS was solely invented to be adopted and practiced by the production processes of Toyota, which is populated by wasteful activities. Lately, more organisations are heads up on minimizing waste in their operations to ensure efficiency. Lean has become a prominent practice to many organizations, according to Camacho-Miñano et al. (2013) the following industries have adopted the same practice such companies include: service providers, supermarkets, marketing, banking, logistics and supply chains, traditional manufacturing, healthcare, transactional processes, and sales. The Lean concept makes a lot of sense and it is an imperative element for the survival and success of a business. Implementing Lean can and has saved organisations immense money through the minimizing waste. Figure 2.1 depicts the seven types of wastes identified by Ohno during his work on the Toyota production System. Render (2011: 654) states that Lean producers set their sights on perfection, no bad parts, no inventory, only value-added activities, and no waste. The wastes depicted in the diagram are frequently denoted as activities that do not add any value to the production system.

According to Render (2011: 654) wastes involve:

- Overproduction – producing in advance before it is demanded
- Waiting – being unable to move to the next stage is a waste of time
- Transport – moving inputs between machines or work stations is waste
- Over processing – work done on the material that does not reflect value
- Inventory – unnecessary storing of extra parts than required is waste
- Movement - Unnecessary motion of employees during production is a waste
- Defects – returned products are a waste



Figure 2.1: Seven types of wastes

Source: (Render 2011: 654)

The viewpoints of TPS were determined by eliminating waste through simplifying the manufacturing process. There are numerous concepts identified which address the goals of TPS namely: work standardization, flexible workforce, Just In Time, links between suppliers and customers and many more. According to this system, Lean principles were developed so as to address the challenges to mass production system that was practiced mostly by American and European enterprises following the second world war (Hines, 2010).

#### 2.4 Lean production system

Liker (2004) argues that The Toyota Production System empowers team members to optimise quality by constantly improving processes and eliminating unnecessary waste in natural, human and corporate resources. TPS influences every aspect of Toyota's organisation and includes a common set of values, knowledge and procedures. It entrusts employees with well-defined responsibilities in each production step and encourages every team member to strive for overall improvement. Nahmias (2009) states that the Toyota Production System views scrap and rework as waste and thus strives for perfect quality.

Figure 2.2 depicts the manufacturing system that was invented by Toyota, which follows the prime streamlining. This is done through eliminating waste and

enhancing quality without compromising cost. With the aim of the Lean Toyota production system comes various technological terms and activities that are necessary to accomplish the objective of the system.

The foundation is built by Kaizen, standard work and heijunka followed by the two main pillars supporting the whole system, namely, “Just-In-Time” and “Jidoka”. Jidoka pillar serves to control variables within a process, securing quality at ones’ own process without passing on poor quality. The Just in Time pillar is built on elements of Takt time, one-piece flow and downstream pull, with many enabling systems, practices and tools. The TPS house requires that quality be built at the source (Dennis, 2015). Reliable processes produce reliable results and processes are the sum of their inputs.

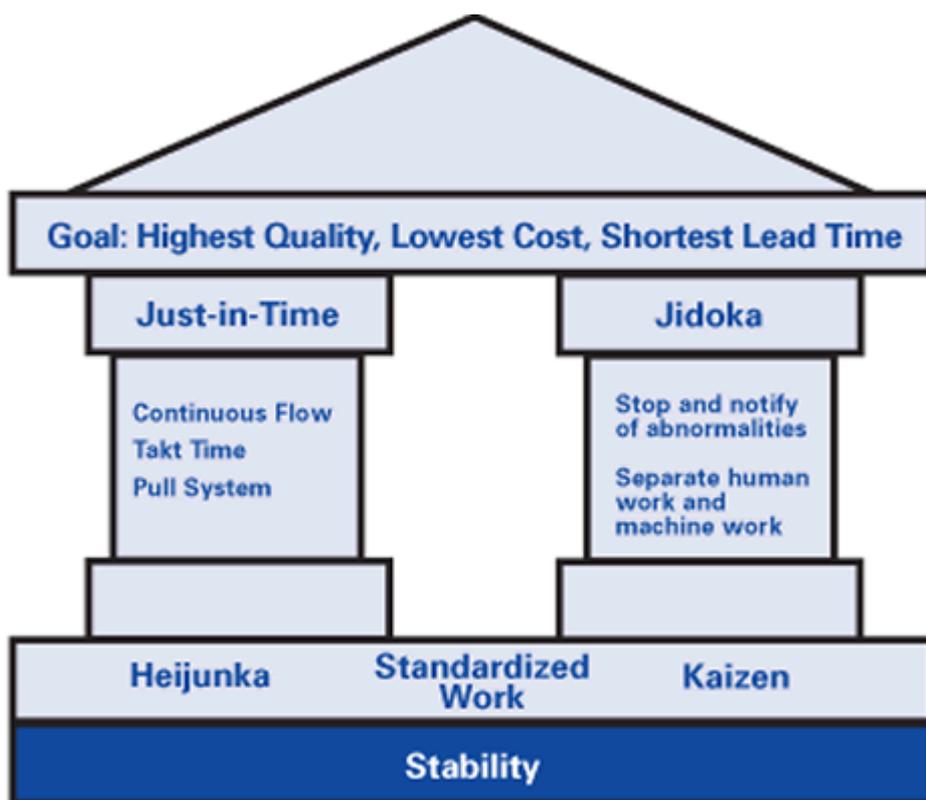


Figure 2.2: Toyota Production System House

Source: Toyota Production System House (Dennis, 2015)

The 4-M factors (i.e., manpower, material, machine, and method) build stabilization and control of the inputs through production preparation. Each and every activity in the house has a responsibility to prevent or find waste through self-checks that has sensors to give a signal when there is a defect. This process allows for continuous improvement. The basic waste (MUDA a Japanese term) at workplace means “any factor that does not contribute to the manufacturing process but only raise costs, the fluctuation (MURA a Japanese term) refers to the irregularities and fluctuations that happen temporarily in a production schedule and in the volume of parts and the overburden (MURI a Japanese term) means giving too heavy mental or physical burden to workers on production sites, for Machinery it also means giving excess workloads to equipment more than it is normally capable of” (Rabakavi et al., 2013: 22). Quality is built through successive checks, accepting only good quality. One-piece flow and process synchronization are the enablers of the successive checks. Finally, quality is built through 100 % inspection. Each and every piece is inspected for quality. Each process must warrant quality coming in and out.

The Toyota Production system has trended as the industry benchmark. It was created to raise Toyota’s competitive edge (Render, 2011). Lean production has come to encompass more than just JIT, but the goal is the same, namely, to reduce work-in-process inventories to bare minimum states Nahmias (2009). There is a minor difference between TPS, Lean and JIT. According to Render (2011), Toyota Production System emphasizes on continuous improvement, respect for people and standard work practices while Lean deals with the elimination of waste through focusing on what exactly the customer wants. At the same time, JIT puts emphasis on continuous and forced problem solving through a minimum inventory levels and throughput. However, these terms are used interchangeably and often mean the same in practice. Wood (2004) describes the concept of Jidoka as a process of transferring human intelligence to automated machinery so machines are able to detect the production of a single defective part and immediately stop themselves while asking for help. Jidoka’s main aim is to identify shortcomings and find solutions right away. Jidoka focuses on investigating the root cause of that problem and make necessary arrangements so

that this defect may not occur again. Defect prevention can be achieved by using Poka Yoke technique. According to Boakye-Adjei et al. (2014), Jidoka has various significant benefits gained through its implementation, namely:

- i. Helps in detecting problems at earlier stages
- ii. It helps in becoming world class organization
- iii. Human intelligence is integrated into automated machinery
- iv. Defect free products are produced
- v. Enhances substantial improvement in productivity of the organization

## 2.5 Five principles of the Toyota Production System (TPS)

The Principles and practices of the TPS are the bases of what is known as Lean manufacturing used in many industries. Wood (2004) states that waste elimination is the aim of Lean manufacturing, however Chaple et al. (2014) and Hines (2010) identifies the following principles which need to be implemented in order to achieve waste elimination:

2.5.1. Identify Value: Identify what the customer actually wants. This is the initial point for lean thinking. Only the customer can define value based on meeting the specific needs of the customer at the right time, right place and right price.

2.5.2. Map the Value Stream: this is a particular set of activities required to process a particular product through problem solving process from the initial concept phase through to the finished product phase and to the customers hands.

2.5.3. Creating flow: Upon specifying value, a tight sequence must be followed to ensure that products flow efficiently to the customer.

2.5.4. Establish pull: Once the flow is presented, allow customers to pull value from the next upstream activity.

2.5.5. Seek perfection: Once organisations are able to precisely specify value, identify value stream, the value creating steps are flowing constantly and customers must pull value from the organization to continue the process until perfection is achieved.



Figure 2.3: Five Lean Principles

Source: Hines (2010)

## 2.6 Lean manufacturing tools

Reduction of waste is a very critical and yet essential element for existence in this day and age. Companies should work towards the goal of creating high quality, at a very cost effective price that will be readily available for the customer as and when required at the right place and time. There are various tools that Lean practitioners use in order to eliminate waste. A few of these tools have substantial effects when they are utilized in isolation; therefore successful practitioners use them in conjunction with other tools. Figure 2.4 depicts sets of tools that were created by Toyota that can be used to reduce waste

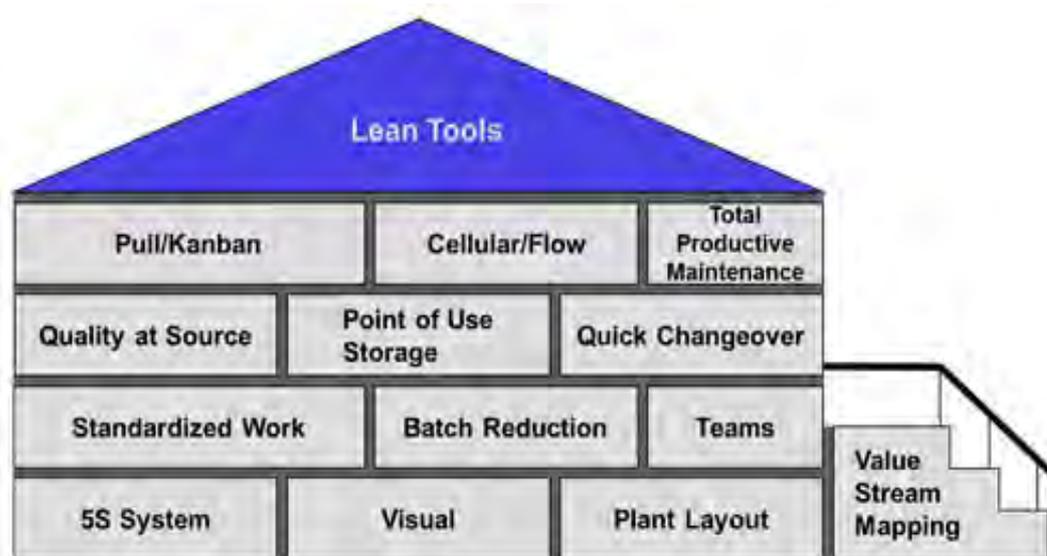


Figure 2.4: Lean Tools

Source: Simona and Cristina (2015)

### 2.6.1. Value stream map

According to Simona and Cristina (2015) the value stream map (VSM) is the “primary analytical tool” in a Lean transformation. They further state that the value stream map is “an extended process flowchart with information about speed, continuity of flow and work in progress that highlights non-value- added steps and bottlenecks”. It helps to understand the flow of the product/customer.

During this process, value is created for the customer. Herzog and Tonchia (2014) identifies a process as any orchestrated sequence of activities and associated tasks required to meet the goals or objectives. They further state that inputs to the process become outputs (Herzog and Tonchia, 2014).

Creating a value stream map is not a difficult task. Value stream map is a representation of the flow of materials from supplier to customer through the organization as well as the flow of information. This enables to see at a glance where the delays are in the process, any restraints and excessive inventory. The current state map is the first step in working towards the ideal state for the organization. VSM is an enterprise improvement technique to visualise an entire

production process, representing information and material flow to improve the production process by identifying waste and its sources.

### 2.6.2. Continuous or Smooth Flow Processing

Producing just-in-time is not possible until the organization ensures smooth flow processing. Continuous or smooth flow processing means arranging work inside each process to flow smoothly from one step to the other (Jacobs and Chase, 2010). Why is it necessary? The answer is simple. Buffer/safety stocks cannot be maintained if JIT system is to run efficiently. Keeping buffer or safety stock in between production process is the part of Just-in-Case system. The term JIT itself indicates fear of parts shortages that can ultimately affect production. In continuous flow production, it is difficult to maintain inventory (Wiles, 2014). There is a need to pass through all the work in a continuous manner so that there is no chance of inventory management. If any defect occurs and remains undetected, it will remain limited to the same or very few components. If defect occurs in the system based on JIT having huge safety stocks, the losses will be much higher and difficult to manage.

### 2.6.3. Continuous Improvement

Continuous improvements is conducted in various forms such as minimizing inventory and minimizing defects. The most effective tool for continuous improvement is the Five S's Method. "Creation of standardized work is a primary reason for using the 5S method, it offers a basic housekeeping discipline for the shop floor and the office" (Breyfogle III, 2007). It includes sifting which emphasises the significance of removing those items and tossing away needless items will make material flow smoothly and workers move and work easily (Feld, 2000). Sorting puts emphasis on easy accessibility where important items are easily accessible. Arranging them in the right place will make tools, jigs, fixtures and resources noticeable, detectable and easy to use (Feld, 2000). Sweeping means that all surfaces must be free from anything that might cause distractions or accidents. A well-maintained workplace creates a healthy environment to work

with (Feld, 2000). Spic and Span emphasises keeping the area clear. Finally, sustenance, sustaining these steps, unconsciously implementing these steps and this is done through regular support and training. An environment that continuously does housekeeping can easily reveal its strengths.

#### 2.6.4. Just in time

The name Just In Time is self explanatory meaning that only what is required is produced when it is needed at the right time and quantity. *“Just-In-Time is the TPS solution to reduce inventory and waiting times. Its name, was coined by Toyota managers to indicate a method aimed to ensure the right products, in the right quantities, just in time, where they are needed”* (Giordano and Schiraldi, 2015). Based on what has been said, JIT is basically the reduction of excess inventory. It uses the pull system and according to Kong et al. (2011), the pull system is the centre of any synchronized factory; it works by working backwards, using signals or cards to trigger or start production. The main focus of the pull system is customer demand. The “pull” is the actual demand. This means that for production activities to be actioned, a pull is required which is stimulated by the customers’ demand through orders. Given the various tight competition in the manufacturing industry, it is imperative that customers’ demands are incorporated efficiently and in a way that cost effectiveness is recognised. From the time a customer places an order, the manufacturing company resumes production by signaling back to the process. All processes are interleaving therefore, they send signals to preceding process. This form of signaling is made visibly through cards and these are the Kanban. According to Deleersnyder et al. (2003), the actual physical implementation of a pull control is most often achieved by means of a kanban system. *“Kanban are instructions enclosed in clear plastic that at a glance communicate information needed at the work station”* (Kong, 2011). Therefore, a kanban is a backward production instruction that leads all former production processes.

#### 2.6.5. Production Smoothing

Production smoothing/levelled production is also known as “Heijunka”, which is the process of producing different models on the same line of production to meet the customers’ needs. According to Bohnen and Deuse (2013) the objective of production levelling is to balance production volume as well as production mix by decoupling production orders and customer demand. Basically, production smoothing is a system that develops the proportions of different demands for different models. Bohnen and Deuse (2013) further states that by decoupling production and customer demand levelling reduces waste, overburden and unevenness which constitutes the three main loss factors for productivity. This leads to a Lean system with zero waste, overburden and unevenness.

#### 2.6.6. Standardisation of work

This principle of waste elimination ensures that each work is organised and carried out effectively. This is ensured by the German concept “takt” that translates to rhythmic time. It is the time to finish the given amount of work-doing a single operation, making one component or assembling an entire car. According to Simona and Cristina (2015), takt time is not a goal to be surpassed, but rather a target to aim:

- Producing faster than Takt Time results in overproduction – the most fundamental form of waste.
- Producing slower than Takt Time results in bottlenecks – and customer orders that may not be filled on time.

