NELSON MANDELA UNIVERSITY

THE EFFECTIVENESS OF LEAN PRINCIPLES IN SOUTH AFRICAN MANUFACTURING COMPANIES

BY

DAVERIL LIONEL ERASMUS

SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER IN BUSINESS ADMINISTRATION

IN THE

FACULTY OF BUSINESS AND ECONOMIC SCIENCES

AT THE

NELSON MANDELA UNIVERSITY

JANUARY 2020

SUPERVISOR: DR LOUIS MOSAKE NJOMO

NELSON MANDELA UNIVERSITY

DECLARATION

NAME: Daveril Lionel Erasmus

STUDENT NUMBER: 20203741

QUALIFICATION: Master in Business Administration

TITLE OF PROJECT: THE EFFECTIVENESS OF LEAN PRINCIPLES IN SOUTH AFRICAN MANUFACTURING COMPANIES

In accordance with Rule G5.6.3, I hereby declare that the above-mentioned thesis is my own work and that it has not previously been submitted for assessment to another University or for another qualification.

SIGNATURE

8/10/19

DATE

ACKNOWLEDGEMENTS

The successful completion of this study would not have been possible without the support, advice, assistance and encouragement of the following parties.

I wish to record my sincere thanks and appreciation to the following:

- Our heavenly Father, God; for giving me the ability and strength to commence such a study.
- All my family members, specifically to my parents, Bruce and Gail Erasmus, for your guidance, love, understanding and encouragement.
- Dr.Njomo who provided guidance and encouragement during the course of my research efforts.
- Mrs Gail Klopper for the language editing and www.OneStopSolution.co.za for the technical editing.

TABLE OF CONTENTS

CHAPTER 2

LITERATURE REVIEW

CHAPTER 3

RESEARCH METHODOLOGY

CHAPTER 4

PRESENTATION AND INTERPRETATION OF THE RESULTS

CHAPTER 5

SUMMARY, RECOMMENDATIONS AND CONCLUSION

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

SCOPE OF THE STUDY

1.1 INTRODUCTION

The Lean approach is a widely discussed and applied manufacturing philosophy in a variety of industries across the globe (Gupta & Jain, 2013), with only a few within the manufacturing industry able to truly say they have not heard of Lean (Melton, 2005). Lean is defined as a philosophy that applies specific tools and methods in a consistent, disciplined and systematic manner to eliminate waste and improve operational effectiveness, where the necessary processes are performed in a sequence in order to achieve the desired results.

The effectiveness of Lean has been well established, with organisations from all over the world and from different industries having proved that Lean principles are well founded. However, despite its effectiveness the implementation of Lean manufacturing into an organisation is not an easy task due to various barriers opposing the effective implementation of Lean principles.

The study was carried out in the South African (SA) Tank manufacturing industry. The study aimed at to establish a framework for successful implementation of Lean principles.

The organisation where research took place, Welfit Oddy, is located in Perseverance, Port Elizabeth (PE) in SA. It is a manufacturing company which specializes in the design, manufacture and sale of tank containers and bulk liquid shipping containers and transport containers used to transport and deliver various goods such as milk, gas, chemicals, oil, petrol and liquid chemicals to customers and end users. The organisation has served this global industry for more than 25 years and is considered by many to be one of the biggest and best manufacturers of intermodal ISO tank containers in the world. Tank containers, also referred to as ISO tanks, intermodal tanks or IMO portable tanks, are designed for intermodal transportation by road, rail, air, and ship (Erera, Morales & Savelsbergh, 2005).

In this study, emphasis will be placed on the issues that need to be addressed for the effective implementation of the Lean Manufacturing philosophy within the organisation.

Chapter 1 provides an introduction and general overview of the study focusing mainly on the research problem. It provides the background, purpose, objectives, research approach and significance of the study.

1.2 BACKGROUND TO THE STUDY

The manufacturing industry operates in a challenging as well as a competitive environment as a result of globalisation. The threat from the far-east as well as the volatility of the rand to major currencies plays an important role in the profitability of a manufacturing firm in South Africa.

The current economic crisis has affected all organisations globally (Hines, Found, Griffiths & Hamson, 2011). In order for the organisations to keep up and make provision for the crisis, many had to take part in mass retrenchments. This reduction in staff has caused staff to be overloaded and bombarded with extra work; resulting in feelings of being overworked and quality fatigue (Gagnon, Jansen & Michael, 2008:430).

The global tank market is poised to grow by 10% a year for the next five years. The cost of stainless steel, the increasing dominance of Chinese manufacturers and the depressed value of the dollar are three of the major factors influencing the future of the tank container industry in South Africa and internationally. While the strong rand to weak dollar holds many advantages for South Africa, it is not good for the tank industry as it has sharply reduced business with dollar-based companies and it is mostly European companies who are buying from South Africans due to the strength of the euro.

The major reasons the South African tank container industry “tanked” were: the introduction of ring-fencing, the subsequent removal of tax shelters and the partial relaxation of exchange controls, all of which served to reduce the attractiveness of the tank container investment scheme for South African investors; and the strength of the

rand against the dollar since 2002, in the face of increasing competition from Chinese manufacturers.

South African organisations, unlike organisations in Japan, are still lagging behind in implementation of Lean thinking; attributable to this is the culture of organisations and the environment within which these organisations operate within. South African organisations are characterised by mass production, job specialisation and hierarchical. Hence South African organisations are still behind when it comes to competing with world class manufacturing in comparison with organisations in Japan and China where Lean has become the culture and a competitive advantage.

China and Japan have increased productivity and reduced costs by implementing Lean tools and techniques in its production system (Moden, 1997). Thus it can be said that Lean can be used as a competitive advantage.

1.3 PROBLEM STATEMENT

Manufacturing companies have found it difficult to identify the root causes as to why

Lean principles have not been implemented successfully. The present study established a model to improve the effectiveness of Lean principles at Welfit Oddy.

1.3.1 Main problem

South African producers constantly face competition from foreign organisations, including China. The adverse effects of this competition stem, in part, from the low levels of productivity which characterize South African industries. The concept of Lean manufacturing offers a proven methodology for increasing the effectiveness and efficiency of production processes.

Before investing in any major project, the potential benefits to costs must be compared, Lean manufacturing being no different. Organisations need to consider whether or not the benefits of Lean will outweigh the costs incurred to implement Lean.

1.3.2 Short and long term benefits

The results will differ from company to company depending on the level of commitment and planning. Listed below are some of the more common benefits companies can expect to see.

Improved quality - Much of the activity in a Lean environment is geared towards improving quality. As quality issues arise, problem solving techniques are used to identify the cause of the problem. From there, mistake proofing is put in place to strengthen the process and prevent recurrence. As a result, the quality of the product will be improved.

Improved Visual Management – Another benefit of Lean manufacturing is management by sight. If done correctly, companies will be able to evaluate an entire area with a visual scan. Any abnormalities will stand out and be easy to identify as a problem.

Increased efficiency – Line balancing ensures that each person in the process is working in the most efficient manner. Standardized work procedures will ensure they are doing it correctly following the same method every time. This leads to repeatability and increased efficiencies.

Manpower reductions – One of the major benefits of Lean is getting more done with less people. With standardized work and increased efficiencies, the ability to do the job with less people becomes a very real possibility. This does not lead to retrenchment; the concept of Lean would have these freed-up people utilized to perform further kaizen activities, for training to enhance skill levels or for the maintenance of the system once it is implemented.

Easier to manage – The work instructions and standardized work let people know what they have to do and when. This makes managing an area much easier although problems will still arise. But these will be much easier to deal with in a team environment where the support groups are eager to help solve problems. http://www.Lean-manufacturing-junction.com/benefits-of-Lean.html

Total Company Involvement – Lean is meant to involve the whole company. It is not intended to be put into action in only one area. It is a management philosophy which should include every part of Welfit Oddy. This helps promote the concept that everyone in the company is part of the team. http://www.Lean-manufacturing-junction.com/benefits-of-Lean.html

Problem Elimination – Lean manufacturing forces an organisation to attack an issue and continue to investigate it until it has been eliminated. Root cause analysis and cross-functional teams are utilized to ensure a problem receives the level of attention it deserves to correct it. http://www.Lean-manufacturing-junction.com/benefits-of-Lean.html)

Reduced Space – As part of the waste reduction process, space will be created. Reduction of finished and raw inventory will save space vertically in your racking as well as horizontally across Welfit Oddy floor. (http://www.Lean-manufacturing-junction.com/benefits-of-Lean.html)

Safer Work Environment – Visual management and 5S translated as "Sort", "Set In order", "Shine", "Standardize" and "Sustain" will help identify when things are out of place. When unnecessary elements are removed from the operation, the workplace becomes much more organized. An organized work environment is a safe work environment.

Improved employee morale – This is a benefit that may not be realized during the initial stages of Lean implementation but once the concept of Lean becomes accepted by the employees the organisation will see employee morale rise. Employee involvement and empowerment will make all members of the organisation feel like a contributing part of the team. The reduction of uncertainty in the workplace as a result of Lean will reduce stress in among team members and lead to improved employee morale.

Given the situation that faces South African manufacturers, Slack et al (2001:612) and Poisat (2006:3) believe that many South African manufacturers restructured and adopted Lean manufacturing techniques in order to improve their manufacturing efficiencies and overall organisational performance through better use of their

organisations' resources. Unfortunately many South African companies are yet to enjoy the benefits of the introduction of Lean principles in their business operations

Many manufacturing industries like Welfit Oddy have found it difficult to identify the root causes as to why Lean principles have not been implemented successfully (Angelis & Fernandes, 2012:76). There are many factors that affect the effectiveness of Lean principles, yet specific emphasis must be placed on other factors affecting the implementation of Lean, which are often overlooked. These are: employee knowledge, understanding and skills, management's involvement, communication, instilling a Lean culture within the organisation and the effect trade unions have within the organisation. These specific factors were selected because of prior communication with colleagues in the organisation as many knew changes were being made, but only a few understood what Lean principles entailed. Therefore, the present study seeks to establish a model for effective application of Lean principles at Welfit Oddy

The primary objective of this study is to improve the effectiveness of Lean principles within a specific tank manufacturing company. More specifically, this study will identify the ineffectiveness of implementing Lean principles by investigating the influence of employee knowledge, understanding and skills, communication, motivation and ownership from management, organisational culture and the impact of trade unions in organisations as mentioned in the problem statement above.

1.4 RESEARCH QUESTIONS

The following research questions were formulated for this study:

i. What are the Lean management challenges faced by Welfit Oddy
ii. What Lean management model is suitable for Welfit Oddy?

This study aims to answer the research questions, by investigating the following objectives:

i. To examine the challenges faced by Welfit Oddy in the implementation of Lean principles
ii. to explore factors that contribute to the challenges faced by Welfit Oddy in the implementation of Lean principles.

iii. To establish a model for successful implementation of Lean principles at Welfit Oddy

1.5 OVERVIEW OF CONCEPTUAL FRAMEWORK

The conceptual framework of the study is to identify the principles that can improve the effectiveness of Lean application in the manufacture industry in South Africa. Views from authors listed in the literature study were summarised and grouped into six main principles. These include:

1.5.1 Employee knowledge, understanding and skills

Every employee in a company contributes to organisational effectiveness (King, 2011:58). A successful strategy requires both the understanding and involvement of employees (Gagnon et al., 2008; Johnston & Michael, 2008:441). Employee knowledge and a global understanding is a prerequisite for effective commitment to organisational goals. The more knowledge an employee has about Lean principles, the better (Franz-Kamissoko, 2011:66).

1.5.2 Management involvement exerts no influence on the effectiveness of Lean principles

Management involvement is important for implementation of Lean principles in any organisation as managers are recognised as the change agents (van Rensburg, 2011b:77). Managers decide what will be done in the organisation and what will not be done (Holtshousen, 2011:65). Continuous support and commitment from top management is of true importance as it has a positive impact on the successful implementation of Lean principles (Jeyaraman & Teo, 2010:200).

Lack of management involvement leads to low levels of collaboration, shared purposes, focus, commitment and general effectiveness (Holtshousen, 2011:64). The cost is huge in terms of time spent correcting wrong perceptions, miscommunications, uncoordinated work and poor application due to low motivation (van Rensburg, 2011a:74).

1.5.3 Communication, motivation and ownership from management

Clear communication is essential for any strategy implementation (van Rensburg, 2011a:74). Different levels of employees require clear descriptions of the benefits, risks, changes and commitment required by the organisation (Nel, 2011:74). Clear, solid and consistent communication can eliminate a lot of the fear, resentment, misunderstandings and blame games that plague many change initiatives within organisations (Nel, 2011:76).

1.5.4 Organisational culture

Adaptability and innovative thinking are essential in a rapidly changing world (van Rensburg, 2011b:76). As suggested by Montiea (2011:30), organisations have to ensure that their processes are streamlined and policies and objectives are constantly re-evaluated in order to be more efficient and cost effective. Instilling a Lean culture is defined as a combination of team work, employees contributing to ideas, quality and improvements (Pieterse et al., 2010:189).

Installing new processes within an organisation requires the right mindset and attitude of all employees at all levels (Jeyaraman & Teo, 2010:195). Non-ergonomic working practices are essential as well, for example research has shown that the use of daylight simulating lighting in office areas greatly improved health, concentration, mood and the well-being of workers (Piercy & Rich, 2009:60).

1.5.5 Trade unions

Certain fundamentals must be included if any Lean programme is to be successful. According to Hines et al., (2011), active leadership and partnerships between management and labour must be part of any Lean initiative. It is essential to convince the labour unions to embrace Lean as management needs to prove that Lean does not stand for "Less Employees Are Needed" (Doolen & Worley, 2006). Many trade unions agree that these Lean change programmes are useful tools and do not mean the end of careers unless there is change in the relationship and culture of the workplace. The responsibility lies with everyone, including the unions, to make Lean work and to transform the organisation. It is only by all working together that this could succeed (Hines et al., 2011).

1.6 OVERVIEW OF RESEARCH METHODOLOGY

The quantitative or positivistic approach was used in this study, as the aim was to statistically test the relationships among the variables investigated in the study. The quantitative investigation of the study was performed using a self-constructed questionnaire based on information from the literature study conducted. This enabled the researcher to obtain information from various participants.The key elements raised by the various authors in the literature study were restructured to formulate the research questions. These questions were then grouped into the main principles and used in the questionnaire to determine the extent to which each of these principles were present. Questionnaires were handed to individuals at different management levels, different departments as well as different shifts within the business unit being studied. As will be discussed in the section below, the management levels include senior management, line supervision and group leaders of the business unit under study.

1.6.1 The Sample

A sample only includes some of the members of a population (Collis & Hussey,

2009). Conclusions of the entire population can be drawn by selecting some of the elements in a population. The sampling method selected for this study is convenience sampling. Convenience sampling refers to the collection of information from members of the population who are conveniently available to provide it.Convenience sampling was used to select a sample of a hundred employees within the specific tank manufacturing firm that employs of 1200 staff members. The sample was stratified to include senior managers, managers, team leaders and lower level employees, as all these occupational categories are involved in the effectiveness of Lean principles. The data collection questionnaires were distributed personally to the focus individual from the above categories.

1.6.2 Data Collection Process

Permission was granted from Welfit Oddy (Annexure C) to conduct the research study. The researcher explained the concept of the study in detail and distributed the questionnaires via e-mail and physical handouts. An explanatory letter was attached

to the front page of the A4 format questionnaires. The letter contained the title, purpose and instructions on how to complete the questionnaire. Assurance of anonymity was given and respondents were informed that their participation was voluntary. Participants were requested to answer the questions accurately and to put the completed questionnaires in a sealed box. Where needed, an explanation was given by the researcher before and during the distribution and filling of the questionnaires. The researcher collected the sealed boxes containing the questionnaires together with the returned email questionnaires and personally captured the data manually on an excel spreadsheet.

1.6.3 The Measuring Instrument

Collis and Hussey (2003:17) explain that data collection within a quantitative study is performed with the intent to measure variables or count occurrences of the specific phenomenon in question. For the purpose of this study, a Five-point Likert scale questionnaire was used as a tool for data collection. This Likert scale has five ratings, consisting of the following descriptive measurements;

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

The questionnaire consisted of questions that were aimed at determining the extent to which the main principles identified have an effect on the sustainability of continuous improvement initiatives in the form of Lean Manufacturing implementation

(Refer Appendix B for the questionnaire).

1.6.4 Reliability and Validity of Results

Questions related to the reliability and validity of research results are inevitable and would be raised by senior management to whom the report will be submitted. It is for this reason that the researcher searched for ways and means that would increase the

reliability and validity of the research findings in order to address questions that might arise.

In order to ensure the reliability and validity of the results, the researcher made use of the data obtained from the questionnaire to attain information that could be analysed and used to formulate the outcome. Questionnaires were handed to each individual personally and the objective of the study was explained by the researcher.

Where requested, further information was given on the background of the study and the reasons for the need to perform the specific research. Furthermore, in order to obtain prompt and un-biased feedback, the researcher requested that the questionnaires be handed back within two days. The various management and line-management levels that participated in this study confirmed that the information provided in the questionnaires were relevant and could be used to constructively formulate conclusions and make recommendations for improvement.

1.7 OUTLINE OF THE STUDY

The study includes the following chapters:

Chapter one: This chapter outlines the scope, problem statement, objectives, hypotheses and methodology of the study.

Chapter two: This chapter will review literature on Lean manufacturing principles and tools and describe the model to analyse the effectiveness of Lean principles.

Chapter three: This chapter outlines the research methodology, which includes the research paradigm, sampling procedure and measuring instruments.

Chapter four: The empirical results. In this chapter the empirical results are presented and interpreted. This includes the reliability and validity assessments of the measuring instruments.

Chapter five: This chapter comprises of the conclusion and recommendations.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Lean manufacturing is defined as “an operational strategy aimed at achieving the shortest possible cycle time by eliminating waste, i.e. producing more goods and services with the least amount of resources” (Badurdeen 2007). The technique is often designed to radically improve profitability, customer satisfaction, throughput time and employee morale (Pieterse et al., 2010:2). Unfortunately, despite its widely acknowledged importance and applicability in most South African industries, Lean manufacturing has been unsuccessful in the manufacturing industry. In this study, the researcher attempts to understand the factors that contribute to inefficiency in Lean manufacturing in the South African industry. This chapter reviews literature in the area of study. The chapter is structured as follows: in section A, the researcher has examined the concept and nature of Lean manufacturing; in section B, Lean Building Blocks and /Strategies will be discussed; in section C, the impact of effective Lean Implementation will be broadly discussed; while section D guides the reader through the conceptual framework/model of this study.

2.2 SECTION A: THE CONCEPT AND NATURE OF LEAN MANUFACTURING

Melton (2005) characterises Lean as a revolution that it is about a complete change of the business process. This includes how the supply chain operates, how the directors direct, how managers manage and how employees go about their daily work.

Mann (2009) is of the view that Lean is more than a cost reduction system but is more of a continuous improvement of the whole system for organisations. This author maintains that Lean designs serve both as operational processes and that it challenges the mind-set that the current design of an operation is the best way to perform these steps or procedures.

Mann (2009) describes Lean as more than just a kit of tools to improve flow and quality, but that it is rather a business philosophy. Discipline is vital to the successful implementation of Lean. The author further states that everybody must take some time

to understand the benefits of the Lean process and what is expected from each of them. Foster (2004:83) argues that Lean Manufacturing can be defined as a productive system whose focus is on optimising processes through the philosophy of continuous improvement.

During its implementation Lean manufacturing becomes an accepted vehicle for organisational transformation and it brings a basis for disciplined action, clarifies the intuitive knowledge gained from experience, and puts an organisation on the path to improved business results (Shulka, 2005:1). The author continues by indicating that Lean Management in itself is an adaptive system for the continuous improvement of numerous linked processes and that it is important for employees within the organisation to understand the interrelationships between the key elements of Lean Management.

