

Factors that affect the sustainability of 5S within Feltex (Pty) Limited - Durban Plant

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DECLARATION

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ABSTRACT

This study investigated the factors that affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. This entire investigation was guided by the following research objectives, namely: to gain an understanding into the various factors that affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant; to assess the extent to which 5S is practiced at Feltex Fehrer (Pty) Ltd – Durban plant; and to recommend ways to improve the sustainability of 5S initiatives using research and case studies. The researcher has adopted positivist epistemology as the philosophical approach. A descriptive study was conducted which enabled the researcher to accurately describe the research phenomenon. The study was conducted using the quantitative method. The research was conducted amongst staff at Feltex Fehrer (Pty) Ltd – Durban plant. The sample size of 82 was selected with the help of simple random sampling. The data was collected using a structured questionnaire. The research instrument was first piloted to determine its reliability and validity. The reliability and validity of the research instrument was tested through statistical tools such as Cronbach's alpha efficient and factor analysis respectively. The data collected was analysed using the Statistical Package for the Social Science (SPSS), version 25.0. The data analysis was done by employing both descriptive and inferential statistics. The results of the study revealed that the main factors that influenced the sustainability of 5S were, namely: top management commitment and communication; inventory system; employee health and safety measures; time management/schedule of implementation; resources; and procedures. The overall results showed that the 5S tool could be applied in the focal organisations. This study recommends the following to address the challenges affecting the sustainability of 5S; being employee training, top management support, employee involvement, awareness of 5S, resource availability and an appropriate reward system.

Keywords: 5S sustainability, shine, sort, set in order, standardize, sustain

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CHAPTER ONE: OVERVIEW AND BACKGROUND OF THE STUDY

1.1 Introduction

Globally, many organisations, particularly those in the manufacturing sector are under significant and continuous pressure to enhance productivity and consequently reduce operational costs (Chuanan & Singh, 2012). Most of these manufacturing organisations face intense competition in the global arena where there is significant pressure to use sophisticated manufacturing tools and/or methods to improve productivity. A study shows that a positive correlation exists between advanced manufacturing practices and some operational performance measures, such as quality and productivity (Bayo-Moriones, Bello-Pintado & Merino-Díaz de Cerio, 2010). Upadhye, Deshmukh and Garg (2010) postulate that achieving sustainability depends on how well the firm satisfies its customers through measures such as quality assurance, cost reduction, and quicker delivery lead times. Research shows that the lean manufacturing approach has a positive effect on a firm's product quality, productivity, operational costs and lead-time (Bayo-Moriones et al., 2010; Upadhye *et al.*, 2010). According to Alefari, Almani and Salonitis (2020), the concept of lean management emerged over the years and is based on a set of fundamental tools and techniques that is considered as the best tool of removing waste, reducing costs and transforming business performance. Alhuraish, Robledo and Kobi (2017) contends that lean manufacturing is widely applied in a large number of manufacturing companies worldwide. AlManei, Salonitis and Xu (2017) postulate that the implementation of the lean manufacturing offers several benefits for organisations, including but not limited to reducing waste and improving operating efficiency. Dieste, Panizzolo and Garza-Reyes (2020) also confirms that the implementation of lean manufacturing enhances environmental performance. Amongst advanced manufacturing practices, 5S is considered as a sophisticated tool that influences productivity in manufacturing firms.

Moreover, it has been found that the 5S tool is a key element in the lean approach (Bayo-Moriones *et al.*, 2010). 5S is considered as one of the pillars in the lean approach. This means that without 5S, the lean approach cannot function effectively. 5S stands for “sort, set in order, shine, standardize, and sustain” (Bayo-Moriones *et.al.* 2010:2). The 5S tool plays a crucial role in the design of lean method and its primary objective is to ensure continuous improvement (Bayo-Moriones *et al.*, 2010). A study shows that although 5S serves as a useful tool for

continuous improvement in manufacturing firms, there are however, some factors, which threatens its sustainability (Naqvi, 2013). Another study (Randhawa & Ahuja, 2017) suggests that the 5S is an outstanding Japanese philosophy, which is designed to develop any type of organisation worldwide. Randhawa and Ahuja (2017) concludes that 5S enhances production, quality, safety and effective utilisation of workspace for the sustained organisational improvement. Srinivasan, Ikuma, Shakouri, Nahmens and Harvey (2016) contend that the primary purpose of 5S is to create an organised work environment, but the effects of 5S on safety climate are not well documented in previous studies.

This study is aimed at investigating the factors that affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban plant. Feltex Fehrer (Pty) Ltd is a joint venture company with KAP Automotive (Pty) Ltd (51%) and F.S. Fehrer Automotive of Germany (49%). The core business of Feltex Fehrer (Pty) Ltd is the manufacture of polyurethane foam moulded seats, headrests, armrests and other moulded foam components, which are supplied into the South African automotive industry. This chapter of the study contains a detailed background of the study focusing on sustainability of the 5S lean tool, problem statement, aims of the research, research objectives and questions, contribution of the study, rationale for the study, summary of the research design and methodology, definition of terms and the organisation of the study.

1.2 Background of the Study

The 5S lean tool was first described in a book published by Ohno Taiichi (1988) on “Toyota Production System”. According to Ohno (1988), the reduction of waste through utilisation of the lean method or approach leads to a reduction in operational costs, thereby increasing the firm’s profitability. In a subsequent publication, Dennis (2007) advocates that eliminating unnecessary materials quicker, with reduced human effort and optimum material usage are the best principles of the lean approach that manufacturing firms seek to adopt in order to improve product quality.

The “5S tool is one of the most useful and most widely used methods to instill process improvements in manufacturing firms” (Bayo-Moriones *et al.*, 2010:218). According to Shil (2009), organisations can adopt the 5S tool to gain a competitive edge through the elimination of waste in processes, resulting in immediate gains. Singh, Mistry, Chavda, Patel and Patel (2015) believe that the lean 5S tool is one of the methodologies of lean manufacturing included

in the Toyota Production System. The 5S tool is also an aspect of “Kaizen”, which translates “change for better”. Singh *et al.* (2015) discover in their study that the 5S tool improves workplace effectiveness by making the environment more comfortable for the workers. They further argue that 5S principles reduces operational working hours, enhances productivity and improves safety; consequently, improving the working environment.

A study by Ghodrati and Zulkifli (2012) regarding “the impact of 5S implementation on industrial organisational performance” reveals that the sustainability of the 5S within the workplace or organisation has a significant impact on the performance of the organisation. Studies such as Todorovic and Čupić (2017), Patel, and Thakkar (2014) reveal that the lean 5S technique reduces waste and improves productivity, particularly in manufacturing firms. Todorovic and Čupić (2017) argue that the 5S tool could be viewed as a system of workplace rules designed to create and promote a safe working environment as well as to ensure efficient and effective realisation of business goals. According to Todorovic and Čupić (2017), the expected results of implementing 5S disciplines is a reduction of defects in production, enhanced product quality, improved workplace safety and employee motivation, as well as an increase in employees’ productivity. A study conducted by Todorovic and Čupić (2017) indicate that the 5S tool contributes positively to an organisations performance, both in the short and medium-term.

According to Kulkarni, Kshire, and Chandratre (2014), the 5S operational model is a technique of the lean philosophy, which is regarded as the cornerstone of lean manufacturing because it enhances the operational stability required to enforce and sustain continuous improvements in the workplace. Kulkarni *et al.* (2014) suggest that the ultimate goal of the 5S tool is to supply the firm’s customers with the high-quality product at the right time and with the actual quantities requested. Kumar and Kumar (2012) also postulate that 5S aims to ensure optimum workplace productivity, quality, output and safety. In a more recent study, Subburaman (2019:1514) argues that “5S is a lean tool which involves workplace organisation and is designed to reduce the searching time of a product”.

It can be observed from the literature that despite the growing importance of 5S, particularly in manufacturing, there are some critical success factors which influences its sustainability (Daraei, Hosseini, Niksirat and Kianbakhsh 2015; Barraza & Pujol, 2012; Todorova, 2013).

This study examines the factors that influence the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban plant.

1.3 Problem Statement

There is no consensus among scholars regarding the factors that influence the sustainability of 5S within the manufacturing firms globally. Daraei *et al.* (2015) in their study identify and rank the most crucial factors that affect the sustainability of 5S in Shahid Rajae Power Plant (SRPP) Iran. Their study identify and rank twelve factors which affects the sustainability of 5S; in ascending order, namely: situational factors; perseverance, knowledge, acceptability and authority of leader; belief; top management support and commitment; employee training; team work; employee satisfaction; commitment; organisational culture; schedule of implementation; 5S implementation costs; rewards and remuneration; and a conscientious work ethic.

By contrast, Singh *et al.* (2015) discover in their study that the barriers to the sustainability of 5S are less awareness, lack of adequate training from top management and ineffective communication. On the other hand, Barraza and Pujol (2012) in their case study on the 5S tool in three Mexican manufacturing facilities find three factors and two inhibitors of 5S sustainability. The three main factors, which influences the sustainability of 5S, are: the strategic link of 5S efforts, the 5S implementation process, and the plan. On the other hand, the inhibitors, which influenced the sustainability of 5S, are: application of 5S, and philosophical vision. Naqvi (2013), Todorova (2013), Barraza and Pujol (2012) and Benjamin (2012); in their studies discover that the factors which threatens the sustainability of 5S in organisations, are: manufacturing tier level, staff strength, the job titles of employees, the degree of utilisation of work teams, training received on 5S, the timeframe or duration for the lean usage, top management support and commitment, communication at plant level, personal responsibility and availability of resources. Conversely, Garza-Reyes, Kumar, Chaikittisilp and Tan (2018) point out that the effects of the lean methodologies such as 5S on environmental performance is still unclear, due to the dearth of empirical research on this field. Srinivasan *et al.* (2016) also argue the lack of research of the effects of 5S on the safety climate in an organisation. Subburaman (2019:1514) suggests that although 5S is found to be an effective lean tool applied to solving problems, especially in inspection departments; however its implementation is

affected by several factors including “messy tool setting, bad working environment and inefficient process flow”.

Recent research (Attri, Ashishpal, Khan and Siddiquee & Khan, 2020) also identifies some factors which hinder the implementation of 5S in organisations, namely: top management support and commitment, education and training, leadership, establishment of role and responsibility, cognition of 5S, integration with the organisational strategy, integration of 5S with quality improvement approaches and access to financial resources. In a similar study, Attri, Singh and Mehra (2017) observe that the barriers which affect the implementation of the 5S lean tool are high driving power and weak dependence power, financial constraints, lack of top management commitment, and lack of vision and mission.

The findings from the above studies confirms that most automotive manufacturing organisations globally, where South Africa is no exception, are faced with the challenge of how to implement and sustain the 5S tool effectively at plant level. However, factors hindering sustainability of each of the phases of the lean 5S tool by component manufacturers in the South African Automotive Industry cannot be ascertained due to limited research in this area. Further, it is observed from the literature there is scarce research in the South African context on how to ensure the sustainability of the 5S. This study is intended to fill the gap in research through the examination of the factors which affect the sustainability of 5S as well as how 5S can be sustained within Feltex Fehrer (Pty) Ltd – Durban plant.

1.4 Aims of the Study

The broad aim of the study is to investigate the various factors that affect the sustainability of 5S in the South African Automotive Component Manufacturing Industry, using Feltex Fehrer (Pty) Ltd – Durban plant as the case study organisation. This study further aims to shed more light on current lean practices, locally and globally, and apply lessons learned to reduce the cost of manufacturing within the South African Automotive Component Manufacturing Industry.

1.5 Research objectives

The research objectives which guides this entire investigation are:

- 1.5.1 To investigate the various factors that influence the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban plant,

- 1.5.2 To assess the extent to which 5S is practiced at Feltex Fehrer (Pty) Ltd – Durban plant; and
- 1.5.3 To recommend ways to improve the sustainability of 5S initiatives at Feltex Fehrer (Pty) Ltd – Durban plant using research and case studies.

1.6 Research Questions

This study seeks to find answers to the following research questions:

- 1.6.1 What are the factors that influence the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban plant?
- 1.6.2 How is 5S practiced at Feltex Fehrer (Pty) Ltd – Durban plant?
- 1.6.3 What are the way to improve the sustainability of 5S initiatives at Feltex Fehrer (Pty) Ltd – Durban plant?

1.7 Importance of the Study

This study is significant in several ways. This study investigates the factors which affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban plant. The findings obtained from this study will add to the existing body of knowledge on the sustainability of 5S. This study will also serve as reference material for future researchers. In addition, this study will also serve as a useful tool for organisations, especially those in manufacturing sector, to improve on their product quality and safety culture. Moreover, this study will assist manufacturing organisations to enhance efficiency in production, thereby increasing their profitability. Finally, this study will help shed more light on how the 5S tool can be implemented and sustained within the Automotive Industry.

1.8 Scope of the Study

The scope of this study is to investigate the factors that affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban plant. This means that the study was limited to only the workforce at Feltex Fehrer (Pty) Ltd – Durban plant. An important implication is that no employees from other automotive manufacturing organisations will be participating in this study. Scholars are likely to critique this study on the basis that the findings cannot be generalised or extended to other manufacturing companies. Nonetheless, the findings from this

study can be generalised to the South African Automotive Component Manufacturing Sector, as the sample size used, is considered adequate. In addition, this study adopts the scientific method of investigation, further supporting that the results can be generalised.

1.9 Research Methodology

This study adopts the positivism paradigm. A descriptive study will be conducted to accurately describe the sustainability of 5S in the automotive industry. A quantitative research will be conducted which will assist to ensure the quantification of the data, in order to provide an accurate understanding of the research findings. This study will be conducted within the Automotive Industry at Feltex Fehrer (Pty) Ltd – Durban plant. The study population comprises of employees from Feltex Fehrer (Pty) Ltd – Durban plant. The entire population for this study is 106. The simple random sampling method is used to select 82 respondents for this study as it gives everyone in the population equal chance of participation. It also gives greater precision than the simple random sampling method. Data is collected from both primary and secondary sources. The secondary data is sourced from journal articles, books, publications, magazines and conferences. The primary data, on the other hand, is collected from the respondents through the administration of questionnaires. The questionnaires were pretested prior to the full-scale investigation. Reliability and validity of the research instrument is determined through a pilot study. The 5-point Likert scale type is used. The data gathered from this study is coded and then analysed using the Statistical Package for the Social Science (SPSS), version 25.0. This study makes use of descriptive and inferential statistics to interpret the results of the study.

1.10 Organisation of the Dissertation

This entire dissertation comprises of six chapters, summarised as follows:

1.10.1 Chapter 1: Overview and background of the study

Chapter one is the introductory chapter, which addresses the background of the study, problem statement, research aims, research objectives, research questions, contribution of the study, scope of the study, brief summary of the research design and methodology, definition of key terms and organisation of the dissertation.

1.10.2 Chapter two: Literature review

This chapter reviews empirical and theoretical works on the concepts of lean manufacturing and 5S. This chapter includes the definition of the keywords such as lean manufacturing and 5S and discusses the factors that influence the sustainability of 5S. The chapter will further discuss the impact of lean manufacturing and 5S on manufacturing processes. Moreover, it will review literature on how the 5S model can be applied in the Automotive Industry and proceed to discuss how 5S can be sustained. The last section of this chapter will review theories on lean manufacturing and 5S and apply the most appropriate theory to the study.

1.10.3 Chapter three: Research method

This chapter describes the procedures and the methods of this investigation. This chapter presents the research design, which directs the entire investigation. The research method adopted will also be discussed in this chapter. Moreover, it will describe the location and population of the study. The chapter further proceeds to discuss the sampling procedure and sample size. In addition, the chapter describes the research instrument used to collect the data. The data analysis, which forms part of the study, is also described in this chapter. Further, the ethical considerations are also discussed in this chapter.

1.10.4 Chapter four: Data analysis and presentation

The chapter presents the results that emanate from this study. The Statistical Package for the Social Science (SPSS), version 25.0 is used to analyse the data. The interpretation of the findings is done through the computation of descriptive and inferential statistics.

1.10.5 Chapter five: Discussion of the findings

This chapter presents the discussion of the key findings in accordance with the research objectives, namely: to gain an understanding into the various factors that affect the sustainability 5S within Feltex Fehrer (Pty) Ltd – Durban Plant; to assess the extent to which 5S is practiced at Feltex Fehrer (Pty) Ltd – Durban plant; and to recommend ways to improve the sustainability of 5S initiatives using research and case studies.