#### 2.6.7. Flexible Workforce (Shojinka)

Flexible workforce or shojinka means to alter (increase or decrease) the number of operators within a shop or production department so that the same could be used according to variation in production demand, in that view, Wong et al. (2014) confirms that a flexible workforce can be developed through continuous training and development. The training should be imparted in a manner that it could develop an employee as a multi-process handler rather than multi-machine handler.

### 2.6.8. Other Waste Reduction Techniques

Total Productive Maintenance – TPM capitalizes on proactive and progressive maintenance methodologies and calls upon the knowledge and cooperation of operators, equipment vendors, engineering and support personnel to optimize machine performance. Results of this optimized performance include elimination of breakdowns, reduction of unscheduled and scheduled downtime, improved utilization, higher throughput, and better product quality. Bottom-line results include lower operating costs, longer equipment life, and lower overall maintenance costs. Total Quality Management – is a management system used to continuously improve all areas of a company's operation. TQM is applicable to every operation in the company and recognizes the strength of employee involvement. Poke yoke an 'error-proofing' technique (Melton, 2005). However, Feld (2000) identifies the goal of Poke yoke as observing the defective parts at the source, detecting the course of the defect and to avoid moving the defective part to the next workstation. Single Minute Exchange of Dies a changeover reduction technique (Melton, 2005).

### 2.7 Benefits of implementing Lean

Herzog and Tonchia (2014) states that like any other work implementation situation, Lean implementation demands stringent different styles of leadership, culture, performance measurements, skills, thinking, training and organizational structures. Many changes can be done, but if the main people who need to implement Lean practices are not the right talent, then challenges in implementation arise. *"A Lean environment requires a different style of management, style of leadership, performance measurements, organizational structures, thinking, and culture"* (Piatkowski, 2004). He further concludes that in order to successfully implement the Lean practices, the organisation has to have the right people in place, there is no quick fix as it took Toyota over 50 years to come up with this system. Below is a list of benefits of implementing Lean manufacturing adopted from Rose et al. (2011):

- Decreased lead times for customers
- Reduced inventories for manufacturers

- Improved knowledge management
- More robust processes and less errors
- Significant Financial Benefits
- Increased Process understanding



Figure 2.5: The benefits of Lean

Adapted from: Rose et al. (2011)

## 2.8. Challenges to successful Lean implementation

The most common challenge in lean implementation is maintaining it (Amit et al., 2014). Lean is a continuous process. Even though Toyota implemented lean more than fifty years ago, they are still utilizing it and continuously striving for improvement. Many companies implement lean concepts thinking it is to be done only once. Maintaining lean is challenging and requires a lot of work that companies are not prepared to commit to. Hobb (2011) it is not enough to simply implement Lean practices, it is also important to note that Lean is behaviour-driven. The workers involved in the implementation (including the senior management team/leaders) need to be motivated to maintain the continuous improvement that is the Lean concept.

Implementing lean is not an easy task. Many of the companies that attempt to implement Lean experience difficulties, or they may not be able to achieve the

anticipated benefits. Below is a list of some of the challenges encountered when implementing Lean, adopted from Amit et al. (2014):

- Resistance – most people do not like change, they fear the unknown and view it as unnecessary. Training must be an area of focus in order to make the employees aware of the changes.
- Cost – sometimes there is need to spend money to make (or save) money. Lean is no different. Mistake proofing processes will cost money. Fixing problem areas permanently usually cost money. Redesigning of equipment to facilitate new line balancing will cost money. But over time, these improvements will pay off.
- Upkeep – to upkeep is required to make Lean successful. Labels get torn and need replacing. Parts get relocated and require kanban reprinting. Levelled production requires regular updating and maintenance (Giordano and Schiraldi, 2015). With proper execution in the general labour area, organisations should be able to free up people to fill these roles.
- Initial Labour increase –additional resources are required to implement lean. The required number will depend on how quickly organisations want to implement and which areas they are focusing on. Initially, organisations can bring in temporary workers to free up some of the full time folks to implement the system. Ultimately, Lean implementation will result in freed-up labour. These people can be utilized to implement Lean as well as the upkeep later on.

Understanding the full implications of lean and making sure that all those involved in the lean process know what is required of them is essential to avoiding challenges of lean implementation and management (Mwacharo, 2013).

## 2.9 Lean manufacturing abroad

Ranking countries globally, according to the 2013 Global Manufacturing Competitive Index, a study conducted by Deloitte (2013), China has the major

manufacturing economy with a 23.2% share of manufacturing activity through extremely fast growth in the physical volume of value-added and modest inflation. China also takes advantage of its population. “Many developing economies’ high manufacturing value-added arises from high populations, even if productivity is relatively low” (Meckstroth, 2015). The U.S. is right behind China with a share of 17.2%.

Table 2.1: The 15 Largest Countries for Manufacturing Value-Added

Rank	% of World Manufacturing		Valued in U.S. Dollars	
	2013	2013	2003	1993
1	23.2%	China	United States	United States
2	17.2%	United States	Japan	Japan
3	7.8%	Japan	China	Germany
4	6.3%	Germany	Germany	China
5	3.1%	Korea	Italy	France
6	2.4%	Italy	France	Italy
7	2.4%	France	United Kingdom	United Kingdom
8	2.3%	Russia	Korea	Brazil
9	2.1%	Brazil	Canada	Russia
10	2.0%	United Kingdom	Spain	Korea
11	2.0%	India	Mexico	Spain
12	1.8%	Mexico	Africa	Canada
13	1.7%	Indonesia	Brazil	Mexico
14	1.6%	Canada	India	Turkey
15	1.4%	Spain	Netherlands	Netherlands

Source: Mapi Foundation (2013)

India is competing in the global arena and various manufacturing practices and philosophies are being used in the Indian industries which are necessary strategies that have assisted them to successfully achieve great results in tough competitive global markets. According to Panizzolo et al. (2012), research shows that the lean implementation process was slow in India, similar to other developing countries, largely because of the anxiety in changing the mind-set of people, lack of awareness and training about the lean concepts, and cost and time involved in lean implementation. However, in the last five years there have been significant efforts in using the lean practices and the results are unveiling it. Panizzolo et al. (2012) further states that the Indian automotive sector is way ahead of the other sectors in the implementation of lean manufacturing principles. It is observed that the Indian companies have tied up with reputed foreign companies, this being common in the automotive sector, progressed in the lean practices or became aware of Lean concepts through company-wide training programmes.

*“The demands for automobiles increased drastically in the last two and half decades in India, many global automobile manufacturers and Tier-1 suppliers have already set up research, development and manufacturing facilities in India. The Indian automotive component industry started implementing Lean practices to fulfil the demand of these customers”* (Jadhav et al., 2014). According to the research conducted by the Boston Consulting Group, the United States is currently serving as the benchmark in the year 2014.

#### 2.10 South Africa's manufacturing industry

South Africa as a developing country has managed to diversify its manufacturing base and has had the opportunity to compete globally. The manufacturing sector provides ground for enhancing growth through activities such as services and achieving specific outcomes, such as employment creation and economic empowerment. According to Statistics SA (2015) the South African manufacturing industry is dominated by the following sectors:

- **Agro-processing**

This industry spans the processing of freshwater aquaculture and mariculture, exotic and indigenous meats, nuts, herbs and fruit. It also involves the production and export of deciduous fruit; production of wines for the local and export market; confectionary manufacturing and export; and the processing of natural fibres from cotton, hemp, sisal, kenaf and pineapple (StatsSa, 2015).

- **Automotive**

The automotive industry is one of South Africa's most important sectors, with many of the major multinationals using South Africa to source components and assemble vehicles for both the local and international markets. The sector accounts for about 12% of South Africa's manufacturing exports, making it a crucial cog in the economy (StatsSa, 2015).

- **Chemicals**

The South African chemicals sector has two noticeable characteristics. Firstly, while its upstream sector is concentrated and well developed, the downstream sector - although diverse - remains underdeveloped. Secondly, the synthetic coal

and natural gas-based liquid fuels and petrochemicals industry is prominent, with South Africa being the world leader in coal-based synthesis and gas-to-liquids technologies (StatsSa, 2015).

- **Information and communications technology**

The South African information and communication technologies (ICT) sector is characterised by technology leadership, particularly in the field of mobile software and electronic banking services (StatsSa, 2015).

- **Metals**

South Africa's large, well-developed metals industry, comprises basic iron ore and steel, basic non-ferrous metals and metal products. The basic industries involve the manufacture of primary iron and steel products from smelting to semi-finished stages. Primary steel products and semi-finished products include billets, blooms, slabs, forgings, reinforcing bars, railway track material, wire rod, seamless tubes and plates.

- **Textiles, clothing and footwear**

The South African textile and clothing industry aims to use all the natural, human and technological resources at its disposal to make it the preferred international supplier. Owing to technological developments, local textile production has evolved into a capital-intensive industry, producing synthetic fibres in ever-increasing proportions and non-ovens, spinning, weaving, tufting, knitting, dyeing and finishing.

According to the preliminary report published by StatsSa (2015) for the 3<sup>rd</sup> quarter, seasonally adjusted manufacturing production increased by 1,4% in the third quarter of 2015, compared with the second quarter of 2015. Eight of the ten manufacturing divisions reported positive growth rates over this period. The main contributor to the 1,4% increase was the petroleum, chemical products, rubber and plastic products division (4,3% and contributing 0,9 of a percentage point) (StatsSa, 2015).

The manufacturing Industry sets the stage for inspiring other growth activities namely employment creation activities, various outcomes, services and economic

empowerment. This center stage of manufacturing brings out opportunities to speed up South Africa's growth and progression.

## 2.11 KwaZulu-Natal manufacturing industry

KwaZulu-Natal's manufacturing sector is the second largest in the country, after Gauteng Province. The manufacturing sector is geared for export, with nearly a third of South Africa's manufactured exports being produced in KwaZulu-Natal. Its diversified nature is significant in the KwaZulu-Natal's economic growth rate and generates 20 % of provincial employment (StatsSa, 2015). According to the statistics presented at the 2015 KZN Manufacturing Indaba, the largest manufacturing industries are the finance, retail estate and business services contributing 16.5%, followed by the manufacturing sector with 15.8% and third largest is the wholesale, retail and motor trade, catering and accommodation with 15.5% (SARB, 2015).

There are many opportunities for small businesses in value added initiatives. Of note is the importance of downstream development, which is required to increase capacity and lay a foundation for successful economic development where it is most needed.

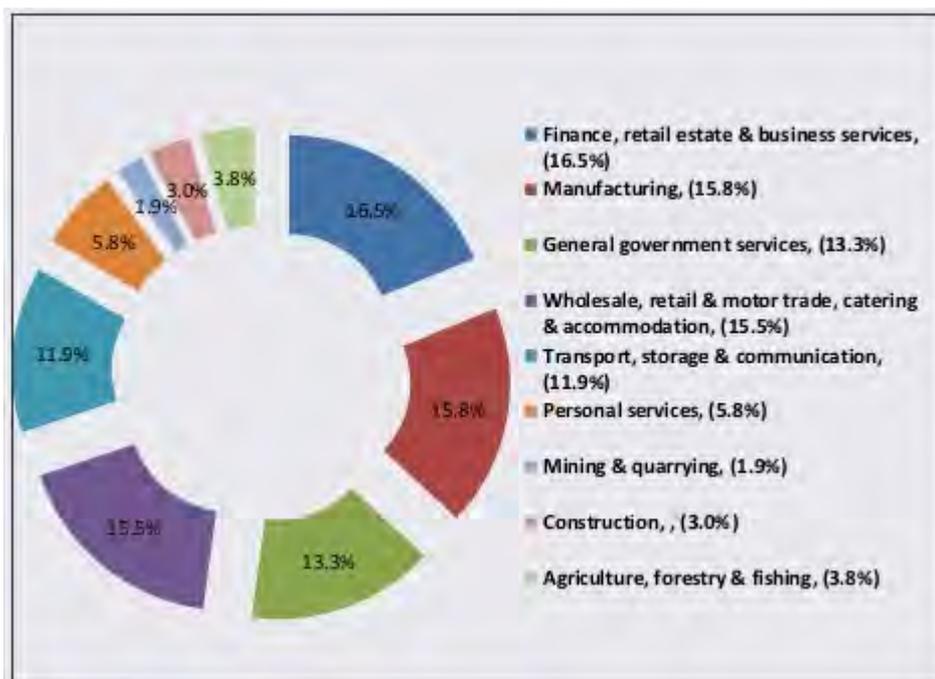


Figure 2.6: Composition of the KZN economy, 2014

Source: (SARB, 2014)

### 2.11.1 Definition of Small Businesses in South Africa

According to the National Small Business Act 102 of 1996 a medium business is defined as a business with less than 200 full time employees with a turnover of R40 000 000.00 per annum, a small business employs less than 50 full time employees with a turnover of R10 000 000.00 per annum, Very small businesses employ less than 20 full time employees with a turnover of R4 000 000.00 per annum and finally, a micro business employs less than 5 full time employees with a turnover of R150 000. This subdivision of categories by the National Small Business Act are depicted on the table 2.2. These categories use the terms “SMME” for small, medium and micro-enterprises. However, the terms ‘SMME’ and ‘SME’ are used interchangeably in SA. Again, the researcher considered the total number of full time employees as the main indication of SME and for the purpose of this study, the term SMEs has be utilized.

Table 2.2: Schedule for small business

Sector or sub-sectors in accordance with the Standard Industrial Classification	Class or size	Total full time Employees Equivalent of paid employees less than:	Total Annual Turnover
Manufacturing	Medium	200	R40.00m
	Small	50	R10.00m
	Very Small	20	R4.00m
	Micro	5	R0.15m

Source: National Small Business Act 102 of 1996 Schedule (DTI, 1996)

According to the National Small Business Act 102 of 1996, "establishment of the Advisory Body and the Enterprise Promotion Agency; to provide guidelines for organs of state in order to promote small business in the Republic; and to provide

for matters incidental thereto" (DTI, 1996). The act aims to provide for small, medium, and micro enterprises based on certain characteristics.

### 2.11.2. The Economic Contribution of SMEs

Small and Medium Enterprises (SMEs) have been identified as productive drivers of inclusive economic growth and development in South Africa and around the world. According to SME development public investment corporation report presented by the Banking Association South Africa (BASA, 2012), SA small and medium-sized enterprises make up 91% of formalised businesses, provide employment to about 60% of the labour force and total economic output accounts for roughly 34% of GDP. While contributing significantly to the economy, SMEs foster diversification through their development of new and unsaturated sectors of the economy (BASA, 2012). In addition, innovative and technology-based small and medium enterprises can provide a platform for local, regional and international growth, especially in Brazil, Russia, India, China, South Africa (BRICS) economies.

SMEs are considered an important contributor to the economy as drivers for reducing unemployment, especially since the formal sector continues to shed jobs.

### 2.11.3 Challenges faced by SMEs

- Crime and corruption
- Lack of appropriate technology and low production capacity (includes access to electricity)
- A lack of management skills and inadequate skilled labour
- Finance and obtaining credit
- Access to markets and developing relationships with customers
- Recognition by large companies and government bureaucracy
- Knowledge and support for the role that they play in economic development
- Regulatory compliance

- High labour production costs

## 2.12. Conclusion

From the literature discussed above, Lean is becoming the next "quality" or "eBusiness" practice area. Back in the days in the 1980s, companies that guaranteed their customers superior quality monopolized markets and were able to easily access new markets and claim higher profits and prices. Now, "quality" is the determining factor of business, there is no room for inferior quality. Therefore, many businesses are forced to implement Lean as their strategy to reduce costs. This allows those businesses that have adopted lean to respond faster and effectively to market trends, provide cost effective products and services and finally, shortened lead times. Lean crosses all industry boundaries, addresses all organizational functions and impacts the entire system – supply chain to customer base.

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1. Introduction

The previous chapter reviewed literature on Lean Management in the context of wider business processes. The chapter contained theoretical literature on lean tools and techniques, lean benefits and challenges in implementation. The present chapter gives the research foundation and provides the discussion of the research methods applied in the study. It begins with outlining the aims and objectives of the study followed by a discussion of how the population and the sample were drawn. The researcher looks at techniques for statistical sampling from real world populations. The chapter further discusses the reasons for selecting the chosen methods, research design and methods. It concludes by explaining the validity and reliability of this study and finally describing the analysis of data.