The term Lean manufacturing is coined to represent half the human effort in the company, half the manufacturing space, half the investment in tools, and half the engineering hours to develop a new product in half the time (Marksberry, 2011:145).

In the sections that follow, the importance of Purpose Process People (3P) as a Lean tool will be explored in order to bring about a better understanding of the concept, to shed light on what it all entails as well as to set the tone for the study that follows.

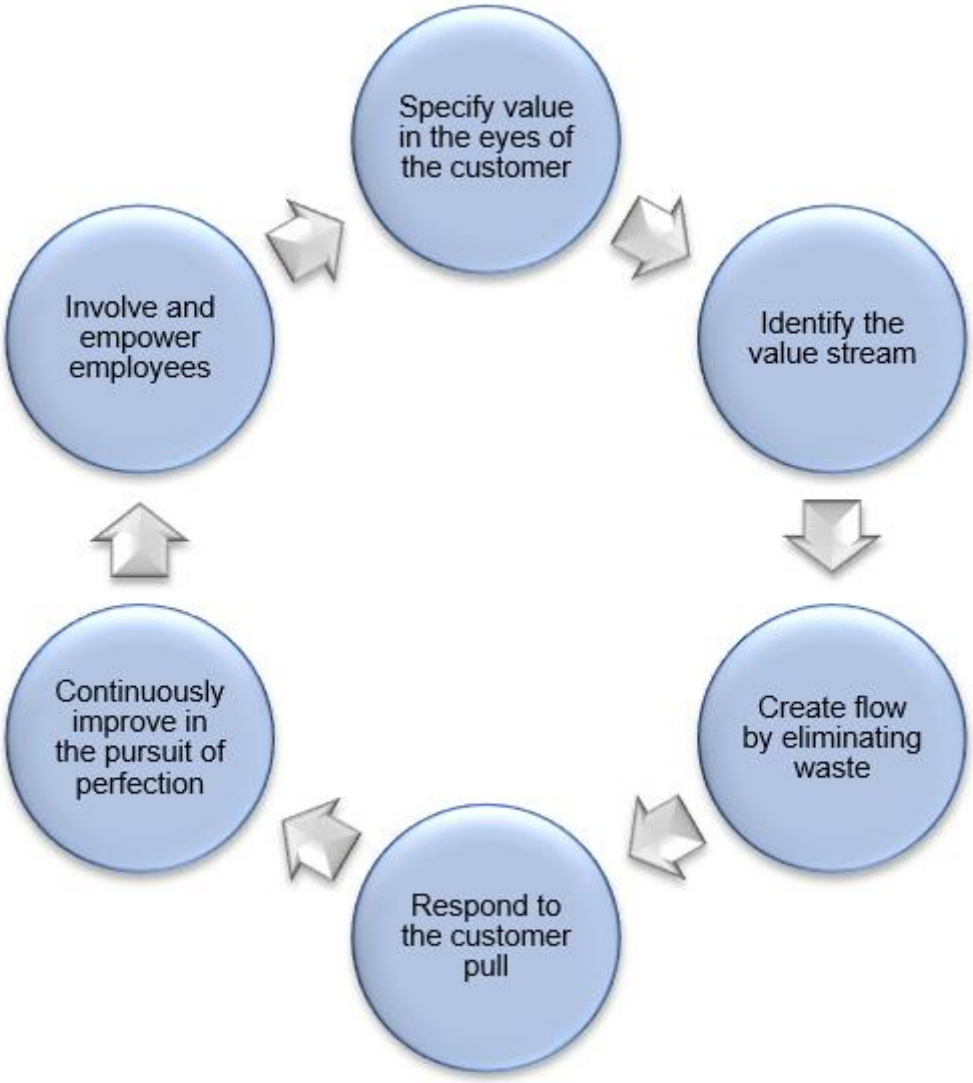
2.2.1 Purpose-Process-People (3P) as a Lean tool

In the Lean manufacturing world the Production-Preparations-Process (3P) is a powerful means of taking a big-picture look at how a product is designed and the production design and production layout. The goal is to develop a process or product that meets customer requirements in the “least-waste way”. (Hines et al. 2011)

The Lean 3P advantage is about rapid learning, collaboration and innovation, and it works with new or established products and on any sized project (Hines et al., 2011). According to Hines et al. (2011), the initial six-step approach to Lean thinking had been amended in order to include the human resource in the process of implementing Lean. The six step process towards implementing Lean consists of:

- Specify value in the eyes of the customer.

- Identify the value stream.
- Create flow by eliminating waste.
- Respond to customer pull.
- Continuously improve in the pursuit of perfection.
- Involve and empower employees.



Source: Hines et al., 2011:4

Figure 2.1: Lean Principles

This process has been revised and is referred to as the 3Ps, which involves purpose, process and people. It is stated by Womack and Jones (n.d.) as cited in Pieterse, et al. (2010) that the organisation firstly has to determine its purpose and then decide upon the processes required to realise the purpose and, finally, to engage the people to agree upon the purpose and create the necessary Lean processes.

2.2.1.1 Purpose

According to Pieterse et al. (2010), purpose is described from two points of view, namely the organisational point of view and the customer's perception of purpose. The organisational point of view is defined in terms of profit generation and expansion. However, the customer's perception of purpose is that the organisation exists to create value and satisfy the needs of its customers.

2.2.1.2 Processes

Pieterse et al. (2010:10-11) state that all processes have to be conducted in the correct sequence and at the right time, to create value for the customer by solving a problem or satisfying their needs. Furthermore, processes are divided into three main groups and ranked as per the following (Pieterse et al., 2010):

- To create the ability or capacity to start solving the problem;
- Thereafter the actual activity of solving of the problem only when the customer requests it , and
- To support the customer through the lifecycle of the problem.

2.2.1.3 People

In the Lean philosophy a high regard is placed on the individuals doing the work, hence the workers are referred to as associates. The intention of the people aspect of 3P is to ask how the organisation can engage their people at every level, to make them feel valued in order for them to willingly dive into operating and improving the process (Pieterse et al., 2010:11).

In following these three principles of Lean, organisations will implement a philosophy that will become just the way things are done (Marksberry, 2011:140). Whilst all three principles are essential in the implementation of Lean, the most important element would be specifying and identifying the value (Angelis & Fernandes, 2012:76). The concept of value is mainly defined by the customer. This will ensure that organisations are driving towards the overall strategy by constant review of processes to ensure that value is constantly and consistently delivered to the customer (Pederson & Huniche, 2011:419). This allows the organisation to maintain its high level of service whilst being

able to grow and adapt with a changing environment and this is accomplished through implementing sustainable change (Weybrecht, 2010).

In the sections that follow, various approaches to implement Lean Manufacturing will be explored in order to bring about a better understanding of the concept, to shed light on what it all entails as well as to set the tone for the study that follows.

2.2.2 Lean implementation

Shuker (2000:110) maintains that in order to successfully implement Lean principles, one needs to have the full cooperation of all employees and the buy-in from top management. Managers must understand and be unswervingly committed to the idea and methods. Any initiative to implement Lean Manufacturing will fail if managers are not determined to make it work. Managers must first know what is going on in the company and the best way to do this is by means of first-hand observations and involvement on the shop floor.

According to Fellows (2002), a positive persistence behavioural change throughout the organisation is required to overcome the adversity of Lean disciplines. It is imperative that active listening becomes a key during the early phase of Lean implementation rather than a conscious ‘to do’ and that barriers to thinking at all levels of the organisation begin to shrink and local initiative replaces unthinking compliance.

Krichbaum (2007) states the importance of everyone understanding and supporting the reasons why the Lean journey is taken. The production lines are normally staffed with skilled workers with years of experience with various background and cultures. It is very important for managers to take time to listen and truly discuss the issues with employees. Only then will gains be quickly made, trust built and relationships formed.

Mann (2009) indicates that senior leaders play a central role in Lean Management and that their contributions are essential in:

- developing and implementing structures and processes that anticipate and respond to the difficulties of a Lean initiative that crosses internal boundaries;
- transforming commitments to change into actual change, supporting and sustaining new behaviours and practices;

- increasing the odds that process improvements survive the transition from project mode to on-going process;
- establishing and maintaining new, process-focused measures alongside conventional measures of results; and
- creating conditions in which a sustainable Lean culture of continuous improvement can develop.

2.2.3 Requirements for successful implementation

Pieterse (2010) is of the opinion that the main reason why Lean implementation has been unsuccessful is that it is regarded as a set of tools with little or no consideration of the human element such as staff management and motivation. Pieterse highlights the following basic implementation criteria that need to be fulfilled in order to make implementation successful. These include:

- ensuring that management is committed to change;
- obtaining operator buy-in;
- proper communication; and
- Lean training.

According to Roper (2002), successful Lean implementation requires incredible focus on extraordinary management leadership, vision and commitment, and enlightened corporate leadership. Unfortunately, most organisations lack charismatic and committed leadership capable of successful implementation of Lean principles.

Alukal (2003:33) states that senior managers should take an active role and place focus on the following points for Lean implementation to be successful:

- undertaking a planned approach to Lean implementation rather than single point solutions;
- providing needed resources;
- appointing Lean champions;
- empowering and involving employees and emphasizing teamwork and cooperation;
- having good communication channels ;

- both top-down and bottom-up;
- managing expectations, such as fear of loss of jobs;
- making sure everyone understands the need for change, as well as their new roles as change is implemented;
- creating an atmosphere of experimentation, a risk taking environment and a safety net for trial and error;
- offering good rewards and recognition programmes, suggestions systems and gain sharing;
- introducing a performance measurement system based on meeting company goals;
- analysing and sharing of cost versus; and
- Managers must enhance job security and investment in the form of communication, on-going training, involvement and motivation

This section above focussed on the various aspects that are required in order for successful implementation of Lean Manufacturing. The aim of the section was to provide the reader with an understanding of the importance of senior manager's roles with regard to Lean implementation. Senior managers play a major role regarding culture change that is required for Lean implementation. Furthermore, it should set the tone for the chapters that follow in the sense that the research topic will now be better understood and that the intent of the research will be viewed more clearly.

Mann (2009:24) highlights that the Lean process should be continuously monitored and reviewed even if it is successfully implemented. The author indicates that the urge to revert back to old habits, conflicting priorities and practices elsewhere in the organisation. The discussion that follows will discuss the barriers that prevent the successful implementation of Lean Manufacturing.

2.2.4 Barriers to successful implementation

Lathin and Mitchell (2001:40) indicate that the biggest barriers hindering the adoption of Lean Manufacturing are the beliefs, norms and values that comprise the mass production mind-set. The authors maintain that this can sabotage or hinder various aspects of Lean production implementation.

The following are potential obstacles to Lean implementation, according to Lathin and Mitchell (2001:40)

- a mass production mind-set;
- people's need for autonomy;
- a lack of real-time information for shop floor production and inventory management;
- feelings of high status among technical specialists that make them resist cooperation with factory floor personnel;
- a bigger is better "mind-set" applied to technology; and
- a full utilisation mind-set or belief that machines and people must always be busy.

This is in contrast to the mass production mind-set where the focus might be on maximizing quantity, building buffers, increasing machine utilization and reducing headcount. While quality, knowledge continuous improvements and the customer are valued to a high degree, they do not provide the overall orientation to the mass production system. Mass production involves a segmented form of thinking that encourages separation and that limits efforts to link across an enterprise and across value streams.

Perhaps the most insidious barrier is the mass production mind-set embedded in almost everyone's minds that constitute the dominant paradigm of organisational efficiency. This mind-set is carried forward throughout life into the industrial world where it influences our thinking so greatly that Lean techniques are often judged as being inefficient.

Melton (2005) stresses the two biggest problems with the application of Lean to business processes are that many companies consider business processes as already efficient, that mass is better. Melton (2005) indicates that Lean thinking may appear at face value an easy concept to use within an apparently willing industry, but they present huge 'change' challenges to any business truly wishing to become Lean. The author further states that perhaps the biggest resisting force to overcome, is the resistance to change.

Regarding resistance to change, Krichbaum (2003) maintains that workers on the shop floor feel threatened by the changes brought about by Lean and that waste is eliminated. To address this and to make sure the individuals on the shop floor understand the seriousness and permanence of Lean changes, it is recommended that one makes sure they understand that their negative views on Lean are viewed as their desire to cease employment at the firm.

Regarding barriers to successful implementation, Kilpatrick (2003:4) identified several difficulties that companies experience. These difficulties include:

- failure of improvements made to financial statements that would represent a monetary value or measure;
- implementation of building blocks in the wrong sequence which in the end creates the perception that Lean implementation is not meant for the organisation;
- choosing a difficult or low-impact project on the first attempt that may not achieve the desired result as a project which identifies large cost saving and reduction in waste therefore a decline in future support;
- overlooking administrative areas due to the mind-set that Lean implementation will have little impact on these areas;
- the perception that the organisation spends too much money on training and not on doing or implementing what has been learnt;
- due to Lean's dependence on just-in-time delivery, failure to expand Lean initiatives to the supply chain will greatly diminish the benefits of Lean initiatives or make them seem non-existent;
- due to the impact that Lean has on every function within the organisation, it causes discomfort and many companies are not able to cope with the magnitude of change;
- due to the turn-over of managers and decision makers in organisations and taking into account the time frame that is associated with fully understanding and implementing Lean, change in management many times results in the programme being scrapped

- the concepts being taught in Lean are different to those that managers, accountants and decision makers were taught resulting in disagreements and mistrust.

Smalley (2005:1) indicates the most common reasons for the lack of progress in Lean implementation efforts are insufficient leadership and resources and a lack of commitment.

Krichbaum (2003:2) stresses that motivation from top management is critical for success in Lean implementation, because in most cases middle managers do not have the influence to change the culture. The author continues by indicating that most of the Lean concepts aren't difficult to grasp and that the obstacles to Lean are cultural and not intellectual or technical. This means that training needs to be delivered in short bursts immediately followed by a workshop in order to let the event become the training or learning means.

The section above focussed on the barriers that a company could experience in order to successfully implement various aspects that are required for the successful implementation of Lean Manufacturing. The aim of the section was to provide the reader with an understanding of the importance of change in culture as well as traditional thinking. In the discussion that follows, Lean building blocks and strategies are critical to overcome these barriers prevent successful implementation of Lean Manufacturing

2.3 SECTION B: LEAN BUILDING BLOCKS AND STRATEGIES

Lean consists of improvement tools and techniques (Holtskog, 2013). The fundamental idea of Lean lies in continuous improvement, the elimination of uncertainty with regard to variation and the process flow developed throughout the organisation (Holtskog, 2013). The purpose of these building blocks is to engage, establish and embed Lean in the organisation. The more common building block or strategies used by organisation are discussed below.

2.3.1 Visual management

Visual management is a clear and simple way to analyse and present information visually and this tool allows for good decision-making. If visual management is used in conjunction with the 5Ss; it ensures that employees follow safe work practices; understand systems; do regular quality checks and follow directions (Strategos-International, 2014).

2.3.2 Kanban

Kanban is a tool used to learn and manage an optimal flow of work within the process. Delays are caused and add waste to the process when materials or parts, documents or customer information are not available at the required time. On the other hand, having too many parts on hand or too much work in process (WIP) is also a form of waste (Klipp, n.d).

2.3.3 Kaizen

Kaizen refers to continuous improvement in performance, cost and quality. Kaizen is a Japanese word that has become common in many western companies. The word indicates a process of continuous improvement of the standard way of work (Chen et al., 2000). It is a complex word involving two concepts: Kai (change) and Zen (for the better) (Palmer, 2001). The term originates from Gemba Kaizen, meaning ‘Continuous Improvement’ (CI). Continuous Improvement is one of the core strategies for excellence in production, and is considered vital in today’s competitive environment (Dean and Robinson, 1991). It calls for endless effort for improvement involving everyone in the organisation (Malik and YeZhuang, 2006).

2.3.4 The 5 S’s (sort, set in order, shine, standardise, and sustain)

According to Carmichael, Mullen and Mante (2009), a fundamental tool in Lean manufacturing that can help any business is the '5S' approach. The 5Ss stand for sort, set in order, shine, standardise, and sustain and is a structuring technique to get rid of clutter and waste. CLeanliness and having a set place for everything is important. A 5S environment has “a place for everything and everything in its place,” with all the required resources ready where and when they are needed.

2.3.5 Pull

Pull refers to matching the consumer's rate of demand with production but not over-producing. Most organisations will have to push to a certain point and respond to a final costumer from that point. The idea with Lean is to push this point as far upstream in the product making process as possible, wait for a demand and then make the product fast and with high quality. So if the delivered products have any defect, only a small batch of products will have been affected (Pieterse et al., 2010:12).

2.3.6 Value Stream Mapping (VSM)

A value stream map is a tool to help sort all the product types into distinct families. The whole process is drawn schematically to show the supplier, the customer and the individual steps in the process. These steps are described in detail to facilitate the drawing of a future state map, which describes the ideal future layout of the process after making appropriate Lean changes. It assists in visualising, identifying and eliminating all forms of waste (Conner, 2001:29).

2.3.7 Total Productive Maintenance (TPM)

Total Productive Maintenance capitalises on proactive and progressive maintenance methodologies and calls upon the knowledge and cooperation of operators, equipment vendors, engineers and support personnel to optimise machine performance (Hines et al., 2011). Results of this optimised performance include: elimination of breakdowns, reduction of unscheduled and scheduled downtime, improved utilisation, higher throughput and better product quality (Pieterse et al., 2010:13). Bottom-line results include: lower operating costs, longer equipment life and lower overall maintenance costs (Hines et al., 2011).

2.3.8 Total Quality Management (TQM)

Pieterse et al. (2010:105) refer to TQM as a management approach to long term success through customer satisfaction. In a TQM effort, all members of an organisation participate in improving processes, products, services and the culture in which they work. Total Quality Management is applicable to every operation in the company and recognises the strength of employee involvement.

2.3.9 Quick set-ups

Russell and Taylor (2003:523) state that the small batch and mixed model production characteristics of a Lean environment require an ability to change set ups quickly.

2.3.10 Standard work

Ehrenfeld,(2005:59) states that standard work ensures that each step in the process is clearly defined so that work can be performed repeatedly in the same manner and within the calculated time.

2.3.11 Cellular layout

Cellular layout involves arranging equipment in the form of a “U-shape” that is dedicated to the production of similar parts in a manufacturing cell (Russell & Taylor 2003:514). In order to successfully utilise a manufacturing cell, the following prerequisites must be met:

- Sufficient volumes of a product family must exist;
- Small, dedicated and movable equipment must be available; and
- Flexible, cross-trainable workers must be available.

2.4 SECTION C: THE IMPACT OF EFFECTIVE LEAN IMPLEMENTATION

According to Villa and Taurino (2013:957), implementing Lean has a significant impact by increasing labour productivity, reducing throughput times and reducing the number of errors reaching customers, increased capacity and output leading to more on time delivery of service/products thereby increasing customer satisfaction as they receive an improved and more consistent level of service (Villa & Taurino, 2013:960).

The impact on the organisation includes:

- Standard processes, reduced variability, flatter management structures and more flexible processes;
- Decreasing work in progress by removing bottlenecks;
- Increased capacity leading to more on time delivery of services thereby increasing customer satisfaction as they received an improved and more consistent level of service;

- Reducing instances of failure demand, i.e. service standards fail to meet or exceed customer expectations resulting in customer complaints.

Lean, impacts on human elements that have longer lasting and more important effects. This supports the development of a culture of continuous improvement within the organisation. These impacts include:

- Culture change to focus on understanding the customer requirements;
- Increased employee morale through more empowerment;
- More cross-functional team work, which can contribute to knowledge transfer between staff from within and across departments. This increases the understanding of the whole system and how it fits together leading to a change in attitude and outlook;
- Increased awareness and time for problem solving;
- Better layout of processes and being able to find items more easily (Holtskog, 2013:576).