1.10.6 Chapter six-Conclusion and recommendations of the study

This chapter presents the conclusion and recommendations of this study, based on the findings, which emanates from this study. This chapter will conclude with the directions for future research.

1.11 Conclusion

This chapter gives detailed background information about the concept of 5S sustainability. This chapter further identifies the gaps in existing studies and how they will be addressed. The aims of this study, research questions and objectives are clearly stated in this chapter. The contribution of this study is also stated in the chapter. Further, this chapter contains a summary of the research method that will be used. This chapter concludes by outlining the structure of this study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter of this study reviews existing literature on the concept of lean manufacturing and the sustainability of 5S. It provides the definition of the key concepts such as lean manufacturing and 5S, which form the basis of this study. This section is followed by the discussion on the historical development of the lean manufacturing and the 5S tool. Further, it also discusses the 5S process or steps. The next section reviews the significance or contribution of the 5S tool towards organisational success. Criticisms levelled against the 5S tool are also part of this discussion. The last section presents the theoretical framework on the sustainability of 5S.

2.2 Definition of Key Terms

The proceeding section of this chapter covers the definition of key words such as lean manufacturing and the 5S tool.

2.2.1 Lean manufacturing

The term lean manufacturing has varied definitions. Lean manufacturing is defined by Manos and Vincent (2012:2), as “an approach or tool to improving product quality, increasing productivity, reducing operation or manufacturing costs, as well as increasing customer satisfaction through the elimination of waste and creating value”. Similarly, Singh, Garg, Sharma and Grewal (2010) consider lean manufacturing as a tool, which aims to enhance production processes, and at the same time boost employee job satisfaction. Singh *et al.* (2010) argue that lean manufacturing is far different from the traditional manufacturing processes because the latter pays attention to inventory systems, whereas the former opposes this concept.

According to Singh *et al.* (2010), lean manufacturing sees inventory systems as a waste of resources. Womack and Jones (1996) state that lean manufacturing has five main purposes, namely: customer value; value stream; value stream; establishing pull and striving for excellence. Rymaszewska (2014) sees lean manufacturing as a tool, which brings out the best results both in the short and long-term perspectives. Rymaszewska (2014) argues that in the short-term, lean manufacturing contributes to an increase in the firm’s profit margin. However, Rymaszewska (2014) argues that lean manufacturing does not have to be efficient at all times, throughout every operation.

Lean manufacturing is defined as the process of re-engineering philosophy, which is made up of a set of principles and a set of tools at the operational level (Al-Balushi, Sohal, Singh, Al Hajri, Al Farsi & Al Abri, 2014). It is a tool, which uses less time, less human effort, less cost and less space, in order to create an organisation that achieves more results.

5S tool: Is a technique for eliminating waste and optimising productivity by maintaining an orderly and safer workplace and using visual management to achieve more consistent operational results.

2.2.2 Defining the 5S tool

There are various techniques of lean manufacturing, of which the 5S is one of such tools. The 5S tool is the basic requirement for the design and sustainability of the lean methodologies and is a tool that ensures continuous improvement (Imai, 1997). The term 5S is a technique for eliminating waste and optimising productivity through the maintenance of an orderly and safer workplace and using visual management to achieve more consistent operational results. According to Singh *et al.* (2015), 5S stands for: sort (the removal of unnecessary materials from the working environment and assigning a red tag to non relevant materials in the work settings), set in order (the customisation of the working area for effective flow of work by maintaining important materials, tools nearby workplace), shine (the cleaning of the working environment and tools to identify and remove unwanted materials), standardise (creating a standardised and consistent 5S work flow through the maintenance of high standards of housekeeping, cleanliness and orderliness), and sustain (the process of ensuring that the 5S achieve its goals by creating awareness and training the workforce by explaining its significance) (Singh *et al.*, 2015).

Daraei *et al.* (2015) postulate that the 5S tool stands for five Japanese words, namely: seiri (organisation), seiton (neatness), seiso (cleaning), seiketsu (standardisation) and shitsuke (discipline). According to Daraei *et al.* (2015), 5S is a lean manufacturing methodology, which was developed to enhance quality as well as achieve efficiency in the organisation by reducing waste through an organised workplace. Similar to lean manufacturing, 5S also aims to reduce space, human resources or efforts, delivery time and waste in the organisation.

2.3 Historical Background of the 5S Tool

The phrase “lean 5S tool” is a Japanese word, which first appeared in the manufacturing sector in the 1950’s (Gapp, Fisher & Kobayashi, 2008). 5S was later implemented by Gunasekaran and Lyu (1997) in a small Taiwanese company that produced a variety of automobile lamps. The lean 5S tool is considered as a workplace organization for safety and standardization (Manos & Vincent, 2012). The 5S tool was designed with the aim of developing a visual workplace as well as to create a safer working environment that is self-explaining, self-ordering and self-improving (Dennis, 2007). There are various authors such as Manos and Vincent (2012), Dennis (2007), Liker (2004), Womack and Jones (1996) and Ohno (1988) who have written on the 5S tool.

Worley and Doolan (2006) in their publication state that the 5S tool is purposely designed to organise and clean the working area. Wood (2004) also express the view that the 5S tool is developed to perform the following functions, namely: to identify obsolete equipment, to arrange and label the work area so that all the working tools could be kept safe; and to clean the working environment and maintain it daily).

Westcott (2006) in his early writings argue that the lean 5S tool helps firms, especially those in the manufacturing sector, to build awareness of the concept of continuous improvement. The lean 5S tool is a discipline, which builds a strong lean organisation. According to Shil (2009), the lean 5S tool is the first step in ensuring continuous quality improvements. The 5S tool helps manufacturers to gain a sustainable competitive advantage. A study reveals that the original phases of the lean 5S tool comprised of only three initial phases, namely: sort, set-in-order and shine (Barraza & Pujol, 2012). According to Barraza and Pujol (2012), this provides an explanation as to why most firms fail to understand the full range of benefits of the 5S tool beyond “housekeeping” and have challenges sustaining all the all five phases. Hirano (1996) argues that the success of other lean manufacturing tools depends on the successful implementation and sustainability of the lean 5S tool.

Recent studies show that the 5S tool has been used in different type of industries, namely healthcare and manufacturing (Todorova, 2013; Bayo-Moriones et al., 2010). The findings from past and recent studies shows that the 5S tool positively influences quality and productivity.

2.4 The 5S process or Steps

As already discussed above, there are five important steps that are involved in the implementation of 5S and sustainability, namely: sort (seiri); set in order (seiton); shine (seiso); standardize (seiketsu); and sustain (shitsuke)

2.4.1 Sort (seiri)

According to Hough (2008), sort is the first step in the 5S sustainability process, which involves the process of eliminating all unwanted materials from the work area. Hough (2008) postulates that during this phase, decisions are then made by management about what is required and what is not. Any material or item, which is not accounted for, or out of use, needs to be properly documented (Hough, 2008). Red tags are then attached to unwanted items in the work environment. These items, be it material and tools, are then kept in the short-run until the assignable action can be undertaken. All the red-tagged items are then moved to a temporary holding area, and that area is clearly identified as the red tag or Seiri area. Hirano (1993) suggests that at the initial stage (sort), a team needs to be formed and they must understand what materials will be used.

2.4.2 Set in order (seiton)

According to Van Pattern (2006), this step involves the process of taking the sorted materials and tools and moving them to the appropriate place where they support the functions of the organisation. However, Van Pattern (2006) recommends that during this stage, employees should be encouraged to place the items at their place of use, in order to improve visibility in the workplace. Samuels (2009) also suggests that pre and post photos should be included in a progress document, including a description of the various activities undertaken; the benefits thereof, which are very significant to this stage. A significant objective of the Seiton is to ensure a proper layout of the work environment in such a manner that missteps can be easily identified and corrected.

2.4.3 Shine (seiso)

Once the first and second steps have been completed successfully, it is important to move to the next phase (Shine) (Howell, 2009). According to Samuels (2009), at this stage, a team from various units or departments within the organisation should be constituted, to agree on the cleaning standards that are required. The Shine stage is where the cross-functional teams

thoroughly remove unwanted materials and repair broken equipment or building components (Hough 2008). This phase aims to identify and remove waste, dirt and damage; and clean up the working area (Van Pattern, 2006). It is suggested that the 5S projects focuses entirely on the cleaning and painting as well as recording the valuable information that can be obtained from the assessment process (Van Pattern, 2006).

Samuels (2009) advocates that the shine requires full involvement of staff to assist in the collection of useful information and in the cleaning the workstation. It is important to create a cleaning schedule, in addition to the existing duties, for all the employees working in the various units within the organisation, as some of them may assume that they are not adequately remunerated to clean. It is recommended that all responsibilities in the designated areas should be listed to include areas that require cleaning and expectations from every staff. An important issue to be considered at this phase is that unclean workstations are more susceptible to safety and health hazards, which are likely to result in injury to the workers (Howell, 2009).

2.4.4 Standardize (Seiketsu)

After organising and cleaning the production area, there is the need to maintain the workstation in a clean, neat and orderly manner (Cooper *et al.*, 2007). This phase demands that the first three phases be improved and maintained. This is why most organisations develop standardised procedures and rules to ensure continuous activity in all the workstations. Seiketsu is the process that will ensure the creation of consistent ways for maintaining a clean work environment (Cooper *et al.*, 2007). The cross functional teams can develop standards by using the 5M's borrowed from Kaoru Ishikawa's Fishbone diagram, namely: manpower, methods, materials, machines and measurements.

2.4.5 Sustain (shitsuke)

The benefits of the first four phase of the 5S sustainability are very powerful and can be easily measured. Nonetheless, self-discipline is required to ensure the sustainability of the fifth phase (Maggie, 2006). Therefore, self-discipline and motivation should go hand in hand to accomplish the desired goals (Santos Wysk & Torres, 2014). To reap the full benefits of 5S, measures must be taken to instill discipline among the employees concerning the need for neatness, cleanness and workplace safety (Maggie, 2006). Every worker must be made to understand the importance of a neat, clean and safe working environment (Cooper *et al.*, 2007).

2.5 The Importance of the 5S Tool in Organisations

The importance of 5S in any organisation cannot be over-emphasised. Evidence from past and recent studies clearly shows that the 5S tool plays a significant role in organisations, especially in the manufacturing organisations. Sofokleous (2007) investigated manufacturing improvements by using the lean method in a small agricultural business, the South American Pineapple Company. The purpose of the research was to ascertain whether the 5S tool could be adopted in an agricultural environment. The main objective was to determine the type of process that could be used to train the workers in the company in order to achieve efficiency. The first step of the study was to adopt the 5S tool and implement it in a storage room. The findings from the study shows that the 5S tool improved efficiency in the South American Pineapple Company by reducing time, provided extra space, minimized inventory system and enhanced employee morale.

Barraza and Pujol (2012) carried out a research in three Mexican manufacturing firms that have adopted the 5S tool for at least five years. The findings from the study indicate that the lean 5S tool not only improved safety and cleanness in the workstation, it also enhanced processes and product, minimised and optimised lead times, minimised operating costs as well as improved process performance.

Bayo-Moriones *et al.* (2010) also explored the link between the lean 5S tool, contextual factors and performance. The contextual factors in the study were made up of structural and performance features. The study also explored structural features such as the firm's environment, human resources, technology, and quality management. On the other hand, the performance features were made up of productivity, quality, processing time and employee satisfaction. The sample size of the study was 230 managers from various Spanish manufacturing firms. The study finds that although the sustainability of the 5S tool was very low, the effectiveness of 5S was positively correlated to the firms' plant size, type of products manufactured, technology adopted, and product quality management programs implemented.

Todorova (2013) researched into the relationship amongst the lean manufacturing tools such as the 5S, which plays a significant role in the lean implementation process, within job shops and assembly line manufacturing settings. The results of the study show that there was a statistical difference in the level of utilisation of the lean 5S tool in the job shop in comparison to the

assembly line group. Singh and Ahuja (2014) examined the effects of the 5S tool on manufacturing performance. The study suggests that the lean 5S tool is a business improvement technique or method, with the purpose of determining and reducing the causes of defects in business processes. The findings show that the lean 5S tool enhances process performance, improves customer satisfaction and positively affects the bottom-line through cost savings and increases in revenue. The study further reveals that the true lean 5S tool helps in achieving manufacturing excellence.

Filip and Marascu-Klein (2015) explored the 5S lean method as a tool for improving manufacturing performance. The study suggests that the 5S tool is designed with the purpose of analysing and deploying management performance in order to address manufacturing problems and working mistakes, eliminate waste, improve work flow, increase transparency, enhance storage areas by properly marking and labelling, establishing work standards, improving safety and enhancing ergonomic working places. The study adequately describes the effects of the 5S lean method in the organisation. The findings from the study suggest that the lean 5S tool improved activities such as storage, cleaning and production in the organisation.

Gupta and Jain (2015) in their study investigated the application of the 5S concept to organise the workplace at a scientific instruments manufacturing company. The purpose of the study was to adopt the 5S tool to assist manufacturing firms become more productive and efficient. The study used a simple approach to create teams to implement the 5S tool. The study adopted the cause-and effect diagram to study the shop floor analysis. The study utilised four instruments to collect the data from the respondents. The findings from the study indicates that the 5S tool ensures continuous improvements in the organisation. The study recommends that the 5S tool could be adopted in all manufacturing firms.

Benjamin (2012) in a study discovered that the 5S tool reduces problems and provides excellent healthcare in hospitals. Abdul Aziz, Nishazini, Fareza and Azizan (2014) investigated the sustainability of 5S at Kpj Seremban Specialist Hospital, Malaysia. Questionnaires were designed and administered to 330 respondents at the hospital. However, only 234 respondents had returned their questionnaires. The study utilised the 5-point Likert scale on the scale of 1-5. The results of the study indicate that the implementation of the 5S tool in the hospital helped to enhance quality healthcare, staff morale and safety.

Ramesh, Muruganantham and Arunkumar (2014) studied the “5S implementation studies in biomass processing unit”, in Malaysia. The principal aim of the study was to assess whether the essential quality practices such as 5S quality practices have a significant impact on quality improvement. The study sampled 36 Indonesian manufacturing SMEs, with 78 per cent of them already applying 5S in their business environment. The focus of the study was to evaluate the development, implementation and evaluation of the 5S tool in the selected firms. The study was conducted at Jakarta and Bekasi, Indonesia. The overall findings from the study shows that the 5S tool provides an essential TQ environment, which is an important base for successful TQM implementation.

Thakkar *et al.* (2014), in their study, carried out a detailed review of the 5S tool in various organisations. The findings from the study suggests that the implementation of the 5S tool leads to improvement in quality, reduction in physical efforts, less industrial injuries or accidents during production process; and better organisational activities.

Ghodrati and Zulkifli (2012) also reviewed the implementation of 5S in industrial and business organisations. The aim of their study was to carry out a comprehensive review on existing research about the benefits of 5S implementation and its efficiency within the organisation. The study suggests that the 5S tool could help organisations ensure continuous improvement in performance and productivity. The study further concludes that the total benefits of 5S could not be realised in industries and business until the barriers associated with implementation and execution are fully understood, addressed and removed.

Todorovic (2017) examined how 5S affects the performance of a manufacturing company. The study was conducted in a rubber goods manufacturer from Serbia, which had implemented 5S in one of its subsidiaries. In order to evaluate the impact of its implementation of 5S, the study used operational and financial performance indicators. It was found that the implementation of 5S could contribute to the performance of an organization in the short and medium term. However, the study finds that the effects of 5S were not evident in longer-term because of the influence of some external factors such as increases in the prices of raw materials, a decrease in purchasing power, a decrease in demand and strong investment activity of its competitors.

Dombrowski and Mielke (2014) conducted a study on lean leadership - 15 rules for a sustainable lean implementation. The findings indicate that the 5S tool could contribute to the

performance of an organisation both in the short and medium-term. The findings reaffirmed the results of a study by Todorovic (2017). According to Dombrowski and Mielke (2014), the implementation of 5S contributes significantly to improvements in the short-run and falls short of expectations in long-term.