#### 3.2 Aim and Objectives of the Study

The aim of the study was to assess the level of Lean Practices in the SMEs Manufacturing sector. There is no doubt that lean manufacturing enhances the value of products, thereby increasing the company's competitiveness. More value is created by identifying and eliminating activities that do not add value to the production process (Čiarnienė and Vienažindienė, 2013). As such, the Lean implementation is an integral role in providing products and services of high customer value. This makes Lean Practices in the Lean Practices in SMEs Manufacturing sector a concept worth exploring for the long-term survival of these companies and for the economic growth of the country.

The objectives for undertaking this study are as follows:

- To assess the awareness of Lean practices within the small and medium manufacturing sector
- To assess the challenges encountered during the implementation of Lean practices
- To evaluate the potential benefits of the implementation of Lean practices

### 3.3 Participants and Location of the Study

The study was conducted in KwaZulu-Natal, a province of South Africa with special attention to Durban. The area was selected on the basis of convenience and proximity to the researcher.

#### 3.3.1 Survey Population

A population is the collection of elements in which the desired information can be gathered (Malhotra, 1999:331). Welman and Kruger, (2002:46), defined a population as the study object, which may be individuals, groups, organisations, human products and events, that is the subject of research of interest or the conditions to which they are exposed. In addition, Merville and Goddard (1996:29), define a population as any group that that is the subject of research of interest. Sekaran and Bougie (2011:262) stated that “surveys are useful and powerful in finding answers to research questions through data collection and subsequent analyses, but they can do more harm than good if the population is not correctly recruited”. In line with Sekaran and Bougie (2011:262) suggestions the population for the present study was recruited from the 2014/2015 Durban Chamber of Commerce and Industry Directory. However, like any other research, it was not easy for the researcher to obtain a complete list of all SMEs in the manufacturing sector. This is due to the fact that not all of these SMEs have registered with Durban Chamber of Commerce and Industry.

This study targeted SMEs in manufacturing sector that are registered with the Durban Chamber of Commerce in KZN as its participants. The 2014/2015

Durban Chamber of Commerce and Industry directory has an approximately 3 500 enterprises which included all sectors of the economy. From this population the researcher only targeted manufacturing companies and further sifted for small and medium manufacturing companies.

However, the directory does not specify whether or not an enterprise is small or medium however the researcher was guided by National Small Business Act 102 of 1996. The Act states that small enterprise has 21 to 50 full time employees and a medium enterprise is one which has between 51 to 200 full time employees (Government, 1996). Thus, through sifting the directory, the researcher found a target population of approximately 500 SMEs in the manufacturing sector. The participants included owners of the business, supervisors, junior and senior managers. This was because in an SME setting the owners are the managers of their own business.

### 3.3.2 Sample Size

A sample is a subset of the population. Kothari (2004) stated that “the size of the sample should neither be too large nor too small, but it should rather be optimal, and then be efficient, representative, reliable and flexible”. Neuman (2000:54) and De Vos (2002:90) identified probability (or random) sampling and non-probability (or non-random) sampling as the two types of sampling procedures.

In determining an appropriate sample size for this study, the researcher used the Raosoft calculator, using confidence level of 95% and a margin of error of 5%. According to this calculator, for a given population size of 500, a recommended sample size of 218 is deemed appropriate to give valid and reliable conclusions.

### 3.4 Research Design and Methods

In determining whether to use quantitative or qualitative research, the researcher had to consider the purpose of the research and the type of data that would achieve the purpose. The qualitative methods allow the researcher to study selected issues in depth, openness and detail as they identify and attempt to

understand the categories of information that emerge from data. On the other hand, a quantitative approach is one in which the investigator primarily uses post-positivist claims for developing knowledge, employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data (Daniel, 2010).

The present study followed a quantitative research methodology because the data that was collected was analysed statistically using descriptive and inferential analysis. The quantitative method was deemed necessary to achieve the purpose of the research: to assess the level of Lean management practices among SMES in the manufacturing sector.

### 3.5 Data Collection Strategies

This study was conducted in 2015 using data collected from respondents by self-administered questionnaires. Initially the intention was to use QuestionPro to collect data conveniently, however, due to the poor response rate; it was decided to use self-administered questionnaires with the help of trained research assistants.

Prior to requesting the participation of any respondent in the study, it was verified that the particular participant was in SMEs in manufacturing sector. Data was collected over a period of two months. The potential respondents were personally approached at their offices by the researcher and research assistants. Self-administered questionnaires were used as means to collect information from respondents.

The questionnaires were administered to respondents by the researcher and the research assistance. The letter of informed consent (Appendix 1) was attached to the questionnaire and the purpose of conducting the study was also explained verbally before the administration of the questionnaire. The survey was completed in two months and it was ensured that all questions were answered.

#### 3.5.1 Construction of the Research Instrument

According to Dolnicar S. (2013) the careful design of the questionnaire does not only involve deciding on a valid answer format, but also on the specific instructions which accompany the questions and help the respondents to understand the task.

The research instrument constructed was a questionnaire survey which consisted of 22 questions see Appendix 2. The questionnaire was constructed in such a way that sections it collects all data required to address the three objectives: the demographical data, awareness level, implantation level and the challenges and benefits of implementing lean practices have four sections.

The measurement scales were adopted from Fricke (2010) and Abdullah (2003) and modified to meet the current research needs. Most of the questions in the questionnaire used a five-point likert interval scale and close ended questions.

### 3.5.2 Recruitment of Study Respondents

In recruiting study respondents, the 2014/2015 Durban Chamber of Commerce and Industry directory. The target population consisted of SMEs in the manufacturing sector and the database was screened to ensure this was accurate. The reason for screening was to ensure that the selected enterprises (manufacturers) were in the manufacturing sector. The enterprises were arranged numerically in an alphabetical order and randomly selected (picking the even numbers from the population) to give a sample of 250 enterprises which is well above the recommended sample size of 218.

### 3.5.3 Pretesting and Validation

Saunders et al. (2009) highlighted the 3 methods of testing reliability:

- The instrument needs to be tested and retested.
- Internal consistency needs to be verified.
- An alternative form of the same question or group of questions should be tested.

In quantitative research the use of validity and reliability is common and it is reconsidered in the qualitative research paradigm (Winter, 2000). He further states that reliability and validity are tools of an essentially positivist epistemology. Hence for Joppe (2000), reliability is the degree to which the results are common over time and a precise representation of the whole population under enquiry is referred to as reliability. If the results of an enquiry can be reproduced under similar methods, then the research tool is considered to be reliable. However, for this study, such a repetition of the study would not produce similar results over time because this study seeks the understanding, awareness and implementation of

Lean Principles from individual SMEs in KZN. Such understanding, awareness and implementation can change over time thus validity (trustworthiness) is supported by the evidence gathered through the survey questionnaire. Kothari (2004) states that reliability testing is not as valuable as validity testing, but it is easier to gauge reliability in contrast to validity. If the quality of reliability is present in an instrument, then while using it we can be confident that the transient and situational factors are not interfering.

#### Validity of Research Instrument

Saunders et al. (2009) describes 4 methods for validity testing as follows:

- Content validity which is the measurability of the questions in the questionnaire to adequately provide analysis of the fact-finding interrogations.
- Internal validity which is the ability of the questionnaire to accurately measure what the researcher sets out to measure.
- The ability of the interrogations to accurately measure the predictions of the study, which is Criterion-related validity.
- The ability of the research instrument to rate the existence of the constructs that the questions are meant to measure, which is Construct validity

##### 3.5.3.1 Pre-testing of the questionnaire

The questionnaire was subjected to pre-testing using 20 MBA students Pre-testing was aimed at identifying any gaps and modifying the questionnaire appropriately before the main survey was done. After pre-testing changes were made, the questionnaire was pilot tested among a representative sample of 20 Business enterprises at a business forum platform and modified accordingly to ensure that the researcher and the respondents had the same question interpretation. These 20 participants were not part of the main study but possessed similar demographic profiles to target population.

##### 3.5.3 Administration of the Questionnaire

Questionnaires are an efficient way of collecting data. Questionnaires can be self-administered, emailed and mailed to respondents” (Sekaran & Bougie 2011).

Initially QuestionPro Online Survey Software was used to administer the survey, to collect the data. The QuestionPro online survey link was sent via electronic mail to 250 SME manufacturers. The survey link was active and available from 1<sup>st</sup> of September to 31<sup>st</sup> of September 2015. During the period that the survey link was available, the response rate was too low.

However, it was decided to use a self-administered questionnaire. This method was chosen as the second best option as it comes with many advantages: the researcher can collect all the completed responses within a short period of time. Any questions that are not clear to the respondents can be clarified on the spot. This method is also less expensive and consumes less time.

The data collection took place between the 5<sup>th</sup> of October and the 30<sup>th</sup> of October. Only one respondent (in management position) was targeted in the participating enterprises. A letter of consent for confidentiality was also attached to the questionnaire. The purpose of the study was explained before administration of questionnaire in order for respondents to be better informed. Participation in the study was completely voluntary. All survey responses were captured and stored anonymously. This was achieved through excluding questions that could personally identify participants.

However, to reach a target of 218 recommended sample size it was difficult due to several problems that were encountered which include: some of the respondents refused to participate, difficulties locating some physical addresses and distance and costs of the location of the business among others

### 3.6. Analysis of the Data

According to Leedy et al, (2014), "all research requires logical reasoning." Drawing meaning, gaining an understanding and developing empirical knowledge through a process of interpreting and or examining data is called data analysis (Corbin and Strauss, 2007). Predictive analytics software called Statistical Package for Social Science (SPSS) was used in the data analysis. The process took the form of an electronic spreadsheet. According to Leedy et al (2014) "the beauty of using electronic spreadsheets is that once you enter data into them, the software can quickly and easily help you organize the data and make simple calculations." According to IBM (2014) the advantage of using SPSS as an

analytical software is that it is a powerful and robust, fast and efficient data handling and analysing product which processes large data sets. In this study, meaningful numerical data and patterns were found and used as the primary data which constituted the base of study and which seek to achieve the study's objectives and answer its research questions. The quantitative data was converted to qualitative meaning so as to answer the study's research objectives and questions.

### 3.7. Ethical considerations

According to Leedy et al, (2014:106), "most ethical issues in research fall into four categories: protection from harm, voluntary and informed participation, right to privacy and honesty with professional colleagues." An ethical clearance form was filled and submitted to the University of KwaZulu-Natal, Westville campus Research Ethics Board for an ethical clearance letter acknowledging the student, the study and giving the student a green light approval to carry on with data collection. A gatekeepers letter was obtained from the Durban Chamber of Commerce and Industry which is a body that represents the Small Medium Manufacturing Enterprises in Durban. The Durban Chamber of Commerce and Industry Directory 2014/2015 to the researcher.

A university, college or research institution should have an internal review board (IRB) that is according to Leedy et al, (2014:110), "scrutinizes all proposals for conducting human research under the auspices of the institution." Creswell (2009:91) is of the view that, "researchers need to protect the research participants, gain their trust, promote the integrity of the research; guard against misconduct and impropriety that might reflect on their organization or institution; and cope with new challenging problems." In this study, all participants were made aware that they were not forced to reply to the survey questionnaire distributed to them participation was voluntary, there was no monetary gain by participating in the study and the name of the company was not required when taking part in the survey. Such guaranteed anonymity and confidentiality of the SMEs that took part in the study.

This study was conducted without pre-judgemental or bias towards the collection of the data and how it was analysed. The researcher was objective and fair in conducting this study.

### 3.8 Summary

In this chapter, the researcher discussed methods utilized for this research and how the data was obtained for analysis. This study entailed a quantitative approach by means of a survey questionnaire. The researcher used a random sampling method to choose the participants and the responses were tabulated for analysis purposes. The data was analysed using SPSS. The next chapter discusses the findings of this study.

## CHAPTER FOUR

### PRESENTATION OF RESULTS

#### 4.1 Introduction

This chapter analyses the research data in relation to the study's aims and objectives. It begins by presenting basic demographic data of the participants, their present work environment, as well as the background information of their respective companies. Thereafter, the data are presented in themes that are guided by the 3 objectives that the research strove to address. These objectives include assessing the level of awareness of Lean practices within the small and medium manufacturing sector, assessing the challenges encountered during the implementation of Lean practices and the potential benefits of implementing Lean practices. Each of these themes is supported by research questions which aim to both address the study's objectives and to give more substance to them. The chapter concludes with a summary of the discussed data.

This section sought to get a more understanding of the study participants. This included their biographical and company-related information. This section begins by determining the gender distribution of the respondents, their ages, the positions that they held in their respective companies and the duration for which they have been holding these positions.

#### 4.2 Response rate

Response rate is rated based on the questionnaires that have been completed in relation to those that were distributed. According to (Denscombe, 2010) "it is important to note that the number in the original sample which can be used in the research may vary from the number of responses ultimately obtained from the respondents".

In total 218 questionnaires were distributed to SME manufacturers. Out of 113 questionnaires received, only 95 were complete and usable. The response rate was 43%.

### 4.3 Biographical data of participants

This section summarises the biographical characteristics of the study participants. This section classifies participants into sub groups that can be identified into age and gender. This allows for data to be interpreted.

#### 4.3.1 Age and gender distribution

- Gender

To get an understanding of the gender distribution of the study participants, each was asked to indicate their genders. The majority of the 95 study participants were male. More specifically, 58% of them were male and the remaining 42% female.

- Age

To get an understanding of the age distribution of study participants, each was asked to indicate their age range. This served as an indication of which age range was more active (and perhaps had more active involvement) within their enterprises. The frequency distributions of participant ages, arranged by age categories, are reflected in Figure 4.1.

Figure 4.1 illustrates the age distribution of the study participants. One participant did not complete this section however a total of 94 participants indicated which group their ages fell under. The majority of respondents fell within the 26 – 40 year age category. This represented almost 60% of the participants.

The second highest age group to have representation in the study were participants between the ages of 18 and 25 years. They represented slightly less than 27% of the participants. Taken jointly, this showed that of the 94 study participants that completed this question, slightly more than 86% were 40 years or younger. Six participants each fell within the 41 to 50 and 51 to 60 year age ranges. Only one study participant was over 60 years of age.

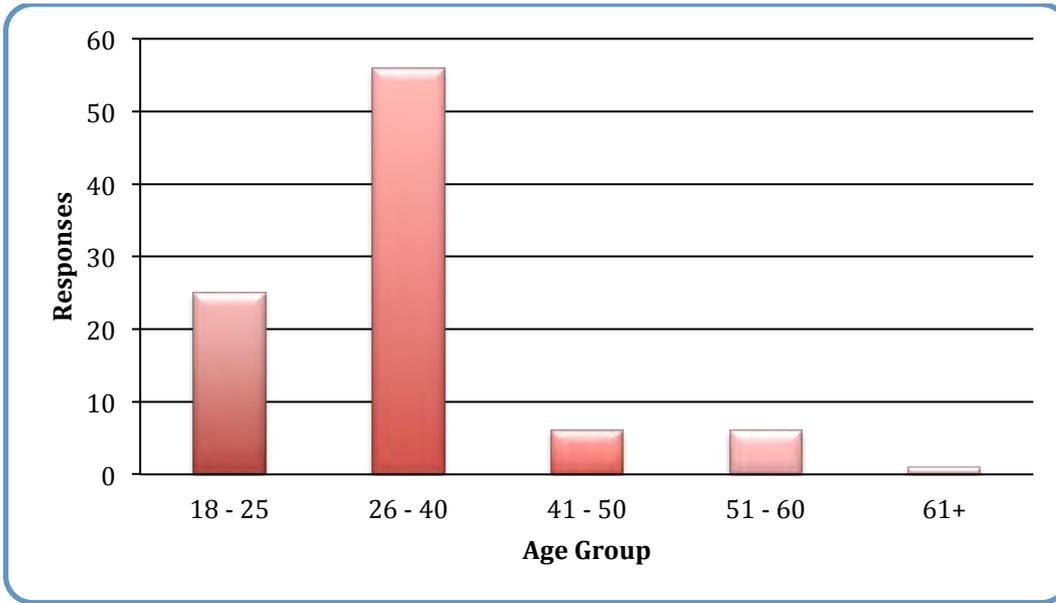


Figure 4.1: Age distribution

#### 4.3.2 Employment position held

This section assessed the management levels of the participants. It also investigated the gender profiles at each management level. The results are presented in Figure 4.2.