2.5 SECTION DCONCEPTUAL FRAMEWORK/MODEL

The conceptual framework of the study is to identify the principles that can improve the effectiveness of Lean application in the manufacture industry in South Africa. Views from authors listed in the literature study were summarised and grouped into fve main principles. These include:

- Employee involvement;
- Management involvement;
- Communication, and training;
- Organisational culture; and
- Trade unions.

2.5.1 Employee involvement

Employee involvement in organisational change is often associated with feelings of insecurity, uncertainty and anxiety, often leading to lack of buy-in and employee resistance (Gagnon et al., 2008:425). Getting all employees on board from the outset is crucial to sustain Lean change. It is important for organisations to ensure that

employees are properly trained, have the skills and support required to efficiently and effectively perform their duties (Bennett, 2007). The working environment should be conducive to allowing an innovative spirit to flourish. Apart from wages, employees' psychological needs such as self-esteem, self-confidence and self-worth need to be met in order for Lean manufacturing to succeed (Trollip, 2008).

Some organisations encourage employee involvement by the use of quality circles and even quality improvement teams (Churchill, 1999). Engaging employees inspires them to come up with sustained innovations that are hard to duplicate, giving the organisation the much-needed competitive advantage. Gubman (2004) suggests that the key goal of engagement must be determined by the organisation in conjunction with its strategic goals on an annual basis. Drivers for success that exist within organisations must be determined by the strongest levers of the company's leadership, culture, brand, rewards framework, communication and infrastructure.

Fellows (2002:2) states that on its own, Lean is only a label under which very effective business principles and practices have been collected and disseminated. For those organisations that have struggled with the reality that Lean delivers to an organisation, the cognitive human changes are subtle, almost imperceptible, but unbelievably effective in improving the bottom line.

Shuker (2000:110) maintains that one needs to have the cooperation of employees to reduce waste. Mann (2009:15) indicates that people often equate "Lean" with the tools that are used to create efficiencies and standardize processes but highlights that implementing tools represent at most 20 percent of the effort in Lean transformations and that the other 80 percent of the effort is expended on changing leaders practices and behaviours, and, ultimately their mind-set

Shulka (2005:2) indicates that in the quest to attain "flow" with "zero" waste, organisations are falling short on the people management aspect of Lean implementation. The people who are actually responsible for sustaining Lean programmes are relegated to the background, not well managed and that their importance in the Lean journey to success is ignored and misunderstood. The author indicates that this often leads to variable and unpredictable process improvements

and business results that can't be maintained. Focusing on the people issues helps organisations solve the Lean puzzle.

Shulka (2005:3) highlights that Lean projects typically focus on one or more concerns regarding customer service, flexibility, cost, cycle time, and quality. The ultimate concern may be to improve business profitability and this can be accomplished by improving the performance of the processes that constitute an organisation's activities. Since people work within an organisation's processes, one needs to improve the performance of both processes and people to gain any substantial and sustainable advantage.

Furthermore, when implemented, these Lean improvement initiatives are at times not sustainable in the long run and production line supervision then has to deal with the problems that arise afterwards. Hence the sustainability of improvements becomes a problem for shop floor management to deal with. This in itself results in a loss in commitment and alignment towards a common goal between senior management, line supervision and group leaders as well as a loss in motivation amongst shop floor workers and, even before roll-out of these workshops start, full ownership is not taken by all involved to obtain the required results.

Not having the full support of line supervisors and group leaders can result in investigations and implementation of Lean initiatives being dragged out and even delayed. This in essence leads to a lack of teamwork during current and future workshops of Lean initiatives and creates an uncomfortable feeling for individuals when these initiatives are mentioned. Also, having senior management, line supervision and group leaders who do not fully understand why a specific decision had been taken can lead to miscommunication. This may further contribute to a loss in teamwork, commitment and alignment towards a common goal and a loss of motivation.

2.5.2 Management involvement

Lucey (2008) identified the inexperience of the Lean implementer as an obstacle to successful implementation of the Lean philosophy. In many instances, the Lean implementer has differing roles within the respective organisation. This depends on

the approach as well as the strategic intent of the Lean initiative. In some instances middle management will be responsible while in other instances it would be the shop floor team leaders and workers who are tasked with the job of implementation. Whatever the role or designation of the implementer, the base knowledge and approach has to be correct to ensure that the concepts are transferred correctly and sustainability ensues.

A robust change management strategy is required when implementing Lean into organisations. This requires transforming the corporate culture (Vermaak, 2008). It is critically important that the leadership of the organisation undergoing the implementation of Lean is committed to and knowledgeable about the change management and implementation process. Another important aspect related to the management and leadership of Lean implementation is the resistance to change encountered as a result of managers and employees who have grown comfortable with the status quo (Vermaak, 2008).

2.5.3 Communication and Training to support changes

With regards to communication, Sharma and Kaur (2008) stated that open clear communication is of utmost importance in any organisation. This will improve the organisations' ability to manage information and to improve teamwork. Sharing information among the employees will provide them with a sense of belonging. According to Pieterse et al. (2010), good communication skills aid in avoiding conflict and misunderstandings. It is of outmost importance that all employees listen carefully and focus on words and messages and wait for a speaker to finish. In doing so, the listener is able to analyse information and provide responses after due consideration of all discussed points. The changes and their impact should be quantified and standardised so that the benefits of sustaining the changes become evident. Employees will easily buy in to this approach (Venegas, 2007).

2.5.4 Organisational culture

The organisational culture of a company affects the company's global competitiveness. Schultz et al (2003:12) state that in order to create a competitive advantage, an organisation's individuals, teams and management need to create a culture that is both effective and efficient. A culture can be defined as the social, moral

and behavioural norms of a group or organisation, which are based on the beliefs, attitudes, values and priorities of the members (Hines et al., 2011). A strong organisational culture will exhibit core values and norms that are deeply entrenched in the company. This will ensure that the management of the company will be aligned to the specific core values and norms, thus helping to ensure a level of consistency within the organisational culture (Hill, 2003:460).

2.5.5 Trade unions

Certain fundamentals must be included if any Lean programme is to be successful. According to Hines et al., (2011), active leadership and partnerships between management and labour must be part of any Lean initiative. It is essential to convince the labour unions to embrace Lean as management needs to prove that Lean does not stand for "Less Employees Are Needed" (Doolen & Worley, 2006). Many trade unions agree that these Lean change programmes are useful tools and do not mean the end of careers unless there is change in the relationship and culture of the workplace. The responsibility lies with everyone, including the unions, to make Lean work and to transform the organisation. It is only by all working together that this could succeed (Hines et al., 2011).

The independent variables for the study represent both the primary and secondary objectives. As indicated in Figure 1 above, the primary objective was to identify the main principles that affect the effectiveness of Lean principles. The secondary objectives were therefore to measure the performance or extent to which these principles are present and functional within the organisation as well as to identify elements to improve the effectiveness of Lean implementation.

2.6 SUMMARY

The chapter above focussed on the various aspects of Lean Manufacturing. The aim of the section was to provide the reader with an understanding of the importance of Lean for organisations, why Lean Manufacturing is required and how proper implementation and sustainability of initiatives can bring about improvements in the various operations of the organisation. Furthermore, it should set the tone for the chapters that follow in the sense that the research topic will now be better understood and that the intent of the research will be viewed more clearly.

The single biggest criticism of Lean manufacturing is that the constant focus on improvement and elimination of waste becomes an obsession and causes stress in the workforce. A further criticism is that Lean makes the workplace too clinical and impersonal, with workers under relentless pressure to do better than before. While such pressures lead to workers stepping out of their comfort zone and assuming a sense of urgency, it also increases stress levels considerably, and high stress levels can have determinable effects on productivity and efficiency.

Lean is more a culture than a method, and there is no standard Lean production model. The implementation of Lean takes place through various tools such as Kaizen, 5S, Six Sigma, Total Quality Management, and others. The absence of a standard methodology, with any or all such tools achieving the elimination of waste in a process, while allowing for flexibility of approach, can also work against Lean with people remaining confused on which tool serves the desired purpose.

The success of any adopted Lean production model depends largely on the extent to which each individual member of the workforce masters the relevant tools and understands the methodology. Even if one individual among the workforce refuses ownership of Lean and fails to adopt Lean practices, the entire Lean system collapses.

A review of the criticisms levied against Lean manufacturing suggests that many of the drawbacks stem from the method of implementation rather than any inherent flaw in the Lean culture. Proper planning, good implementation by incorporating effective change management practices and leadership, stress management interventions, and effecting a change of culture so that each member of the workforce inculcates the philosophy of Lean, helps resolve much of the limitations of using Lean manufacturing and overcoming the criticism of Lean manufacturing.

Beyond simply reducing costs and improving efficiency, Lean production techniques introduce systems and develop skills with your staff that support changes in the workplace. Space saved on warehousing may be used to add new product lines. The same is true of time savings. Your staff can absorb new work and react quickly to changes in client demand. Producing work quickly, in short iterations, without waste and that is delivered on time enhances your advantage over your competition.

The framework that the authors Repenning and Sterman (2001) developed brings out the challenges associated with implementing improvement programmes and provides some practical suggestions that would increase the chances for future success in such efforts.

In order to make Lean manufacturing completely successful you must have the support of everyone from employees to upper management. This can sometimes be difficult to attain as some people do not take well to change. When you are trying to implement Lean manufacturing you must have leaders within your company that can direct teams. These must be people with a good rapport and who are well liked with employees as well as management. As is the case with all businesses, there are personality clashes and sometimes it is hard to get people to follow and take orders from their co-workers. Training for Lean manufacturing is a constant ongoing process and, when first starting out, it takes a lot of time and effort on everyone's part. You may find that employees get sick of all the "new stuff" and just want to go back to how things were, or you yourself might get tired of everything. The complexity of Lean management implantation, especially obstacles through using the concept of ‘people management failings’ (which could also include traits of leaderships or culture barriers), is not described.

The impact of culture has being spotlighted as well, for example, difference in national culture could limit the application of the Japanese mentality to western industry. This becomes even more important as numerous authors state that corporate culture and the alignment between thinking and behaving Lean are crucial to reaching the potential organisational benefits (Bhasin Barcher, 2006).

In order to increase performance with Lean management, the corporate culture needs to support or align with Lean thinking.to highlight the true nature of how Lean is implemented in practice, Lean management seems to be as exhausting as losing weight is for human beings (Springer and Schulz, 2007:68). In western industry Lean implementation has focused on improvements and management has tended to concentrate on tools and practise (Pepper and Spedding, 2010:142).

Adequate attention has not been paid to the human element or people management in particular (Enilana, 2006:169) leading to several problems in the organisational

culture. Failure in engaging shop floor employees (including supervisory staff) in Lean, lack of supervisory skills in leading workers and lack of Lean technical knowhow among the shop floor employees are some of the major obstacles in Lean transformation. One of the reasons of inefficient Lean transformation is the shortage in frameworks or plans in implementing Lean**.**

Future studies related to the implementation of Lean principles initiatives, several issues than can be affected come to mind. Listed below are possible topics that can be considered as future research topics: the impact of continuous improvement initiatives on quality system improvement; the impact of continuous improvement initiatives in assisting organisations to become more sustainable; and the continuous improvement initiatives as a driver to improve employee innovation.

2.7 DEFINITIONS AND OVERVIEW OF KEY TERMINOLOGY

2.7.1 Lean

Lean is a philosophy that applies specific tools and methods in a consistent, disciplined and systematic manner to eliminate waste and improve operational effectiveness. It emphasizes the smoothest possible flow of work (Solotorow and Banks, 2006).

2.7.2 Lean Manufacturing

This focuses on making the product flow through value adding processes without interruption (one-piece flow). It is a “pull” system that cascades back from customer demand by replenishing only what the next operation takes away at short intervals. It is a culture in which everyone strives continuously to improve (Womack and Jones, 2003).

2.7.3 Effectiveness

The necessary processes are performed in sequence in order to achieve the desired results and to add value.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter the researcher has presented and discussed the methodology adopted in the study. According to Cooper and Schindler (2009) a research methodology is a master plan for achieving the research objectives and answering research questions. This chapter is structured as follows: in section A the conceptualisation of the study will be discussed .In section B the research paradigm of the study will be discussed. In section C the measuring instruments of the study will be discussed. Chapter three justifies the chosen research paradigm used to test these independent variables identified in the literature.

3.2 SECTION A: CONCEPTUALISATION OF THE STUDY

Welfit Oddy is the South African company that has weathered the Chinese onslaught and today still accounts for about 35% of the international tank container market with the equivalent of around 5 500 manufactured tanks a year. After taking over from Europe as the world's tank container capital in the 1990s, the South African tank container industry took a nosedive after 2003 resulting in only Welfit Oddy remaining. The major reasons why the South African tank container industry "tanked" were: the introduction of ring-fencing, the subsequent removal of tax shelters and the partial relaxation of exchange controls, all of which served to reduce the attractiveness of the tank container investment scheme for South African investor together with the strength of the rand against the dollar since 2002, in the face of increasing competition from Chinese manufacturers.

South African producers constantly face competition from foreign organisations, including China. The adverse effects of this competition stem, in part, from the low levels of productivity which characterise South African industry. The concept of Lean manufacturing offers a proven methodology for increasing the effectiveness and efficiency of production processes.

The study as detailed in this report is performed at Welfit Oddy and is aimed at developing a model for successful implementation of Lean principles

3.2.1 The Research Paradigm

A research paradigm is a philosophy or a specific way of thinking (Robson, 2011). There are two main research paradigms that are mostly used in conducting social research studies, namely positivism or quantitative and phenomenological or qualitative. Positivism generates hypotheses, which allow the hypothesis to be tested using various approaches (Creswell, 2011; Zikmund et al., 2013). According to Collis and Hussey (2009), this research paradigm rests on the concept that social reality is singular and objective and is not affected by the act of investigation being undertaken. Positivism involves a deductive process with a view to providing exploratory theories in order to understand a social phenomenon (Arnolds, 2012). The phenomenological research paradigm allows for exploratory research to be conducted by employing various methods such as observations (Cooper and Schindler, 2009; Yin, 2009). According to Collis and Hussey (2009), this research paradigm rests on the concept that social reality is the way people understand reality and is subjective. Therefore, social reality is affected by the act of investigating it. It involves an inductive process with a view to presenting an interpretive argument of social phenomena with a specific context (Collis and Hussey, 2009; Arnolds, 2012). The research paradigm in this research study was the quantitative paradigm.

The quantitative or positivistic approach was used in this study, as the aim was to statistically test the relationships among the variables investigated in the study. The quantitative investigation of the study was performed using a self-constructed questionnaire based on information from the literature study conducted. This enabled the researcher to obtain information from various participants.

This method is general for understanding views and perceptions. It offers visions to different problems and helps in developing concepts or theories for potential quantitative research. Quantitative approach is used to enumerate the problem through creating numerical date or data which can be converted into useable statistics.

Qualitative research method is specifically designed to uncover a target audience behaviour its connection to a particular topic or issue. It uses in-depth analysis of small groups of people. The results of qualitative research are not predictive, but descriptive.

The researcher was able to obtain information, through the use of a questionnaire, from the various participants in the specific tank container manufacture to improve the effectiveness of Lean principles implementation.

The principles were formulated through summarising the key elements raised by the various authors as detailed in the literature. These key elements, considered the benchmark to ensure successful implementation, were then grouped into the five main principles required to ensure successful Lean implementation initiatives. These key elements were restructured to formulate the research questions and the questions were then grouped into the seven main principles and used in the questionnaire to determine the extent to which each of these principles were present.

The researcher works in the same organisation being researched. To avoid the risk of bias, questionnaires were handed to individuals at different management levels, different departments as well as different shifts within the business unit being studied.

3.2.2 Study Population

The population of a study is the research object or case study unit which is the focus of the research study being conducted (Daniels, 2010). The population in this research study is located within a tank container manufacturer, Welfit Oddy in the RSA which employs 1200 workers.

3.2.3 The Sample

A sample is a finite part of a statistical population whose properties are studied to gain information about the whole (Collis & Hussey, 2009). When dealing with people, it can be defined as a set of respondents selected from a larger population for the purpose of a survey. A population is a group of individuals, persons, objects, or items from which samples are taken for measurement for example a population of presidents or professors, books or students.

A sample of 100 employees was selected within Welfit Oddy. The population of the study consisted of senior managers, team leaders, permanent employees and contract workers.

3.2.3.1 Sampling Technique

The sampling method selected for this study is convenience sampling. Convenience sampling refers to the collection of information from members of the population who are conveniently available to provide it. A sample of employees was selected within the respective business unit.

Convenience sampling was used to select a sample of a hundred (100) employees within the specific tank manufacture. The sample was stratified to include senior managers, managers, team leaders and lower level employees. Questionnaires were distributed personally to the focus groups from the above categories. The views of each section of the population are recorded in a balanced way, thus preventing bias as mentioned by Collis and Hussey (2009).

3.2.4 The Response rate

The sample size of this study was 100 respondents, of which 74 completed questionnaires were returned. A response rate is the percentage of people who responded to a survey, and this can be calculated by taking the number of completed questionnaires and dividing this by the number of participants contacted. The higher the response rate, the more likely it is that the results are representative of the population (Surveymonkey, 2009). A 74% (n-74) response rate was achieved in this study.

Table 3.1: Overall Response Rate

RESPONSE RATE		
	Response	**Percentage %**
Received	74	74%
Outstanding	26	26%
Distributed	100	100%

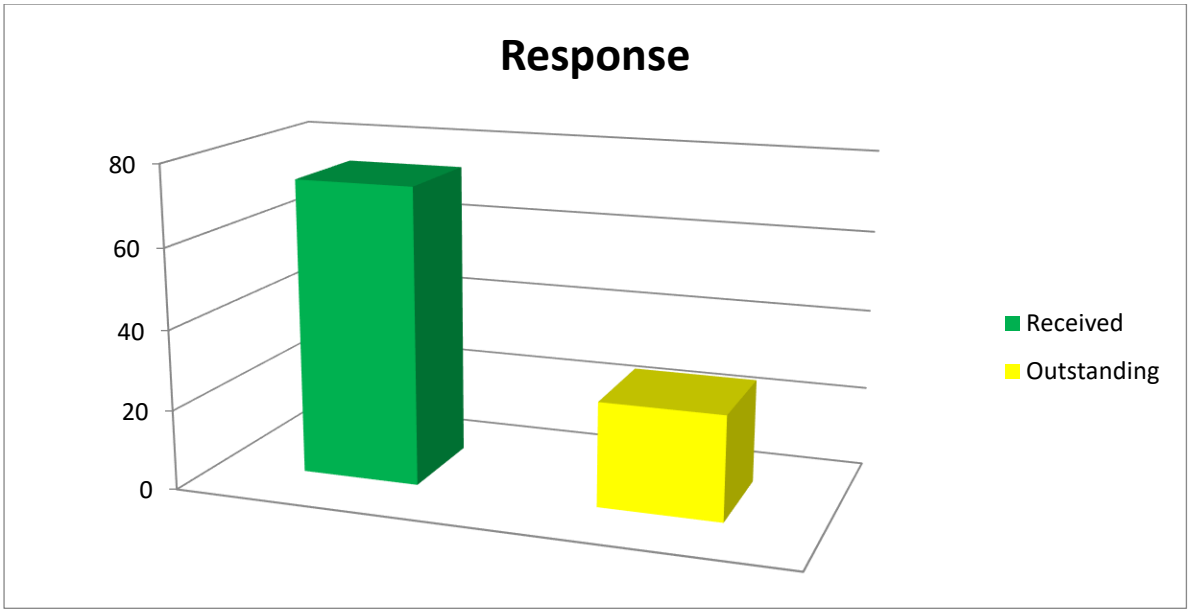


Figure 3.1: Graphical illustration of Response Rate

The gender of the seventy respondents is depicted in Figure 4.2 in the following chapter. Only twenty seven percent (27%) were represented by females and seventy three percent (73%) percent were represented by males.