2.6 Criticism of Lean and 5S

Although evidence suggests that the 5S tool is significant to organisational performance and productivity, it has however been widely criticised by some scholars on various grounds. The lean 5S tool has been criticised on several grounds. Emiliani (2013) points out that the 5S tool fails to consider human factors. It also lacks strategic direction and the ability to cope with variability. In addition, the 5S tool has narrow operational focus on the shop floor (Emiliani, 2013). According to Emiliani (2013), critics argue that lean production may result in elevated stress levels and therefore increased worker turnover and absenteeism, with a negative impact on manufacturing performance. Karlsson (2012) notes that although some critics failed to gain widespread support for their views, they have indeed raised an important point, in that human factors such as motivation, empowerment and respect affect lean 5S. According to Karlsson and Nikolaidou (2016), critics were of the view that lean production is not strategically driven. The more common approaches to lean, mostly focuses on manufacturing and operational process, which provides only a limited understanding of the transition process required to bridge from the present status to the future one. However, the critics suggest that this gap has led to a lack of sustainability of many Lean transformation programs,

2.7 Factors that Affect the Sustainability of the 5S Tool

The aim of this study was to investigate the factors influencing the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. Several studies such as Daraei et al. (2015), Alaskari, Ahmad, Dhafr and Pinedo-Cuenca (2013) and Gapp *et al.* (2008) investigates the critical success factors affecting the implementation and sustainability of 5S in organisations. The findings from these studies reveal the following.

2.7.1 Skilled employees and expertise

Alhuraish, Robledo and Kobi (2017) argue that organisations that desire to implement 5S in the most effective and efficient manner will require skilled employees as well as expertise who have knowledge of lean manufacturing. Alhuraish, Robledo and Kobi (2016) also concurred

that the implementation of 5S lean manufacturing will require very skilled employees and expertise. Cherrafi, Elfezazi, Chiarini, Mokhlis and Benhida (2016) agree with the aforementioned scholars, that the successful implementation and sustainability of 5S can only be possible through highly talented employees. Mahzan and Hassan (2015) concur that the successful implementation of 5S requires staff competency. AlManei, Salonitis and Tsinoopoulos (2018), in their conceptual model, argue that the implementation of 5S will require multi-skilled personnel. From the various studies, it can be suggested that in order for an organisation to successfully implement 5S tool in the most effective and efficient manner, it will require employees with relevant skills and expertise.

2.7.2 Training and development

Research (Daraei *et al.*, 2015; Mostafa, Dumrak & Soltan, 2013; Michalska & Szewieczek, 2007) suggest that training and development are critical in ensuring the successful implementation and sustainability of 5S in an organisation. Khan, Khan and Khan (2011) argue that training and development programs aim to change skills and knowledge of the workforce who are required to complete a specific task. Training and development are two separate words. Training is considered as a process of equipping employees with the skills, knowledge, experience and all human attributes required to perform well on the job, whereas employee development is the upgrading or enhancing of the already existing skills and knowledge (Daraei *et al.*, 2015). According to the study conducted by Daraei *et al.* (2015), employee training and development ranked fourth, amongst the twelve critical factors, which influenced the sustainability of 5S in Iran. According to the study conducted by Benjamin (2012), on the topic “the implementation of the 5S system within the healthcare industry”, there were five common inhibitors, which prevented the success of 5S in the healthcare industry, and one of such inhibitors was the lack of training.

Similarly, Ghodrati *et al.* (2012) observed that inadequate training affects the sustainability of 5S in most organisations. Ghodrati *et al.* (2012) argue that the success of implementing 5S depends on training. Singh *et al.* (2015) also added that inadequate training of employees is among the major barriers of 5S sustainability.

Alaskari *et al.* (2013) argue that employee training and development strongly influenced the sustainability of 5S. Alaskari *et al.* (2013) suggests that both employees and managers needed

to be aware of the basic training requirements of 5S. The resistance to lean transformation among most employees and managers is as a consequence of the lack of knowledge on the implementation of lean 5S. Alaskari *et al.* (2013) advocates that the sustainability of lean 5S should start from the production line; hence, workers should be trained on the 5S's elements in their respective workplace. Alaskari *et al.* (2013) are of the view that adequate training and development will help everyone to understand the sustainability of 5S and this will assist to improve product quality, efficiency and effectiveness within the organization; and prepare the workforce to accept and cope with organisational changes.

Recent research (Alhuraish *et al.*, 2016; Cherrafi *et al.*, 2016) also confirms that education and training are critical factors, which influences the implementation of 5S in an organisation. It can be argued that education and training have a high level of importance for lean methodology. The scholar argues that education is linked to lean implementation for every employee within the organization, as opposed to six sigma where only certain persons are involved. Experience suggests that employees can learn basic lean tools at all levels of employment and can be trained to appreciate and achieve continuous improvement without much difficulty. Bose (2020) concurs that training is required in order to ensure the successful implementation of the 5S lean tool. A study conducted by Benjamin (2012) reveals that training (Mean = 3.71) has a significant impact on the implementation of 5S.

2.7.3 Employee involvement

According to Warwood and Knowles (2004), the degree of employee involvement is the most significant factor, which influences the sustainability of 5S. According to Eckhardt (2001), employee involvement is part of 5S sustainability, and it plays an important role in gaining employees commitment towards the success of 5S. Gapp *et al.* (2008) suggests that employee involvement is necessary if the benefits of 5S are to be reaped. Japanese companies have placed much emphasis on employee involvement given the fact that it enhances the staff morale and commitment (Gapp *et al.*, 2008). Similarly, Alhuraish *et al.* (2017) discover that employee involvement is considered a key critical factor, which influences the implementation of 5S. Piercy and Rich (2015) postulate that the involvement of employees in the implementation of 5S has generated environmental benefits for organisation. In a more recent study, Powell, Lundeby, Chabada and Dreyer (2017) confirm that employee participation and involvement

affects the implementation of the 5S in the organisation. AlManei *et al.* (2018) proposes that in order to implement 5S, the organisation needs to engage both internal and external stakeholders such as employees, shareholders, suppliers and customers. The organisation must engage the workforce by informing them of the need for 5S. Srinivasan *et al.* (2016) discovers that employee involvement ($p=0.03$) positively influenced the implementation of 5S.

2.7.4 Awareness of 5S tool

Singh *et al.* (2015) researched into the “identification of factors which are effective for sustainability of 5S techniques in SMEs of Vadodara Region” and finds that awareness is an important factor affecting the sustainability of 5S. The study therefore suggests that awareness should be created among staff about the sustainability of 5S in an organisation, which includes what are 5S, the pros and cons of sustaining 5S, the 5S sustainability processes and how to apply 5S systematically in respective industries.

Ghodrati *et al.* (2015) finds that the failure of 5S sustainability in most organisations is as a result of less awareness. According to Ghodrati *et al.* (2015), most employees and managers are not fully aware of the 5S technique. Ghodrati *et al.* (2015) advocates that without awareness how can one exactly develop their action plan and steps to implement lean 5S? According to AlManei *et al.* (2018), in order to implement 5S successfully, the organisation needs to create awareness of the vision throughout the company.

2.7.5 Job satisfaction

Liyanage, Wijesinghe and Fonseka (2010) identifies employee job satisfaction as a key critical success factor, which influences the sustainability of 5S. Liyanage *et al.* (2010) perceived job satisfaction as the extent to which employees are happy about their job. Saari and Judge (2004) considers employee job satisfaction as “a pleasurable or positive emotional state resulting from the appraisal of the employee’s job or job experiences”. Employee satisfaction has an important role in enhancing a firm’s profitability and quality of good and services. According to Latif, Ahmad, Qasim, Mushtaq, Ferdoos and Naeem (2013), employee job satisfaction is a critical factor for the sustainability of 5S and without this, organisations cannot start to think of being successful. Daraei *et al.* (2015) in their study ranks employee job satisfaction (Mean = 7.77) as sixth, amongst the twelve most critical factors, which influences the sustainability of 5S. Bakotic (2016) finds that workers with high level of job satisfaction appreciate their jobs.

2.7.6 Real commitment of employees

Akpan (2013) and Truitt (2011) argues that employee and organisational commitment are important factors in every organisation. Organisational commitment refers to attitude, which occurs between the individual in the organisation, where it is considered as a relative strength of the individual's psychological identification and involvement with the organisation (Truitt, 2011). Organisational commitment is the extent to which people identify themselves with the organisation and desire to keep working with the organisation. Akpan (2013) argues that there are three levels of commitment, namely: affective, continuance and normative commitment. According to Akpan (2013), affective commitment deals with the employee's emotional attachment with the organisation. The continuance commitment on the other hand is the worker's perception about the risks associated with leaving the organisation. The normative commitment refers to the morale dimension based on a person's felt obligation and responsibility towards the organisation. A study conducted by Daraei *et al.* (2015) reveals that real employee commitment (Mean = 7.52) was ranked seventh, amongst the twelve critical factors influencing the sustainability of the 5S tool. A study by Juhari, Abidin and Omar (2011) identifies employee commitment as one of the most important variables in management and organisational behaviour, which affects the sustainability of 5S. The authors further argued that employee commitment is not only for a particular level of employees in the organisational hierarchy, but should also come from all levels of employees, including top management.

Yogish and Sudheer (2016) in their study, explore the various factors that lead to a lack of employee commitment towards the sustainability of 5S. The study identifies five important constructs, which contributed to low employee commitment towards the sustainability of 5S, namely: individuality; group norms; communication; cohesiveness and trust. Among these factors, individuality was ranked the most significant factor, which affected employee commitment towards the sustainability of 5S.

2.7.7 Organisational communication

Juhari *et al.* (2011) refers to organisational communication as the process of sharing information among individuals or groups in order to reach a common understanding. Banihashemi (2011) sees communication as the art of sending and receiving information. Sharma, Bansal and Garg (2014) points out that communication is vital in every organisation and without it; the

organisation is unable to function effectively. Organisational communication plays an important role towards the sustainability of 5S. Benjamin (2012) finds that a lack of communication was amongst the five most common inhibitors, which prevented the successful sustainability of 5S in the healthcare industry.

A study by Ghodrati *et al.* (2012) on the “review of the 5S sustainability in industrial and business organisations” indicates that poor organisational communication is one of the major barriers for effective implementation of 5S. According to Ghodrati *et al.* (2012), the technique of communication is seldom addressed in the industrial workplace. Ghodrati *et al.* (2012) recommends that 5S should be used as an improvement tool for communication. In a more recent study, AlManei *et al.* (2018) advocates that in order to implement the 5S tool, the organisation should communicate the vision throughout the company. Salonitis and Tsinopoulos (2016) also agree with the aforementioned scholars that effective organisational communication is required to implement the 5S lean tool in the most effective and efficient manner. Benjamin (2012) concurs that lack of organisational communication (Mean =2.00) influenced the implementation of 5S.

2.7.8 Team spirit/work

Team spirit has been identified as one of the barriers, which affects the sustainability of 5S in an organisation. Sabry (2014) describes team spirit as the collaboration between departments, suppliers and customers, and managers and non-managers. Alhuraish, Robledo and Kobi (2014) consider teamwork as an important factor that ensures the sustainability of lean manufacturing because different team players have different skills, talent and knowledge to solve specific problems.

A study by Daraei *et al.* (2015) finds that teamwork is ranked the fifth critical factor amongst the twelve identified factors that influences the sustainability of 5S in an organisation. Yogish and Sudheer (2016) also investigated the topic “study and analysis of the factors affecting the sustainability of 5S”. The study finds that the implementation of 5S in some industries failed because of identity and group norms. AlManei *et al.* (2018) suggests that the organisation needs to establish self-driven improvement teams to assist in the implementation of the 5S lean tool. Salonitis and Tsinopoulos (2016) also admit that teamwork is critical to the successful implementation of 5S.

2.7.9 Rewards or compensation

Reward is considered as an important factor affecting the performance of every employee in organisations. Hissom (2013) claims that reward is the oldest and most common organisational factor influencing employee's performance towards achieving a specific objective. Better pay serves as motivation for employees to increase their performance levels in an organisation (Hissom, 2013). A well-paid employee performs far better than the one who receives less pay (Hissom, 2013).

Muogbo (2013) points out that remuneration is one of the human resource management (HRM) strategies an organisation can adopt to improve the performance of employees and thereby increase the overall productivity of the organisation. Research shows that a common problem across all organisations is that they do not believe how an adequate reward system can affect sustainability of lean systems such as 5S (Juhari *et al.*, 2011). Juhari *et al.* (2011) discover that among the identified critical success factors, a reward system is the most significant one, which contributes to successful implementation of lean 5S. Juhari *et al.* (2011) therefore recommend that employees should be well compensated, rewarded and recognised based on their outstanding performance.

Similar to the study Juhari *et al.* (2011), Daraei *et al.* (2015) researched into the topic "identifying and ranking factors affecting the sustainability of 5S". The principal aim of the study was to identify and rank the factors that affected the sustainability of 5S in Shahid Rajaei Power Plant. The study identified twelve critical factors and ranked them in the scale of 1-12. The overall findings show that suitable methods of reward was ranked eleventh, amongst the twelve critical factors that affected the sustainability of 5S in Shahid Rajaei Power Plant. This meant that a suitable method of rewards had a moderate impact on the sustainability of 5S in the organisation.

2.7.10 Top management support and commitment

Similar to the real commitment of employees towards the sustainability of 5S, the success of the implementation of 5S also requires the support and commitment of top management. The implementation of 5S is a strategic tool, which requires full support and commitment from the top management. Naqvi (2013) finds that lack of management support and commitment were some common critical factors, which hampered the sustainability of the 5S lean system.

Benjamin (2012) also discovered that lack of management support was one of the key issues facing the sustainability of the lean 5S system. Daraei *et al.* (2015) discovered that commitment and support of top management (Mean = 10.09) was ranked as the fourth critical success factor that affected the implementation of 5S in Shahid Rajae Power Plant.

McNamara (2014) explored the factors that influenced the sustainability of 5S. The study concludes that a lack of top management support was a major barrier to the implementation of 5S. Yogish and Sudheer (2016), as part of their study investigated the factors leading to the lack of support and commitment towards the sustainability of 5S. The study identified and ranked five most common factors of management commitment, which influence the implementation of 5S. These factors include budget, 5S training, 5S auditing, safety and 5S infrastructure. Budget, however, was found to be the major factor affecting the sustainability of 5S. AlManei *et al.* (2018) argues that in order for 5S to be successfully implemented, the managers or team responsible for the implementation need to obtain senior management buy-in. Salonitis and Tsinopoulos (2016) also proposes that top management commitment and ownership is required in order to successfully implement 5S. Srinivasan *et al.*, (2016), in their study, observe that management commitment ($p=0.011$) influenced the implementation and sustainability of 5S. The study concludes that management commitment increased by approximately 16% (Srinivasan *et al.*, 2016). In a similar study, it was discovered that management support (Mean = 3.85) had significant effect on the implementation of 5S in an organisation (Benjamin, 2012).

2.7.10 Situational analysis

According to Bayo-Moriones *et al.* (2010), normally, to achieve success in the sustainability of any management system, the organisational characteristics need to be considered. Bayo-Moriones *et al.* (2010) argues that some systems are not adequate or properly designed for some organisations. Mostafa, Dumrak and Soltan, (2013) suggest that it is important to evaluate an organisation in order to understand its core strengths and weakness prior to the implementation of 5S.

According to Blackwell and Eppler (2014), achieving success and competitive advantage often begins with a strategic situation analysis that includes internal and external environmental forces. Blackwell and Eppler (2014) argue that most business initiatives fail because the managers often do not conduct a thorough analysis of the business environment. According to

the study conducted by Daraei *et al.* (2015), in their study, identify twelve critical factors and ranked them in the ascending order from 1-12. Based on the study, situational analysis (Mean = 11.74) was ranked as the first factor amongst the twelve identified factors that affected the sustainability of 5S in Shahid Rajae Power Plant.

2.7.11 Schedule of implementation

Schedule is regarded as an important factor for organisational change. When firms prepare for lean transformation, quick reaction with the implementation activities is required, sometimes even taking a risk (Kovacheva, 2010). Anbari and Kwak (2004) believed that any project such Six Sigma requires a Project Charter, Project Scope, Project Statement and Work Breakdown Structure (WBS). According to Anbari and Kwak (2004), any project should be monitored and controlled through project planning and control tools such as Gantt charts, milestone charts and project reporting. However, in a study conducted by Daraei *et al.* (2015), the schedule of implementation (Mean = 6.35) was ranked ninth, amongst the twelve identified critical success factors that affected the sustainability 5S in Shahid Rajae Power Plant. Salonitis and Tsinopoulos (2016) advocate that a successful implementation of 5S requires the setting of realistic timescales for change and to make effective use of commitments and enthusiasm for change.