A total of 87 of the 95 participants indicated the positions that they held in their respective companies. As shown in Figure 4.2, the vast majority of participants held senior management positions in their respective companies. Senior managers outnumbered both middle and junior management by more than 6 times, with senior management representing 62% of respondents and both middle and junior management comprising 9% each. Seven participants indicated that they did not hold any management positions.

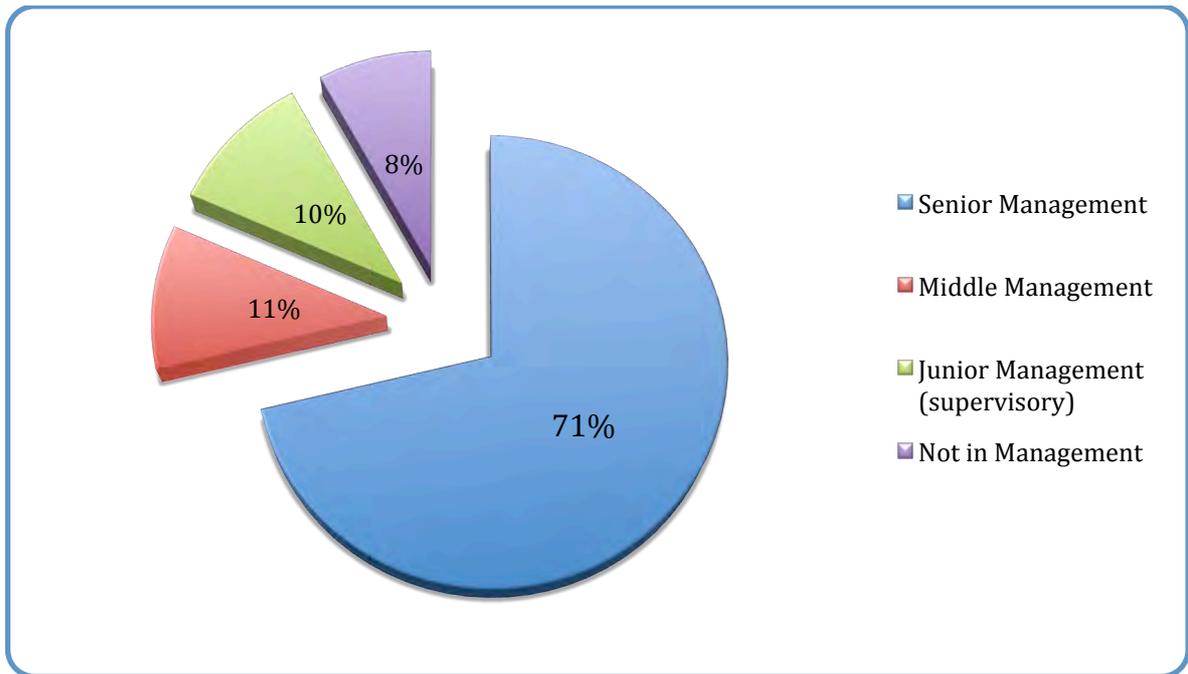


Figure 4.2: Management position held in company

To investigate gender dominance in the various management positions, a cross-tabulation analysis was performed. The findings of this analysis are tabulated in Table 4.1, the majority of senior management positions were held by males. Males outnumbered females by a ratio of 1.7:1 in such positions. This indicated that for every senior management position held by female participants, there were roughly 2 males holding similar management positions. Females also held only one third of the middle management positions.

Table 4.1: Cross-tabulation of position held with gender

Position held	Gender			%	Total (N)
	Male (N)	%	Female (N)		
Senior Management	39	63	23	37	62
Middle Management	6	67	3	33	9
Junior Management (supervisory)	4	44	5	56	9
Not in Management	5	71	2	29	7
<b>Total</b>	<b>54</b>	<b>62</b>	<b>33</b>	<b>38</b>	<b>87</b>

It is only in junior management positions where it is seen that female participants were slightly more than males. If inferences were to be made of these findings, it would seem to demonstrate that females are yet to be empowered to a stage where equal gender representation existed within companies.

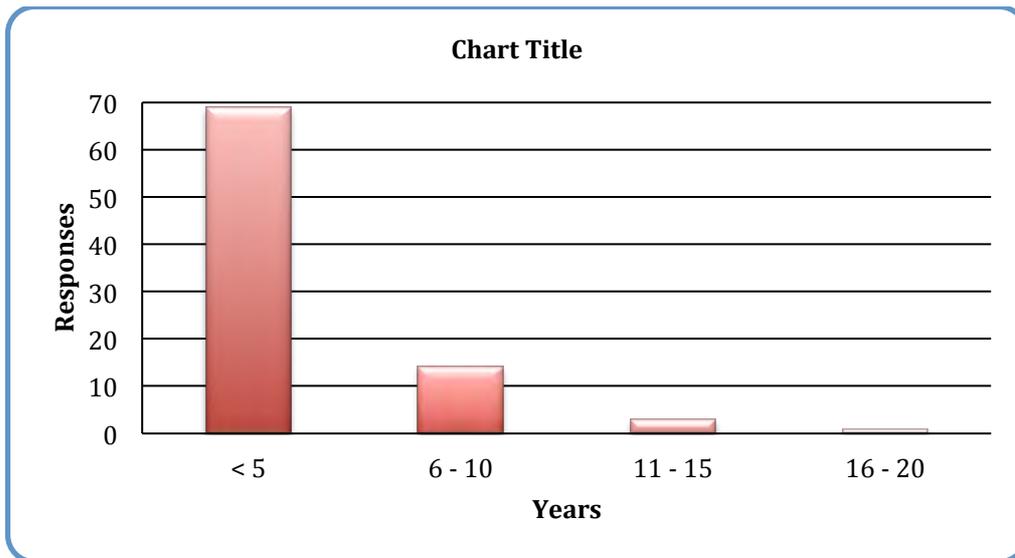


Figure 4.3: Years in current position

Figure 4.3 illustrates that the majority of respondents had less than 5 years of experience in their present positions at their companies. This group represented 79.3% of the 87 participants that indicated the number of years that they had held their present positions for. Fourteen (16.1%) of the respondents indicated that they had held their current for about 6 to 10 years, three for 11 to 15 years, and only 1 participant had been in the same position in their company for a minimum of 16 years.

#### 4.4 Company background

This section focused on obtaining greater insight of represented companies. This included company registration status, how long companies had been operating, the number of employees, business activities and annual company revenues. Each of these will be discussed in the paragraphs that follow.

#### 4.4.1 Total Number of Employees

Of the 90 participants that indicated how many employees worked in their enterprises, the majority indicated that they had a maximum of 5 employees. This group represented 67.8% of responses. This was followed by 27.8% indicating that they had 6 to 20 employees in their organisations. Only one enterprise had more than 200 employees, while 3 had from 21 to 200 employees.

Based on the National Small Business Act of 1996 (the Act), small businesses in the manufacturing sector can be divided into 4 categories based on the number of employees within that “business”. These are micro enterprises (having less than 5 employees), very small enterprises (6 to 19 employees), small enterprises (20 to 50 employees) and medium enterprises (51 to 199 employees).

Based purely on size, it can be reasonably deduced that approximately 95% of the represented enterprises were either micro- or very small enterprises (i.e. had less than 20 employees).

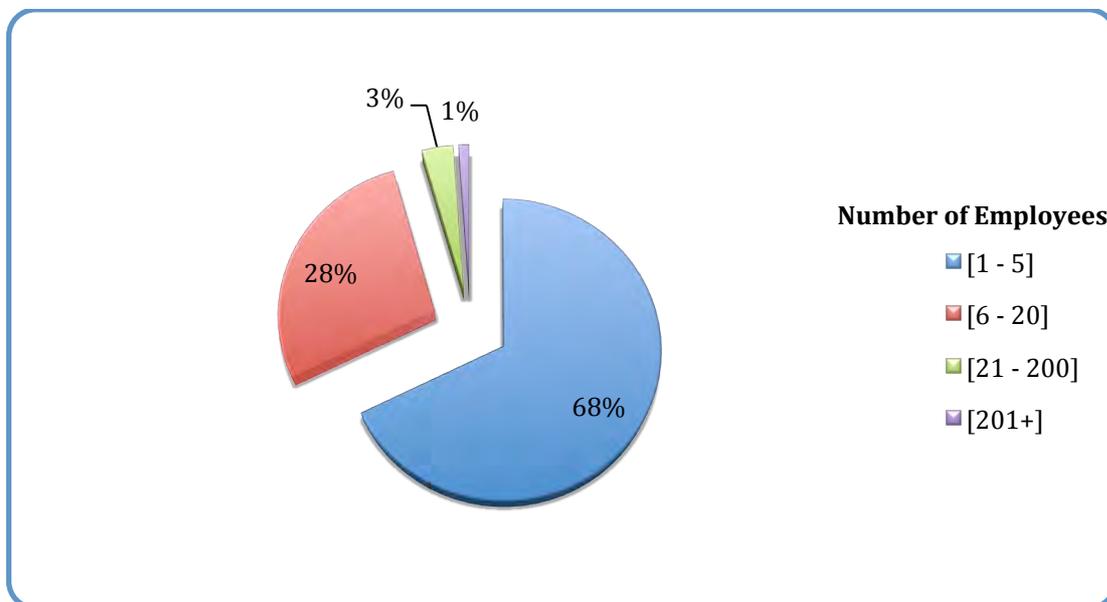


Figure 4.4: Number of employees in the organisation

Only 3 enterprises would be considered to be small to medium enterprises as per the Act, with one enterprise being sufficiently large enough to be considered a large enterprise (i.e. in excess of 200 employees)

#### 4.4.2 Company registration Status

Figure 4.3 shows that the majority of the represented enterprises were privately owned with limited proprietorship. These privately owned companies represented 55% of the sample pool. 26% of the enterprises in this study were closed corporations, 10% sole proprietorships and 9% were partnerships.

As illustrated in Figure 4.3, the majority of represented companies were still very young, having at most 5 years of operating experience. These companies represented 68.5% of the 89 participants that indicated the operational experience of their respective companies. This is perhaps an encouraging finding because it possibly indicates that the “entrepreneurial machinery” of South Africa is working (in terms of young businesses being created).

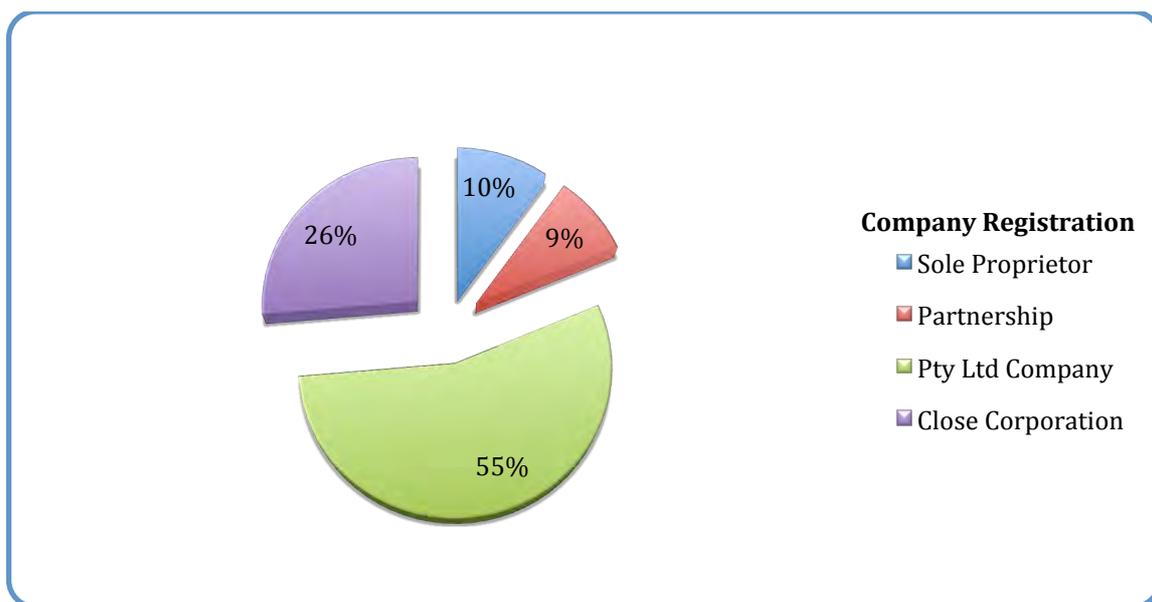


Figure 4.5: Company registration status

#### 4.4.3 Number of years in operation

On the downside, it might also be an indication that not many small businesses enjoy operating beyond 5 years. The above figure shows that only 31.5% of participating companies survived beyond the 5 year milestone.

If Figure 4.3 were the golden standard, it would indicate that less than a third of start-ups or young companies survived the 5 year milestone to enjoy operating up to 10 years.

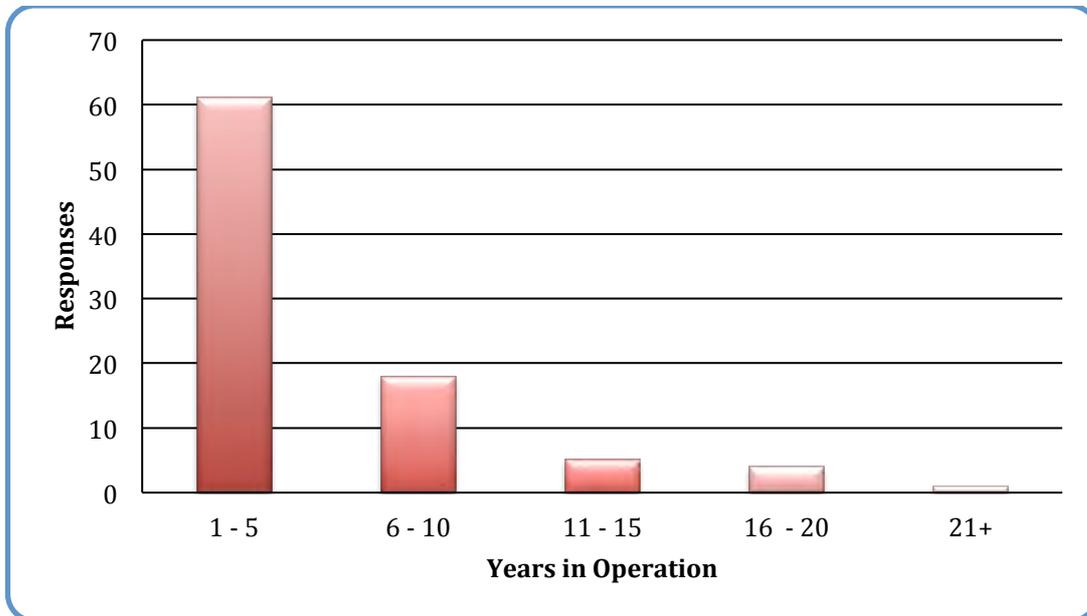


Figure 4.6: Number of years company registered

However, since the study involved only a cross section of the SMEs, as opposed to it being longitudinal, it is only possible to generalise and infer based on the present study sample. Finally, only one company proved to have survived the many challenges of staying in business, having operated for more than 20 years.

#### 4.4.4 Business activity

In assessing the types of operational activities that the various companies were involved in, participants were asked to select all the activities that applied to their respective companies from 4 proposed activities. Their responses are presented in Figure 4.7. The responses, however, are based on the frequencies of activities selected. As illustrated in Figure 4.7, Rubber and Plastic Products constituted nearly 50% of the activities that were selected. This was followed by Food, Beverages and Tobacco (25%), Metal Products and Machinery (23%) and Wood and Paper Products (4%).