3.3 THE MEASURING INSTRUMENTS

Good measurement is of the utmost importance for good research. It is unfortunate that problems in measurement so often go unrecognized and, if recognized, are treated so lightly. It is impossible to demonstrate effectiveness of any intervention without reliable measurement (Sechrest: 2001).

According to Collis and Hussey (2003:17), the process of collecting data in a quantitative study is an attempt by the researcher to measure variables or count occurrences of a phenomenon. For the purpose of this research, a Five-point Likert scale questionnaire was used as a tool to collect data from participants as listed in the research sample. This Likert scale has a five point rating scale, consisting of the following descriptive measurements, namely strongly disagree, disagree, neutral, agree and strongly agree.

In order to capture the responses from the participants, a database was created to differentiate questionnaire information and to categorise participants, the position and department section of the participants as listed in the headings of the questionnaire.

Differentiating the data in this manner allowed the researcher to group information into leadership level and department in order to form relationships between the information obtained. Furthermore, the five point rating scale as displayed in the questionnaire was converted from being descriptive to numerical.

Table 3.2: Five point rating scale converted from descriptive to numerical

Descriptive	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Numerical	1	2	3	4	5

As can be seen from the above, a numerical number was allocated to each descriptive answer. The Likert Scale questionnaire used in this study ranged from one (1) Strongly Disagree through three (3) Neutral to five (5) Strongly Agree. The STATISTICA Version 12 (2013) computer software programme was used to conduct the statistical analysis in the study.

3.3.1 Data Collection Process

Permission was granted from Welfit Oddy (Annexure C) to conduct the research study. The researcher explained the concept of the study in detail and distributed the questionnaires via e-mail and physical handouts. An explanatory letter was attached to the front page of the A4 format questionnaires. The letter contained the title, purpose and instructions on how to complete the questionnaire. Assurance of anonymity was given and respondents were informed that their participation was voluntary. Participants were requested to answer the questions accurately and to put the completed questionnaires in a sealed box. Where needed, an explanation was given by the researcher before and during the distribution and filling of the questionnaires. The researcher collected the sealed boxes containing the questionnaires together with the returned email questionnaires and personally captured the data manually on an excel spreadsheet.

3.3.2 Data Analysis

The analysis of quantitative research involves aiming to uncover and/or understand the big picture by using the data to describe the phenomenon and what this means.

Both qualitative and quantitative analysis involves labelling and coding all of the data in order that similarities and differences can be recognised. Responses from even an unstructured qualitative interview can be entered into a computer in order for it to be coded, counted and analysed. The qualitative researcher, however, has no system for pre-coding, therefore a method of identifying and labelling or coding data needs to be developed that is bespoke for each research.

There are a wide range of statistical techniques available to analyse quantitative data, from simple graphs to show the data through tests of correlations between two or more items, to statistical significance. Other techniques include cluster analysis, useful for identifying relationships between groups of subjects where there is no obvious hypothesis and hypothesis testing to identify whether there are genuine differences between groups.

3.3.3 Questionnaire Design

Questions detailed in the questionnaire focused on various principles and elements that were highlighted in this study by the researcher as being important. Questions asked were focused on the principles as detailed in the questionnaire.

Collis and Hussey (2003:173) describes a questionnaire as a list of carefully structured questions that are chosen after considerable testing with a view to drawing out reliable responses from a chosen sample on what they do, think or feel. Questionnaires are associated with both quantitative and qualitative methodologies. A quantitative approach suggests that closed questions should be used, whereas a qualitative approach suggests open-ended questions (Chambers & Skinner, 2003).

The questionnaire consisted of five questions for each of the five main principles that affect the Lean implementation. The questions were aimed at determining the extent to which each of the five principles had an effect on the ineffectiveness of Lean principle implementation (Refer to Appendix B for the self-constructed questionnaire that was used).

The questions were designed to determine the extent to which the five main principles were present and functional within the organisation. By scoring each of these questions, the researcher was able to analyse the information, summarise them and

determine the extent to which these main principles were present and functional within the organisation. From this, conclusions and recommendations were made on how to improve the implementation of Lean principles.

3.3.4 Reliability of the Measuring Instrument

The extent to which results are consistent over time and are an accurate representation of the total population under the study is referred to as reliability and if the results of a study can be reproduced under a similar methodology then the research is considered to be reliable (Blumberg et al., 2008). There are three types of reliability referred to in quantitative research, which relates to:

- The degree to which a measurement given repeatedly, remains the same.
- The stability of a measurement over time.
- The similarity of measurements within a given time period.

The Cronbach alpha is an example of this test for reliability. According to Nunnally (1978), reliabilities that are 0.5 are basic and reliabilities within 0.6 to 0.7 ranges are considered to be fair, between 0.7 and 0.8 are good and those coefficients over 0.8 are considered to be very good.

The notion that the consistency with which questionnaire (test) items are answered or individual scores remain relatively the same, can be determined through the test-retest method at two different times. This attribute of the instrument is actually referred to as stability. When dealing with a stable measure, the results are similar. A high degree of stability indicates a high degree of reliability, which means the results are repeatable (Zikmund et al., 2010).

3.3.5 Validity of the measuring Instruments

This is concerned with the soundness and effectiveness of the measuring instrument. Validity raises questions on whether the measuring instrument measures what it is intended to measure, what the actual test is that is being measured and the degree of accuracy of that measurement (Zikmund et al., 2010). Validity is the extent to which the accuracy of the research findings represents what really is happening in a particular situation. Researchers generally determine validity by asking a series of

questions, and will often look for the answers in the research of others (Collis & Hussey, 2009).

There are different ways in which validity can be assessed. The main methods are face validity, content validity, predictive validity, concurrent validity, construct validity and incremental validity as explained by Zikmund et al. (2010).

- **Face Validity.** This form of validity is based on commonly accepted opinion or consensus of opinion. Face validity is normally established by qualified professional observation, investigation or experience with an instrument, test or a computer-based test interpretation system. Face validity is based on how the results look.
- **Content Validity.** This form of validity is based on the content (actual questions) used in a survey or questionnaire. Content validity is established by a professional or professionals selecting appropriate content for questions and statements. The results of a questionnaire or survey are considered valid if the questions are appropriate and necessary to identify a specific attribute, state or quality.
- **Predictive Validity.** This form of validity is based on a questionnaire's ability to predict what it is supposed to predict, that is its ability to predict some future state, result or event.
- **Concurrent Validity**. This form of validity means a questionnaire or survey is capable of identifying a state, attribute, quality or result that is already known. An instrument is valid if it correctly identifies by some other means a state or result that is already known to exist.
- **Construct Validity.** This form of validity is the most difficult to establish. It is normally based on demonstrating meanings, relationships among elements or states, attributes, results, problems or disorders.
- **Incremental Validity.** This form of validity can help determine whether or not a particular instrument or method provide a significant improvement in addition to the use of another approach. If a particular approach is said to have incremental validity this helps more than not using it.

3.3.6 Validity of data

An exploratory factor analysis was not conducted due to the small sample size. The instruments used in the present study showed good content and face validity.

3.4 ETHICAL CONSIDERATIONS

Ethics is concerned with the rules that have to do with conforming to a specific code of conduct (Robson, 2011). Ethical dilemmas can be context specific, related to anonymity, include confidentiality, issues of consent, dignity and publication protocols (Collis and Hussey, 2009; Robson, 2011). It is also important that coercion should not be used to force respondents to take part in the research (Collis and Hussey, 2009). The respondents should not be offered financial reward or other forms of reward to induce them into taking part in the research study (Arnolds, 2012). Participation should be voluntary and respondents should be informed of the duration of the research.

In this research study all ethical issues were adhered to. No vulnerable respondents were used; therefore an ethical clearance certificate was not necessary nor required. The respondents agreed to participate in the research and they were not coerced in any way. The true nature of the research was revealed to the participants in a covering letter requesting an interview session (see Appendix A). Invasion of privacy was avoided by allowing the respondents to disclose only what they wanted to disclose of themselves, their organisation and industry without being forced. All participants were treated fairly, with consideration, and respect. The findings of the research are not likely to harm those involved. Proper community and society protocols were followed as the researcher requested permission to conduct the study first from the participants and organisation leaders where the case study was conducted. No invasive questions were posed to the respondents.

3.5 LIMITATION OF THE STUDY

Collis and Hussey (2009) describe the limitations of a study as the identification of weaknesses and deficiencies of a research study. The purpose of discussing the limitations of a study, according to Arnolds (2012) and Collis and Hussey (2009).

The following limitations have been identified for this study:

- It is conducted in a single organisation in the RSA that produces tank containers due to difficulties in identifying respondents from the organisations that have closed down;
- Some of the research findings cannot be generalised to the international tank container industry context;
- The questionnaire measures perceptions of Welfit Oddy staff on resilience factors within Welfit Oddy. The dilemma for the respondent is that they could be subjective in their responses to hide their deficiencies;
- The context in which the respondents are to rate the questions could be confusing if not well understood.

3.6 SUMMARY

A research methodology is the master plan for conducting a study. A research paradigm is a specific way of thinking. In this chapter, the model to improve the effectiveness of Lean principles in a specific manufacture was discussed. The research methodology to test this model was explained, which included the research paradigm, the sample and the measuring instruments underpinning this investigation. The data analyses conducted were also discussed, as well as the reliability and validity of the measuring instruments was reported. In the next chapter the empirical results which originated from the data analyses are discussed.

CHAPTER 4

PRESENTATION AND INTERPRETATION OF THE RESULTS

4.1 INTRODUCTION

In this chapter the researcher presents, interprets and discusses the findings of the study. The chapter is structured as follows: in Section A the researcher presents the biographical information of the respondents; in Section B the researcher discusses the empirical results with the use of descriptive statistics. In Section C the researcher establishes a Lean management model to overcome challenges faced by Welfit Oddy.

4.2 SECTION A: ANALYSIS AND INTERPRETATION OF BIOGRAPHICAL INFORMATION

In this section the researcher presents and discusses the biographical characteristics of the respondents. These include gender, age, language, education, position in the company and experience.

4.2.1 Gender

As seen in table 4.1, the sample was male dominated with 73% (n-51) being male and 27% (N-19) being female. This implies that the manufacturing industry in South Africa is largely imbalanced in terms of gender.

Table 4.1: Gender composition of the sample

Gender distribution of respondents		
Gender	**Respondents**	**Percentage %**
Male	51	73%
Female	19	27%
TOTAL	70	100%

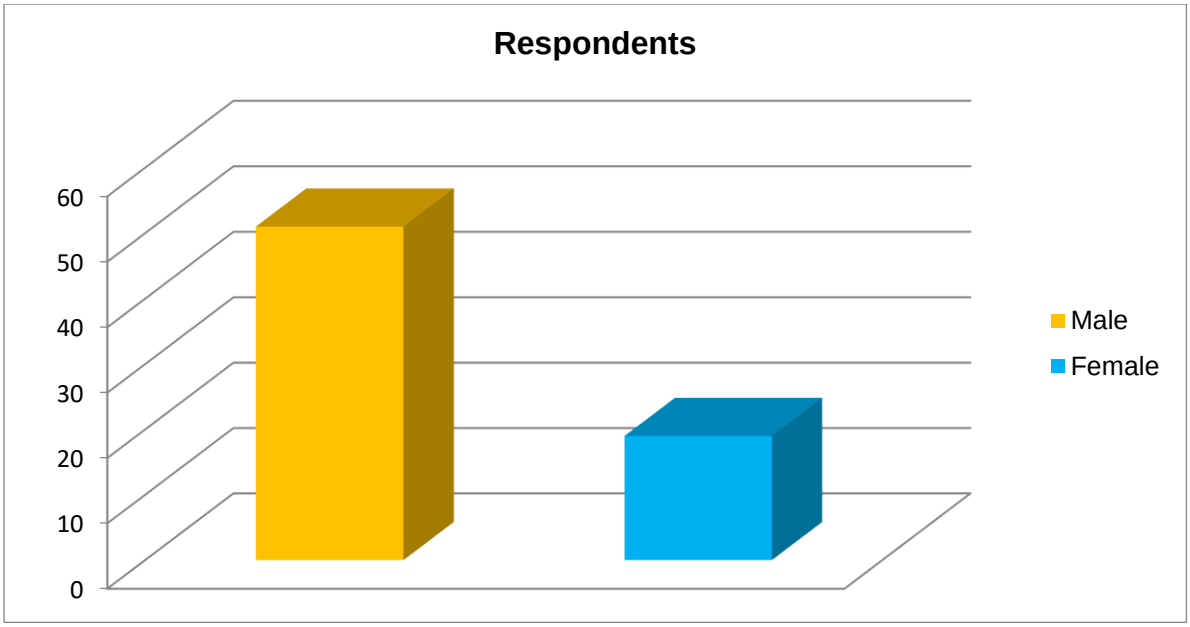


Figure 4.1: Graphical illustration of response gender

4.2.2 Age

Questionnaire respondents' ages ranged from 20 to 59 years. From the study it was evident that the largest percentage of respondents, 46% (n-31), was between the ages of 30-39. The age distribution of respondents is provided in table 4.2. Twenty five percent, 25% (n-17), of the respondents were between the ages of 20-29; 46% (n-31) were between the ages of 30-39, 24% (n-16) were between the ages of 40-49 and 6% (n-4) were between the ages 50-59.

Table 4.2: Age distribution of respondents

Age distribution of respondents		
Age groups	**Respondents**	**Percentage %**
20-29	17	25%
30-39	31	46%
40-49	16	24%
50-59	4	6%
60+	0	0%
TOTAL	68	100%

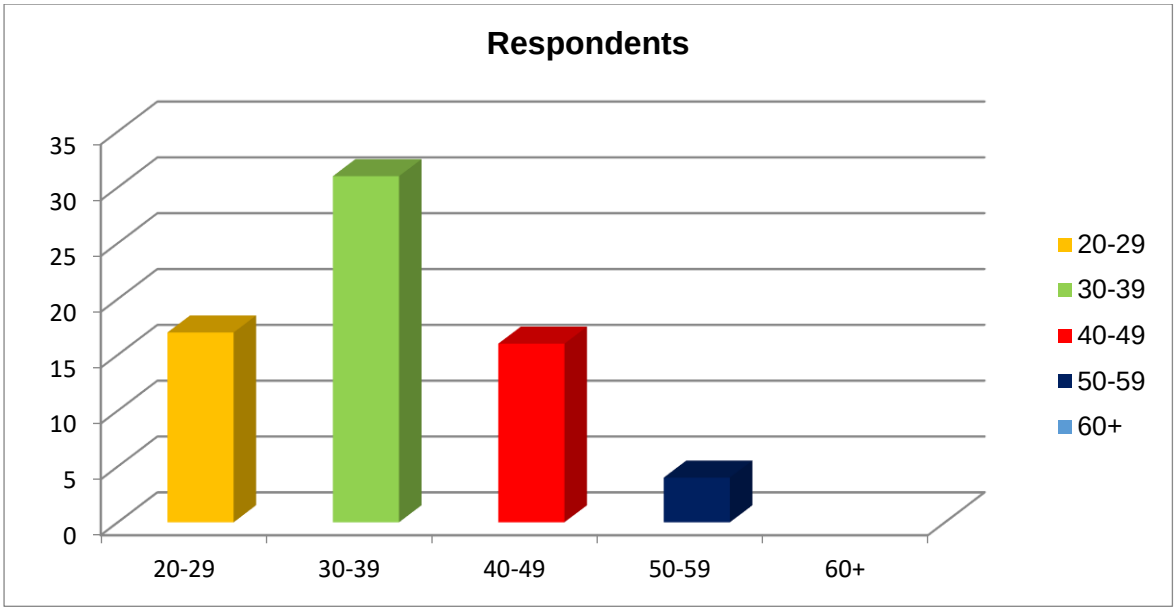


Figure 4.2: Age representation of respondents

4.2.3 Level of Education

Table 4.3 indicates that the majority of respondents, 50% (n-35), had obtained a matriculation certificate, followed by 44% (n-31) who had completed undergraduate degrees or master's degrees. Only 6% (n-4) of the study respondents had not achieved a grade 12 qualification.

Table 4.3: Qualification Achieved and Years of Experience

Distribution of qualification achieved by respondents		
Highest qualification	**Responses**	**Percentage %**
Less than Grade 12	4	6%
Grade 12	35	50%
Undergraduate degrees or Master's degree	31	44%
TOTAL	70	100%
Respondents' years of Experience		
No of years	**Response**	**Percentage %**
Less than 5 years	26	37%
5-9	27	39%
10-14	8	11%
15-19	1	1%
20+	8	11%
TOTAL	70	100%

4.2.4 Nature of Position

According to the findings, 54% (n- 40) of the respondents occupied team member roles within the manufacturing operations, while a significant component of 46% (n- 34) of the respondents occupied support functions within the value chain.

Table 4.4: Position in the Company

Respondents position in the company		
Position	**Response**	**Percentage %**
Creditors Clerk	3	4%
Store Controller	6	8%
Draughtsman	2	2%
Production Supervisor	6	8%
Planner	1	1%
Welder	10	14%
Fabricator	2	2%
Production Manager	3	4%
Clerk	3	4%
Human Resource	6	8%
Human Resource Supervisor	1	1%
Quality Inspector	3	4%
Store Clerk	2	2%
Assembler	9	12%
Material Picker	2	2%
Team leader	1	1%
Procurement Specialist	1	1%
Maintenance Buyer	1	1%
Technician	1	1%
Shipping Clerk	1	1%
Manager	1	1%
Store man	1	1%
Material Controller	2	2%
Operator	1	1%
Design Engineer	1	1%
TOTAL	70	100%

4.3 SECTION B: EMPIRICAL RESULTS: DESCRIPTIVE STATISTICS

This section presents the results of Section B of the questionnaire, which provides a quantitative analysis. The results of each variable are presented in tabular form and analysed according to the mean scores, percentages and standard deviations. The measuring instrument was a 5 point Likert scale (Strongly agree, Agree, Neutral, Strongly Disagree and Disagree). The summary of the results of all the perceptions on variables are discussed with the aid of tables and graphical illustrations.

The researcher implemented condensation of scales for ease of interpretation and due to the distribution of the small sample's responses. Strongly agree and agree were grouped into one category (AGREE), whilst strongly disagree and disagree were grouped into another category (DISAGREE). Neutral remained separate.

4.3.1 Factors that influence the challenges faced by Welfit Oddy

The results have shown that the organisation did not implement any Lean systems fully, even though they were considered by the executive management as being part of the process. The majority of the sample, 60% (n-42), of the respondents were of the opinion that management continually re-assesses and tries to improve upon strategies in order to minimise economic and other waste in the organisation. Fifty-nine percent, 59.46% (n-41), of the respondents were of the opinion management efficiently and effectively responded to changes in customer demand with strategies that best suited the organisation.

Thirty-nine percent, 39.19% (n-27), of respondents of the respondents were of the opinion that they did not have good understanding of Lean principles and their purpose. This was evident in the next two statements where sixty-eight percent, 68.10% (n-51), of the respondents were of the opinion that the employees themselves were not committed to the Lean initiatives nor did they share the vision, resulting in their reluctance to implement the systems.

Forty-three percent, 43.24% (n-30), of employees felt that all processes are already seen as being efficient and that one should not tamper with what works. Fifty-nine percent, 59.46% (n-41), of respondents felt that business processes are performed out of habit and as a result it is more difficult to implement new strategies.

This is a concern because, in order for Lean principles to be successfully implemented, the following criteria need to be achieved: a good understanding of Lean principles and the purpose as well as the employee commitment to implement the Lean process. It is evident from the responses that the organisation did not implement any Lean system initiatives and that they did not understand the Lean concept well enough in order to facilitate an effective implementation.