2.7.12 Implementation and inventory costs

Cost has been identified as one of the critical success factors affecting the implementation of 5S. According to Zhang, Irfan, Khattak, Abbas, Zhu and Shah (2012), any project in an organization, similar to lean 5S, requires a significant investment. Therefore, the financial capability or position of the organisation is considered a crucial factor. Zhang *et al.* (2012) discovered that project costs comprise of both direct and indirect costs, including employee development, staff salary, equipment and machinery costs, consultancy, process design and installation costs. Other costs also include infrastructure or facility, maintenance and fuel (Anand, 2015).

Daraei *et al.* (2015) finds that costs (Mean = 6.35) was ranked tenth, amongst the twelve identified factors that affected the sustainability of 5S in Shahid Rajae Power Plant. According to Srinivasan *et al.* (2016) post the implementation of 5S, inventory space was reduced due to developing standards such as not placing units on the floor and removing unnecessary inventory

and equipment, which led to a decrease in floor space utilised by 18.2%. Srinivasan et al. (2016) postulate that the inventory ratio significantly reduced from a mean ratio of \$5.79/unit (\$0.62/unit) prior to the implementation of 5S, to \$3.67/unit (\$0.43/unit) one month post the implementation of 5S. Keysor and Sawhney (2013) claim that the implementation of the 5S lean tool leads to a reduction in inventory.

2.7.13 Conscientious work ethics

Studies (Singh & Ahuja, 2014; Zhang *et al.*, 2012) identify work ethics as an important critical success factor that influences the sustainability of 5S in any organisation. Zhang et al. (2012) define work ethic as the constellation of attitudes and beliefs concerning work behaviour. According to Zhang *et al.* (2012), the fundamental basis of this ethic includes hard work, shunning of leisure and the avoidance of ostentation and unnecessary expenditure. Blau and Ryan (1997) describe work ethic in the following four dimensions, namely: belief in hard work, no leisure, independence and asceticism. However, scholars such as Daraei *et al.* (2015), Kaushik, Khatak and Kaloniya (2015) and Singh and Ahuja (2014) identify work ethics as one of the common factors influencing the sustainability of 5S in an organisation. According to the study conducted by Daraei *et al.* (2015), work ethics (Mean = 3.43) was ranked as the last (twelfth) factor that affected the sustainability of 5S in Shahid Rajae Power Plant.

2.7.14 Employee health and safety

According to Jonathan and Mbogo (2016), employee health and safety are major concerns for many employees and managers in every enterprise. Jonathan and Mbogo (2016) argue that employee health and safety should be a major priority for every manager or organisation because their lives have major implications on the firm's productivity and costs. The South African occupational health and safety laws require every employer to take necessary steps to avoid or reduce health and safety hazards in their workplaces.

It has however been argued that the sustainability of 5S in most organisations fail because of lack of employee health and safety measures (Filip & Marascu-Klein, 2015). Furthermore, it has been suggested that employee health and safety can be enhanced through the provision of protective clothing and equipment, proper construction of floors and stairs, provision of safe and clean drinking water, provision of fire detectors and alarms, security barricading of the organisation, regular repairs and maintenance of faulty machines, replacement of obsolete

machines, and employee training. Daraei *et al.* (2015), in their study, find that health and safety (Mean = 7.46) was ranked as the ninth critical success factor that affected the implementation of 5S in Shahid Rajae Power Plant. Srinivasan *et al.* (2016) find that there was a sharp increase in total safety climate ($p=0.02$) after the implementation of 5S. This suggests that there is a positive relationship between safety culture and 5S in an organisation.

2.7.15 Organisational culture and religious beliefs

Organisational culture and religious beliefs have also been identified as other factors affecting the sustainability of 5S across several organisations. Culture includes values, beliefs, communications and simplification of behaviour, which gives direction to people (Hofstede, 1985). Organizational culture on the other hand is a collective programming of the mind, which differentiates members of one organisation from others (Hofstede, 1980). According to Ahmed and Shafiq (2014), organisational culture is as important factor, which influences any system in organisations.

In a study conducted by Naqvi (2013), it was discovered that religion and culture negatively influenced the sustainability of 5S in the organisation. Further, a study by Daraei *et al.* (2015) revealed that organisational culture (Mean = 7.46) was ranked eight, amongst the twelve identified factors that affected the sustainability of 5S in Shahid Rajae Power Plant. Pacheco *et al.* (2015) points out that lean manufacturing tools are tailored towards behavioural changes. Therefore, most organisations erroneously believe that it is only possible to implement 5S within a specific culture. Grant and Hallam (2016), in their study, discover that culture was ranked higher among the critical factors that influence the implementation of the 5S tool. Grant and Hallam (2016) advocate that organizational culture and behaviour of employees are very critical for the implementation of the 5S tool.

2.9 Recommendations to Improve the Implementation of 5S

Several recommendations were offered by past and present scholars as corrective measures in addressing the challenges that affect the sustainability of 5S in organisations. Patel and Thakkar (2014) in their study on the topic “implementation of 5S in ceramics manufacturing company” make the following recommendations to improve the 5S system. According to Patel and Thakkar (2014), in order to make 5S practices more influential, top management support and commitment are very critical. Furthermore, Patel and Thakkar (2014) recommend that firms

implement a system to benchmark with other sister companies or competitors that are performing well and refer on a regular basis with the product quality team, which will help the organisation to achieve its overall objectives. Moreover, Patel and Thakkar (2014) suggest that employee involvement is key in ensuring the sustainability of the 5S tool in organisations.

Hirano (1995) in his book on the title “5 pillars of the visual workplace” recommend the following strategies for the sustainability of 5S, namely: establish 5S promotion in the organisation, establishing a 5S promotion plan, establishing 5S campaign materials, in-house education and awareness, 5S implementation, monitoring and evaluation of the 5S sustainability.

Singh and Ahuja (2014), in their study, also made the following recommendations to management to improve the sustainability of 5S, which includes: communication of top management decisions to implement 5S; training of staff on the implementation of 5S and data collection; establish organisational culture; policy formulation; 5S plan for deployment; feasibility study and presentation of findings; conducting a pilot study on the 5S implementation; plant wide installation; progress audits and 5S certification and award.

2.10 Theoretical Framework

There exists several theories that support 5S in the manufacturing sector. However, the theory that best supports this study is the lean theory. The lean theory originates from the Toyota production system (Pinkney, Rance, Bengel Brant, Joel-Edgar, Swancutt & Endacott, 2016). According to Alefari, Almani and Saloni (2020), lean manufacturing became very popular ever since it was first introduced as the Toyota Production System after the World War II. The concept of “lean manufacturing” was coined by Krafcik (1988); post the first introduction of the Toyota Production System. Womack, Jones and Roos (1990) contend that the primary aim of lean is to achieve high performance while using less input including but not limited less time, less space, less human effort, less machinery, less material and less cost. Shah and Ward (2007) propose that lean manufacturing is an integrated social and technical system, designed purposely to remove waste through reducing supplier, customer, and internal variability. It has been argued that although there is a tendency of oversimplification suggesting that lean management and manufacturing are only a set of tools that can help boost productivity, reality is quite different, as many publications on the topic have proved until now (Alefari *et al.*, 2020).

The lean theory is based on five important principles such as value, value stream, flow, customer pull and perfection. Concerning value, it is argued that products or services offered to customers should deliver value to them (Drtina & Correa, 2011). Value stream refers to the processes and activities that are needed to design, order and provide a particular product or service to customers (Mohd Nishat, 2011). The third assumption or principle of the lean manufacturing theory is flow, which aims to achieve efficiency at each stage of the manufacturing process (Murray, 2012). The pull principle suggests that production of goods and services will not take place until customers request for them (Drtina & Correa, 2011). The principle of perfection assumes that a standardised process of benchmarking is required to measure or assess improvements over time (Mohd Nishat, 2011).

The lean manufacturing theory has been applied in manufacturing industries across many countries, with the aim to improve efficiency and effectiveness of manufacturing operations. The lean theory further aims to deliver value for customers while at the same time minimising waste that result from production process (Pinkney *et al.*, 2016). Proponents (Campbell, 2010; Cudney & Elrod, 201) who ascribe to the lean manufacturing theory assume that its aim is to minimise variability and waste as well as enhance efficiency in manufacturing firms. Belekoukias, Garza-Reyes and Kumar (2014) also concur that the lean methods and tools are effective technologies that assist manufacturing organisations to improve their operations and processes. According to Bhasin (2012), the various methods and tools that enhance operational performance of manufacturing firms emerged from the lean strategy's umbrella. Bayou and Korvin (2008) postulate that when assessing the impact of lean practices, different scholars have attempted to link and reflect the collective effect of these practices into one indicator, now popularly known as "leanness". To this end, Bayou and de Korvin (2008) developed a model to assess the level of leanness using lean attributes such as Just-In-Time, quality control, and kaizen. Bayou and de Korvin (2008) adopted the model to compare the level of leanness of General Motors and Ford using Honda as a benchmark company. Based on the financial statements of these automotive firms, it was concluded that Ford was 17% leaner as opposed to General Motors. In a similar study, Soriano-Meier and Forrester (2002) developed a model with nine constructs to evaluate the degree of leanness of manufacturing organisations. This model has been adopted by the UK ceramic industry to assess the degree of leanness (Soriano-Meier & Forrester, 2002).10).

There are several reasons that support the choice of the lean manufacturing theory in this study. An important reason was that the lean manufacturing theory reduces operational costs by enhancing efficiency in the production process. In addition, the lean manufacturing theory was chosen because it enhances continuous improvements throughout an organisation. Moreover, the lean manufacturing theory helps organisations to save money and improve customer experience.

2.11 Relationship between Lean Theory and 5S

Sundar, Balaji and Kumar (2014), in their study, reviewed literature on lean manufacturing implementation techniques. Sundar et al. (2014) argues that lean manufacturing emerged as an approach to maximise resource utilisation through reduction of waste and to respond to the fluctuating and competitive business environment. The study finds that implementing a lean manufacturing system is becoming a core competency in ensuring sustainability of manufacturing firms. Rahani and Al-Ashraf (2012) suggest that the “value stream”, which forms part of the principles of the lean theory, influences 5S by sorting out bottleneck cycle time against Takt time (the frequency that a part or component must be produced to meet customers’ demand). Sorooshian, Salimi, Bavani and Aminattaheri (2012) postulate that there is a relationship between lean theory and 5S given that the lean theory promotes the reduction of space, the reduction of time, promotes safety and clean workplaces and the detection of damage. Moreover, Sorooshian et al. (2012) claims that the lean theory contributes to the successful implementation of 5S, given that it supports set in order within the workplace, thereby facilitating employees to have efficient control over the operations. From the discussion above, it can also be argued that there exists a significant relationship between lean theory and 5S because lean theory guides organisations on how to implement 5S in the most effective and efficient manner, thereby eliminating waste, unplanned downtime, reducing inventories and improving quality, production and the financial position of the organisation.

2.12 Chapter Summary

This chapter contained definitions of the terms lean and 5S. In this chapter, the term lean manufacturing was defined as “an approach or tool to improve product quality, increasing productivity, reducing operational or manufacturing costs, as well as increasing customer satisfaction through the elimination of waste and creation of value”. The concept of lean 5S

was identified as the foundation of lean manufacturing, which is defined as a technique for eliminating waste and optimizing productivity and quality through the maintenance of an orderly and safer workplace and using visual cues to achieve more consistent operational results. This chapter further provided the historical background of the concept 5S. Further, this chapter described the five steps involved in implementation of 5S, namely: sort (seiri); set in order (seiton); shine (seiso); sustain (shitsuke); and standardize (seiketsu). In addition, this chapter reviewed the scholarly literature on the importance of 5S in an organisation and it was found that the sustainability of 5S contributes to improved product quality, increase in productivity, continuous improvement, and increase in employee performance. This chapter further identified the factors affecting the sustainability of 5S, including employee training and development, rewards, real employee commitment, employee involvement, top management commitment and support, sustainability costs, employee health and safety, organisational culture, work ethics, and schedule of sustainability. This chapter also provided the recommendations on how to improve the sustainability of 5S. It concluded with the discussion on the relevant theories, which supports the sustainability of 5S.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The chapter describes how this research was conducted. It first explains the research philosophy that guides this study, followed by the description of type of research design that was conducted. It also discusses the research method that was used to investigate the research phenomenon and provides the justification behind such method. Moreover, the next section renders the discussion on the research location and the population of the study. The relevance of the sampling method that used to select the respondents is also discussed in this chapter. In addition, it gives an account of the research instrument used to collect the data and how it was used. The reliability and validity of the research instrument is adequately explained in this chapter. Moreover, this chapter gives an account of how the data was analysed and proceeds further to describe the ethical considerations of this study. The last section of the chapter outlines the limitations encountered by the researcher during the study.

3.2 Research Philosophy

According to Saunders, Lewis and Thornhill (2009), both social science and scientific researchers demonstrate a different understanding, knowledge and beliefs about the term “research philosophy. Saunders et al. (2009) see research philosophy as the beliefs about the way in which the researcher views the world. Saunders et al. (2009) further argues that the beliefs regarding a chosen philosophy underpins the research strategy and the method adopted. There are different types of research philosophies, namely: positivism, post-positivism, realism, interpretivism and pragmatism. The nature of this study requires the researcher to adopt the positivist paradigm.

According to Scotland (2012), positivism is noted for its objectivity. Positivism goes far into the world to discover knowledge concerning objective reality. The positivists believe that meaning solely resides in objects, but not in the conscience of the investigator. Rahi (2017) also postulates that positivists assume that true knowledge about reality is obtained through observation and experiment; hence, they often use scientific methods to produce knowledge. Denscombe (2013) also agrees that positivism is based on the notion that an objective reality exists outside a person’s experiences.

Positivist paradigm plays an important role in this study because it allows the researcher to remain very objective and detached interpretations about the data that was gathered in an apparently value-free manner. Furthermore, the positivism ensures credibility of the research findings by allowing the researcher to be independent of the investigation.

3.3 Research Design

A research design is the master plan, which describes how the research will be conducted (Sekaran & Bougie, 2013). It provides a detailed plan about how the data will be collected, the instrument to be used to collect the data and how the data will be analysed. There are several forms of research design, including explanatory, causal and descriptive research. A descriptive study was conducted to provide adequate description of the sustainability of the 5S within Feltex Fehrer (Pty) Ltd – Durban Plant.

A descriptive study was carried out to provide a detailed description of the subject matter under investigation (Dane, 2011). Different authors such as Monette, Sullivan and Dejong (2011) postulate that a descriptive study is usually carried out with the aim of discovering facts or describing the research phenomenon accurately as it exists in order to provide a better understanding of an event. This approach to research enables the researcher to accurately describe the phenomenon that is being investigated. It also helps to provide a true picture of the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant.

3.4 Research Method

There are three classifications of research, which are: qualitative, quantitative and mixed methods of research. The nature of this study requires that a quantitative study be conducted. Sekaran and Bougie (2013) believe that a quantitative research involves the process of collecting statistical figure. Rahi (2017) advocates that a quantitative research method is rooted in a scientific approach to research and has its origins in the positivist paradigm. Quantitative research method is useful in collecting fist hand information from a large group of people (Rahi, 2017). This method of research works on "objectives and measures them through the actions and opinions which helps the researcher to accurately explain the data rather than to interpret the data" (Rahi, 2017, p.2).

A very strong justification for conducting a quantitative study is that it ensures that the data is quantified in order to provide an accurate understanding of the research findings. Another

important reason for conducting quantitative research is that it makes the analysis very simple and clear.

3.5 The Research Location

This research was conducted at Feltex Fehrer (Pty) Ltd – Durban Plant, located at 291 Paisley Road, Jacobs, 4026. Feltex Fehrer (Pty) Ltd is a joint venture company with KAP Automotive (Pty) Ltd (51%) and F.S. Fehrer Automotive of Germany (49%). The core business of Feltex Fehrer (Pty) Ltd is the manufacture of polyurethane foam moulded seats, headrests, armrests and other moulded foam components, which are supplied into the South African automotive industry.