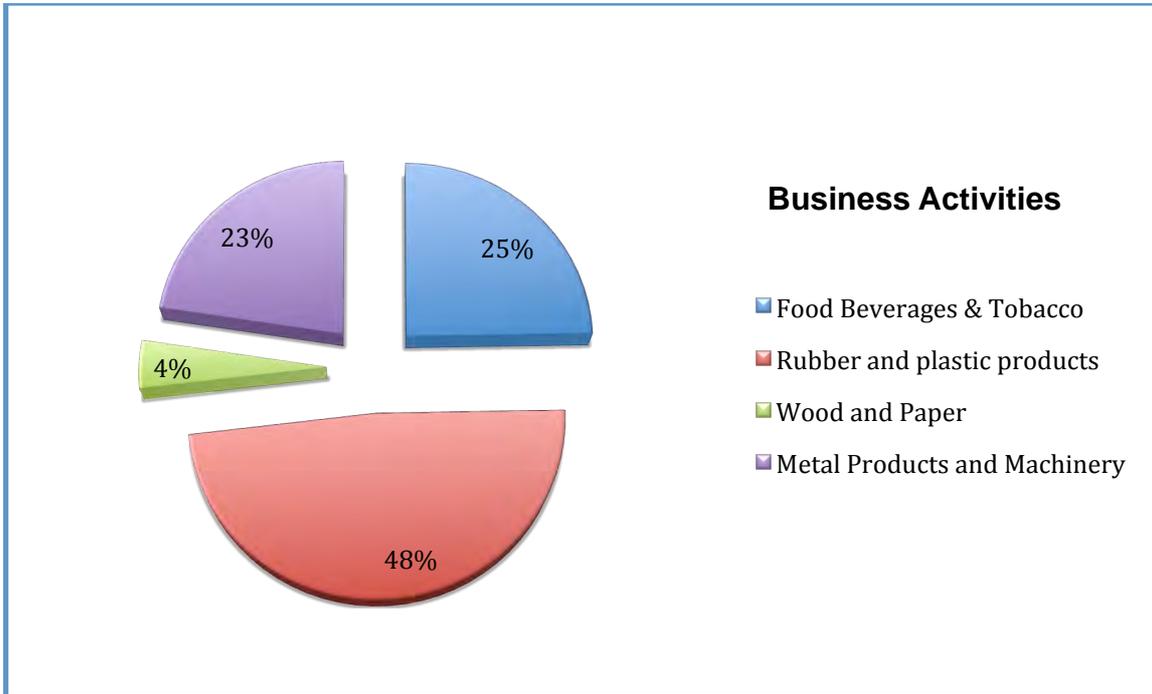


Figure 4.7: Business activities

#### 4.4.5 Annual company revenue

Of the 95 participants, sixteen did not give any indication of their companies' annual revenue. As depicted in Figure 4.8, the majority (77%) of the represented 79 companies earned less than R 200 000 in annual revenues. Twelve companies earned in the excess of R200 000 but less than R5 million. Four of the remaining 6 companies earned between R5.1 million and R13 million. One company earned between R13.1 million and R 51 million, with the remaining company earning in excess of R51.1 million in annual revenues.

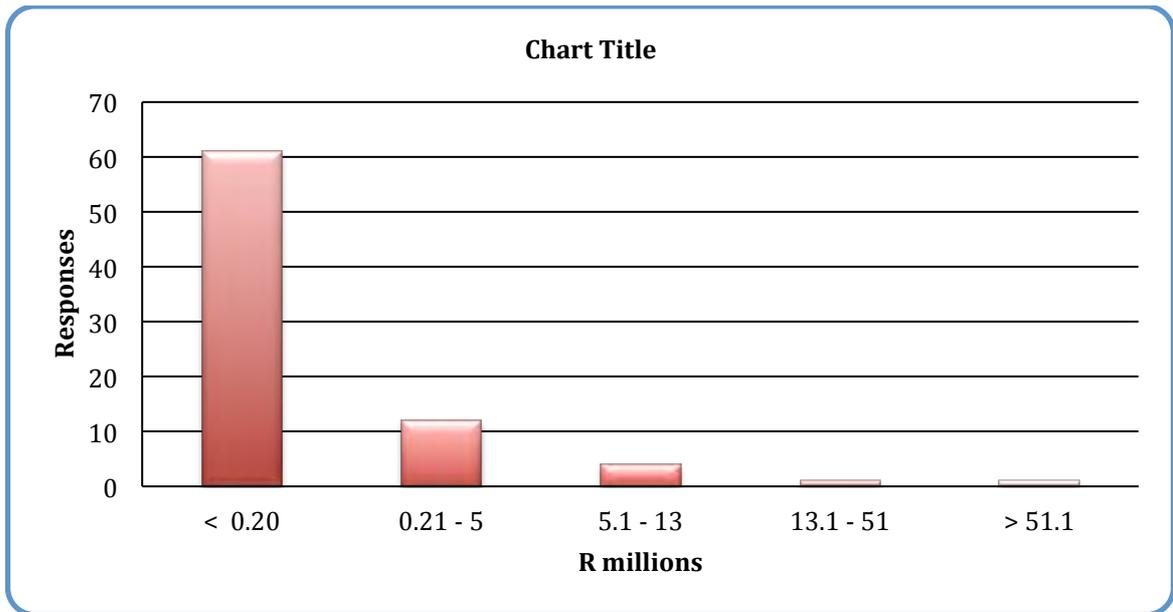


Figure 4.8: Annual company revenue

#### 4.5 Objective 1: To assess the level of awareness of Lean practices within the small and medium manufacturing sector

Respondents indicated what lean management practices were in use or were planned to be utilised by their respective companies. Study participants also indicated what strategies they thought could best be used to implement Lean management strategies as well as their level of satisfaction with the implemented strategies.

##### 4.5.1 Understanding of Lean Management

Figure 4.9 illustrates the level of participants' understanding of Lean management. Participants were initially asked whether they understood the concept of lean management. Thereafter, a brief explanation of the concept was presented to them after which they were asked for the second time whether they understood the concept a bit better.

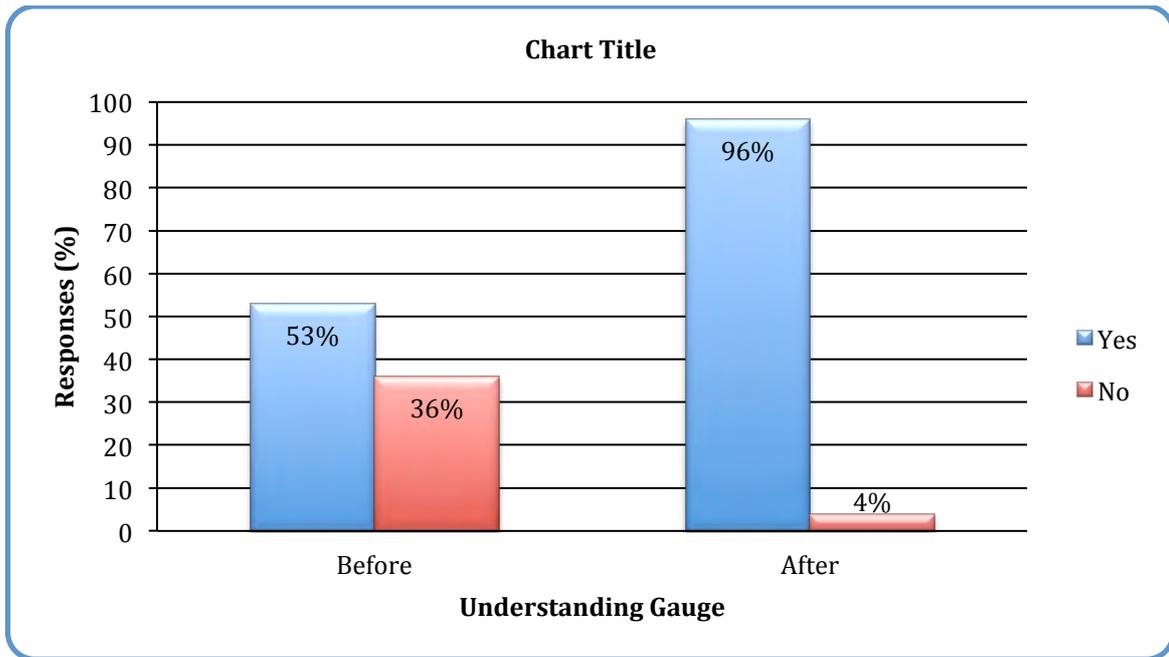


Figure 4.9: Before and after understanding of the Lean management concept

Figure 4.9 presents the “before” and “after” responses to the concept of Lean management. Initially a little over 53% of the participants understood the concept. After question 10 of the questionnaire a bit of background about the Lean concept, is provide which increased the percentage of those who are aware of the concept to 96%. This increase perhaps indicates that some participants were aware of Lean management in practice, but were unaware of the concept, which only became clearer once a brief description was given in question 10 of the questionnaire. Only 4% of the participants did not grasp the concept even after the brief description.

#### 4.5.2 Awareness of the Lean practice in their companies

Respondents were then asked whether they were aware of Lean practices being implemented in their companies. This question was responded to by 80 of the 95 participants. As can be seen in Figure 4.10, 80% of the respondents indicated that they were aware of lean practices being used in their respective companies.

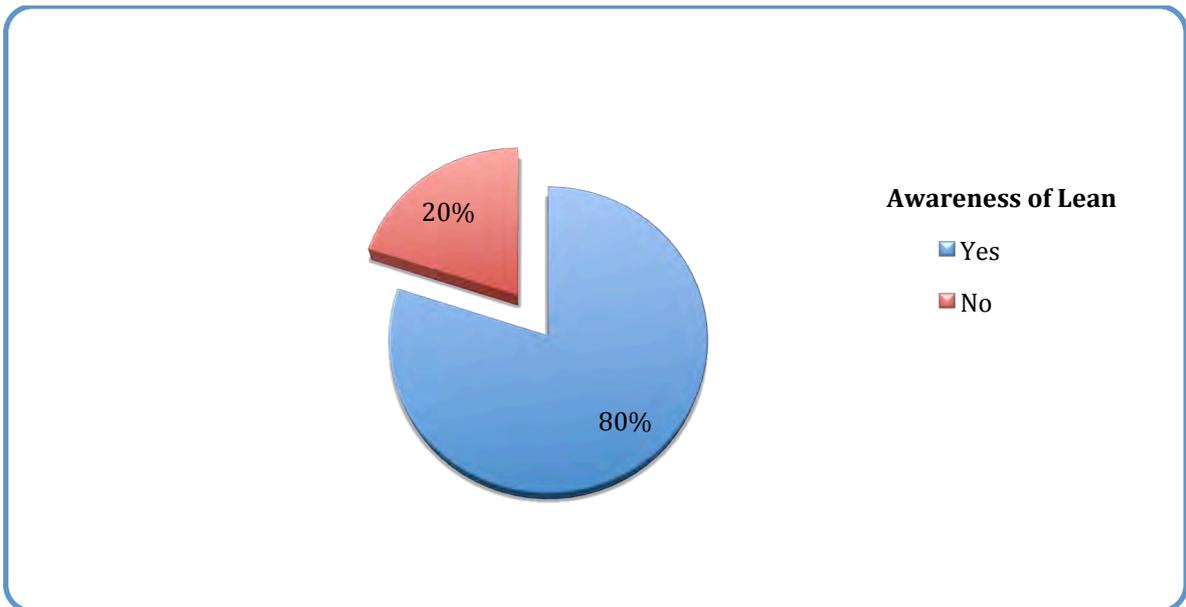


Figure 4.10: Awareness of Lean Practice in your company

#### 4.5.3 Which of the following have you implemented?

Respondents were then given a list of 27 programmes and / or management activities or operations from which to select the practices that were either currently in use in their companies or were planned to be used in the near future. They were also given the option to indicate whether these were not planned to be used by their companies in the foreseeable future.

Based on their responses, companies most often used vision and mission statements to guide strategy and operations. This is evidenced by 83% of the respondents indicating that these were in use in their respective companies for each programme. "Training management and executives", "Training shop floor employees and Admin staff", "Standard Work" and "Genchigenbutsu" followed with 72%, 67%, 65% and 65% of responses received selecting these respectively. In total, 15 of the 27 proposed programs were in use at least 52% of the time in the represented companies. These ranged from "vision statement" through to "Shop floor employee skills Matrix" (see Appendix 2).

With respect to programmes that were yet to be implemented within a year's time, "value stream mapping" was the most often selected programme. Thirty % of respondents identified this programme as the one that their institutions planned to

implement within the space of a year. “Takt Time”, “Single minute exchange of die (SMED)”, “5-why-analysis”, “One-Piece-flow” and “Shop floor employee skills Matrix” were among the more frequently selected programmes planned to be implemented in a year’s time.

The “Pull System”, “Root cause analysis”, “5-why-analysis”, “Kanban System” and “Supermarket replenishment system” were the most frequent programmes planned to be used in the next 3 years, with 18%, 15%, 14%, 12% and 12% of participants indicating this respectively.

The least likely programme to be implemented was the “5S method”. This is evidenced by 36.9% of the responses received indicating this. This method was closely followed by the “Kanban System” (35.3%), the “Supermarket replenishment system” (34.9%), “Single minute exchange of die” (33.3%) and the “A3 report” (30.1%) programmes.

#### 4.5.4 Methods to successfully implement Lean practices

Study participants were asked to select as many methods as they thought could be used by their respective organisations to successfully implement Lean practices. Figure 4.11 illustrates the relevant frequencies that successful implementation practices were selected.

As visualised in Figure 4.11, training was identified as the best method for implementing lean practices. This is evidenced by this particular method being selected 44% of the time relative to the other methods. Communication was the second most frequent method identified; after being selected 23% of the time. This method was followed by management commitment (19%), change management (8%) and union-management relationship (6%).

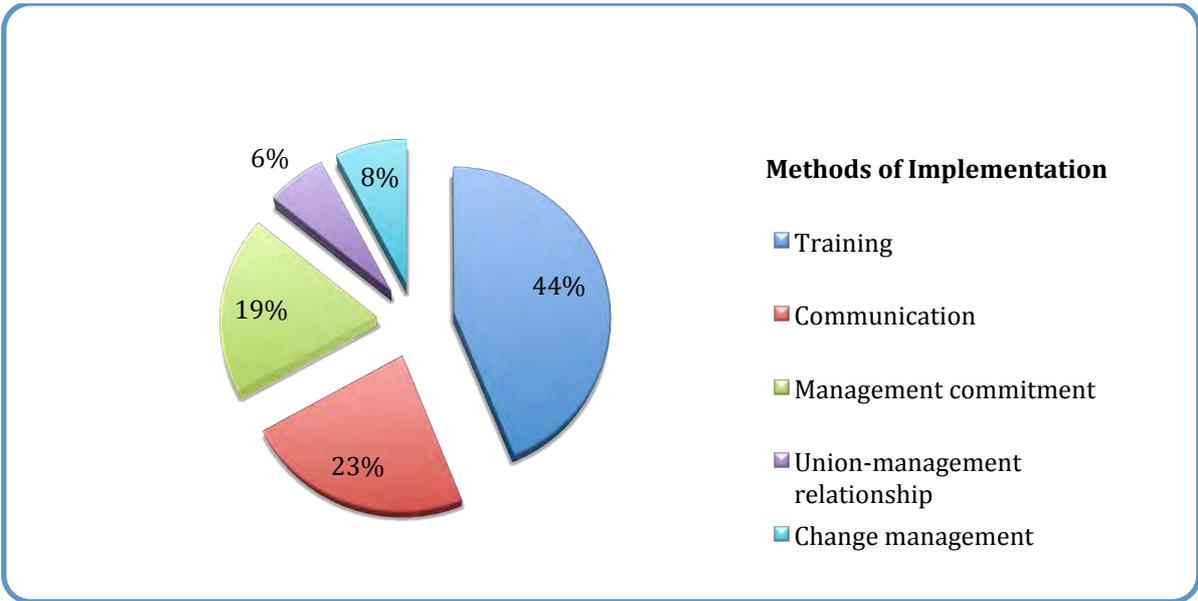


Figure 4.11: Methods for successful implementation of Lean practices

4.5.5 If Lean elements have been implemented, did the improvements meet your expectations?

In response to whether implemented lean practices had met the participants' expectations, 51% of the 83 participants that responded agreed that they did (see Figure 4.12). An additional 19% strongly agreed that implemented Lean practices met their expectations. Of the remaining responses, 6 (7%) strongly disagreed and 2 (2%) disagreed with their perceived expectations of Lean practices that were executed in their companies. The remaining 17 (21%) participants opted to remain neutral in this regard.