There is a high level of uncertainty that needs to be addressed by leadership in order to overcome the challenges facing successful implementation of the Lean principles.

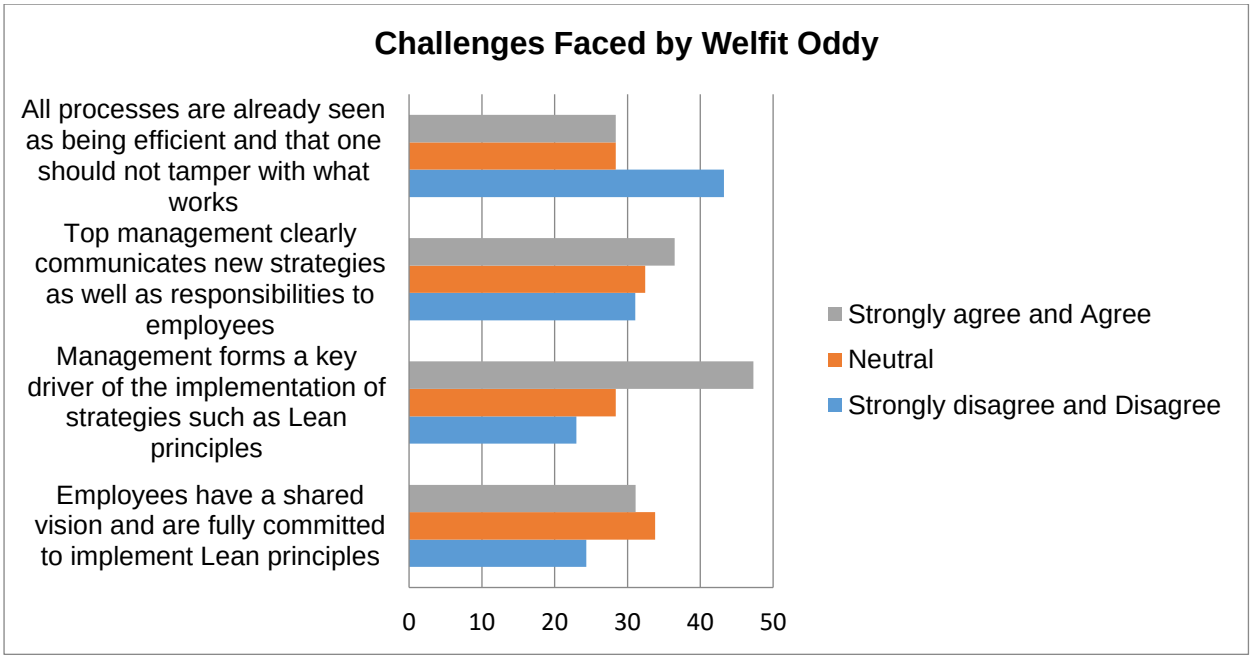
4.4 SECTION C: CHALLENGES FACED BY WELFIT ODDY IN THE IMPLEMENTATION OF LEAN PRINCIPLE

The study examined the following elements in the domain of challenges faced:

a) Employees have a shared vision and are fully committed to implement Lean principles;
b) Management forms a key driver of the implementation of strategies such as Lean principles;
c) Top management clearly communicates the new strategies as well as the responsibilities to employees;
d) All processes are already seen as being efficient and that one should not tamper with what works.

Table 4.5: Challenges Faced by Welfit Oddy

Challenges faced	Strongly disagree and Disagree	Neutral	Strongly agree and Agree	Mean	Std. Dev
Employees have a shared vision and are fully committed to implement Lean principles	35	34	31	2.90	1.11
Management forms a key driver of the implementation of strategies such as Lean principles	23	30	47	3.25	1.08
Top management clearly communicates new strategies as well as responsibilities to employees	31	32	37	3.00	1.12
All processes are already seen as being efficient and that one should not tamper with what works	43	29	28	2.78	1.02
AVERAGE MEAN SCORE				**2.98**	
AVERAGE STANDARD DEVIATION					**1.08**



Note: Average agree to strongly agree = 35.82%; average neither agree nor disagree = 30.74% and average disagree to strongly disagree = 30.40%

Figure 4.3: Graphical Illustration of Challenges Faced

4.4.1 Employees have a shared vision and are fully committed to implement Lean principles

There was a mixed perception on whether or not employees have a shared vision and are fully committed to implementing Lean principles. This is evident in that thirty-three percent, 33% (n-25), of respondents were uncertain regarding this statement. According to the findings, 31% (n-23) of the respondents agreed that they held a shared vision and are fully committed to implementing Lean principles, while 35% (n-26) of the respondents disagreed in this category.

4.4.2 Management forms a key driver of the implementation of strategies such as Lean principles

Forty-seven, 47% (n-35), of the respondents felt that management forms a key driver of the implementation of strategies such as Lean principles, 30 % (n-22) of the respondents were indecisive while 23 % (n-17) of the participants disagreed that management forms a key driver of the implementation of strategies such as Lean principles.

4.4.3 Top management clearly communicates new strategies as well as responsibilities to employees

Thirty-six percent 36% (n-27) of the respondents felt that top management clearly communicated new strategies as well as responsibilities to them. There is however a concern that sixty-three percent, 32% (n-24), of the respondents were unsure that top management clearly communicated new strategies as well as responsibilities to them while 31% (n-23) of the respondents disagreed that top management clearly communicated new strategies as well as responsibilities to them.

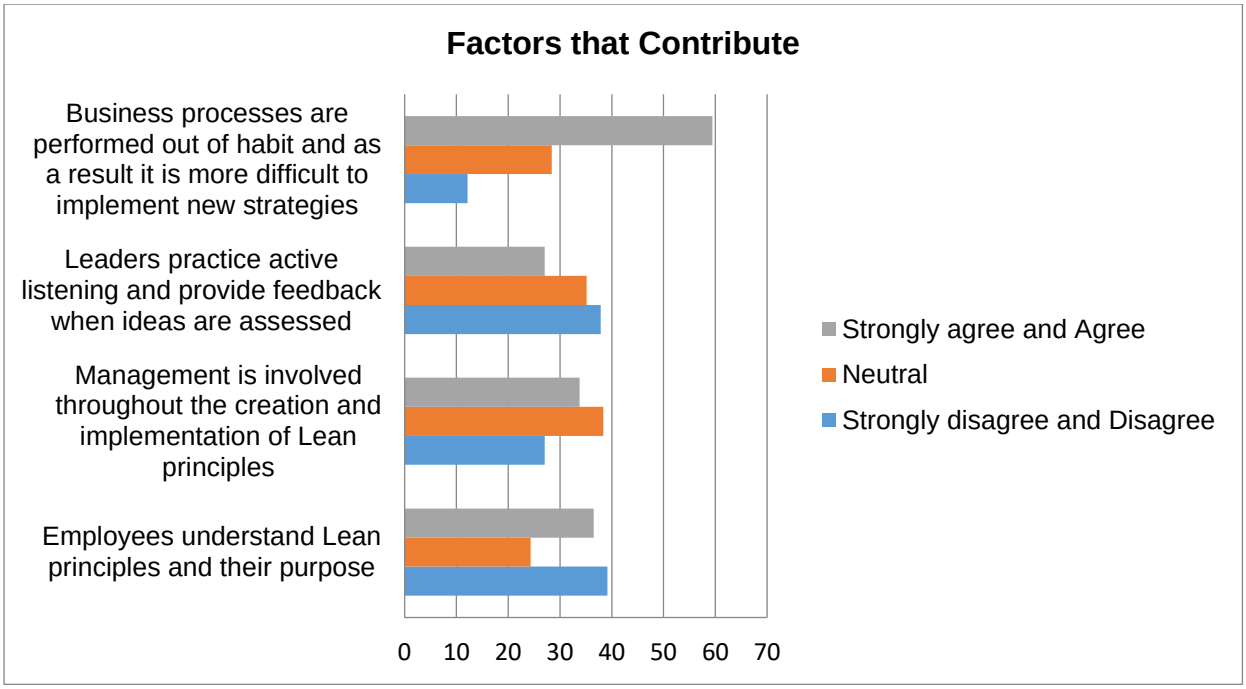
4.4.4 All processes are already seen as being efficient and that one should not tamper with what works

Forty-three percent, 43% (n-32), of the respondents disagree with the statement that all processes are already seen as being efficient and that one should not tamper with what works, 29% (n-22) of the respondents were indecisive while a significant number of participants 28% (n-20)agreed that business processes are all processes are already seen as being efficient and that one should not tamper with what works.

The mean response for the challenges faced is 2.98. This indicates that the majority of the respondents felt that there were numerous obstacles to overcome in order to successful implement Lean principles.

Table 4.6: Factors That Contribute to Effective Lean Application at Welfit Oddy

Factors that contribute	**Strongly disagree and Disagree**	**Neutral**	**Strongly agree and Agree**	**Mean**	**Std. Dev**
Employees understand Lean principles and their purpose	**39**	25	36	2.96	1.18
Management is involved throughout the creation and implementation of Lean principles	27	**39**	34	3.02	1.06
Leaders practice active listening and provide feedback when ideas are assessed	**38**	35	27	2.86	1.10
Business processes are performed out of habit and as a result it is more difficult to implement new strategies	12	28	**60**	3.59	1.91
AVERAGE MEAN SCORE				**3.11**	
AVERAGE STANDARD DEVIATION					**1.31**



Note: Average agree to strongly agree = 39.19%; average neither agree nor disagree = 31.55% and average disagree to strongly disagree = 29.05%

Figure 4.4: Graphical Illustrations of Factors that Contribute

4.4.5 Factors that contribute to effective Lean application at Welfit Oddy

i. Employees understand Lean principles and their purpose;
ii. Management is involved throughout the creation and implementation of Lean principles;
iii. Leaders practice active listening and provide feedback when ideas are assessed;
iv. Business processes are performed out of habit and as a result it is more difficult to implement new strategies.

4.4.5.1 Employees understand Lean principles and their purpose

It was noted that at least 39% (n-29) of the respondents felt that they did not understand Lean principles and their purpose. Twenty-four percent, 24 % (n-18), said they could not decide while 36% (n-27) of the respondents agreed that they understand Lean principles and their purpose.

4.4.5.2 Management is involved throughout the creation and implementation of Lean principles

According to 35% (n-26) of the participants, management was involved throughout the creation and implementation of Lean principles; 38 % (n-28) said they could not decide while 27% (n-20) of the respondents disagreed that their management was involved throughout the creation and implementation of Lean principles.

4.4.5.3 Leaders practice active listening and provide feedback when ideas are assessed

At least thirty-seven percent, 38% (n-28), of the respondents did not agree that leaders practiced active listening and provided feedback when ideas are assessed. According to 35% (n-26) of the respondents, they couldn't decide while 27% (n-20) of the participants agreed that the leaders practiced active listening and provided feedback when ideas were assessed. This could be seen as a concern because employees might feel that decisions are just made between top and middle management.

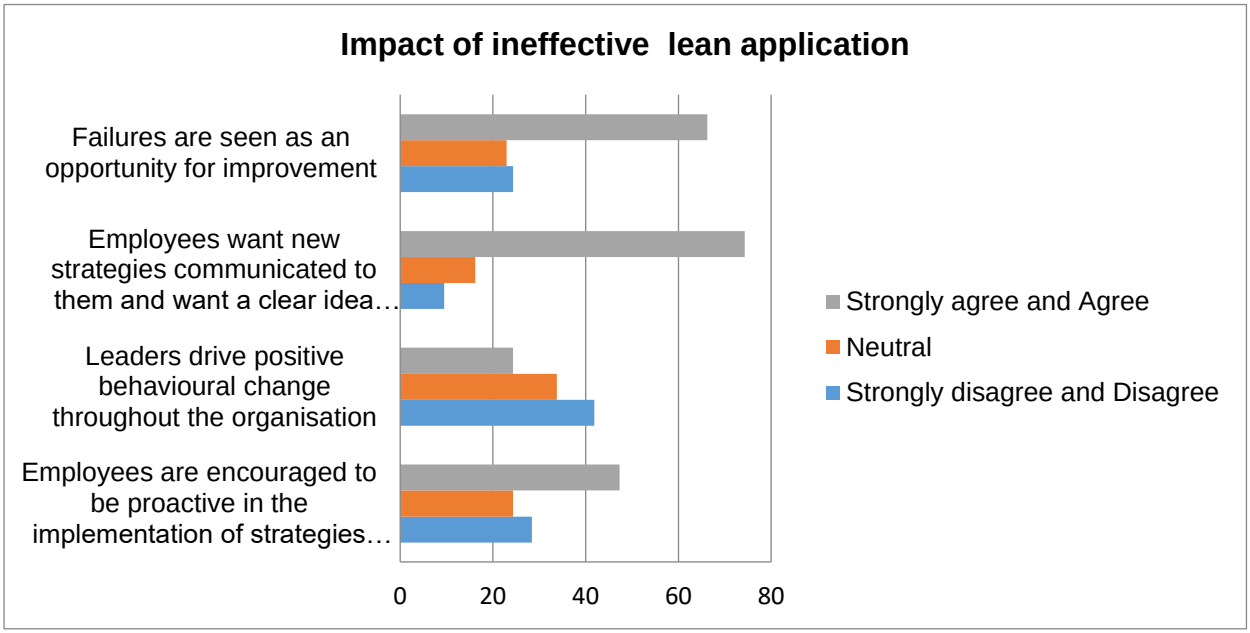
4.4.5.4 Business processes are performed out of habit and as a result it is more difficult to implement new strategies

A significant number of participants agreed that business processes were performed out of habit and as a result it was more difficult to implement new strategies. Fifty-nine percent, 59% (n-44), responded in this manner. The study also found that 28% (n-21) of the respondents were indecisive while 12% (n-9) of the participants disagreed that business processes were performed out of habit and as a result it was more difficult to implement new strategies.

The mean response for the ineffective application is 3.11. This indicates that the majority of the respondents felt there are numerous obstacles to overcome in order to successfully implement Lean principles.

Table 4.7: Impact of Ineffective Lean Application at Welfit Oddy

Impact of ineffective application	Strongly disagree and Disagree	Neutral	Strongly agree and Agree	Mean	Std. Dev
Employees are encouraged to be proactive in the implementation of strategies and give feedback with regards to the state of the implementation process	28	24	**48**	3.24	1.09
Leaders drive positive behavioural change throughout the organisation	**42**	34	24	2.74	1.01
Employees want new strategies communicated to them and want a clear idea of their responsibilities	9	16	**75**	3.92	1.07
Failures are seen as an opportunity for improvement	24	23	**53**	3.41	1.31
AVERAGE MEAN SCORE				**3.33**	
AVERAGE STANDARD DEVIATION					**1.12**



Note: Average agree to strongly agree = 53.04%; average neither agree nor disagree = 24.32% and average disagree to strongly disagree = 26.01%

Figure 4.5: Graphical Illustration Of Ineffective Lean Application At Welfit Oddy

4.4.6 Perception impact of ineffective Lean application at Welfit Oddy

i. Employees are encouraged to be proactive in the implementation of strategies and to give feedback with regards to the state of the implementation process;
ii. Leaders drive positive behavioural change throughout the organisation;
iii. Employees want new strategies communicated to them and want a clear idea of their responsibilities;
iv. Failures are seen as an opportunity for improvement.

4.4.6.1 Employees are encouraged to be proactive in the implementation of strategies and give feedback with regard to the state of the implementation process

At least forty-seven percent, 47% (n-35), of the respondents were of the opinion that employees are encouraged to be proactive in the implementation of strategies and to give feedback with regard to the state of the implementation process. The study found that 24% (n-18) of the respondents were neutral while 28% (n-21) of the participants disagreed that employees were encouraged to be proactive in the implementation of strategies and to give feedback with regard to the state of the implementation process**.**

4.4.6.2 Leaders drive positive behavioural change throughout the organisation

It is noted that at least forty-one percent, 42% (n-31), of the respondents strongly disagreed that leaders drive positive behavioural change throughout the organisation. According to 34% (n-25) of the respondents, they could not decide whether leaders drive positive behavioural change throughout the organisation. A further twenty-four percent, 24% (n-18), responded positively to this statement.

4.4.6.3 Employees want new strategies communicated to them and want a clear idea of their responsibilities

A significant number of participants felt that new strategies were communicated to them and that a clear idea of their responsibilities was indicated. Seventy-four percent, 74% (n-55), responded in this manner. The study found that 16% (n-12) of the participants were neutral while 9% (n-7) the respondents disagreed that new strategies were communicated to them and wanted a clear idea of their responsibilities.

4.4.6.4 Failures are seen as an opportunity for improvement

According to 53% (n-49) of the participants, failures were seen as an opportunity for improvement; 23 % (n-17) said they could not decide while 24% (n-18) of the respondents disagreed that failures were seen as an opportunity for improvement.

The average mean of 3.33 is an indication of the ineffectiveness of Lean application.

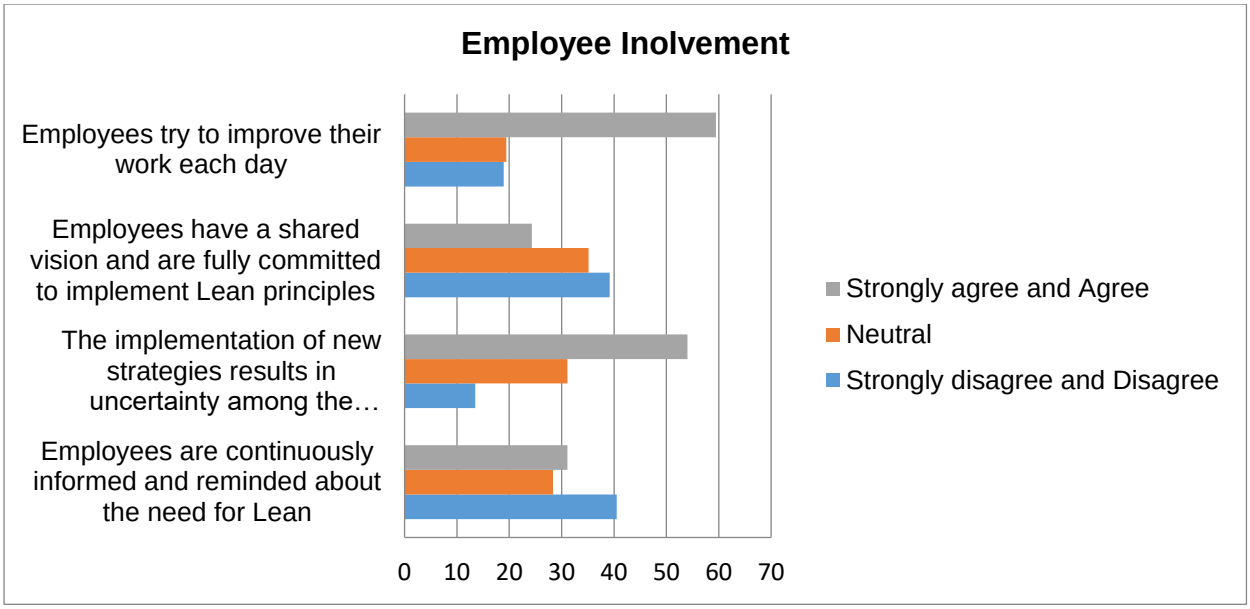
4.5 SECTION D: EFFECTIVE IMPLEMENTATION OF LEAN PRINCIPLES

In this section the following variables will be analysed and discussed:

- Employee involvement;
- Management involvement;
- Communication, and training;
- Organisational culture; and
- Trade unions.