3.6 Target Population

Sekaran and Bougie (2013) defines population as the whole or total group of persons, events, or things that a researcher studied. It comprises of components or elements that meet specific criteria for inclusion in a study. Fernandes, Braun, Ozawa, Compton, Guzman and Somogyi-Zalud (2010) explains population as a collective items or things that are part of the society, which the researcher intends to study. The population of this study is made up of the workforce, middle and senior managers in Feltex Fehrer (Pty) Ltd – Durban Plant. The population size for this study is 106.

3.7 Sampling Strategy

Sampling involves the process of choosing a portion of the target population for an investigation (Haque, 2008). Sampling is further been defined as the process of collecting information about the target population. There are two main kinds of sampling strategies including probability and non-probability sampling.

Sekaran and Bougie (2013) suggest that the probability sampling technique gives every elements or units of the population the same opportunity to take part in a study. Likewise, probability sampling affords every member of the population a known zero chance to be involved in a specific study. Non-probability sampling on the other hand does not give the elements of the population an equal chance to be chosen for a study (Manjunath, Ravindra & Archana, 2012). Since this study is a pure quantitative study, the researcher is restricted to using only probability sampling.

Probability sampling has various methods such as systematic sampling, stratified sampling, cluster sampling and simple random sampling. However, given the categorisation of this study population, the simple random sampling method is used to select the respondents for this study. Simple random sampling is often used when the entire study population is accessible and the researcher has a list of all subjects in the target population (Elfil & Negida, 2017). The list of subjects within the population is termed “sampling frame”. From the sampling frame, a representative sample is drawn using sampling table. The simple random sampling is used to ensure that each unit of this population has an equal chance of being selected.

3.8 Sample size

A sample size is a subset of the entire population that is selected to be included in a unique study (Sekaran & Bougie, 2013). Suresh, Thomas and Suresh (2011) refers to sample size as the smaller unit of the larger population which the researcher intends to study. The sample size in this study was chosen from what is known as “sample frame”. A sample is the segment of the population where the sample is drawn. The sample frame is comprises Senior Management, Middle Management and Operational Workforce at Feltex Fehrer (Pty) Ltd – Durban Plant. For the purpose of this study, the sample size of 82 was drawn from the sample frame. The sample size was extracted from the population and sample table designed by Sekaran and Bougie (2013). The sample size of 82 is sufficient for the study of this nature.

The selection criteria used to select the participant are as follows. The researcher selected only the permanent employees in the Feltex Fehrer (Pty) Ltd – Durban Plant. Furthermore, the participants who had more than two years of working experience in the organisation were selected for the study. Moreover, the study involved only the participants who had adequate experience on lean manufacturing and 5S.

3.9 Instrument for Data Collection

The questionnaire is the main instrument for data collection in this study. Data in this study was collected from two sources including primary and secondary data. Primary data refers to fresh information which the researcher and participants have no existing knowledge on (Vartanian, 2010). Secondary data on the other hand is a type of information that is collected for another purpose (Vartanian, 2010). The secondary data was collected through the review of journal

articles, thesis, textbooks and publications. The primary data on the other hand was sourced from the participants using structured questionnaires.

Mathers, Fox and Hunn (2009) postulate that questionnaires are mostly used in a large study that comprises of several groups of people. Questionnaires consist of items that are used to elicit vital information from the respondents (Sekaran and Bougie, 2013). In this study, self-constructed questionnaires are used to collect the data from the respondents. Structured questionnaires are used because they are easy to administer and analyse. Questionnaires are used because it ensures high response rate. Another reason for using questionnaires in this study was the tendency to gather large amount of information from several participants.

In designing the questionnaires, the following wording principles were adhered to. For instance, they were constructed in simple language by considering the educational background of the respondents. Further, the questionnaires were short, simple and very concise. Questions that were very ambiguous were discarded and long sentences were avoided.

3.9.1 Procedures for the distribution of the research instrument

Prior approval for the study was obtained from Feltex Fehrer (Pty) Ltd – Durban Plant and the University of KwaZulu-Natal, Graduate School of Business. The researcher has also obtained the consent of the respondents prior to the distribution of the questionnaires. Arrangements were made with the respondents on how the study should be conducted to avoid the disruption of workflow. After all the necessary arrangements, the researcher proceeded to administer the questionnaires.

The questionnaires comprised four sections as follows:

- Section A (demographical information of the respondents);
- Section B (various factors that affect the sustainability 5S within Feltex Fehrer (Pty) Ltd – Durban Plant);
- Section C (the extent to which 5S is practiced at Feltex Fehrer (Pty) Ltd – Durban Plant);
and
- Section D (ways to advance 5S initiatives with reference to global practices)

3.10 Pilot Study

A pilot study was done prior to the full-scale research. A pilot study is a mini version of a larger study. It is useful in designing a clear road map that the researcher can follow. Pre-testing of the research instrument represents the cornerstone of a good research design. A pilot study is an important initial step in a research, and this applies to all types of research studies, as is the case in this study. Kezar (2000) sees a pilot study as mini versions of a full-scale study that pre-tests a particular research instrument. The pilot study was conducted to test both the reliability and validity of the questionnaires. Ten (10) participants were shortlisted for the pilot study. The participants who took part in the pilot study were exempted from the actual study. After the pilot study, some of the questions were discarded and others reviewed. The participants were divided into two groups. Thus, five (5) participants from each group.

3.11 Reliability and Validity of the Questionnaires

Reliability and validity are two most important criteria used to ensure data quality control in quantitative research. These statistical instruments are very relevant in scientific research, as is the case in this study.

3.11.1 Reliability: Cronbach's alpha coefficient

Sekaran and Bougie (2013) describes reliability as the consistency of the research instrument. This means that the research instrument should produce the same scores or results over repeated measures. The reliability of the research instrument was tested using the Cronbach's alpha. Sekaran and Bougie (2013) recommends that the Cronbach's alpha score of 0.070 and beyond should be considered as reliable; hence, the instrument should be accepted. The results of the reliability test are presented in the subsequent chapter.

3.11.2 Validity: Factor analysis

Validity measures what the research instrument was designed for (Sekaran & Bougie, 2013). According to Ghauri and Gronhaug (2005), validity measures how well the data collected from the respondents covers the specific area of the study. Field (2005) states that validity measures what the instrument is designed to measure. There are different ways of measuring validity of research instrument. However, the content validity is used in this study. Content validity is defined as the extent to which the items in the research instrument reflect the content of the population to which the instrument will be generalised (Straub, Boudreau & Gefen, 2004). The

new research instrument designed for the purpose of this study was evaluated to ensure that it includes all the items necessary to achieve the research questions and objectives. Further, a literature review was conducted, which was followed with an evaluation by the statistician. In addition to the content validity, factor analysis was used to measure the validity of the questionnaire.

3.12 Data Measurement Scale

Measurement in research means assignment of numbers or qualitative attributes to objects using some specified rules (Asika, 1991). There are different measurement scales in research, but this study adopts the Likert scale type. In this study, 5-point Likert scale is used. The interpretation of the scale are:

- Strongly Disagree = 1;
- Disagree = 2;
- Neutral = 3;
- Agree = 4;
- Strongly agree Very satisfied = 5.

3.13 Data Analysis

According to Jeanty and Hibel (2011), quantitative data analysis involves three approaches, namely: data reduction, data display and data integration. These steps were duly followed during the analysis of the data. The data was coded and analysed with the help of the Statistical Package for the Social Science (SPSS), version 25.0. Descriptive and inferential statistics were used to assist in the interpretation of the findings. The descriptive statistics used were, mean, minimum, maximum, confidence level and standard deviation. On the other hand, the kind of inferential statistics used were Cronbach's alpha coefficient, factor analysis, correlations, analysis of variance (Anova) and Post Hoc Scheffe's Test.

3.14 Ethical Considerations

Ethical considerations remain very important issues in research, especially scientific research. It is the requirement of every researcher to adhere to certain ethical principles in research. The researcher has obtained the ethical approval from the University of KwaZulu-Natal. Prior to this, an ethics application was submitted to the Research and Ethics Committee. Written

permission was also obtained from Feltex Fehrer (Pty) Ltd – Durban Plant before the study was conducted. The ethical considerations in the study are:

- **Informed consent:** The respondents were approached after the full approval was granted by the University. The respondents were approached to participate voluntarily in the study. A written informed consent form was attached to each questionnaire. Each respondent was requested to read the consent form thoroughly. The respondents were required to append their signatures after they consent to participate in the study. They were encouraged to withdraw voluntarily from the study at any stage if they desire to do so. The procedures for investigation were clearly indicated in the informed consent form.
- **Anonymity:** The anonymity of the data was protected by ensuring that the participants' personal identities or information is withheld from third parties. The research instrument was constructed in the manner that the participants were not requested to provide personal details like names, address and contact details. Furthermore, codes were assigned to the participants in order to ensure their anonymity.
- **Privacy and confidentiality:** The questionnaires and the data collected from the respondents were stored safely in a locked cupboard. This data will be stored for five years and will be discarded after this period.
- **Harm to respondents.** To avoid harm to the respondents, the respondents were fully briefed about the procedures of the study and their consent was obtained prior to the administration of the questionnaires. The researcher ensured that all responses from the respondents were kept anonymous and confidentiality of the data maintained. The researcher always remained honest and transparent with the respondents.

3.14 Limitation of the Study

The greatest limitation of the study was the limited time for which the study was to be completed. Another challenge was the difficulty involved in recruiting the respondents. Nevertheless, prior arrangements were made with all the respondents to ensure their maximum participation in the study.

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter of the research presents the results that were obtained from the research respondents at Feltex Fehrer (Pty) Ltd – Durban Plant. The numeric data collected from the respondents were coded and captured into the SPSS latest version 25.0 for analysis. A total of 82 questionnaires were administered to the research participants, however only 76 of them were received back and accounts for 92.7% response rate. The analysis is based only on the number of the questionnaires that were retrieved. This study makes use of both the descriptive and inferential statistics as described in the chapter three (research methodology). The presentation and analysis are done in accordance with the main research objectives, which are:

- To gain an understanding into the various factors that affect the sustainability 5S within Feltex Fehrer (Pty) Ltd – Durban Plant;
- To assess the extent to which 5S is practiced at Feltex Fehrer (Pty) Ltd – Durban plant; and
- To recommend ways to improve the sustainability of 5S initiatives at Feltex Fehrer (Pty) Ltd – Durban plant using research and case studies.

This chapter first presents the information on the response rate, which then follows with the results on the demographic variables of the participants and the research objectives.

4.2 Response Rate

The Table 4.1 indicates the information on the response rate.

Table 4.1 Response Rate

Item	Frequency	Percentage (%)
Number of questionnaires retrieved	76	92.7
Number of missing questionnaires	6	7.3
Total	82	100

Source: Field Data, 2019

As reflected in Table 4.1, out of a total of 82 questionnaires distributed to the respondents, only 76 of them were received back, which accounts for the 92.7% response rate. The 6 questionnaires that were not received back accounts for 7.3% of the missing questionnaires. The 76 questionnaires retrieved from the research participants are considered adequate for this research.

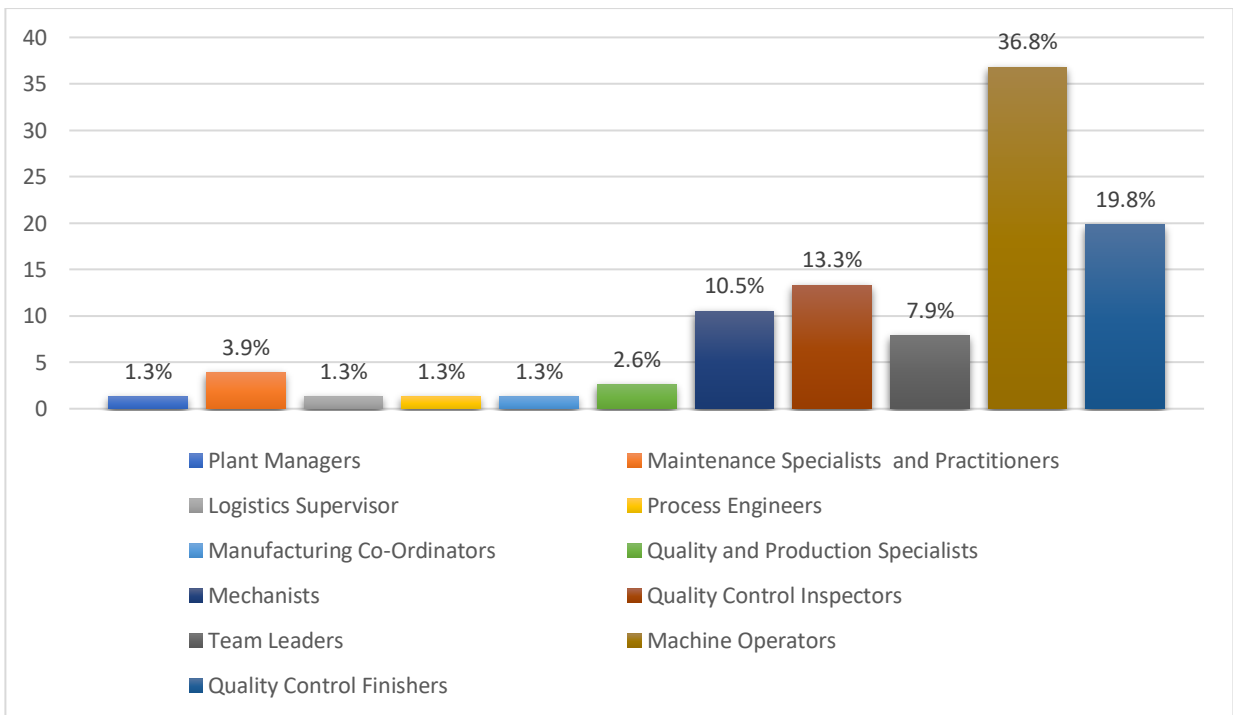
4.3 Demographic Information

This part of the chapter describes the results, which relate to the respondents demographic information, including: current job function/positions, tenure at Feltex Fehrer (Pty) Ltd – Durban Plant, percentage of time spent working as teams and knowledge of the industry supplied into.

The results are displayed in the Figures below.

4.2.1 Current Job/Position

The information presented in the Figure 4.1 relates to the respondents’ current job at Feltex Fehrer (Pty) Ltd – Durban plant:



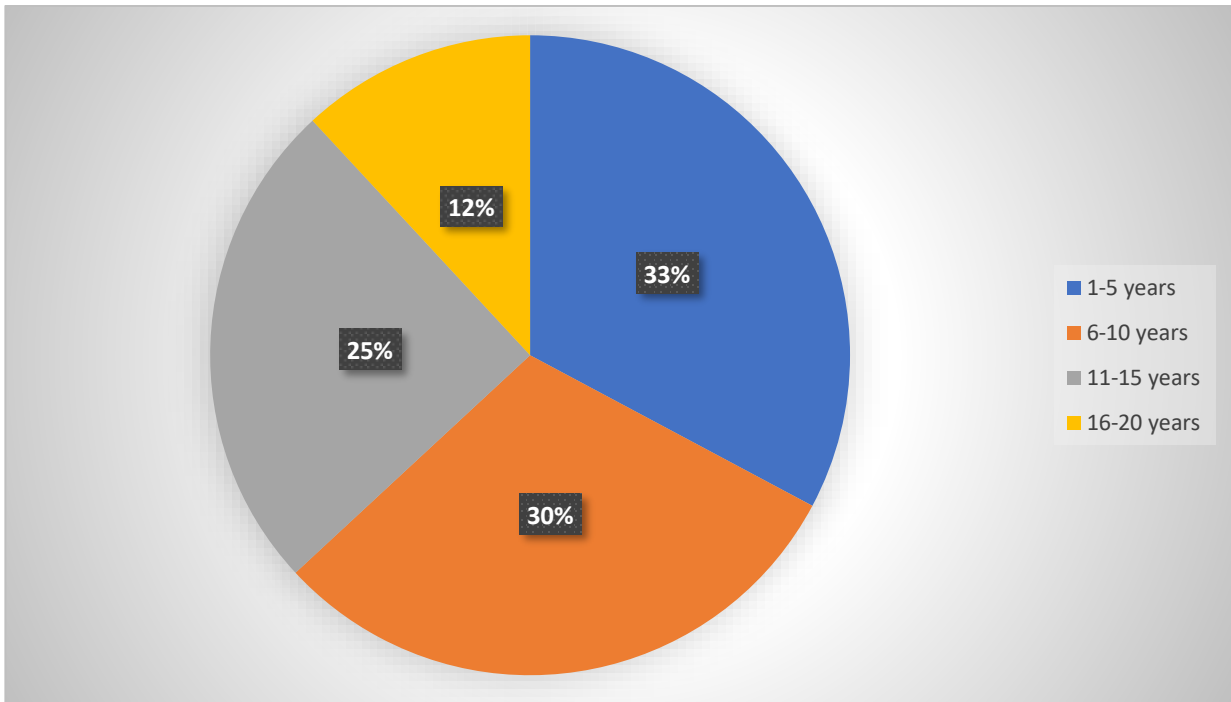
Source: Field Data, 2019

Figure 4.1 Current Job/Position

The results presented in the Figure 4.1 show that most (36.8%) of the research respondents were Machine Operators, followed by Quality Control Finishers (19.8%), Quality Control Inspectors (10.3%), Machinists (10.5%) and Team Leaders (7.9%). The findings of the study suggest that these employees form the greatest proportion of the workforce within the Feltex Fehrer (Pty) Ltd – Durban Plant. This is the true reflection of the demographic representation of the organisation.