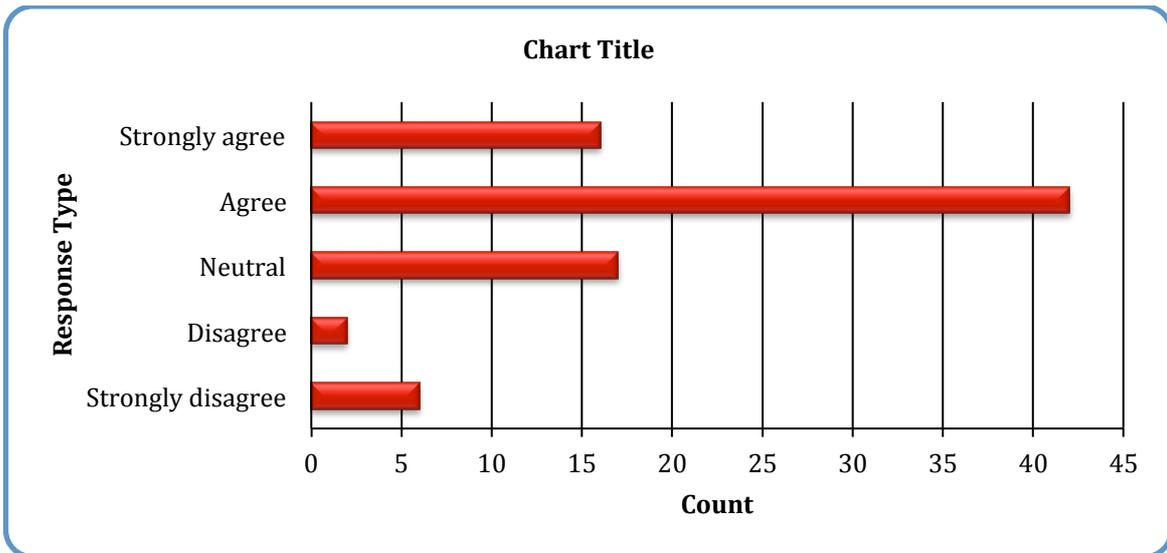


Figure 4.12: Satisfaction with implemented Lean practices

#### 4.5.6 Please indicate reasons why certain improvements did not meet expectations

Study participants were also asked to indicate possible reasons why certain lean management measures did not give desired outcomes. Their responses are illustrated in Figure 4.13.

As seen in figure 4.13, the most frequently selected cause for the failure of Lean practices was attributed to employees not being trained enough. This is consistent with section 4.5.4, in which training was cited as the most important measure to ensure successful lean practice implementation. Respondents also felt that internal or organisational communication was very important for lean practices to be successful. This is evidenced by the lack of internal communication receiving the second highest rating (i.e. 25%) for the reasons why lean improvements were unsuccessful.

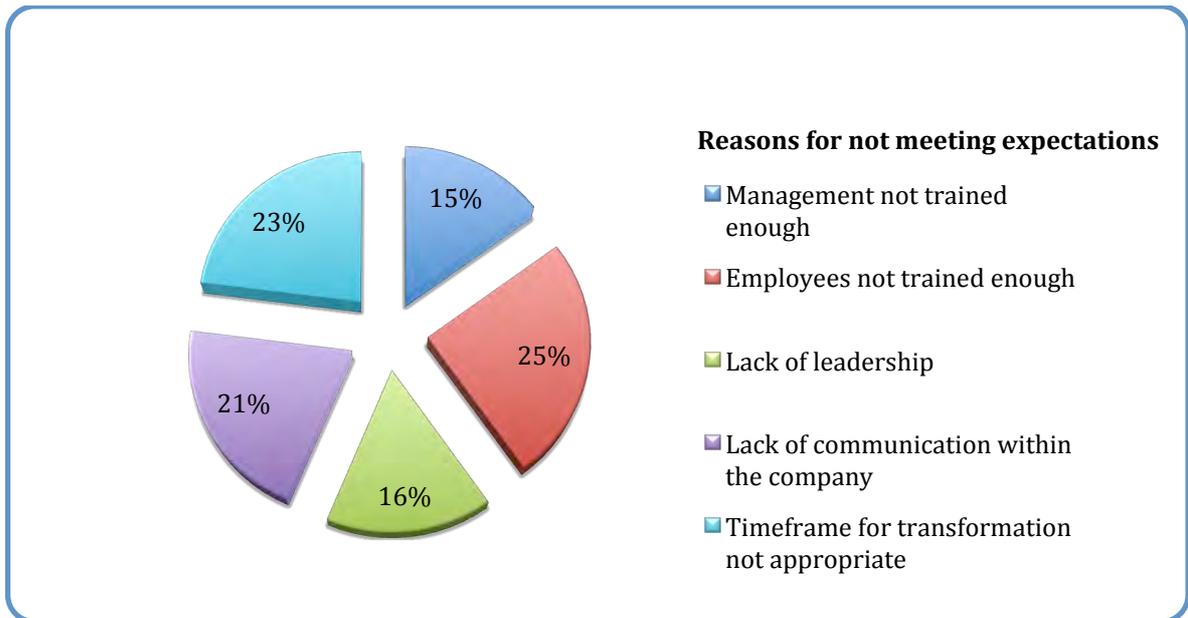


Figure 4.13: Reasons why certain improvements did not meet expectations

The time within which to implement improvements was the third most frequently selected reason for why Lean practices failed within participants' organisations. This could either be caused by top management having unrealistic expectations or because of employees' resistance to change. Management not being trained enough was also considered to play a role in the failure of Lean practices. However, this reason was the least chosen option. It is foreseeable that the reason why management and leadership received the least frequent criticisms is because 92% of the participants held management positions (see section 4.3.2). Consequently, respondents were less likely to state that they were the cause of poor improvement implementation.

#### 4.6 Objective 2: To assess the challenges encountered when implementing Lean practices

Respondents were initially asked to indicate the challenges they faced with Lean management. Thereafter, they were asked to indicate whether they felt that proposed solutions would help to reduce implementation challenges.

#### 4.6.1 Which of the following Lean management challenges do you face in your business?

To assess the challenges that respondents faced with Lean management, participants were asked to select as many reasons as applied from 4 common or known challenges. They were also given the option to indicate whether the proposed challenges were inapplicable to their organisational environment. Their responses are illustrated in Figure 4.14.

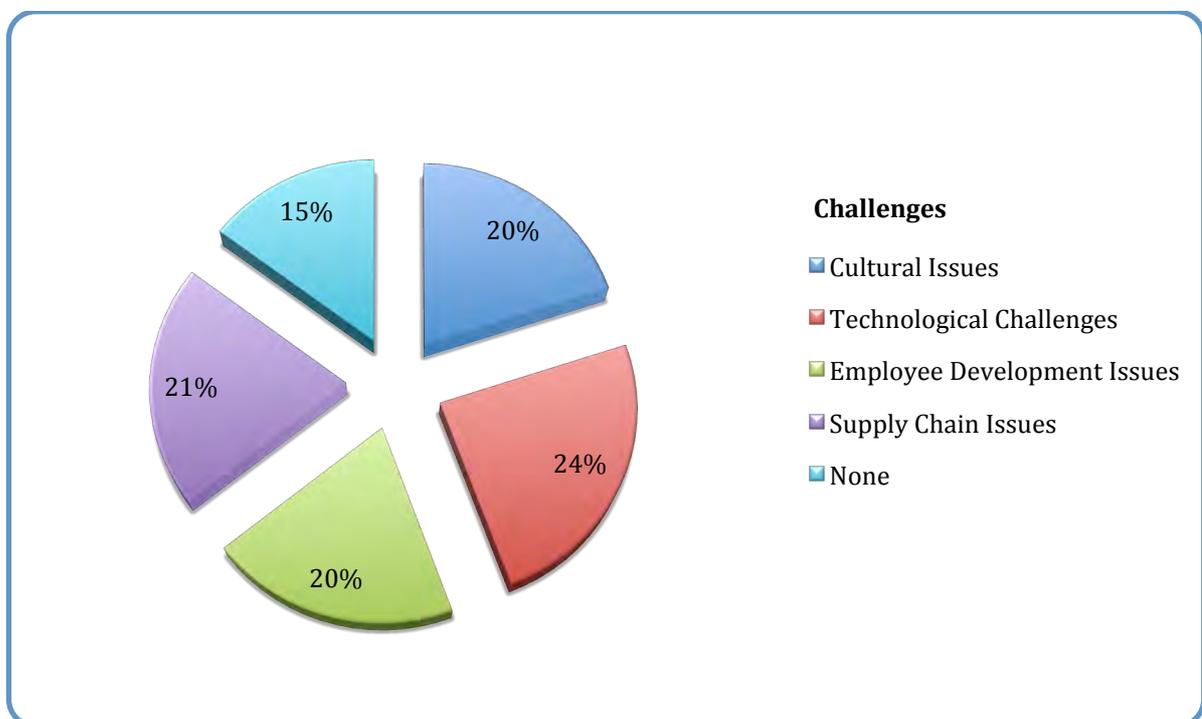


Figure 4.14: Lean management challenges faced in the workplace

As can be seen in Figure 4.14, technological challenges ranked the highest among the challenges faced with Lean management in the represented companies. Supply chain, cultural issues and employee development were weighed more or less the same in terms of the challenges that they posed. Only 15% of the time did participants indicate that their companies did not experience any of the common or listed obstacles. This could be interpreted to mean that their companies did not

experience any hiccups with Lean management or alternatively, the challenges that they faced with it were not presented as options in the current survey.

4.6.2 Thorough training and support decreases the implementation challenges  
Respondents were then asked whether they felt that meticulous training and support would help to reduce Lean implementation challenges. The views of 83 of the 95 participants are illustrated in Figure 4.15.

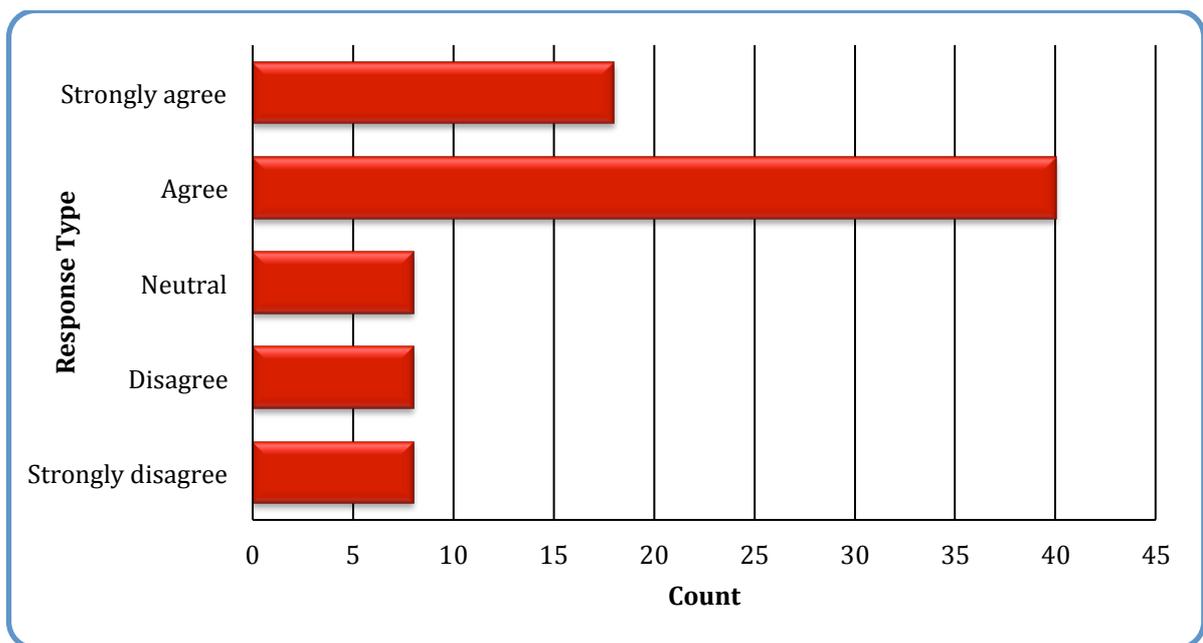


Figure 4.15: Responses to whether training and support would reduce implementation challenges

As depicted by Figure 4.15, a little less than 50% of the respondents agreed that training and support would be instrumental in reducing the challenges that they faced with the implementation of Lean practices. A further 22% felt strongly that this would be a solution to reducing implementation challenges. Taken jointly, this made over 70% of respondents who were favourable towards support and thorough training. Once again, this highlighted the value that respondents placed behind thorough training when implementing Lean practices. Almost 20% of respondents either disagreed (9.8%) or strongly disagreed (9.8%) to this statement. The remaining 9.8% of the respondents remained neutral on the matter.

#### 4.6.3 Do you have a need for external support in order to improve your company's performance?

This section assessed whether participants felt confident in their companies' abilities to improve performance internally without outsourcing. The responses from the 84 participants are summarised in Figure 4.16.

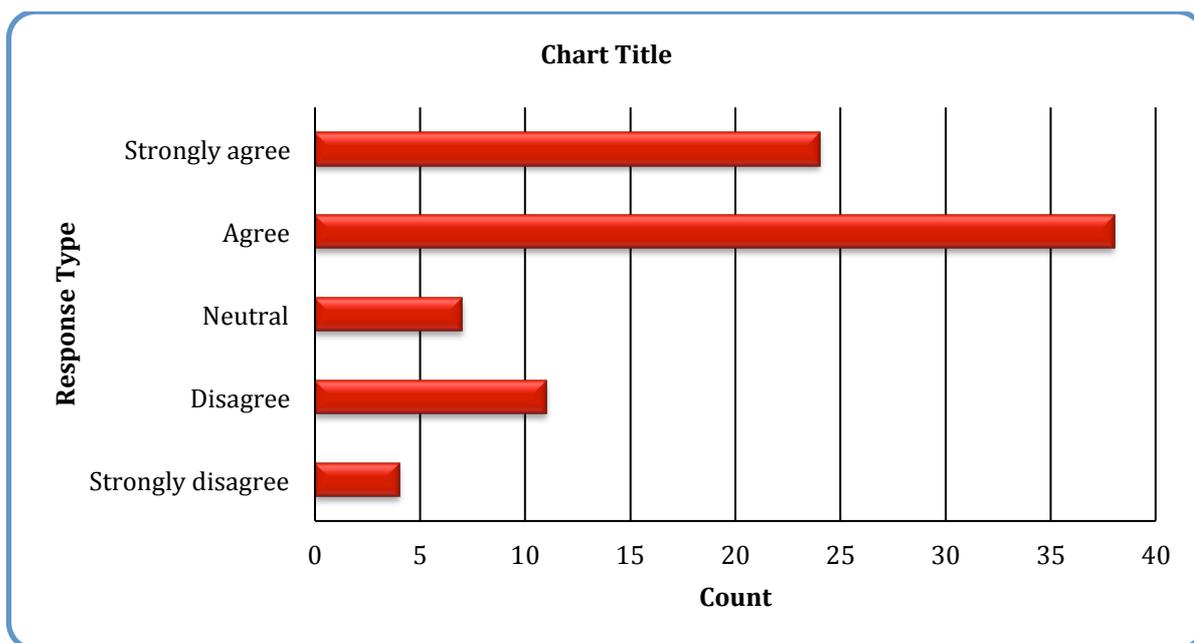


Figure 4.16: External support to improve performance

As seen in Figure 4.16, almost 74% of the respondents felt that their companies needed to outsource help from seasoned professionals to improve performance. This is evidenced by 45% of the respondents agreeing and 29% of them strongly agreeing to this question. Only 15 (18%) respondents felt confident that their companies did not need outside help to improve performance. These either disagreed (13%) or strongly disagreed (5%) with this question. The remaining 7 (8.3%) respondents chose to remain neutral.

#### 4.7 Objective 3: The potential benefits gained from implementation of Lean practices

This section aimed to ascertain whether the participants felt that Lean management practices were beneficial to their respective organisations and to

extract from them the aspects that they thought were beneficial. The section concludes by evaluating if their organisations received external help in implementing their Lean practices.

#### 4.7.1 Lean Management Practice is beneficial to our business environment?

To evaluate participants' opinions on the usefulness of Lean management practices in their environment, they were asked to rate their degree of agreement or disagreement to the statement "Lean Management Practice is beneficial to our business environment". 82 participants responded to this statement. Their responses are shown in Figure 4.17.