Table 4.8: Employee Involvement in Lean Implementation at Welfit Oddy

Employee involvement	**Strongly disagree and Disagree**	**Neutral**	**Strongly agree and Agree**	**Mean**	**Std. Dev**
Employees are continuously informed and reminded about the need for Lean	**40**	29	31	2.81	1.07
The implementation of new strategies results in uncertainty among the employees	14	32	**54**	3.46	0.90
Employees have a shared vision and are fully committed to implement Lean principles	**40**	35	25	2.74	1.02
Employees try to improve their work each day	19	19	**62**	3.61	1.04
AVERAGE MEAN SCORE				**3.16**	
AVERAGE STANDARD DEVIATION					**1.01**



Note: Average agree to strongly agree = 42.23%; average neither agree nor disagree = 28.51% and average disagree to strongly disagree = 28.04%

Figure 4.6: Graphical Illustration of Employee Involvement in Lean Implementation at Welfit Oddy

4.5.1 Employee involvement in Lean implementation at Welfit Oddy

i. Employees are continuously informed and reminded about the need for Lean;
ii. The implementation of new strategies results in uncertainty among the employees;
iii. Employees have a shared vision and are fully committed to implement Lean principles;
iv. Employees try to improve their work each day.

4.5.1.1 Employees are continuously informed and reminded about the need for Lean

Forty-one percent, 41% (n-30), of the respondents felt that they were not continuously informed, trained and reminded about the need for Lean principles and its purpose. The study found that 28% (n-21) of the respondents were neutral while 31% (n-23) of the participants agreed that they were continuously informed and reminded about the need for Lean. This indicates that at least half of the respondents were not well versed with Lean principles. This was evident as it creates uncertainty among employees.

4.5.1.2 The implementation of new strategies results in uncertainty among the employees

Fifty-four, 54% (n-40), of the respondents agreed that the implementation of new strategies resulted in uncertainty among the employees; 32% (n-24) of the respondents were neutral while 14% (n-10) of them disagreed that the implementation of new strategies resulted in uncertainty among the employees.

4.5.1.3 Employees have a shared vision and are fully committed to implement Lean principles

According to the findings, 24% (n-23) of the respondents admitted that they have a shared vision and are fully committed to implement Lean principles. The study found that 35% (n-26) of the participants were neutral while 41% (n-30) the respondents disagreed that they have a shared vision and are fully committed to implement Lean principles.

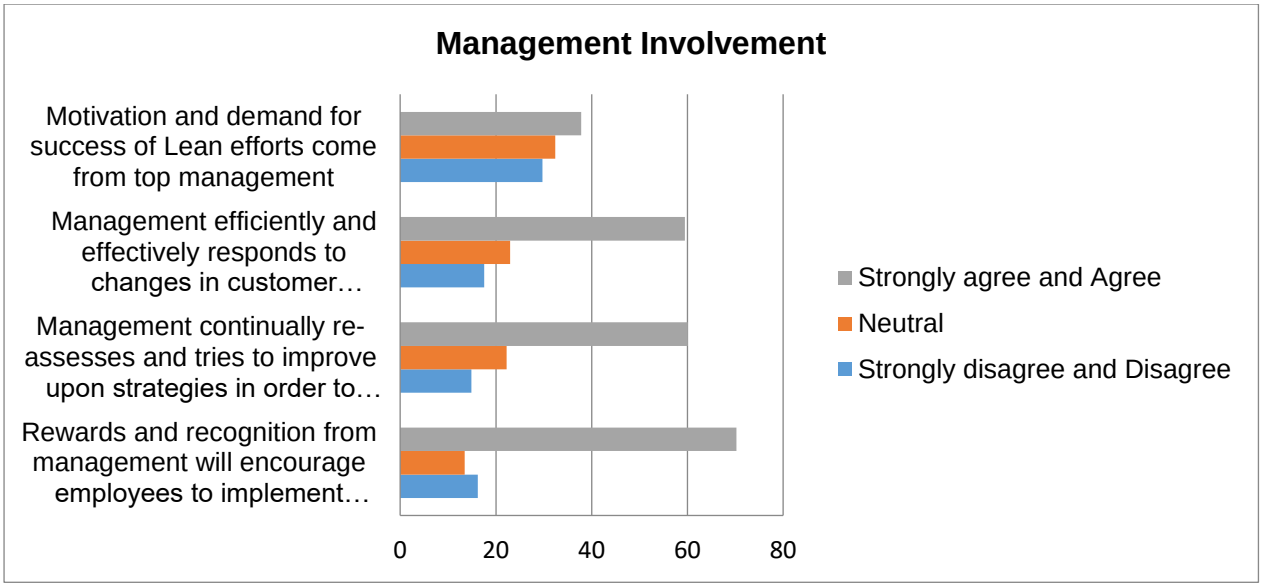
4.5.1.4 Employees try to improve their work each day

Sixty-two percent, 62% (n-46), of respondents did however feel strongly that they try to improve on their work on a daily basis. According to the study, 19% (n-14) of the respondents were neutral while 19% (n-14) of them disagreed that they try to improve on their work on a daily basis.

The mean response for the employee involvement was 3.16. This indicates that the majority of the respondents felt employee involvement had an influence on the effectiveness of Lean principles.

Table 4.9: Management Involvement In Lean Application

Management involvement	Strongly disagree and Disagree	Neutral	Strongly agree and Agree	Mean	Std. Dev
Rewards and recognition from management will encourage employees to implement lean principles in their daily tasks	16	14	**70**	3.86	1.23
Management continually re-assesses and tries to improve upon strategies in order to minimise economic and other waste in the organisation	15	22	**63**	3.56	0.99
Management efficiently and effectively responds to changes in customer demand with strategies that best suit the organisation	18	23	**59**	3.50	1.05
Motivation and demand for success of Lean efforts come from top management	30	32	**38**	2.97	1.12
AVERAGE MEAN SCORE				**3.47**	
AVERAGE STANDARD DEVIATION					**1.1O**



Note: Average agree to strongly agree = 56.91%; average neither agree nor disagree = 22.79% and average disagree to strongly disagree = 19.60%

Figure 4.7: Graphical Illustration of Management Involvement in Lean Application

4.5.2 Management involvement in Lean application

i. Rewards and recognition from management will encourage employees to implement Lean principles in their daily tasks;
ii. Management continually re-assesses and tries to improve upon strategies in order to minimise economic and other waste in the organisation;
iii. Management efficiently and effectively responds to changes in customer demand with strategies that best suit the organisation;
iv. Motivation and demand for success of Lean efforts come from top management.

4.5.2.1 Rewards and recognition from management will encourage employees to implement Lean principles in their daily tasks

Respondents felt that employees should be encouraged through rewards and recognition in order to have a shared vision with the organisation. Seventy percent, 70% (n-52), of respondents strongly felt that rewards and recognition from management will form a key driver to encourage employees to implement Lean strategies. In the opinion of 14% (n-10) of the respondents, they could not decide; while 16% (n-12) of the participants disagreed that rewards and recognition from

management will encourage employees to implement Lean principles in their daily tasks. This is an indication that rewards and recognition from management are an important factor in strategy implementation. This will be beneficial to the organisation as employees will work together with the organisation to ensure that Lean principles are implemented effectively.

4.5.2.2 Management continually re-assesses and tries to improve upon strategies in order to minimise economic and other waste in the organisation

Sixty-four percent, 64% (n-47), of respondents felt that management continually re-assessed and tried to improve upon strategies in order to minimise economic and other waste in the organisation, 22% (n-16) said they could not decide while 15% (n-11) of the respondents disagreed that management continually re-assessed and tried to improve upon strategies in order to minimise economic and other waste in the organisation.

4.5.2.3 Management efficiently and effectively responds to changes in customer demand with strategies that best suit the organisation

The study found that 59% (n-44) of respondents felt that management efficiently and effectively responded to changes in customer demand with strategies that best suited the organisation. In the opinion of 23% (n-17) of the respondents, they could not decide; while 18% (n-13) of the participants disagreed with the statement that management efficiently and effectively responded to changes in customer demand with strategies that best suit the organisation.

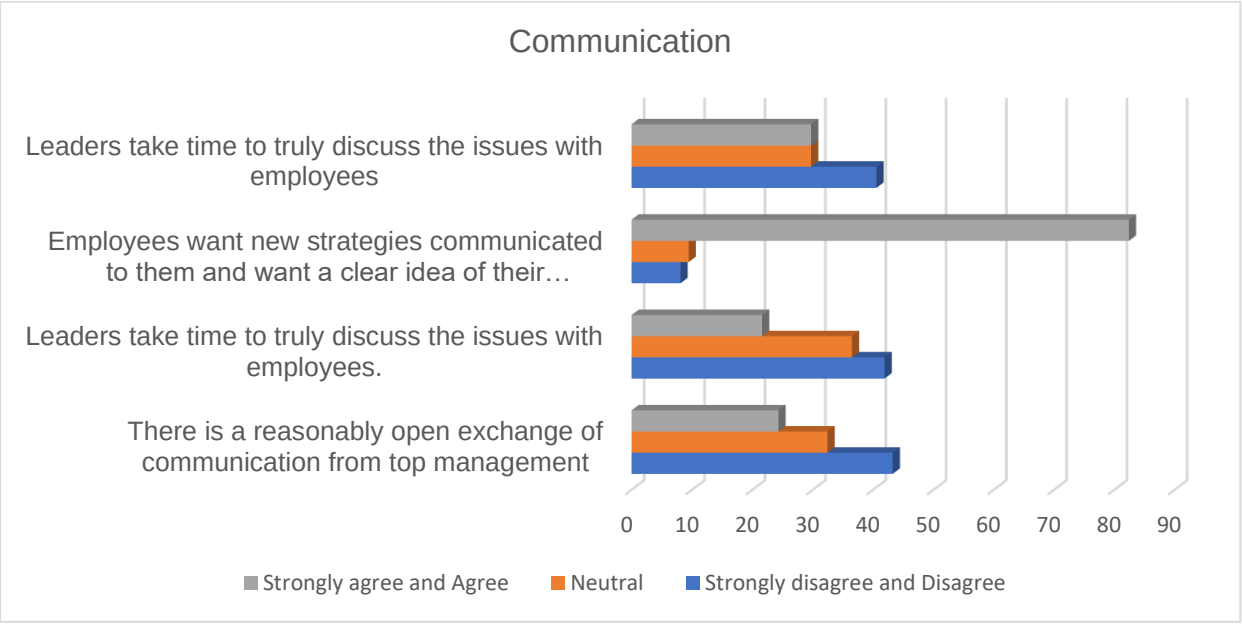
4.5.2.4 Motivation and demand for success of Lean efforts come from top management

According to the findings, 38% (n-28) of the respondents agreed that motivation and demand for the success of Lean efforts came from top management, 32% (n-24) of the respondents could not decide while 30% (n-22) of the respondents disagreed that motivation and demand for success of Lean efforts came from top management.

With an average mean score of 3.47, respondents felt that management involvement was important for the effective implementation of Lean principles

Table 4.10: Communication

Communication	Strongly disagree and Disagree	Neutral	Strongly agree and Agree	Mean	Std. Dev
There is a reasonably open exchange of communication from top management	**44**	32	24	2.68	1.07
Leaders take time to truly discuss the issues with employees.	**42**	36	22	2.76	0.98
Employees want new strategies communicated to them and want a clear idea of their responsibilities	8	10	**82**	4.05	0.99
Leaders take time to truly discuss the issues with employees	**40**	30	30	2.80	0.10
AVERAGE MEAN SCORE				**3.08**	
AVERAGE STANDARD DEVIATION					**0.79**



Note: Average agree to strongly agree = 39.53%; average neither agree nor disagree = 27.03% and average disagree to strongly disagree = 33.45%

Figure 4.8: Graphical Illustration Of Communication

4.5.3 Perception about communication

i. There is a reasonably open exchange of communication from top management;
ii. Leaders take time to truly discuss the issues with employees;
iii. Employees want new strategies communicated to them and want a clear idea of their responsibilities.

4.5.3.1 There is a reasonably open exchange of communication from top management

Clear communication in any organisation is essential for strategy implementation or even understanding what the organisation's goal is and what the employees' responsibilities are. The study found that 43% (n-32) of respondents felt that there was a lack of open exchange of communication from top management; 32% (n-24) of the respondents were neutral while 24% (n-18) of the respondents agreed there was a reasonably open exchange of communication from top management.

4.5.3.2 Leaders take time to truly discuss the issues with employees.

According to 42% (n-30) of respondents, leaders did not take time to truly discuss the issues regarding Lean implementation, 36% (n-26) of the respondents were neutral while 22% (n-16) of the respondents agreed that leaders did not take time to truly discuss the issues regarding Lean implementation. This could be seen as a concern because employees might feel that decisions are just made between top and middle management.

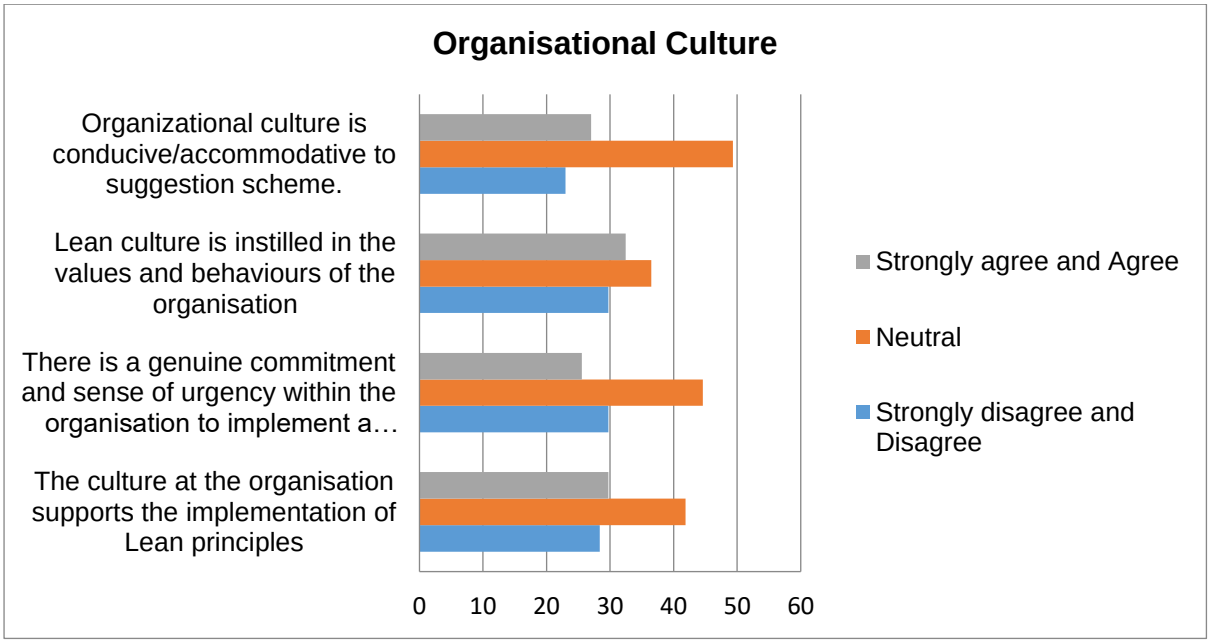
4.5.3.3 Employees want new strategies communicated to them and want a clear idea of their responsibilities

The study found that 82% (n-61) of the respondents agreed that they want new strategies communicated to them and want a clear idea of their responsibilities; 10% (n-7) of the participants were indecisive while 8% (n-6) of the respondents disagreed that they want new strategies communicated to them and want a clear idea of their responsibilities.

The average mean of 3.08 was an indication that communication did in fact have a very positive influence on the effectiveness of Lean principles.

Table 4.11: Organisational Culture

Organisational culture	Strongly disagree and Disagree	Neutral	Strongly agree and Agree	Mean	Std. Dev
The culture at the organisation supports the implementation of Lean principles	28	**42**	30	2.95	0.94
There is a genuine commitment and sense of urgency within the organisation to implement a Lean culture.	30	**44**	26	2.92	0.92
Lean culture is instilled in the values and behaviours of the organisation	30	**37**	33	2.98	0.95
Organisational culture is conducive/accommodative to suggestion scheme.	23	**50**	27	2.98	0.89
AVERAGE MEAN SCORE				**2.96**	
AVERAGE STANDARD DEVIATION					**0.93**



Note: Average agree to strongly agree = 28.69%; average neither agree nor disagree = 43.07% and average disagree to strongly disagree = 27.70%

Figure 4.9: Graphical Illustration of Organisation Culture

4.5.4 Organisation culture

i. The culture at the organisation supports the implementation of Lean principles;
ii. There is a genuine commitment and sense of urgency within the organisation to implement a Lean culture;
iii. Lean culture is instilled in the values and behaviours of the organisation;
iv. Organisational culture is conducive or accommodative to suggestion schemes.

4.5.4.1 The culture at the organisation supports the implementation of Lean principles

One of the key factors for successful strategy implementation is to ensure that the organisation culture adapts to this strategy. The overall feel of the respondents, 42% (n-31), felt uncertain that the organisation culture supports the implementation of Lean principles. Thirty percent, 30% (n-30), of the participants agreed that the organisation culture supports the implementation of Lean principles while 28% (n-21) disagreed with this statement.

4.5.4.2 There is a genuine commitment and sense of urgency within the organisation to implement a Lean culture

According to the findings, 26% (n-19) of the respondents agreed that there was a genuine commitment and sense of urgency within the organisation to implement a Lean culture; 44% (n-33) of the respondents were neutral while 30% (n-22) of the respondents disagreed that there was a genuine commitment and sense of urgency within the organisation to implement a Lean culture.

4.5.4.3 Lean culture is instilled in the values and behaviours of the organisation

The study found that 32% (n-24) of the respondents agreed that Lean culture is instilled in the values and behaviours of the organisation. The opinion of 38% (n-28) of the respondents was neutral while 30% (n-24) of the respondents disagreed that Lean culture is instilled in the values and behaviours of the organisation.

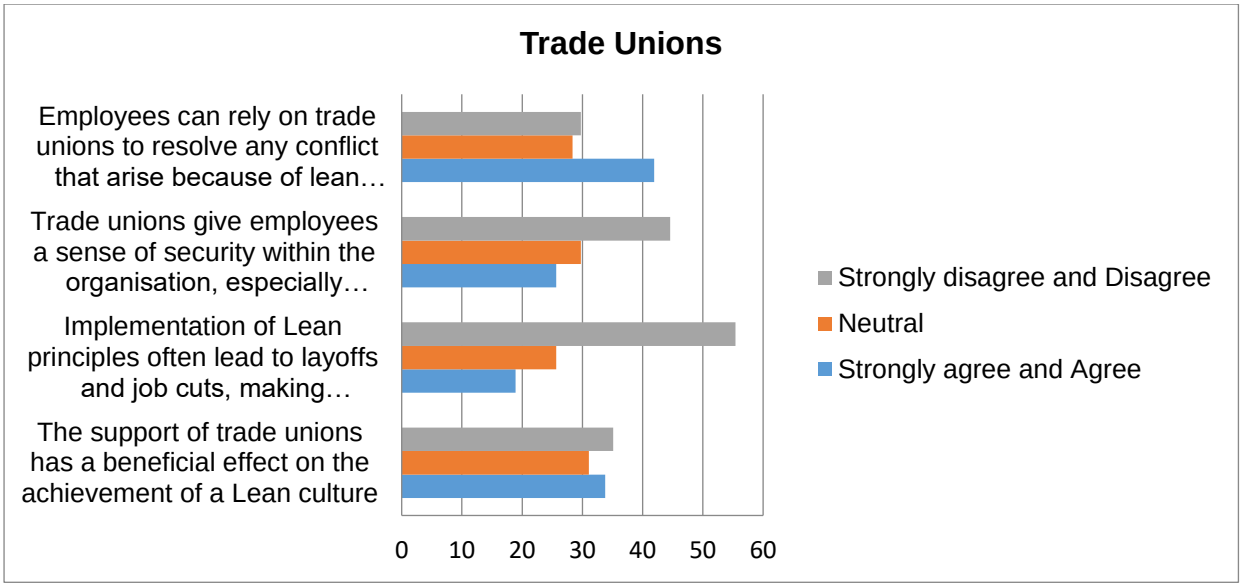
4.5.4.4 Organisational culture is conducive or accommodative to suggestion schemes

According to the findings, 28% (n-21) of the participants agreed that organisational culture is conducive or accommodative to suggestion schemes. The opinion of 49% (n-36) of the respondents was neutral while 23% (n-17) of the participants disagreed that organisational culture is conducive or accommodative to suggestion schemes.