4.2.2 Tenure

The Figure 4.2 contains the information on the tenure or the number of years the respondents were employed at Feltex Fehrer (Pty) Ltd – Durban Plant.



Source: Field Data, 2019

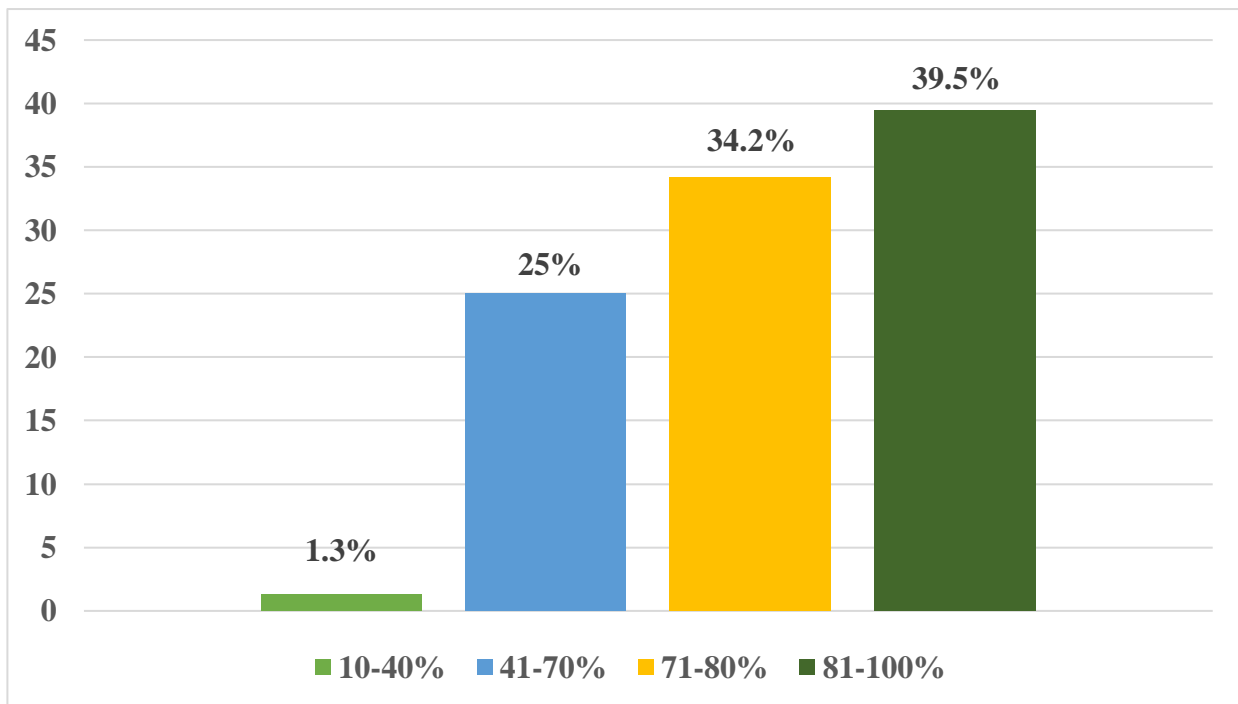
Figure 4.2 Tenure

The information presented in the Figure 4.2 shows that 33% of the respondents length of service at Feltex Fehrer (Pty) Ltd – Durban Plant is between 1-5 Years. Another 30% of respondents length of service is between 6-10 years. In addition, 25% of respondents length of service is between 11-15 years. The remaining 12% of the respondents have length of service with Feltex

Fehrer (Pty) Ltd – Durban Plant between 16-20 years. As observed from the data, the majority (33% and 30%) of the respondents work for the organisation between 1-5 years and 6-10 years respectively. This means that the respondents have sufficient working experience at Feltex Fehrer (Pty) Ltd – Durban Plant.

4.2.3 Percentage of Time Respondents Spent Working in Teams

Figure 4.3 displays the information on the percentage of time the respondents spent working in teams at Feltex Fehrer (Pty) Ltd – Durban Plant.



Source: Field Data, 2019

Figure 4.3 Percentage of Time Respondents Spent Working in Teams

An analysis of Figure 4.3 reveals that only 1.3% of the respondents spent 10-40% of their time working in teams. Furthermore, 25% of the respondents report that they spent between 41-70% of their time working in teams. In addition, 34.2% of the respondents indicate that they spent 71-80% of their time working in teams. Lastly, 39.5% of the respondents said that they spent 81-100% of their time working in teams. The analysis of the information from the respondents reveals that the majority spent 71-100% of their time working in teams at Feltex Fehrer (Pty) Ltd – Durban Plant. The percentage of time spent working in teams can have a positive or negative impact on the firm’s performance. However, since most of the respondents spent more

hours of their time (71-100%) working in teams, this has the potential to increase the firm's productivity.

4.3 Reliability Statistics: Cronbach's Alpha Coefficient

To determine the reliability of the research instrument (questionnaires) used to collect the data, the Cronbach's alpha coefficient was computed. As recommended by Sekaran and Bougie (2016), the Cronbach's alpha score of 0.70 and above should be considered as reliable and a score below 0.70 should be considered as unreliable. The results of the Cronbach's alpha coefficient score are depicted in the Table 4.3.

Table 4.2 Reliability Statistics: Cronbach's Alpha Coefficient

Total Items	Cronbach's Alpha
15	0.846

Source: Field Data, 2019

From the Table 4.2, there were 15 items in total, which had the Cronbach's alpha score of 0.846, which is beyond the recommended score (0.70). Hence, it can be agreed that the questionnaire used to collected data in this study is reliable. This means that the research instrument used in this study can be adopted by students or researchers for similar studies.

4.4 Validity: Factor Analysis

To measure validity of the questionnaire, two types of factor analysis were computed, including the principle component analysis and Kaiser-Meyer-Olkin Measure of Sampling Adequacy Bartlett's Test (KMO). The two statistical tests have been adequately explained in chapter three of this research. In terms of the principle component analysis, only items with loadings > 0.4 were considered very significant.

Table 4.3 Factor Analysis: Rotated Component Matrix

Items	Components						
	1	2	3	4	5	6	7

B1			0.666			0.652	
B2	0.474		0.484				
B3	0.473				0.503		0.069
B4	0.439			0.487		0.054	
B5		0.692					
B6	0.450	0.629					
B7	0.649	0.404					
B8	0.663	0.494					
B9		0.621					
B10	0.589		0.507				
B11	0.753						
B12	0.903					0.043	
B13	0.781						
B14	0.739		0.043				
B15	0.776						
Eigenvalue	5.369	2.559	1.598	1.010	0.959	0.823	0.686
% of Variance	35.8	17.1	10.7	6.7	6.4	5.5	4.6

Source: Field Data, 2019

The results show that 12 loaded significant on Factor 1 and accounts for 35.8%. Out of the total, 1 item relates to top management commitment and communication, 3 items relate to employee health and safety, 2 items relate to inventory system, 1 item relates to employee training and development, 2 items relate to time management, one item relates to resources, whilst the remaining two items relate to procedures. As per the rule of thumb, if an item loaded perfectly

on more than one factor, the highest loading items only should be considered. Therefore, from this explanation, most of the items (3) were related to employee health and safety, hence Factor 1 can be named otherwise.

Further, in terms of Factor 2, 6 items loaded perfectly and accounts for 17.1%. Of the 6 items, 1 item relates to employee training and development, another 1 relates to top management commitment and communication, another item also relates to inventory system, and the last item relates to time management. From the analysis, one will notice that 1 item loaded significantly at all the constructs. In terms of the rule of thumb, only the item with the highest value should be considered. Therefore, in this case, top management commitment and communication has the highest value of item (0.692), hence Factor 2 can be named as such.

In addition, 4 items loaded perfectly at Factor 3, which accounts for 10.7%. Of the total 4 items, 1 item connects with top management commitment and communication, 1 item relates to employee health and safety; 1 item also relates to time management and 1 item relates to procedures. From the above results, top management commitment and communication has the item with the highest value (0.666). Therefore, Factor 3 can be referred to as top management commitment and communication.

Further, 1 item loaded significantly at Factor 4, which accounts for 6.7%. The 1 item relates to employee training and development. Therefore, Factor 4 can be named as such.

Also, 1 item loaded perfectly at Factor 5 and accounts for 6.4%. This item relates to inventory system. Hence, Factor 5 can be named as inventory system.

Moreover, 3 items loaded significantly at Factor 6, which accounts for 5.5%. Of the 3 items, 1 of them relates to top management commitment and communication, whilst the remaining 2 items were related to employee health and safety. The Factor 6 may be referred to employee health and safety.

Finally, 1 item loaded significant at Factor 7 and accounts for 4.6%. This item relates to inventory system. Factor 7 could be termed as inventory system.

The validity was further determined by KMO and Bartlett's Test and the results are shown in the Table 4.4.

Table 4.4 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.708
Bartlett's Test of Sphericity	Approx. Chi-Square	762.385
	Df	105
	Sig.	0.000

Source: Field Data, 2019

The KMO and Bartlett's Test was used to the adequacy of the sample size selected for the study. The score ranges from 0 to 1. When the score reaches 1, it means that there was no error in the sample size. The interpretations of the scores are: ≥ 0.80 (meritorious); ≥ 0.70 (middling); ≥ 0.60 (mediocre); ≥ 0.50 (poor); < 0.50 (unacceptable). KMO value for the items which critical factors affecting 5S lean manufacturing was 0.708, which is greater than the minimum level and indicates that it is an acceptable value. Furthermore, Bartlett's test was significant ($p < 0.05$). This implies that the instrument used was middling. The results suggest that the questionnaire used in this study was valid, hence, can be adopted by researchers for similar purpose.

4.5 Descriptive Statistics

The results of this study are further presented using simple descriptive statistics such as mean, minimum, maximum, lower and upper bound and standard deviation. The respondents were required to rate each of the item on the scale of 1-5, where:

- Strongly Disagree = 1,
- Disagree = 2,
- Neutral =3,
- Agree = 4, and
- Strongly Agree = 5.

Table 4.5 Descriptive Statistics

Items	Mean	95% Confidence Interval		Std. Dev.	Min.	Max.
		Lower	Upper			

		Bound	Bound			
Top management commitment and communication	4.19	4.04	4.32	0.61015	1.00	5.00
Inventory system	4.23	4.07	4.38	0.66051	1.00	5.00
Health and safety	4.25	4.08	4.42	0.72239	1.00	5.00
Training and development	4.22	4.07	4.36	0.63946	1.00	5.00
Time management	3.89	3.68	4.01	0.91505	1.00	5.00
Resources	4.20	3.95	4.48	1.09569	1.00	5.00
Procedures	4.12	3.92	4.29	0.79668	1.00	5.00
5S applicability	4.15	4.03	4.28	0.54661	1.00	5.00

Source: Field Data, 2019

From Table 4.5, the results firstly identify that top management commitment and communication has a mean score value of 4.19 using the scale of 1 to 5. The strength of the mean score suggests that top management commitment and communication has a strong positive impact on the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. This means that top management commitment and communication is required to achieve the implementation and sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant.

Secondly, inventory system had the mean score value of 4.23 when compared against a maximum attainable score of 5 on a 1 to 5-point Likert scale. This mean score value implies that inventory system has a significant strong positive effect on the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The interpretation of the statistical figure suggests that the inventory system is critical to the sustainability of 5S within the organisation. From this perspective, it can be argued that inventory system will be required to ensure the sustainability of 5S.

Thirdly, findings from the study showed that employee health and safety measures has a mean score value of 4.25. The interpretation of the mean score suggests that employee health and safety measures have a strong positive influence on the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. Better still; the results of the study imply that employee health and

safety measures are critical issues that are likely to have positive or negative effects on the sustainability of the 5S within Feltex Fehrer (Pty) Ltd – Durban Plant.

Fourthly, employee training and development has a mean score of 4.22. The findings therefore suggest that employee training and development has a significant strong positive effect on the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. From the statistical point of view, it could be argued that employee training and development are crucial factors for the success or failure of the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. This means that offering employees the opportunities for training and development will lead to a successful sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant and vice-versa.

Fifthly, time management has a mean score value of 3.89, which suggest that there is significant moderate effect of time management on the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The statistics imply that effective schedule or time management sill positively influence the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. However, lack of proper time management will negatively affect the sustainability of 5S in the organisation.

In addition, evidence shows that resources has a mean score value of 4.20 points to a positive direction. The mean value implies that resources has a strong positive effect on the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The results imply that the availability of resources will influence positively on the sustainability of 5S within Feltex Fehrer (Pty) Ltd-Durban Plant.

Further, procedures has a mean score of 4.12, which also suggests that procedures has a strong positive influence on the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The results of the study suggest that policies and procedures within the organisation will have either a positive or a negative effect on the sustainability of 5S within Feltex Fehrer (Pty) Ltd-Durban Plant.

Finally, the evidence also suggests that the applicability of 5S has a mean score value of 4.15 on a scale of 1-5. This means that the lean 5S tool could be applicable in Feltex Fehrer (Pty) Ltd – Durban Plant.