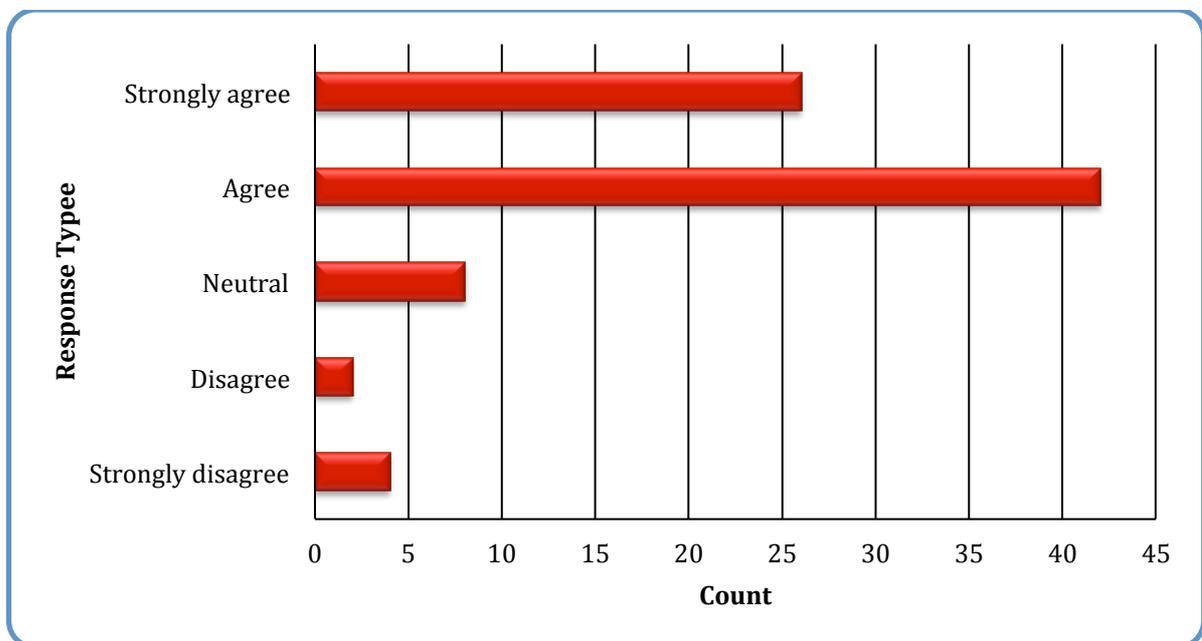


Figure 4.17: Responses to whether lean management practices were beneficial

As seen in Figure 4.17, the majority of participants either agreed (51%) or strongly agreed (32%) to this statement. Their combined responses indicate that 83% of them felt that Lean management practices were beneficial to their organisations. 7%, however, felt that Lean management had no relevance to their working environment. This is evidenced by 2% disagreeing and 5% strongly disagreeing to this statement. The remaining 10% of participants neither agreed nor disagreed with this statement.

#### 4.7.2 Which of the following benefits do you achieve when implementing Lean management?

Participants were then asked to select as many items from 8 possible benefits that could be derived from the successful implementation and use of Lean management practices. The frequencies of benefits selected are shown in Figure 4.18.

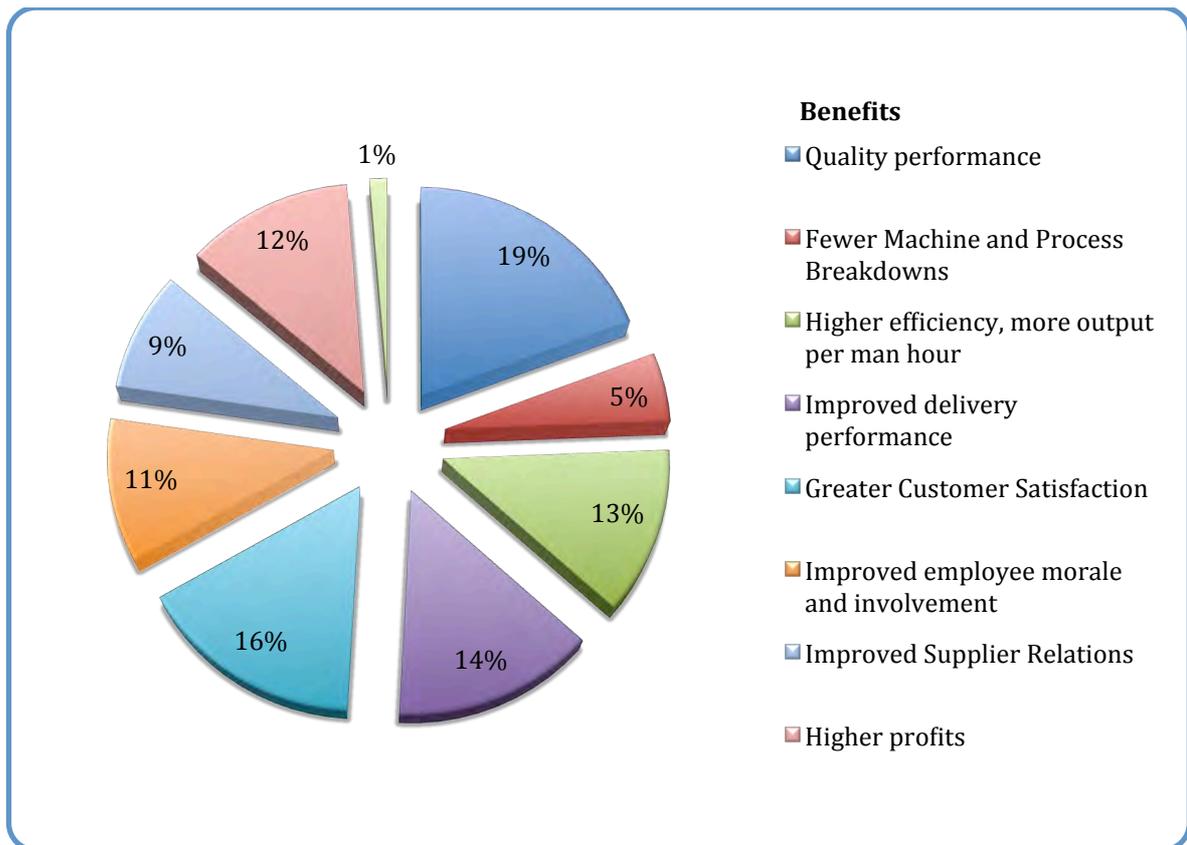


Figure 4.18: Benefits derived from implementing lean management practices

Quality performance ranked the highest benefit that could be derived from the successful implementation and use of Lean management practices. Figure 4.18 also shows that participants felt that greater customer satisfaction was also an important benefit that could come from Lean management practices. Improved delivery performance (14%), higher efficiency (13%), higher profits (12%) and improved employee morale and involvement (11%) ranked 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> respectively in terms of derived benefits. Fewer machine and process breakdowns ranked the least popular benefit of the 8 benefits that were proposed.

#### 4.7.3 Did your organization get support from an external party?

When asked whether their companies had received external help to implement their lean management systems, a fairly even divide existed between companies that did and those that did not.

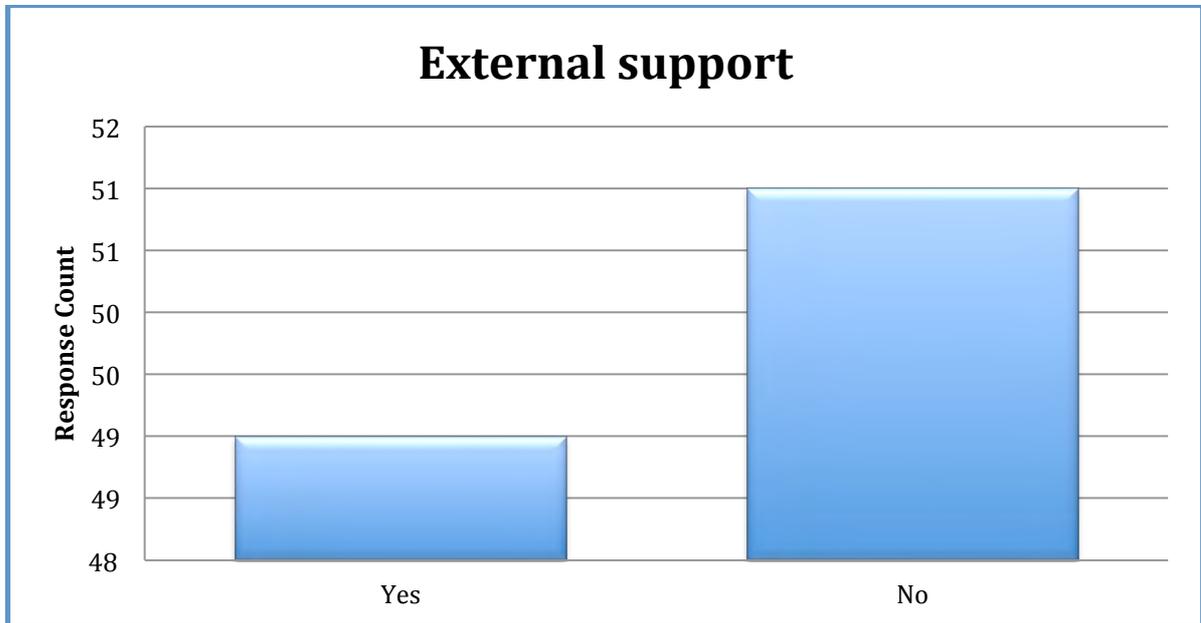


Figure 4.19: Company received external help

As illustrated in Figure 4.19, the difference was only 2% in favour of companies who implemented Lean management practices on their own. With such a marginal difference between the two, no meaningful conclusion can be drawn from this finding.

#### 4.8 Summary

A total of 95 participants took part in this study. The majority were males with most of them falling within the 26 to 40 age group. Most participants held senior management positions in their companies, which they held for 5 years or less. The majority of the represented companies were propriety limited companies and on average, had less than 6 employees. In addition, the majority of participating companies were still young companies with no more than 5 years of experience and annual revenues less than R 200 000. Trading was the most frequent business activity that the companies did.

Participants were very familiar with the concept of lean management, to which 80% indicated were in use in their respective companies. Vision and mission statements served as the main source of strategy guiding represented companies. Participants were most frequently aware of “Training management and executives”, “Training shop floor employees and Admin staff”, “Standard Work” and “Genchigenbutsu” lean practices being implemented in their organisations. Training and communication were credited as 2 of the most important methods for implementing lean practices. 70% of the participants felt that Lean practices in their organisations were effective and met their personal levels of satisfaction. Employees not being given enough training and the short timeframe for implementing lean practices were cited as two of the most important reasons why Lean implementation failed.

In addition to this, participants indicated that technological challenges were the greatest hindrance to implementing Lean management practices. Supply chain issues, cultural issues and employee development issues weighed within the same range as contributory challenges to the failure of successful Lean practice implementation in the workplace. Thorough training and support was thought to be an important instrument with which to reduce challenges. In addition, the majority of respondents also felt that outsourcing professional assistance to help implement Lean practices would also contribute towards reducing implementation challenges.

Over 80% of the respondents felt that lean practices were of benefit to their organisations. The most frequently raised benefits of Lean management were quality performance and greater customer satisfaction. In implementing Lean practices, almost half of the represented companies had solicited outside help to do so.

## CHAPTER 5

### DISCUSSION OF THE FINDINGS

#### 5.1 Introduction

A detailed statistical analysis of the questionnaire results was presented in the preceding chapter (Chapter 4). Simple descriptive statistical methods were used to analyse the data.

In this chapter the analytical results obtained in the previous chapter are used to develop an understanding of whether the objectives of the study were met or not and also provide a perspective of how consistent the results are with the theory and findings from other studies as covered in chapter 2 of the research study.

The objectives of the study will be revisited before the research results are discussed to establish the extent to which the objectives were met.

An explanation will also be provided of how the questionnaire was constructed in line with the objectives of the study and how the questionnaire results relate to both study objectives and theory.

A chapter summary will conclude the chapter by outlining key aspects as discussed in this chapter.

#### 5.2. Aims and objectives of the study

The aim of this study was to assess the level of awareness and implementation of lean practices in the small and medium manufacturing businesses, as well as to assess the challenges encountered during the implementation of lean practices.

The objectives of this study are:

- To assess the level of awareness of Lean practices within the small and medium manufacturing sector
- To assess the challenges encountered during the implementation of lean practices

- To evaluate the potential benefits of the implementation of lean practices

The results of the research are intended to benefit SME's that intend to implement Lean practices. Similarly, SME manufacturers that are experiencing difficulties in successfully implementing Lean practices could refresh their approach as guided by the findings of this research.

The questionnaire was therefore specifically designed to provide information aimed at establishing facts in line with the four research objectives as outlined above and the results of which are discussed below.

### 5.3 Demographics of respondents

The demographic section (Section A) was addressed in the questionnaire by questions 1 up to 9. Question 3 and question 9 ensured that the respondents fall part of the target group being SME's. The demographic profile of the respondents was made up of 58% males and 42% females.

The employment category (level of employment) of respondents targeted had more direct bearing or impact on the research study due to that the business owners of SME manufacturers were also the managers of their own business. Whilst the purpose of the study was aimed at assessing the level of awareness and implementation Lean it is important to note that the majority of respondents (i.e. 71% of the respondents) were senior managers.

It is therefore prudent to maintain a perspective that the 71% of questionnaire results are a reflection of perception by senior management in the sample whom are the decision makers in the business.

### 5.4. Lean practices awareness

Lean practice awareness was addressed in the questionnaire by questions 10 up to 12 (Section B). In question 10 respondents did not grasp the terminology of Lean practices however a brief description was provided thereafter and the researcher realized an increase in statistics once the terminology was briefly explained. The statistic grew from 53% to 96% of those that understood the concept after it was explained and fell from 36% to 4% of those that still did not

grasp or understand the concept. However the majority of respondents are aware of Lean practices in their organization. According to a study conducted by Fricke (2010) very few SME's who are aware of lean have implemented.

#### 5.5. Lean practices implementation

It was important to establish the understanding of the respondents with regard to the specific Lean tools that have been implemented and training they have received as this would assess implementation in the SME manufacturers in KZN. Lean practice implementation was addressed in the questionnaire by question 12 up to 15 (Section C). It requested respondents to identify Lean tools that have been implemented (question 13) by selecting from the list. Question 14 revealed that majority of respondents regarded training as an important method of implementing lean practices, hence why Hu et al. (2015) research study recommends that the implementation process should start with training and educating employees or managers rather than simply implementing Lean tools. Research study conducted by Dora et al. (2013) also reveals that the success of lean manufacturing practices critically depends on employee participation, proper training and the commitment from top management.

The respondents did show to have a great knowledge of Lean tools that have been implemented and consistent with management information that was provided they confirmed that the following Lean tools have been implemented as follows. It was evident from the responses that vision and mission statement was the most often used tool. This could be explained by the fact that each and every company needs a business plan and in that business plan the vision and mission is outlined. Training programmes, standard work, 5s and skills matrix was mostly selected from the Lean tools list (FELD, 2000), this could explain the awareness of the lean practices. The other programs such as Value Stream Mapping, Takt Time, Single Minute Exchange of Die, 5 why analysis, one piece flow tools are in the pipeline to be implemented. Due to the scope of the SME this could be understood that with growth the enterprise plans on implementing tools that will enhance the growth and competitiveness of the enterprise.

However some tools were not selected by the respondents due to the fact that some employees would have been exposed to Lean tools that are relevant to their

type of work (Simona & Cristina, 2015) e.g. PM would be specifically relevant for employees in the Engineering department whereas 5s is relevant to all personnel including office admin personnel. Hence 5s Lean tool received the highest confirmation of implementation. This should then explain the variation in the level of implementation confirmation for the Lean tools as per the questionnaire.

The overall response on question 5 therefore provides good ground to suggest that the respondents were generally familiar with the Lean tools that have been implemented in their organization.

#### 5.6. Challenges of Lean practice implementation

The challenges of Lean practice implementation section (Section D) was addressed in the questionnaire by questions 16 up to 18. These questions ensured that the challenges faced by SME's are identified. "The literature promotes the view that many of the traditional barriers preventing the adoption of lean are still prevalent" (Bhasin, 2012). However full benefits cannot be realised with low levels of implementation.

This section revealed that training of employees was the highest cause of failure of Lean practice implementation. In the previous questions the respondents revealed that they were not aware of the Lean terminology until it was briefly described to them and they regarded training as an important method of implementing lean and now in this section it is revealed that employees lacked training in lean practices which has led to failed Lean practice implementation which has also been evident in Mwacharo (2013) study. However this could be explained by the high costs of training since the pool of capital available to SME's is limited and this is confirmed by research conducted by Sharma et al. (2015) where he states that most of small scale manufacturers have failed to capitalize on the available technologies largely due to financial constraints and lack of trust among supply chain partners.