The average mean of 2.96 is an indication that the organisation culture does in fact have a very positive influence on the effectiveness of Lean principles.

Table 4.12: Trade Unions

Trade unions	**Strongly disagree and Disagree**	**Neutral**	**Strongly agree and Agree**	**Mean**	**Std. Dev**
The support of trade unions has a beneficial effect on the achievement of a Lean culture	34	31	**35**	3.00	1.11
Implementation of Lean principles often lead to layoffs and job cuts, making employees perceive these processes in a negative light, resulting in employees depending on trade unions for support	19	26	**55**	3.39	0.92
Trade unions give employees a sense of security within the organisation, especially when uncertainty arises because of streamlined processes	26	30	**44**	3.16	1.16
Employees can rely on trade unions to resolve any conflict that arise because of lean implementation, which cannot be resolved by management	**42**	28	30	2.80	1.12
AVERAGE MEAN SCORE				**3.09**	
AVERAGE STANDARD DEVIATION					**1.08**



Note: Average agree to strongly agree = 41.22%; average neither agree nor disagree = 28.72% and average disagree to strongly disagree = 30.07%

Figure 4.10: Graphical Illustration of Trade Unions

4.5.5 Perceptions about trade unions

i. The support of trade unions has a beneficial effect on the achievement of a Lean culture;
ii. Implementation of Lean principles often leads to layoffs and job cuts, making employees perceive these processes in a negative light, resulting in employees depending on trade unions for support;
iii. Trade unions give employees a sense of security within the organisation, especially when uncertainty arises because of streamlined processes;
iv. Employees can rely on trade unions to resolve any conflicts that arise because of Lean implementation, which cannot be resolved by management.

4.5.5.1 The support of trade unions has a beneficial effect on the achievement of a Lean culture

There was a mixed perception on whether or not the support of a trade union within the organisation has a beneficial effect on the achievement of a Lean culture. Thirty-five percent, 35% (n-26), of the respondents felt that trade unions will have a beneficial effect on the achievement of a Lean culture, 31% (n-23) said they could not decide while 3% (n-25) of the respondents disagreed that trade unions will have a beneficial effect on the achievement of a Lean culture.

4.5.5.2 Implementation of Lean principles often lead to layoffs and job cuts, making employees perceive these processes in a negative light, resulting in employees depending on trade unions for support

The study found that 55% (n-41) of respondents felt that implementation of Lean principles will lead to layoffs and job cuts thus it is important for all employees to belong to a trade union. The opinion of 26% (n-19) of the respondents was neutral while 19% (n-14) remarked that their disagreed that the implementation of Lean principles will lead to layoffs and job cuts.

4.5.5.3 Trade unions give employees a sense of security within the organisation, especially when uncertainty arises because of streamlined processes

Forty-five percent, 45% (n-33), of respondents felt that trade unions provided a sense of job security, 30 % (n-22) said that they could not decide while 26% (n-19) of the respondents disagreed that trade unions provided a sense of job security.

4.5.5.4 Employees can rely on trade unions to resolve any conflict that arise because of Lean implementation, which cannot be resolved by management

The study found that 42% (n-31) of respondents felt that trade unions could not resolve conflicts that arise because of Lean implementation that cannot be resolved by management. According to 28% (n-21) of the respondents, they could not decide while 30% (n-22) agree that employees can rely on trade unions to resolve any conflicts that arise because of Lean implementation that cannot be resolved by management

An average mean of 3.09 indicates that trade unions have a positive influence on the effectiveness of Lean principles.

4.6 SECTION C: SUGGESTED MODEL OF EFFECTIVE LEAN IMPLEMENTATION FOR WELFIT ODDY

In this section the researcher establishes a Lean management model that will overcome challenges faced by Welfit Oddy in applying Lean principles in the manufacturing of their products. These include a shared vision, top management

commitment establish a Lean culture within the organisation, open communication, rewards and recognition to encourage employees participation, support of trade unions and employees continuously informed, trained and reminded about the need for Lean.

4.6.1 Management Commitment

Management involvement is often seen as the holy grail of a successful organisation. Research has shown that poor management has been identified as the reason for poor sustainability of Lean change (Worley & Doolen, 2006). Management forms a key driver of the implementation of strategies such as Lean principles. The mean score of 3.47 indicates that the majority of the respondents felt that management involvement had a positive influence on the effective implementation of Lean principles. The results indicate that the respondents felt that management does not liaise with employees about decisions that must be made.

Management should liaise with employees first when discussing new strategy implementation in order get the employees' support. Employees will be able to advise managers as to what processes will work and what processes will not work as the employees have hands- on experience.

4.6.2 Open Communication

Since Lean implementation involves employees at all levels, there is a need for a good communication system to enable a smooth flow of the process. One of the main challenges of communication is to ensure that the changes are being readily accepted and implemented by everyone at all levels (Puvanasvaran et al., 2009).

The mean score of 3.07 indicates that the majority of respondents felt that communication has a positive influence on the effective implementation of Lean principles. The results indicate that even though new processes and strategies are readily available in the organisation, respondents still felt that there is no clear exchange of information from top management about new strategies or its implementation.

The organisation must ensure that all strategy and process changes are always communicated to employees from the inception until the end of new strategy or process implementation.

4.6.3 Establish a Lean Culture

One of the key factors for successful strategy implementation is to ensure that the organisation culture adapts to this strategy. Instilling Lean principles requires the right culture. The mean score indicates that the majority of the respondents felt that the organisational culture has a positive influence on the effective implementation of Lean principles.

The mean score of 3.09 indicates that the majority of the respondents felt that the organisational culture has a positive influence on the effective implementation of Lean principles. Respondents do however feel that employees should be encouraged through rewards and recognition in order to have a shared vision with the organisation. This will be beneficial to the organisation as employees will work together with the organisation to ensure that Lean principles are implemented effectively.

4.6.4 Rewards and Recognition to encourage employees participation

Respondents feel that employees should be encouraged through rewards and recognition in order to have a shared vision with the organisation. This is an indication that rewards and recognition from management are an important factor in strategy implementation. This will be beneficial to the organisation as employees will work together with the organisation to ensure that Lean principles are implemented effectively.

4.6.5 Trade Unions

Certain elements must be included if any Lean programme is to be successful. Typically, active leadership and partnerships between management and labour must be part of any Lean initiative (Hines et al., 2011). Convincing trade unions to embrace Lean is a must, as management needs to prove that Lean does not stand for fewer employees are needed (Doolen & Worley, 2006).

There was a mixed perception on whether or not the support of a trade union within the organisation has a beneficial effect on the achievement of a Lean culture.

4.6.6 Employee involvement

Employees need to be continuously informed, trained and reminded about the need for Lean principles and its purpose. This will eliminate uncertainty among employees and establish a Lean culture.

4.7 RELIABILITY OF THE DATA

The Cronbach alpha scores of the instruments indicate that the instruments have rendered reliable data at the basic research level, with the exception of the Factors that Contribute variable with the alpha = 0.41. If item FACT 4 is however deleted from this instrument, the Cronbach alpha changes to 0.63. This item was therefore deleted from the Factors that Contribute variable. Nunnally (1978) suggests that a Cronbach alpha of 0.50 is acceptable for basic research.

The final Cronbach alpha scores were therefore as follows:

Table 4.13: Final Cronbach Alpha Scores

VARIABLE	INITIAL ALPHA	ITEMS DELETED	FINAL ALPHA
Challenges Faced	0.65	None	0.65
Factors that Contribute	0.41	FACT 4	0.63
Impact of Ineffective Application	0.59	None	0.59
Employment Involvement	0.54	None	0.54
Management Involvement	0.64	None	0.64
Communication	0.57	None	0.57
Organisation Culture	0.78	None	0.78
Trade Unions	0.74	None	0.74

4.7.1 Validity and reliability of the study

The principles of validity and reliability are fundamental cornerstones of every research project. Together, they are the core of what is accepted as scientific proof by scientists and philosophers alike (Cohen et al., 2007: 133).

4.7.2 Reliability of the measuring instrument

The extent to which results are consistent over time and are an accurate representation of the total population under the study is referred to as reliability, and if the results of a study can be reproduced under a similar methodology, the research is considered to be reliable (Blumberg et al., 2008).

In this study a number of steps were taken to ensure the reliability of the findings. First, a rich collection of secondary literature was reviewed to define the problem, background, aims and conceptual or theoretical foundation of the study. The literature review gave the researcher an insight into the methodological and theoretical lapses of existing studies in the subject. This served as a guide in designing the methodological approach of this research.

Secondly, similar questions were asked in existing studies in the subject at the interviews and in the questionnaire survey. This was to ensure accuracy and consistency in the findings.

Finally all the participants in the study passed the selection criteria. This was to ensure that the data obtained from the participants was as accurate as possible.

4.7.3 Validity of the measuring Instruments

Validity is concerned with the soundness and effectiveness of the measuring instrument. Validity raises questions of whether the measuring instrument measures what it is intended to measure, what the actual test is that is being measured and the degree of accuracy of that measurement (Zikmund et al., 2010). Validity is the extent to which the accuracy of the research findings represents what really is happening in a particular situation. Researchers generally determine validity by asking a series of questions, and will often look for the answers in the research of others (Collis & Hussey, 2009).

An exploratory factor analysis was not conducted due to the small sample size. The instruments used in the present study showed good content and face validity.

Secondly the study has achieved the purpose for which it was intended namely, the effectiveness of the application of Lean Principles in South African manufacturing companies. In the process of realising the purpose of the study, the author included all the parties involved in Lean implementation in South Africa tank manufacture. In other words, it included senior managers, managers, team leaders and lower level employees as all these occupational categories contributed enormously in realising the project.

In addition, the questionnaire survey was carefully designed to ensure that the answers were aligned to the purpose of the study. Also, prior to rolling out the questionnaire, the questions were carefully reviewed by the researcher's supervisors.

In order to increase the reliability and validity of the results obtained from the research, feedback obtained from analysing the questionnaires were compared and used to formulate the conclusions and make recommendations.

4.8 SUMMARY

This chapter discussed the empirical results and presented these in graphic form. Responses were analysed and interpreted to determine whether the empirical study supported the concepts. Responses were interpreted in order to evaluate the effectiveness of the Lean implementation principles at Welfit Oddy.

On the basis of the interpretation and the presentation of the results, recommendations for successful Lean implementation will be formulated. These are presented in Chapter 5 together with the final conclusions drawn from the study as a whole.

CHAPTER 5

SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 INTRODUCTION

The final chapter briefly summarises the entire study, the empirical results thereof, the interpretations made and conclusion drawn from the findings. In addition, this section will indicate via the responses obtained, further opportunities to enhance or improve the effectiveness of Lean principles are also discussed.

The thematic analysis in Chapter Four affords an opportunity to understand the responses in greater detail and to determine from the overarching themes presented how certain barriers may impact on lean implementation. This study has used five variables (employee knowledge, management involvement, communication, organisational culture, trade unions) to examine the effectiveness of lean implementation in tank manufacture. This chapter presents the main findings and conclusions in the study. The author has also made possible recommendations to enhance effectiveness of lean implementation in tank manufacture.

5.2 SECTION A: EMPLOYEE KNOWLEDGE

Getting all employees on board from the outset is crucial to sustain Lean change. Employees who add or create value are displaying Lean behaviours (Angelis & Fernandes, 2012). Lean behaviour is a strong source of competitive advantage, and once it is deeply understood and practiced diligently, it will become sustainable behaviour that replaces old habits (Hines et al., 2011).

5.2.1 Summary of findings

In this category, 41% of the respondents felt that they were not continuous informed, trained and reminded about the need for lean principles and its purpose, 54% of the respondents, agreed that the implementation of new strategies results in uncertainty among the employees ,41% the respondents disagreed that their have shared vision and are fully committed to implement Lean principles ,62% of respondents did however strongly feel that that their try to improve on their work on a daily base

5.2.2 Conclusions

Based on the findings of the study the following conclusions were drawn:

i. According to the findings, 36% of the respondents felt that employee knowledge, understanding and skill are important for the effective implementation of Lean principles. Thus it can be said that lack of employee knowledge of lean principle is one of the factors that influence effectiveness of Lean principles.

ii. It can also be concluded that major factors that contribute to lack of employee knowledge of lean principle are lack of training programs available to educate the employees about the Lean principles already implemented in the organisation such as 5 S's, Kaizen, Visual management, Kanban ,Pull ,Value Stream Mapping (VSM) ,Total Productive Maintenance (TPM), Total Quality Management (TQM) ,Quick set-ups ,Standard work ,Cellular layout. These are all Lean procedures, yet employees are not aware of this.

5.2.3 Recommendations

Listed below are recommendations to improve the effectiveness of lean implementation in tank manufacture

The organisation should also ensure that there are training programs available to educate the employees about the Lean principles already implemented in the organisation such as 5 S's, Kaizen, Visual management, Kanban ,Pull ,Value Stream Mapping (VSM) ,Total Productive Maintenance (TPM), Total Quality Management (TQM) ,Quick set-ups ,Standard work ,Cellular layout. These are all Lean procedures, yet employees are not aware of this.

The following recommendations for the approach towards lean implementation would favour improved understanding and acceptance from all.

Training sessions and material in the most prominent languages in the organisation plays a big role in bringing about a better understanding of what Lean is all about and why it is important for organisations to become Lean. More than just explaining the tools, proper training needs to focus on the philosophical aspects of Lean and how a

change in mind set will bring about sustainable improvement within the processes of the organisation. Employees at all levels need to know what role they play in the implementation process as well as in ensuring the sustainability of these initiatives.

Refresher training needs to be provided and during training sessions, individuals should be made aware of how and where the specific tools have been implemented and what savings have been achieved through the implementation thereof. Training provided should also be structured and specific to the relevant leadership level so that everyone knows what part or role they must play in order to ensure sustainability of continuous improvement initiatives. Basic (class room exercises) and advanced (pilot areas) simulation exercises to clarify the various lean tools used.

Recommendation for improving the investment focus of lean implementation

The investment in lean is viewed by many organisations as a once-off cost that would see long-term benefits. The cost however is ongoing and the benefits often outweigh the costs. The focus for investment should be spread over key elements of implementation relating to the following:

- Training investment
- Infrastructure investment (training material, machinery and basic equipment for lean improvements)
- Incentive scheme investment cost to ensure sustainability.

5.3 SECTION B: THE INFLUENCE OF MANAGEMENT INVOLVEMENT ON EFFECTIVE LEAN PRINCIPLES

Business strategy and leadership development are tightly interwoven. This is the reason that executive involvement and sponsorship is so critically important to leadership development success. The best leadership development systems foster an ability to execute business strategy (Ninth House, 2006:14). Organisational effectiveness is critical to the success of any business. In order to achieve increased and sustainable business results, organisations need to execute strategy and engage employees. To create organisational effectiveness and success the business leaders have a responsibility to keep their focus on aligning and engaging the employees (including organisational culture) with the strategy.

5.3.1 Summary of findings

In this category 47% of the respondents felt that management forms a key driver of the implementation of strategies such as Lean principles, 70% of respondents strongly felt that rewards and recognition from management will forms a key driver to encourage employees to implement lean strategies, 64% of respondents felt that management were continually re-assessed and tried to improve upon strategies in order to minimise economic and other waste in the organisation, 59% of respondents felt that management efficiently and effectively responded to changes in customer demand with strategies that best suit the organisation ,38% of the respondents agreed that motivation and demand for success of Lean efforts come from top management

5.3.2 Conclusions

Based on the findings of the study the following conclusions were drawn:

i. The mean score of 47% indicates that the majority of the respondents felt that management involvement had a positive influence on the effective implementation of Lean principles.
ii. The results indicate that the respondents felt that management does not liaise with employees about decisions that must be made.

5.3.3 Recommendation

The involvement of senior and middle management from organisations is critical in implementation programs. A balance between task and relationship orientated leadership is required to ensure goals are met and the intended outcome achieved. Leadership is found in this context to impact the large majority of other barriers and in doing so becomes the pivotal requirement for lean. Leaders should be charismatic in their approach to inspire and motivate the people.

There is tremendous scope for improvement in this area that would have positive spill over effects in all areas of the organisation. This will ensure the stigma attached to lean practices is removed from the minds of the people and replaced with the view of lean as the philosophy to improve the lives of all involved.

Regarding Lean as a philosophy, leaders within the organisation should live Lean and not just consider it to be the implementation of continuous improvement initiatives and use of tools to achieve improvement. Lean is more than just that and if not lived by the leaders, the positive change will not spill over to the workers. This in the end will affect the Engagement/commitment shown by others and in the end affect the sustainability of these initiatives.

5.4 SECTION C: THE INFLUENCE OF COMMUNICATION ON EFFECTIVE LEAN PRINCIPLES

Clear effective internal communication is important to accomplish the effectiveness of Lean principles as it fosters trust (Worley & Doolen, 2006). Since Lean implementation involves employees at all levels, there is a need for a good communication system to enable a smooth flow of the process. One of the main challenges of communication is to ensure that the changes are being readily accepted and implemented by everyone at all levels (Puvanasvaran et al., 2009).

5.4.1 Summary of findings

The study found that 43% of respondents felt that there is a lack of open exchange of communication from top management, 41% of respondents felt that leaders did not take time to truly discuss the issues regarding lean implementation that 82% of the respondents agreed that their want new strategies communicated to them and want a clear idea of their responsibilities.

5.4.2 Conclusions

Based on the findings of the study the following conclusions were drawn:

i. Generally, most (mean of 43%) of the respondents declared that there was a lack of open exchange of communication from top management. Therefore it is safe to conclude that ineffective communication significantly contributes to ineffective lean implementation at Welfit Oddy.
ii. It is also safe to conclude that major contributors to ineffective communication at Welfit Oddy are: lack of clear and concise messaging; lack of open exchange of communication from top management and lack of communication feedback.

iii. Also, the study found managers at Welfit Oddy endeavor to make themselves visible and accessible.

5.4.3 Recommendation

The organisation must ensure that change of strategies and processes are always communicated to employees from inception until the end of new strategy or process implementation.

Leaders should start sharing and considering ideas and suggestions that come from the shop floor. Leaders should listen to what workers on the shop floor have to say about certain improvements that need to be implemented and should create an environment where individuals feel free to raise their opinion as well as identify areas for improvement. To make those giving ideas/suggestions feel appreciated and part of the team, constructive feedback should be given when ideas/suggestion are not used and praise when they are used.

Regular communication by leaders at all levels (top-down and bottom-up) will raise awareness within the organisation and will demonstrate their commitment to Lean initiatives. It is important that the communication reaches the shop floor or those individuals closest to the processes so that they can become familiar with the terms and benefits that these initiatives bring about. Communication, however, needs to be detailed and should be able to highlight why the Lean implementation is a necessity for the organisation.

It is also important that leaders participate in Lean initiatives so that shop floor workers see that these workshops are not only for the shop floor but that the success and improvements achieved are important for all.

5.5 SECTION D: THE INFLUENCE OF ORGANISATIONAL CULTURE ON EFFECTIVE LEAN PRINCIPLES

The concept of lean manufacturing, as discussed earlier in previous chapters, is larger than just the tools that enable process improvements and cost reductions to be implemented. The initial organisational culture that exists within an organisation also plays a significant role in the success or failure of the implementation of lean

manufacturing in a company. It is therefore important for an organisation to understand that its culture also plays a role in becoming competitive especially in South Africa. This is mainly due to South Africa having the added challenge of successfully merging a multi-cultural society.