The findings from the study are further presented using simple frequency and percentage as follows:

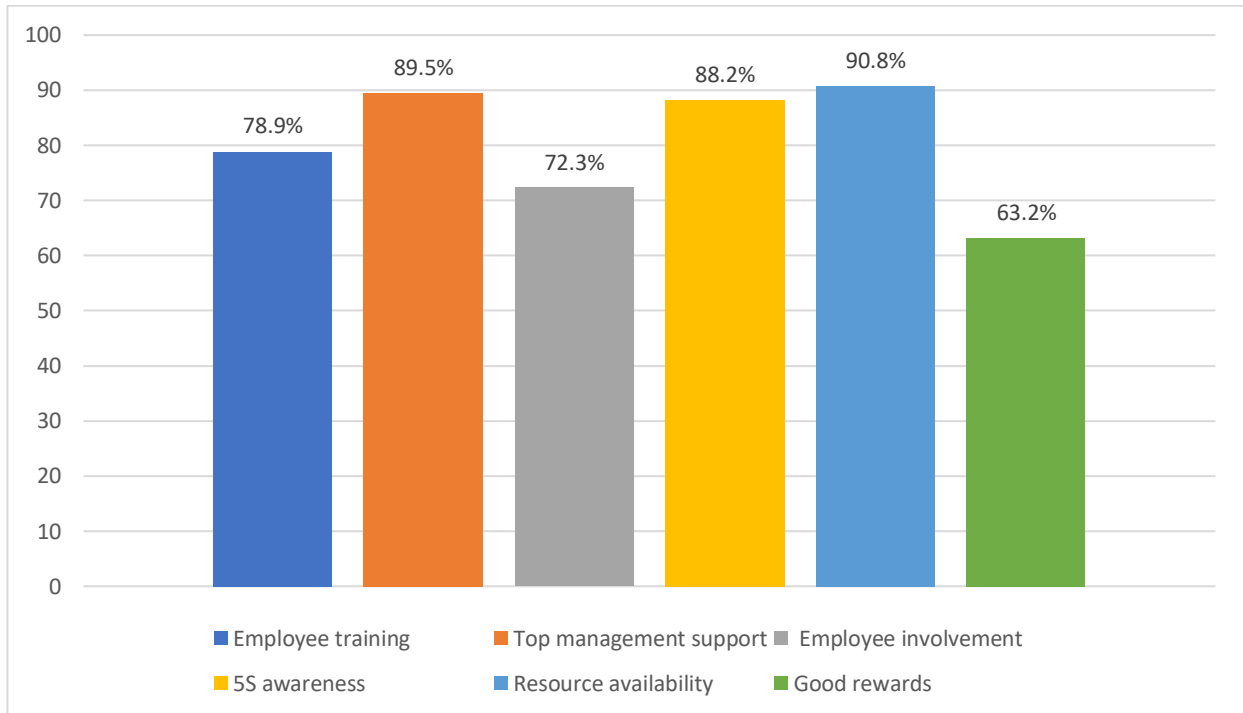
- 14.5% of the respondents disagree that the plant manager is committed to the success of 5S, while 85.5% of the respondents agree that the plant manager is committed to the success of 5S.
- 7.9% of the respondents indicate that they neither agree nor disagree that outdated materials, tools and equipment are cleared from their work area, however the balance 92.1% of respondents agree that outdated materials, tools and equipment are cleared from their work area.
- 2.6% of the respondents neither agree nor disagree that the inventory system is organised and easily identified, whilst 97.4% of respondents agree that the inventory system is organised and easily identified.
- 2.6% of the respondents disagree that training on 5S is provided for employees, 7.9% of respondents neither agree nor disagree that training on 5S is provided for employees, whilst the balance 89.5% of the respondents were of the view that training on 5S is provided for employees.
- 7.9% of the respondents disagree that adequate training on 5S is provided for management, 15.8% of them were neutral that training on 5S is provided for management and the balance 76.3% of respondents were in total agreement that adequate training on 5S is provided for management.
- 10.5% of the respondents reported that communication within the plant is excellent, 15.8% of the respondents indicate that they neither agree nor disagree that communication within the plant is excellent, whilst the balance 73.7% of respondents agree that communication within the plant is excellent.
- 15.8% of the respondents disagree that 5S implementation and sustainability procedures are documented and utilised, 18.4% of respondents neither agree nor disagree that 5S implementation and sustainability procedures are documented and utilised, whilst the balance 65.8% of the respondents agree that 5S implementation and sustainability procedures are documented and utilised.
- 14.4% of the respondents agree that 5S schedules are implemented and are in place; 17.1% of respondents neither agree nor disagree that schedules are implemented and are

in place, whilst the balance 68.5% of respondents agreed that 5S schedules are implemented and are in place.

- 18.5% of the respondents disagree that 5S policies and procedures are continuously reviewed and monitored, 5.3% of respondents neither agree nor disagree that 5S policies and procedures are continuously reviewed and monitored, and the balance 76.2% of the respondents agreed that 5S policies and procedures are continuously reviewed and monitored.
- 18.5% of the respondents disagree that adequate time is given for 5S implementation, 6.6% of respondents neither agree nor disagree that adequate time is given for 5S implementation, whilst the balance 74.9% of the respondents agree that adequate time is given for 5S implementation.
- 11.5% of the respondents disagree that adequate resources are provided for 5S implementation, 3.9% of respondents neither agree nor disagree that adequate resources are provided for 5S implementation, whilst the balance 84.6% of respondents agree that adequate resources are provided for 5S implementation.
- 7.9% of the respondents disagree that visual aids are in place, promoted and unobstructed, another 10.5% of the respondents neither agree nor disagree that visual aids are in place, promoted and unobstructed, and the balance 81.6% of respondents agree that visual aids are in place and, promoted and unobstructed.
- 7.9% of the respondents disagree that workstations are clean and neatly organised, 2.6% of them neither agree nor disagree that workstations are clean and neatly organised, and the balance 89.5% of the respondents reported that workstations are clean and neatly organised.
- 10.5% of the respondents were of the view that following a proper 5S system improves productivity in the workplace, while 89.5% of the respondents agreed that following a proper 5S system improves productivity in the workplace.
- Finally, 10.6% of the respondents reported that they would not recommend that a 5S system be implemented in other companies, 2.6% neither agree nor disagree that they would recommend a 5S system be implemented in other companies and the balance 87.1% of respondents agree that they would recommend that a 5S system be implemented in other companies.

4.5.1 Recommendations on improving the sustainability of 5S in Organisations

This study further explores how the implementation of 5S could be improved within Feltex Fehrer (Pty) Ltd – Durban Plant. The findings are shown in the Figure 4.5 hereunder:



Source: Field Data, 2019

Figure 4.5: Recommendations for improving the implementation in Organisations

The information presented in figure 4.5 shows that:

- 78.9% of the respondents recommends employee training as a means of improving 5S implementation in the focal organisation.
- 89.5% of the respondents recommends that there should be top management support.
- 72.3% of the respondents suggest that employees should be involved in the implementation of 5S.
- 88.2% of the respondents recommend that awareness about the 5S implementation should be created.
- 90.8% of respondents recommend resource availability.
- Lastly, 63.2% of the respondents recommend for a good reward system.

4.6 Inferential Statistics

Inferential statistics like Spearman's correlation, analysis of variance [Anova] Post Hoc Scheffe's Test were computed to help in the analysis and interpretation of the results. The information relating to each of the statistics are shown in the preceding sections.

4.6.1 Spearman's correlation

Spearman's correlation is used to determine the relationship that exists between top management commitment and communication, inventory system, health and safety, training and development, time management, resources and procedures. The results are reflected in the proceeding sections (Table 4.6).

Table 4.6 Spearman's correlation: Relationship between the critical success factors

Dimension	r/p	Commitment & communication	Inventory system	Health & safety	Training & development	Time management	Resources	Policies & Procedures
Commitment & communication	<i>r</i> <i>p</i>	1.00	-	-	-	-	-	-
Inventory system	<i>R</i> <i>P</i>	0.703** 0.000*	1.000	-	--	-	-	-
Health and safety	<i>R</i> <i>P</i>	0.476** 0.000	0.290* 0.001	1.000	-	-	-	-
Training & development	<i>R</i> <i>P</i>	0.325** 0.004	0.468** 0.000	0.036 0.755	1.000	-	-	--
Time management	<i>R</i> <i>P</i>	0.357** 0.002	0.462** 0.000	0.331** 0.003	0.425** 0.000	1.000	-	-
Resources	<i>R</i> <i>P</i>	0.596** 0.000	0.055 0.638	0.555** 0.000	0.185 0.110	0.378** 0.001	1.000	-
Policies & Procedures	<i>R</i> <i>P</i>	0.360** 0.001	0.250* 0.030	0.021 0.854	0.472** 0.000	0.402** 0.000	0.355** 0.002	1.000

Source: Field Data, 2019

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

As reflected in the Table 4.6, there is a significant positive relationship between critical such factors such as communication, commitment, and inventory system. Moreover, the results of this study indicate that there is a significant relationship between health and safety and communication and commitment. Besides, there exists a positive significant relationship between health and safety and inventory system. In addition, the results of this study shows that there is a positive significant relationship between training and development; and communication and commitment. There is also a significant relationship between training and development and inventory system. However, there is no relationship between training and development and health and safety. The results show that there exists a positive relationship between time management/schedule and communication and commitment. Furthermore, there is a positive relationship between time management and inventory management. A significant relationship also exists between time management and health and safety, training and development, respectively. The results of this study also shows that there is a significant relationship between resources, communication and commitment, health and safety and time management, respectively. On the contrary, there is no relationship between resources and inventory system and training and development respectively. Finally, the results of this study indicate that there exists a strong positive relationship between policies and procedures, communication and commitment, inventory system, training and development, time management and resources, respectively. By contrast, there is no relationship between policies and procedures and health and safety. This study further seeks to determine the relationship between the critical success factors and 5S implementation and sustainability. The results are shown in the Table 4.7.

Table 4.7 Relationship between critical success factor and 5S sustainability

Dimension	r/p	5S sustainability
Critical success factors	R	0.581**
	P	0.000*

Source: Field Data, 2019

As reflected in Table 4.7, the results of this study indicate that there is a significant positive relationship between the critical factors and the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. This means that the critical factors such as management commitment and

communication, inventory system, health and safety, training and development, time management, resources and procedures influences the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant.

4.6.2 Analysis of variance [Anova]

The analysis of variance is further computed to determine whether the demographic information of the respondents’ influence commitment and communication, inventory system, employee health and safety, employee training and development, time management, resource and procedures at Feltex Fehrer (Pty) Ltd – Durban Plant.

4.6.2.1 Current job and all the dimensions

This section of the chapter contains the results of whether the current job of the respondents influence the factors such as commitment and communication, inventory system, employee health and safety, employee training and development, time management, resource and procedures at Feltex Fehrer (Pty) Ltd – Durban Plant. The results are shown in Table 4.8.

Table 4.8 Anova: Current job and various dimensions

Items	F	p
Commitment and communication	2.821	0.022
Inventory system	2.856	0.021
Employee health and safety	21.126	0.052
Employee training and development	1.1483	0.207
Time management	9.489	0.000*
Resources	4.741	0.002*
Procedures	2.997	0.005*

Source: Field Data, 2019

* $p < 0.01$

** $p < 0.05$

The information presented in the Table 4.18 suggests that there is no significant difference in the levels of commitment and communication, inventory system, employee health and safety, and employee training and development varying in the current job occupied by the respondents at the 1% significant level respectively. The results of the study imply that the respondents’ positions have no significant impact on the above-mentioned constructs. There is however, a

significant difference in the level of time management, resources and procedures varying in the current job occupied by the respondents at the 1% significant level respectively. This implies that the respondents' positions have an effect on the constructs such as time management, resources and procedures. To evaluate where the differences occur, the Post Hoc Scheffe's test is used further.

Table 4.9 Post Hoc Scheffe's Test: Current job and various items

Items	Categories of Job	N	Mean
Commitment and communication	Plant Manager	1	4.32
	Maintenance Specialist and Practitioners	3	4.25
	Logistics Supervisor	1	4.44
	Process Engineers	1	4.83
	Manufacturing Coordinator	1	4.78
	Quality and Production Specialists	2	4.50
	Machinists	8	4.00
	Quality Control Inspectors	10	4.00
	Team Leaders	6	4.00
	Machine Operators	28	4.09
	Quality Control Finishers	15	4.63
Inventory system	Plant Manager	1	4.78
	Maintenance Specialist and Practitioners	3	4.17
	Logistics Supervisor	1	4.61
	Process Engineers	1	4.40
	Manufacturing Coordinator	1	4.25
	Quality and Production Specialists	2	4.33
	Machinists	8	4.75
	Quality Control Inspectors	10	4.22

	Team Leaders	6	4.15
	Machine Operators	28	4.03
	Quality Control Finishers	15	4.17
Employee health and safety	Plant Manager	1	4.51
	Maintenance Specialist and Practitioners	3	4.46
	Logistics Supervisor	1	4.67
	Process Engineers	1	4.11
	Manufacturing Coordinator	1	4.02
	Quality and Production Specialists	2	4.27
	Machinists	8	4.42
	Quality Control Inspectors	10	4.44
	Team Leaders	6	4.33
	Machine Operators	28	4.44
	Quality Control Finishers	15	4.63
Employee training and development	Plant Manager	1	4.12
	Maintenance Specialist and Practitioners	3	4.25
	Logistics Supervisor	1	4.44
	Process Engineers	1	4.50
	Manufacturing Coordinator	1	4.08
	Quality and Production Specialists	2	4.40
	Machinists	8	4.25
	Quality Control Inspectors	10	4.08
	Team Leaders	6	4.25
	Machine Operators	28	4.66
	Quality Control Finishers	15	4.73
Time management	Plant Manager	1	4.13

	Maintenance Specialist and Practitioners	3	4.00
	Logistics Supervisor	1	3.50
	Process Engineers	1	2.52
	Manufacturing Coordinator	1	4.40
	Quality and Production Specialists	2	4.75
	Machinists	8	4.42
	Quality Control Inspectors	10	3.50
	Team Leaders	6	4.13
	Machine Operators	28	4.11
	Quality Control Finishers	15	4.08
Resources	Plant Manager	1	3.94
	Maintenance Specialist and Practitioners	3	4.50
	Logistics Supervisor	1	5.00
	Process Engineers	1	3.67
	Manufacturing Coordinator	1	3.44
	Quality and Production Specialists	2	4.80
	Machinists	8	4.25
	Quality Control Inspectors	10	4.50
	Team Leaders	6	3.50
	Machine Operators	28	4.51
	Quality Control Finishers	15	4.22
Procedures	Plant Manager	1	4.30
	Maintenance Specialist and Practitioners	3	4.33
	Logistics Supervisor	1	4.04
	Process Engineers	1	3.17
	Manufacturing Coordinator	1	4.00
	Quality and Production Specialists	2	4.00

	Machinists	8	4.58
	Quality Control Inspectors	10	4.44
	Team Leaders	6	3.33
	Machine Operators	28	4.40
	Quality Control Finishers	15	4.06

Source: Field Data, 2019

From Table 4.9, the following is evident:

- In relation to communication and commitment, there is a significant difference between the Plant Manager, Maintenance Specialist and Practitioners, Logistics Supervisor, Process Engineers, Manufacturing Coordinator, Quality and Production Specialists and Quality Control Finishers on one hand and Machinists, Quality Control Inspectors, Team Leaders and Machine Operators. The results suggest that whilst the Plant Manager, Maintenance Specialist and Practitioners, Logistics Supervisor, Process Engineers, Manufacturing Coordinator, Quality and Production Specialists and Quality Control Finishers are more convinced that positions influences the sustainability of 5S, other respondents such as Machinists, Quality Control Inspectors, Team Leaders and Machine Operators are least satisfied that positions influences communication and commitment at the plant level.
- With regards to positions and inventory system, there is a significant difference between the managers at various positions. Whilst Plant Manager, Logistics Supervisor, Process Engineers, Quality and Production Specialists and Machinists are more convinced that the inventory system influenced the sustainability of 5S, others (i.e. Maintenance Specialist and Practitioners, Manufacturing Coordinator, Quality Control Inspectors and Team Leaders) are less convinced that the inventory system influences the sustainability of 5S within the organisation.
- The results of this study further shows that there is a significant difference between the managers regarding the influence of positions on health and safety. Whilst the Plant Manager, Maintenance Specialist and Practitioners, Logistics Supervisor, Machinists, Quality Control Inspectors, Machine Operators and Quality Control Finishers are more concerned that health and safety influences the sustainability of 5S, others such as the

Process Engineers, Manufacturing Coordinator, Quality and Production Specialists and Team Leaders are less convinced that health and safety influences the sustainability of 5S.

- Regarding training and development, there results show that there is a significant difference between the respondents. Whilst the Logistics Supervisor, Process Engineers, Quality and Production Specialists, Machine Operators and Quality Control Finishers are more satisfied that training and development influences the sustainability of 5S, by contrast, others (i.e. Plant Manager, Maintenance Specialist and Practitioners, Manufacturing Coordinator, Machinists and Quality Control Inspectors are least satisfied that training and development influences the sustainability of 5S.
- In terms of time management, there is a significant difference between those employees who hold the positions of Logistics Supervisor, Process Engineers; and the rest of the positions at Feltex Fehrer (Pty) Ltd – Durban Plant. This implies that the respondents who hold the above-mentioned positions are more satisfied that positions have significant effect on time management as compared to others.
- With regards to resources, there is a significant difference between those employees who hold the positions of Plant Manager, Process Engineers and Manufacturing Coordinator; and the rest of the positions at Feltex Fehrer (Pty) Ltd – Durban Plant. The results suggest that the Plant Manager, Process Engineers and Manufacturing Coordinator are more convinced that resource availability influences the sustainability of 5S in the organisation as opposed to others.
- Finally, in relation to policies and procedures, the results show that there is a statistical difference between those employees who hold the positions of Process Engineers and Team Leaders and the rest of the positions at Feltex Fehrer (Pty) Ltd – Durban Plant. The results signify that the Process Engineers and Team Leaders are more satisfied that policies and procedures within the organisation influences the sustainability of 5S.