#### 5.7. Lean Benefits

The benefits of Lean implementation section (Section E) was addressed in the questionnaire by questions 19 up to 22. These questions gauged the level of

satisfaction and benefits to implementing Lean practices. The majority (51%) of respondents agreed and 32% strongly agreed that Lean implementation is beneficial to the SME. The most selected benefit was quality and performance at 19%, followed by the other benefits which ranged from 16% for customer satisfaction, 14% for improved delivery and performance, 13% for higher efficiency and 12% for higher profits.

#### 5.8. Summary

The objectives of the study were revisited and the statistical results of the data were in line with the study objectives.

It was established that respondents had a basic understanding of the Lean tools that have been implemented in the organization. Respondents felt they have not receive enough training on Lean practices. Overall, respondents believed that the implementation of this program in their organisation did add value to their organization however greater benefits could be achieved through training..

An interesting observation of the study was that awareness and training had a relationship that was regarded as an important aspect for a successful Lean implementation.

It is the purpose of the next chapter to discuss and provide context of the findings made in this chapter with regards implications of the findings and to provide recommendations for future studies.

## CHAPTER 6

### RECOMMENDATIONS AND CONCLUSIONS

#### 6.1 Introduction

This chapter contains a summary of the study's findings. Conclusions are drawn from the findings in alignment with the research's aims and objectives. In addition, study benefits, limitations and recommendations are also presented.

#### 6.2 Summary and conclusions

The purpose of this study was to assess the level of awareness and implementation of lean practices in small and medium manufacturers registered with the Durban Chamber of Commerce in KZN. The study therefore, had as its objectives to assess the level of awareness of lean practices within the small and medium manufacturing sector; to assess the challenges encountered when implementing lean practices; and to gauge the benefits that could be derived from the implementation of lean practices.

It emerged from the research that the vast majority of the study participants were not familiar with the terminology of Lean management but they were familiar with the Lean practice. Companies' vision and mission statements were the main strategy guiding tools employed by the represented companies. Participants were most frequently aware of the lean practices of "Training management and executives", "Training shop floor employees and Admin staff", "Standard Work" and "Genchigenbutsu" lean practices being implemented in their organisations. Training and communication were credited as two of the most important methods for implementing lean practices. In addition, the majority of the study participants also felt that lean practices in their organisations were effective and met their personal levels of satisfaction.

However, inadequate training and the short timeframe for implementing lean practices were cited as two of the most important reasons why lean

implementation failed. Technological challenges were seen as the greatest hindrance to implementing lean management practices. Supply chain issues, cultural issues and employee development issues were also considered as contributory challenges to the failure of successful lean practice implementation in the workplace. Thorough training and support were thought to be an important instrument with which to reduce implementation challenges. In addition, the majority of respondents were of the view that outsourcing professional assistance to help implement lean practices would contribute positively towards reducing implementation challenges.

An overwhelming majority of respondents felt that lean practices were of benefit to their organisations. The most frequently raised benefits of lean management were quality performance and greater customer satisfaction. In implementing lean practices, almost half of the represented companies had solicited outside help to do so.

Therefore, the study found that the level of awareness of lean practices within the small and medium manufacturing sector was very high; it identified the challenges experienced with implementing lean practices within this sector. It was also found that the use of lean management practices was considered highly beneficial by the majority.

### 6.3 Implications of this research

Compared to external factors affecting SME enterprises, very little is known about the internal factors that affect the success or failure of SMEs in South Africa. Even less is known about the management practices that contribute towards the performance of these enterprises. This study therefore bridges the gap in the knowledge pool on lean management practices in small and medium companies within the manufacturing sector. The study found that lean practices were being employed within the SME manufacturers, *albeit*, not optimally. The reasons for the lack of efficient implementation and utilisation of these practices were also identified. Based on these findings, small and medium manufacturing concerns

can work on strategies to limit these challenges and improve their performance, thereby increasing their contribution towards the South African economy.

the findings of this study could also be of benefit to alleviating the South African unemployment burden as resources will be used optimally. This translates to less wastage, increased profitability and expansion of operations and subsequently, necessitating the need to recruit additional employees.

The study is could also be of benefit to employees within the SMEs in the manufacturing sector. This is particularly so in the strong employee training theme that emerged from the study. Training employees thoroughly will not only benefit the bottom line of the SMEs, but will equip and empower employees with skills and knowledge to improve their performance. This will make them more productive and it is envisioned that they will take ownership and pride in and / or with their contributions.

#### 6.4 Recommendations

The study set out to identify the challenges faced during the implementation of lean practices within SMEs in the manufacturing sector. It found that lean management implementation was a challenge across the several SMEs within the sector. This highlighted the need to investigate strategies that would result in the successful implementation of lean practices. Based on the findings from the study, the following recommendations are proposed:

- a. It is important to first assess whether lean management practices are needed within an organisation. The question to ask is “whether operations are complex- and / or large enough to warrant lean management practice implementation”
- b. SME’s need to invest in technology that ploughs back returns on their investments as it is clear that some parts of lean practices require high technology in order to keep up with the trends in business and remain current and efficient.

- c. SMEs need to research the lean management practices that would best suit their operations. This is essential because using inappropriate strategies will not have desired outcomes. It is also a relatively costly affair to implement such strategies, often requiring that resources be diverted in support of these practices. Intangible costs may also amount, especially in getting employee buy-in and in boosting employee morale.
- d. It is advised that employees be included in the selection of lean practice(s) to be employed within the organisation. This will enhance employee buy-in as employees will be partners in the implementation of the selected method.
- e. A clear unequivocal strategy needs to be communicated to employees to avoid any confusion as to what is expected of them. This can be achieved through the use of various communication channels. These channels, it is advised, should also contain the human aspect and not merely be an electronic instruction or hardcopy distribution to employees. These latter methods can be employed later.
- f. Management needs to be thoroughly trained on the lean practice(s) to be employed. It is also vital that all employees be appropriately trained to ensure that the entire organisation works in unison towards common goals.
- g. Companies should review the progress of implemented programmes timeously. Appropriate revisions and adjustments should be made to customise lean practices to companies' operations and goals.
- h. More often, the expertise to implement lean management practices is lacking within SMEs. Although outsourcing is seen as an excellent solution, affordability, especially among small enterprises, poses a challenge. It is suggested that smaller companies network and be "taken under the wing" of larger organisations that have successfully implemented lean practices. This has the additional benefit of creating partnerships between established and

emerging companies. It will also ensure the survival of younger companies (as they are often the smaller ones).

Therefore, in order to implement lean management practices, it is important that the decision to implement (and which strategy / strategies) be duly deliberated. Once appropriately implemented, the benefits of lean management can be enjoyed by all stakeholders, including customers.

### 6.5 Limitations and areas of further study

In carrying out this study, a few challenges were encountered. These limitations, together with strategies to overcome them in future research, will be discussed briefly below. The limitations of this study were:

#### 6.5.1 Access to study sample

Ideally, the researcher would have loved to have had participation from the entire 500 manufacturing SMEs within the Durban Chamber of Commerce (DCC) database. This would have been of benefit to all registered organisations as each would have had representation in the study. Nonetheless, only 95 representatives participated. The researcher experienced challenges in getting participants, mainly due to the following reasons:

- Using the Durban Chamber of Commerce (DCC) database was limiting because this only allowed the researcher to gather the data from only DCC registered businesses
- The methodology used had a small response rate
- The questionnaire that was distributed to respondents was restrictive as it did not cater for those that are non-English speakers

#### 6.5.2 Research Scope

Although the present research sheds light on the internal challenges faced by SMEs within the manufacturing sector, it does so through the lens of lean management practices. In order to get a holistic understanding of the challenges faced by this sector, further research needs to be done on internal factors that hinder the manufacturing sector's national and international

performance. This will provide comprehensive solutions that will strengthen the country's manufacturing base.

To overcome these challenges, it is advised that the DCC be approached in advance to conducting research among its member organisations. Preference would be to do so prior to the regular seminars/imbizo's that take place every quarter. As these meetings are often attended by the majority of member organisations, this would then serve as an ideal opportunity to brief member organisations of the research to be conducted. Given appropriate time and planning, the research could also feature as part of the agenda at such meetings.

#### 6.5.3 Demographic data

Demographic data did not include race which limits statistical correlations between this demographic group and the level of awareness of lean in SME's. The reason why this question was not incorporated in the printed questionnaire was to reduce the number of questions in the questionnaire for better response rate from the respondents. However, this data would have been interesting for assessing the race amongst the SME's and lean practice awareness.

#### 6.6 Summary

The study sought to investigate the level of lean management practices of SMEs within the manufacturing sector in KwaZulu-Natal. It revealed that there was a wide spectrum of lean practices that were employed within these organisations and some of these organisations are unaware that they are actually implementing lean management practices when these practices are identified by their field names. The study also identified the main challenges why lean practices were not successfully implemented and possible solutions to overcoming these challenges. The research findings also offer opportunities for manufacturing SMEs to improve lean practices as the general challenges faced by companies within the sector were presented.

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# Appendix 1: Research Questionnaire Consent

UNIVERSITY OF KWAZULU-NATAL  
GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

Dear Respondent,  
MBA Research Project  
Researcher: Mrs. Sanele Khuluse (072 451 2742)  
Supervisor: Mr Christopher Chikandiwa (031 260 8883)  
Research Office: Ms P Ximba 031-2603587

I am, SANELE MALULEKA-KHULUSE, an MBA student, at the Graduate School of Business and Leadership, of the University of KwaZulu-Natal. You are invited to participate in a research project entitled Survey on Lean Practices in Small and Medium Enterprises in KwaZulu-Natal, a Province of South Africa.

The aim of this study is to

3. To assess the level of awareness of lean practices within the small and medium manufacturing sector
4. To assess the challenges encountered when trying to implement lean practices
5. The potential benefits gained from implementation of lean practices

Through your participation I hope to understand:

- The level of awareness in the small and medium manufacturers in KwaZulu-Natal
- Whether lean practices are currently being implemented in small and medium manufacturing businesses
  - If not, What are the reasons for not implementing and
  - If yes, what are the reasons for implementing
- What are the challenges in implementation?
- What are the potential benefits in implementation?

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this survey/focus group. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN.

If you have any questions or concerns about completing the questionnaire or about participating in this study, you may contact me or my supervisor at the numbers listed above. The survey should take you about 15 minutes to complete. I hope you will take the time to complete this survey.

Sincerely

Investigator's signature \_\_\_\_\_ Date \_\_\_\_\_

**This page is to be retained by participant**

UNIVERSITY OF KWAZULU-NATAL  
GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

MBA Research Project

Researcher: Mrs. SaneleKhuluse (072 451 2742)

Supervisor: Mr Christopher Chikandiwa (031 260 8883)

Research Office: Ms P Ximba 031-2603587

CONSENT

I.....(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

SIGNATURE OF PARTICIPANT

DATE

.....

## Appendix 2: Research Questionnaire

### Section A

1. Gender?

1. Male
2. female

2. What is your age?

1. between 18 - 25
2. 26- 40
3. 41- 50
4. 51 - 60
5. 61 – above

3. Total number of employees?

1. 1 - 5
2. 6 - 20
3. 21 – 200
4. 201 and more

4. what is the status of your company?

1. Sole proprietor
2. Partnership
3. Pty Ltd Company
4. Close Corporation

5. For how many years has your company been registered?

1. 1 – 5 years
2. 6 – 10 years
3. 11 – 15 years

4. 16 - 20 years
5. 21 years or more

6. Which of the following is your company involved in (Select all that apply)?

1. Rubber and Plastic Products
2. Food, Beverages and Tobacco
3. Metal Products and Machinery
4. Wood and Paper Products

7. What is your employment position in the company?

1. Senior Management
2. Middle management
3. Junior Management (supervisory)
4. Not in Management

8. Number of years serving in the current position?

1. under 5 years
2. 6 - 10 years
3. 11 - 15 years
4. 16 - 20 years
5. 21 years or more

9. What category best represents your annual revenue?

1. R0.20 million or less
2. R0.21 million - R5 million
3. R5.1 million - R13 million
4. R13.1 million - R51 million
5. R51.1 million or more

**Section B: Awareness of Lean practices**

10. Do you understand the concept of lean management?

- 1. yes
- 2. no

If No above: the purpose of lean manufacturing is to eliminate waste and enhance the value of products produced thereby increasing the company's competitiveness

11. Now do you understand the concept of lean management?

- 1. yes
- 2. no

12. Are you aware of this lean practice in your company?

- 1. yes
- 2. no

**Section C: Lean Implementation**

13. Based on the following table, which of the following have you implemented (select all that apply)?

	Already in use	Planned to be used in the next 1 year	Planned to be used in the next 3 years	Not planned to be used
Vision Statement				
Mission Statement				
Value Stream Mapping				

Takt Time				
Pull System				
Supermarket replenishment system				
Just-in-time				
One-Piece-flow				
Kanban System				
Standard Work				
Standardised work sheet				
Leveling Production and schedules (heijunka)				
Single minute exchange of die (SMED)				
Error proofing (Poka Yoke)				
Visual Management				
Notification System for quality and process problems (Andon)				
Training shop floor employees and Admin staff				
Training management and Executives				
Shop floor employee cross –training				
Shop floor employee skills Matrix				
Continuous improvement (Kaizen) Events				
Root cause analysis (Fish bone)				

diagram)				
5-why-analysis				
Plan-do-check-act (PDCA)-Cycle				
A3-report				
5S method				
Go to where the problem is and see (Genchigenbutsu)				

14. In your view, based the following, which method could be used to successfully implement lean practices (Select all that apply)?

1. Training
2. Communication
3. Management commitment
4. Union-management relationship
5. Change management

15. If lean elements have been implemented, did the improvements meet your expectations?

1. Strongly disagree
2. disagree
3. Neither agree nor disagree
4. agree
5. Strongly agree

#### **Section D: Challenges in implementation**

16. Which of the following lean management challenges do you face in your business (Select all that apply)?

1. Cultural Issues
2. Technological Challenges
3. Employee Development Issues
4. supply chain issues
5. None

17. Please indicate reasons why certain improvements did not meet expectations (Select all that apply)?

1. Management not trained enough
2. Employees not trained enough
3. Lack of leadership
4. Lack of communication within the company
5. Timeframe for transformation not appropriate

18. Thorough training and support decreases the implementation challenges?

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

19. Do you have a need for external support in order to improve your company's performance?

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

## **Section E: Benefits of Lean implementation**

20. Lean Management Practice is beneficial to our business environment?

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

21. Which of the following benefits do you achieve when implementing lean management Practice (Select all that apply)?

1. Quality performance, fewer defects and rework (in house and at customer)
2. Fewer Machine and Process Breakdowns
3. Higher efficiency, more output per man hour
4. Improved delivery performance
5. Greater Customer Satisfaction
6. Improved employee morale and involvement
7. Improved Supplier Relations
8. Higher profits
9. None

22. Did your organization get support from an external party?

1. yes
2. no

## Appendix 3: Ethical Clearance



11 May 2015

Mrs Sanele Khuluse (200300566)  
Graduate School of Business & Leadership  
Westville Campus

Dear Mrs Khuluse,

Protocol reference number: HSS/0433/015M

Project title: Survey on Lean Practices in Small and Medium Enterprises in KwaZulu-Natal, a Province of South Africa

### Full Approval – Expedited Application

With regards to your application received on 30 April 2015. The documents submitted have been accepted by the Humanities & Social Sciences Research Ethics Committee and **FULL APPROVAL** for the protocol has been granted.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Dr Shenuka Singh (Chair)

/ms

Cc Supervisor: Mr Christopher Chikandiwa  
Cc Academic Leader Research: Dr M Hoque  
Cc School Administrator: Ms Zarina Bullyraj

Humanities & Social Sciences Research Ethics Committee

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## Appendix 4: Turnitin Report

The screenshot displays the Turnitin Document Viewer interface. The main document content is titled "CHAPTER ONE" and "OVERVIEW OF THE STUDY". It includes two sections: "1.1 Introduction" and "1.2 Background and motivation of the study". The text in the introduction discusses lean practices in Small and Medium Manufacturing Enterprises in KwaZulu-Natal (KZN), South Africa, and mentions a literature overview and research methodology. The background section discusses challenges for SME manufacturers and references a study by the Banking Association South Africa (2015).

On the right side, the "Match Overview" panel shows a total of 1 match. The matches are listed as follows:

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