The implementation of lean manufacturing concepts is not an easy one. This is due to the change involving a process of implementing new concepts and tools that requires a significant change in the company's organisational culture depending on the initial environment. It is therefore important for a company to analyse its organisational culture prior to embarking on the implementation process. This analysis will help the company ascertain its initial organisational culture in comparison to a lean culture with the aim of determining its strengths and weaknesses to help it build a successful strategy of implementation.

5.5.1 Summary of findings

The overall feel of the respondents, 42% of employees felt uncertain that the organisation culture supports the implementation of Lean principles ; 44% of the respondents were neutral regarding a genuine commitment and sense of urgency within the organisation to implement a Lean culture as well 38% of the respondents was neutral regarding lean culture is instilled in the values and behaviours of the organisation, 49% of the respondents was neutral regarding organizational culture is conducive/accommodative to suggestion scheme.

5.5.2 Conclusions

Based on the findings of the study the following conclusions were drawn:

i. The mean score of 30% of the respondents felt that the organisational culture has a positive influence on the effective implementation of Lean principles.
ii. Respondents do however feel that employees should be encouraged through rewards and recognition in order to have a shared vision with the organisation.
iii. This will be beneficial to the organisation as employees will work together with the organisation to ensure that Lean principles are implemented effectively.

5.5.3 Recommendation

Strategic vision allows for the motivation of staff by creating a shared vision of the future. The vision allows for common goals that contribute to the improvement of all involved in the organisation. The vision would ensure that the correct leaders are present within the organisation thus allowing the inspiration of people towards shared goals. This vision should be well communicated regularly to all in the organisation. A strategy must rather seek to benefit all stakeholders with the aim of a continued and successfully sustainable business in the future. The strategy itself should inspire and motivate all parties involved to passionately pursue the goals of the strategy.

The methodical approach taken to implement a lean program is currently lacking in that the language barrier is largely overlooked. Multilingual approach to training in South Africa is utmost important due to South Africa is home to eleven official languages. The diversity of the workforce requires an approach to training that would allow employees to understand the concepts in their own language. It is relevant and important that language barriers be addressed as employees who undergo training in a language they do not understand often make it a futile exercise. Realistically though, not all languages can be catered for, but certainly the most popular languages can be used in both training material and the spoken word. At present training is often given in one language and the workers do not necessarily understand the concept of various lean initiatives as clearly as they should.

5.6 SECTION E: THE INFLUENCE OF TRADE UNIONS ON EFFECTIVE LEAN PRINCIPLES

5.6.1 Summary of findings

There was a mixed perception on whether or not the support of a trade union within the organisation has a beneficial effect on the achievement of a lean culture. According to 35% of the respondents felt that trade unions will have a beneficial effect on the achievement of a lean culture, that 55% of respondents felt that implementation of Lean principles will lead to layoffs and job cuts thus it is important for all employees to belong to a trade union, 45% of respondents felt that trade unions provide a sense of job security, that 42% of respondents felt that trade unions could not resolve conflict that arise because of lean implementation

5.6.2 Conclusions

Based on the findings of the study the following conclusions were drawn:

i. There was a mixed perception (35%) on whether or not the support of a trade union within the organisation has a beneficial effect on the achievement of a Lean culture.

ii. The main contributory factors to lack of trade union involvement regarding lean implementation.

iii. Certain elements must be included if any Lean programme is to be successful. Typically, active leadership and partnerships between management and labour must be part of any Lean initiative.

iv. Nevertheless, the study found that managers make significant efforts to empower their employees and convincing trade unions to embrace Lean.

5.6.3 Recommendation

Currently, there is a mixed perception of whether trade unions have an impact on the effective implementation of Lean principles, therefore management should always ensure that before any strategy change, all trade unions are on board and have a clear understanding of what the strategy entails. With increasing global competitiveness pressures, a workforce that is de-motivated and negative towards the philosophy that could ultimately secure their jobs makes it an urgent matter to change this negative perception of lean held by unions and the workforce.

Union engagements should allow for equal voices from all levels in the organisation. The aim of their involvement is to gain commitment, assist them in understanding the intentions of a particular program and familiarise them with the intended outcomes of each lean initiative. Union involvement is the key to communication with the shop floor and reduces both overt and covert resistance experienced in any lean program. The collective ownership should be made clear with the strategic intent being the drive of competitiveness to ensure long-term survival of the respective organisation. Union support for lean would see the fast tracking of implementation throughout the organisation. Involving unions from the early planning stages is thus a recommendation that would yield many benefits for any lean program.

5.7 OPPORTUNITY FOR FURTHER RESEARCH

This section of the study proposes recommendations for future research opportunities. The empirical evidence from the study has enabled the researcher to propose recommendations to assist management in further investigation in the operation. The research model and findings in Chapter four provide managers with insight into where the main potential for improvement is found. These findings can enable management to apply the right tools and strategies to improve lean implementation principles.

In order for Lean to be rolled out successfully to the rest of the organisation, the question of organisational readiness for change can be explored. Pieterse et al. (2010, p. 15) point out that the hardest part in the implementation process of Lean is changing the attitudes and habits of the people in the organisation. Organisational culture in the context of Lean is an important indicator for Lean success as it can impact the work practices, layout, organisational hierarchy and staff engagement (Pieterse et al., 2010, p. 189).

Future research studies should also investigate successful Lean manufacturing operations and benchmark an existing, struggling operation on targeted identified parameters. Similarly, the barriers, drivers and costs of Lean implementation and the efficiencies gained from Lean can be researched in different sectors of the economy and especially in under-researched industries.

5.8 LIMITATIONS OF THE STUDY

There are certain limitations in the findings of the study that should be highlighted for similar, future studies to consider.

- The results of this study were limited to one operation in this specific tank manufacture.
- The response rate of 75% can be deemed as acceptable, but a higher response rate with a bigger sample size could provide more evidence of employees' perceptions regarding the effectiveness of Lean principles

A possible reason for not receiving a one hundred percent (100%) response rate is that employees are not familiar with answering questionnaires, some stating lack of

time and others not being interested. Some employees informed the researcher after the questionnaires were distributed that they were not interested in answering surveys that would have no effect on their work or bring positive changes. Further feedback from the employees was that they found the survey a waste of time. Another reason for the lower response rate is that some of them felt that certain questions seemed sensitive and might reveal confidential company issues, which added to the difficulty of receiving more positive feedback.

This study, as many others, was limited in the risk of observer bias as no statistical measure was taken to ensure an acceptable margin of error for this study.

5.9 CONCLUSION

Many manufacture industries routinely apply the management principles of Lean manufacturing to help standardise straightforward business procedures. The advantages include speedier operations, lower costs, better products and an improved customer experience (Garrigues & Tan, 2008). Lean Manufacturing brings with the appeal and awareness to 'take note' and notice things around you (cost, waste, movement, clutter, scrap etc.) and then do something real, meaningful and constructive about it (Spear, 2012).

Continuous improvement must have a strong adaption to really work. Standardized tools copied directly from Lean literature are no guarantee for success. Motivation for implementing Lean principles is built on education, simplified operations, commonly understood goals, involvement with trade unions and engaged leadership (Holtskog, 2013).

Education is about learning the tools, but it also makes each employee capable of working independently and to take autonomous decisions. Unions can be a powerful ally, as their participation and collaboration speed processes up and support the building of a local common sense. Cultural aspects of the work and how people operate are also important aspects for effective implementation of Lean principles (Villa & Taurino, 2013).

5.10 SUMMARY OF RESULTS

In chapter one, it was highlighted in the problem statement that for South Africa tank manufacture industry to compete with foreign competition, mainly based in China , certain strategies were introduced such as Lean manufacturing in order to increasing the effectiveness and efficiency of production processes. Manufacture companies have found it difficult to identify the root causes as to why Lean principles have not been implemented successfully. The present study investigated a model to improve the effectiveness of Lean principles and examined factors that could lead to the successful implementation of Lean principles within a tank manufacture organization.

In this study the researcher examine the following challenges faced by Welfit Oddy in applying lean principles in the manufacturing of their products: shared vision, top management commitment establish a lean culture within the organization, open communication, rewards and recognition to encourage employees participation and support of trade unions.

The focus of the study was on a specific tank manufacture in Port Elizabeth. The research methodology was quantitative in nature. Data was gathered with the use a questionnaire.

REFERENCES

Alan L. Erera, Juan C. Morales and Martin Savelsbergh

Anderson, D., Lee, P. T. & Ruby, S., 2008. Final Report: Lean Production & Sky Chefs, CA: s.n.

Angelis, J. & Fernandes, B. 2012. Innovative Lean: work practices and product and process improvements. International Journal of Lean Six Sigma, 3(1), pp. 74-78.

Arnolds, C. A. (2012) *Research methodology: study unit 4.* Port Elizabeth: Unpublished notes. Nelson Mandela Metropolitan University.

Badurdeen A. (2007) *Lean Manufacturing Basics*

Bennett, R. 2002 “Gaining a competitive advantage through customer satisfaction.” Bank Marketing. (http://www.highbeam.com) accessed 2008/08/29 30

Berkshire, London, United Kingdom: Mcgraw-Hill Education Limited.

Berkshire, London, United Kingdom: Mcgraw-Hill Education Limited.

Blumberg, B., Cooper, D. & Schindler, P. 2008. *Business research methods.* 2nd ed.

Blumberg, B., Cooper, D. & Schindler, P. 2008. *Business research methods.* 2nd ed.

Bonneau, N., 2011. Lean implementation in service organisation, Sweden: s.n.

Byrne, M. *Sampling for qualitative research*. 2001. Available from http://findarticles.com (Accessed 13 May 2011)

Carmichael, C., Mullen, S. & Mante, E.-, 2009. Banking industry leverages Lean principles to eliminate waste. [Online] (1) Available at: HYPERLINK http://www.northhighland.com/results/whitepapers/pdfs/BankingindustryLeveragesLean.pdf. http://www.northhighland.com/results/whitepapers/pdfs/BankingindustryLeveragesLean.pdf [Accessed 17 April 2012]

Chambers, R. & Skinner, C. 2003. *Analysis of survey data.* United Kingdom: John Wiley and Sons.

Chen J C, Dugger J and Hammer B (2000), “A Kaizen Based Approach for Cellular Manufacturing Design: A Case Study”, The Journal of Technology Studies, Vol. 27, No. 2, pp. 19-27.

Churchill, G.A. 1999. Marketing Research: Methodological Foundations (6th edition.). Fort Worth. Dryden Press.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th ed.). Abingdon: Routledge.

Collis & Hussey, 2009

Collis, J. & Hussey, R. 2009. *Business research. A practical guide for undergraduate and postgraduate students*. 3rd ed. New York: Palgrave Macmillan.

Collis, J. & Hussey, R. 2009. Business research. A practical guide for undergraduate and postgraduate students. 3rd ed. New York: Palgrave Macmillan.

Collis, J. & Hussey, R. 2009. *Business research. A practical guide for undergraduate and postgraduate students*. 3rd ed. New York: Palgrave Macmillan.

Conner, G. 2001. Lean manufacturing for the small shop. Dearborn, MI.: Society of Manufacturing Engineers.

Dean M and Robinson A (1991), “America’s Most Successful Export to Japan: Continuous Improvement Programmes”, Sloan Management Review, Vol. 3, p. 67.

Dombrowski, U. & Mielke, T. 2013. Lean leadership. Fundamental principles and their application. Journal of Operations Management, 7(2), pp. 569-574

Doolen, J. & Worley, I. 2006. Role of communication and management in a Lean manufacturing implementation. 1st ed. New York: Management Decision.

Ehrenfeld, J.R. 2005. The roots of sustainability. MIT Sloan Management Review, 46(2),pp.50-62.

Folinicis, D. & Faruna, T. 2011. Implementing Lean thinking paradigm practices in medical set up. Management Dynamics, 1(2), pp.61-78.

Ford, 2014. The Evolution of Mass Production. [Online] Available at: www.ford.co.uk/experience-ford/heritage/evolutionofmassproduction [Accessed 06 April 2014].

Franz-Kamissoko, L. 2011. Get some culture. Celebrating excellence in organisations, 10(11), pp.66-68.

Gagnon, M.A., Jansen, K.J. & Michael, J.H. 2008. Employee alignment with strategic change: a study of strategy-supportive behavior among blue-collar employees. Journal of Managerial Issues, 20(4), pp.425-443

Gagnon, M.A., Jansen, K.J. & Michael, J.H. 2008. Employee alignment with strategic change: a study of strategy-supportive behavior among blue-collar employees. Journal of Managerial Issues, 20(4), pp.425-443.31

Garrigues, F. & Tan, M. 2008. Adapting Lean for customised bank processes. McKinsey and Company, 7(1), p.16.

Gubman, E., 2004. From Engagement to passion for work: the search for the missing person. HR Planning, 42: pp. 3-27.

Hart, S.L. & Milstein, M.B. 2007. Creating sustainable value. Academy of Management Executive, 17(2), pp.56-69.

Hill, C.W.L., 2003. International Business: competing in the Global marketplace. International edition. (4th Ed); New York: McGraw-Hill Companies Inc.

Hines, P., Found, P., Griffiths, G. & Harrison, R. 2011. Staying Lean, thriving, not just striving. 2nd ed. New York: Productivity Press.

Hines, P., Found, P., Griffiths, G. & Harrison, R. 2011. Staying Lean, thriving, not just striving. 2nd ed. New York: Productivity Press.

Hines, P., Found, P., Griffiths, G. & Harrison, R. 2011. Staying Lean, thriving, not just striving. 2nd ed. New York: Productivity Press.

Holtshousen, M. 2011. The deficiency mentality: What the economic crisis did to leaders. Celebrating excellence in organisations, 10(2), pp.64-65.

Holtskog, H. 2013. Continuous improvement beyond the Lean understanding. Journal of Operations Management, 7(2), pp. 575-579.

Hussey, J. Hussey, R. 1997. Business research: A practical guide forundergraduate and post graduate students. Macmillan Press LTD, London.

Jeyaraman, K. & Teo, L.K. 2010. A conceptual framework for critical success factors of Lean six sigma: implementation on the performance of electronic manuafacturing service industry. International Journal of Lean Six Sigma, 1(3), pp.191-215.

King, K. 2011. Investing in human capital. Celebrating excellence in organisations, 10(5), pp.58-59.

Klipp, P., n.d. Getting started with Kanban. [Online] (1) Available at: https://kanbanery.com/ebook/GettingStartedWithKanban.pdf [Accessed: 11 May 2015].

Lucey, J. (2008) The state of Lean manufacturing in the UK: 2001 to 2006', Management Services, pp. 16-25.

Mahwah, New Jersey: Lawrence Erlbaum Associates.

Malik S A, Li-bin L, YeZhuang T and Xiao-Lin S (2007), “Continuous Improvement Practices in Asian Developing Countries: A Comparative Analysis between Chinese and Pakistani Manufacturing Industry”, 14th International Conference on Management Science and Engineering, pp. 692-697, Harbin, PR China,32

Marksberry, P. 2011. The Toyota way: a quantitative approach. International Journal of Lean Six Sigma, 2(2), pp.132-150.

Melton, T. (2005) The Benefits of Lean manufacturing: What Lean Thinking has to offer the process industries [online]. Available from: http://mimesolutions.com/PDFs/WEB%20Trish%20Melton%20Lean%20Manufacturing%20July%202005.pdf. [Accessed 17 February 2012]

Montiea, B. 2011. Striving to make the client happy. Celebrating excellence in organisations, 10(11), p.30.

Nel, R. 2011. Womenomics: The way of the future. Celebrating excellence in organisations, 10(2), pp.74-76.

Ninth House, 2006. Leadership development practices of top-performing organisations.

O’Neill G. 2006.What are the critical steps for Lean success? AMIEI of Manufacturing Solutions. Available from: http://www.manufacturing-solutions.org (Accessed: 11 August 2011)

Piercy, N. & Rich, N. 2009. Lean transformation in the pure service environment: the case of the call service centre. International Journal of Operations and Production Management, 29(1), pp.54-76.

Pieterse, K., Lourens, A., Louw, A., Murray, A. & van der Merwe, K. 2010. Implementing Lean in South African industry. Port Elizabeth: TriLean Publishing. Pieterse, K. et al., 2010.

Puvanasvaran, P., Megat, H., Sai Hong, T. & Mohd.Razali, M. 2009. The role of communication process for an effective Lean manufacturing implementation. Journal of Industrial Engineering and Management, 2(1), pp. 125-152.

Rugg, G. & Petre, M. 2007. *A gentle guide to research methods*. 1st ed. England: Open University Press.

Russell, R.S, Taylor, B.W. 2003. Operations management. 4th ed. Prentice Hall.

Schultz, H., Bargain, J., Pogieter, T., Viedge, C. and Werner, A., 2003. Organisation Behaviour. A contemporary South African Perspective. Van Schaik Publishers, Pretoria.

Sechrest L*: 2001. Methodological Issues in Management Research:* White paper prepared for the Department of Veterans Affairs *Management Research in VA Workshop*, sponsored by the HSR&D Management Decision and Research Center. http://www.colmr.research.va.gov. Accessed 12 August 2011

Shaman Guta & Sanjiv Kumar Jain (2013) a literature review of Lean manufacturing , international journal of management science and engineering management, 8;4,241-249, DOL :10/17509653.2013.825074

Sharma, K & Kaur, G., 2008. Employee Empowerment: A Conceptual Analysis. The Journal of Global Business Issues, 2(2), pp. 9-10

Slack, N., Chamber, S. and Johnson, R., 2001. Operations management. Harlow, England: Prentice Hall. 3rd Edition.

Solotorow, L. & Banks, S. 2006. Resolve to Be Lean: Efficiencies for Any Industry. Planning & Operations Universal Advisory, 1, 1.

Spear, S. 2012. *Adapting lean manufacturing into your business*. [Online] Available at: http://www.whatisleanmanufacturing/adapting-lean-to-your-business.org [Accessed 19 April 2012].

Strategos-International, 2014. Strategos – Consultants in Lean manufacturing and manufacturing strategy [Online] Available at: http://www.strategosinc.com/Lean_implementation1.htm [Accessed: 10 May 2015].

Transportation Research Part E: Logistics and Transportation Review, 2005, vol. 41, issue 6, 551-566

Trollip, Neil, (Dr). 2008. Quality Management, Study notes.

van Rensburg, G. 2011a. Is there such a thing as too much urgency? Celebrating excellence in organisations, 10(8), pp.74-75.

Venegas, C., 2007. Flow in the Office: Implementing and Sustaining Lean Improvements. United States: CRC Press, Taylor & Francis Group.

Vermaak, T.,(2008). Critical success factors for the implementation for Lean thinking in South African manufacturing organisations, Unpublished Doctoral thesis, University of Johannesburg

Villa, A. & Taurino, T. 2013. From JIT to Seru, for a production as Lean as possible. Journal of Operations Management, 63(4), pp. 956-965.

Womack, J. P., Jones D.T. and Roos, D., 1991. The Machine that Changed the World: A story of Lean production. New York: Harper Pernnial. Womack, J. and Jones, D., 1996. Lean Thinking. New York: Simon and Schuster

Womack, J., Jones, D. and Roos, D., 2007. The Machine that Changed The World Published by Simon & Schuster; New York.

Worley, J.M. & Doolen, T.L. 2006. The role of communication and management support in a Lean manufacturing implementation. Management Decision, 44(2), pp.228-245.

Worley, J.M. & Doolen, T.L. 2006. The role of communication and management support in a Lean manufacturing implementation. Management Decision, 44(2), pp.228-245.

Zikmund, W., Babin, B., Carr, J. & Griffin, M. 2010. *Business research methods.* Canada: Cengage.

Zikmund, W., Babin, B., Carr, J. & Griffin, M. 2010. *Business research methods.* Canada: Cengage.