4.6.2.1 Tenure and all the dimensions

The Anova results on the influence of tenure or years of working on the variables such as commitment and communication, inventory system, employee health and safety, employee

training and development, time management, resource and procedures are reflected in Table 4.10:

Table 4.10 Anova: Tenure and various dimensions

Items	F	P
Commitment and communication	1.070	0.385
Inventory system	4.574	0.001*
Employee health and safety	15.697	0.000*
Employee training and development	2.643	0.030
Time management	5.132	0.000*
Resources	2.843	0.002*
Procedures	5.448	0.000*

Source: Field Data, 2019

*** p < 0.01**

**** p < 0.05**

As shown in the Table 4.10, there is no significant difference in the levels of commitment and communication and employee training and development varying in tenure at the 1% significant level respectively. However, there is a significant difference in inventory system, employee health and safety, time management, resources and procedures varying in tenure at the 1% significant level respectively. Post Hoc Scheffe's Test

Table 4.11 Post Hoc Scheffe's Test: tenure and all dimensions

Items	Tenure	N	Mean
Commitment and communication	1-5 Years	25	4.50
	6-10 Years	23	4.10
	11-15 Years	19	4.00
	16-20 Years	9	4.50
Inventory system	1-5 Years	25	4.50
	6-10 Years	23	3.90
	11-15 Years	19	3.00

	16-20 Years	9	4.00
Employee health and safety	1-5 Years	25	4.33
	6-10 Years	23	3.33
	11-15 Years	19	3.29
	16-20 Years	9	4.44
Employee training and development	1-5 Years	25	4.00
	6-10 Years	23	4.00
	11-15 Years	19	5.00
	16-20 Years	9	4.67
Time management	1-5 Years	25	3.29
	6-10 Years	23	4.44
	11-15 Years	19	5.00
	16-20 Years	9	5.00
Resources	1-5 Years	25	3.14
	6-10 Years	23	4.50
	11-15 Years	19	5.00
	16-20 Years	9	5.00
Procedures	1-5 Years	25	4.00
	6-10 Years	23	4.40
	11-15 Years	19	4.00
	16-20 Years	9	3.50

Source: Field Data, 2019

From Table 4.11, the following is evident:

- In terms of inventory system, there is a significant difference between those employees with length of service between 6-10 years and 11-15 years respectively and the rest of the employees at Feltex Fehrer (Pty) Ltd – Durban Plant. This means that the employees who have length of service for these periods (between 6-10 years and 11-15 years) are less satisfied that the inventory system influences the sustainability of 5S within the organisation.

- In terms of health and safety, there is a significant difference between those employees worked between 6-10 years and 11-15 years respectively and the rest of the positions at Feltex Fehrer (Pty) Ltd – Durban Plant. This means that the employees who have length of service for these periods (6-10 years and 11-15 years) are less satisfied that health and safety affects the sustainability of 5S within the organisation.
- In terms of time management, there is a significant difference between those employees worked between 1-5 years and the rest of the positions at Feltex Fehrer (Pty) Ltd – Durban Plant. This means that the employees who have length of service for this period (1-5 years) are less satisfied that time management impacts the sustainability of 5S within the organisation.
- In terms of resources, there is a significant difference between those employees worked between 1-5 years and the rest of the positions at Feltex Fehrer (Pty) Ltd – Durban Plant. This means that the employees who have length of service for this period (1-5 years) are less satisfied that resources influence the sustainability of 5S within the organisation.
- In terms of procedures, there is a significant difference between those employees worked between 16-20 years and the rest of the positions at Feltex Fehrer (Pty) Ltd – Durban Plant. This means that the employees who have length of service for this period (16-20 years) are less satisfied that procedures influence the sustainability of 5S within the organisation.

4.6.2.3 Percentage of time spent working in teams and all the dimensions

Table 4.17 below provides the information concerning the influence of the percentage time spent working in teams on the variables such as commitment and communication, inventory system, employee health and safety, employee training and development, time management, resource and procedures

Table 4.12 Anova: Percentage of time spent working in teams and various dimensions

Items	F	P
Commitment and communication	1.787	0.127

Inventory system	3.597	0.006*
Employee health and safety	4.058	0.001*
Employee training and development	1.128	0.354
Time management	1.940	0.076
Resources	1.223	0.309
Procedures	3.170	0.003*

Source: Field Data, 2019

*** p < 0.01**

**** p < 0.05**

As shown in the Table 4.12, there is no significant difference in the levels of commitment and communication, inventory system; employee training and development, time management and resources varying in the percentage of time spent working in team at the 1% significant level respectively. However, there is a significant difference in inventory system, employee health and safety, and procedures varying in the percentage of time spent working in team tenure at the 1% significant level respectively. To identify where the difference occurs the Post Hoc Scheffe's Test was computed and the results are shown the proceeding Table

Table 4.13 Post Hoc Scheffe's Test: Percentage of hours spent working and all dimensions

Items	Hours/time spent on work	N	Mean
Commitment and communication	10-40	1	4.15
	41-70	19	4.17
	71-80	26	4.08
	81-100	30	4.53
Inventory system	10-40	1	4.48
	41-70	19	3.77
	71-80	26	3.13
	81-100	30	4.00
Employee health and safety	10-40	1	4.33

	41-70	19	3.45
	71-80	26	3.71
	81-100	30	4.44
Employee training and development	10-40	1	5.00
	41-70	19	5.00
	71-80	26	5.00
	81-100	30	4.43
Time management	10-40	1	5.00
	41-70	19	4.87
	71-80	26	5.00
	81-100	30	5.00
Resources	10-40	1	4.90
	41-70	19	4.70
	71-80	26	4.66
	81-100	30	5.00
Procedures	10-40	1	4.24
	41-70	19	4.40
	71-80	26	4.00
	81-100	30	3.19

Source: Field Data, 2019

From Table 4.13, the following is evident:

- In terms of inventory system, there is a significant difference between those employees who spend 41-70% and 71-80% of their time working and the rest of employees at Feltex Fehrer (Pty) Ltd – Durban Plant. The results of this study imply that those who spend 40-70% and 71-80% of their time working in the organisation believe that the inventory system has less influence on the sustainability of 5S within the organisation.
- Regarding employee health and safety, there is a significant difference between those employees who spend 41-70% and 71-80% of their time working and the rest of employees at Feltex Fehrer (Pty) Ltd – Durban Plant. The results of the study suggest that those participants who spend 40-70% and 71-80% of their time working in the

organisation are least satisfied that employee health and safety affects the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant.

- In terms of procedures, there is a significant difference between those employees who spend 81-100% of their time working and the rest of employees at Feltex Fehrer (Pty) Ltd – Durban Plant. The results of the study suggest that those participants who spend 81-100% of their time working in the organisation are least satisfied that procedures affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant.

4.7 Chapter Summary

This entire chapter of the study presented the results of the study using descriptive and inferential statistics. The data collected was analysed using the Statistical Package for the Social Science (SPSS), latest version 25.0. The data analysis employed both the descriptive and inferential statistics. The results of the study revealed that the main factors, which influenced the implementation of 5S, were, namely: top management commitment and communication (Mean = 4.19); inventory system (Mean = 4.23); employee health and safety measures (Mean = 4.25); time management/schedule of implementation (Mean = 3.89); resources (Mean = 4.20); and procedures (Mean = 4.12). The results (Mean = 4.15) suggest that 5S could be applied in the focal organisation. This study recommends the following to address the challenges of 5S implementation: employee training; top management support; employee involvement; 5S awareness; resource availability; and a good reward system. The next chapter deals with the discussion of the results.

CHAPTER FIVE: DISCUSSION OF THE RESULTS

5.1 Introduction

Chapter four of this research contained the presentation and analysis of the results. The purpose of chapter 5 is to carry out a detailed discussion about the key findings from the research. The research objectives, which guided this investigation, were:

- To gain an understanding into the various factors that affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant;
- To assess the extent to which 5S is practiced at Feltex Fehrer (Pty) Ltd – Durban plant; and
- To recommend ways to improve the sustainability of 5S initiatives at Feltex Fehrer (Pty) Ltd – Durban plant using research and case studies.

5.2 Objective 1: Factors that Affect the Sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant

The first objective of the research was to investigate the factors that affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The results of the research reveal that the main factors which affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant are: commitment and communication (Mean = 4.19), inventory system (Mean = 4.23); employee health and safety measures (Mean = 4.25), employee training and development (Mean 4.22), time management/schedule of implementation (Mean = 3.89), resources (Mean = 4.20), and procedures (Mean = 4.12).

5.2.1 Real employee commitment, top management commitment and organisational communication

As indicated above, employee commitment, top management support and commitment as well as organisational communication are some of the factors which affects the implementation and sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The findings from this study reaffirms the results of the research.

The results of this study supports the findings of research conducted by scholars such as Akpan (2013) and Truitt (2011), who argue that employee commitment is critical to the implementation of 5S in an organisation. Organisational commitment is considered an attitude,

which exists between the individual and the organisation where it is considered as a relative strength of the individual's psychological identification and involvement with the organisation. According to Truitt (2011), organisational commitment is the degree to which an employee identifies himself/herself with the organisation and wants to continue active participation in it. Truitt (2011) also concurs that organisational commitment is a measure of willingness to remain with the firm in the future. It mostly reflects the employee's belief in the mission and goals of the firm, willingness to expand effort in their accomplishment, and intentions to continue working in the organisation. A study conducted by Daraei et al. (2015) reveals that real employee commitment (Mean = 7.52) is ranked seventh among the twelve critical factors affecting the implementation of 5S. A study by Juhari *et al.* (2011) shows that employee commitment is an important variable in management and organisational behaviour, which affects the implementation of 5S. Yogish and Sudheer (2016), in their study, identify five important constructs that contributes to low employee commitment towards lean 5S implementation, namely: individuality; group norms; communication; cohesiveness and trust. Amongst these factors, individuality is ranked as the most significant factor, which affects employee commitment towards the implementation of 5S.

The results of this study further shows that top management support and commitment influences the implementation of 5S within the organisation. The findings agree with existing research (McNamara, 2014; Naqvi, 2013; Benjamin, 2012). In a study conducted by Naqvi (2013) among Indian sub-continent workers in U.S.A, it was found that a lack of management support and commitment were some of the common critical factors which hampered the sustainability of the 5S lean system. Benjamin (2012) also observed that a lack of management support is one of the key issues facing the sustainability of the 5S lean system. McNamara (2014) further concludes that that a lack of top management support is a major barrier to the sustainability of 5S. Yogish and Sudheer (2016) admits that a lack of top management support and commitment affects the implementation of 5S. Daraei *et al.* (2015), in their study, discovered that commitment and support of top management (Mean = 10.09) is ranked as the fourth critical success factor that affected the implementation and sustainability of 5S in Shahid Rajae Power Plant. Srinivasan *et al.*, (2016), in their study, observed that management commitment ($p=0.011$) influences the implementation and sustainability of 5S. Their study concludes that management commitment increased by approximately 16% (Srinivasan *et al.*, 2016). In a

similar study, it was discovered that management support (Mean = 3.85) has a significant effect on 5S implementation in an organisation (Benjamin, 2012).

Moreover, the results of this study reveals that organisational communication is one of the most critical factors affecting the implementation of 5S. The findings from this study agree with existing research such as Sharma (2014), Benjamin (2012), Banihashemi (2011), Ghodrati et al. (2012) and Juhari *et al.* (2011). Effective communication is considered as important organisational factor, which influence policy initiatives within organisations (Sharma, 2014). The aforementioned scholars finds that organisational communication plays an important role towards the implementation of 5S. Benjamin (2012), in his study, observed that a lack of communication was among the five most common inhibitors, which prevents the successful sustainability of 5S in the healthcare industry. Ghodrati et al. (2012) admits that poor organisational communication is a major barrier for effective 5S implementation. According to Ghodrati et al. (2012), the technique of communication in the industrial workplace is very seldom addressed. Benjamin (2012) concurs that a lack of organisational communication (Mean =2.00) influences the implementation of 5S.

5.2.2 Effect of inventory system on sustainability of 5S

The results of this study shows that an inventory system is a critical factor, which affects the implementation and sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The results of this study support the findings from previous studies. According to Dicken (2003), the automotive industry represents a technical marvel by human resource. This industry has a strong multiplier effect on a country's economic growth, through efficient and effective management of inventory systems. Samuel and Domfeh (2014) argue that a “sane” inventory system is required in every business organisation. Unfortunately, scholarly research shows that most organisational initiatives including the sustainability of 5S fails because of lack of an efficient inventory system (Daraei et al., 2015; Mostafa et al., 2013).

Daraei *et al.* (2015), in their study, finds that inventory costs (Mean = 6.35) was ranked as the tenth among the twelve identified factors that affected the sustainability of 5S in Shahid Rajae Power Plant. Srinivasan *et al.* (2016) also concurred that post the implementation of 5S, inventory space is reduced due to developing standards such as not placing units on the floor and removing unnecessary inventory and equipment, which led to a decrease in floor space

utilised by 18.2%. Srinivasan et al. (2016) discovered that the inventory ratio significantly reduced from a mean ratio of \$5.79/unit (\$0.62/unit) prior the implementation of 5S to \$3.67/unit (\$0.43/unit) one month post the implementation of 5S. Keysor and Sawhney (2013) claim that the implementation of the 5S lean tool lead to a reduction in inventory.

5.2.3 Employee health and safety measures

The results of this research also reveals that inadequate employee health and safety measures are some of the critical factors that affects the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The findings also support previous studies (Jonathan & Mbogo, 2016; Srinivasan et al., 2016; Daraei *et al.*, 2015) discussed in chapter two of this research. Jonathan and Mbogo (2016) postulate that employee health and safety are major concerns for many employees and managers in every organisation. According to Jonathan and Mbogo (2016), employee health and safety should be a major priority for every manager or organisation because their lives have a major implication on the firm's productivity and costs. South African occupational health and safety laws require every employer to take necessary steps to avoid or reduce health and safety hazards in their workplaces. Unfortunately, it has been argued that 5S lean sustainability in most organisations fails because of a lack of employee health and safety measures (Filip & Marascu-Klein, 2015).

Daraei *et al.* (2015), in their study, finds that organisational culture (Mean = 7.46) was ranked as the ninth critical success factor that affected implementation and sustainability of 5S in Shahid Rajae Power Plant. By contrast, Srinivasan et al. (2016) finds that there is a sharp increase in total safety climate ($p=0.02$) after the implementation of 5S. This suggests that there is a positive relationship between a safety culture and implementation of 5S in an organisation.

5.2.4 Employee training

Following on the discussion in chapter four of this research, employee training is considered one of the critical success factors, which influences the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The results of this study conforms to existing research.

Scholarly literature (Daraei et al., 2015; Mostafa et al., 2013; Michalska & Szewieczek, 2007) suggests that training and development are critical success factors, which influences the sustainability of 5S in an organisation. Khan *et al.* (2011) argue that training and development programs attempt to change the skills, knowledge, or attitudes of employees, which are required

by the job post. According to the study conducted by Daraei et al. (2015), employee training and development was ranked fourth, among the twelve critical factors that influenced the sustainability of 5S in Iran. Recent research (Alhuraish *et al.*, 2016; Cherrafi *et al.*, 2016) also confirms that education and training are critical factors, which influences the implementation of 5S in an organisation. Bose (2020) concurs that training is required in order to ensure the successful implementation of the 5S lean tool. A study conducted by Benjamin (2012) reveals that training (Mean = 3.71) has a significant impact on the 5S implementation.

Similarly, in a study conducted by Ghodrati et al. (2012), it was found that poor employee training is as a crucial factor affecting the sustainability of 5S in most organisations. Singh et al. (2015) also concurs that inadequate training of employees is among the major barriers of successful 5S sustainability. Alaskari et al. (2013), in their study, argue that employee training and development strongly influences the implementation of 5S. Alaskari et al. (2013) suggests that both employees and managers undergo basic training in 5S. The resistance to lean transformation among most employees and managers is as a consequence of a lack of knowledge on lean 5S sustainability. Sustainability of lean 5S often starts from the production line; hence, workers should be trained on the various 5S elements in their respective workplace.

5.2.5 Schedule of implementation

From this research, the schedule or time management has been identified as a crucial factor, which affects the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The findings from this study further supports the results of existing research. Anbari and Kwak (2004) believe that any project, similar to that of Six Sigma, requires a well-written and approved Project Charter, Scope Statement, and a Work Breakdown Structure (WBS). According to Anbari and Kwak (2004), lean 5S sustainability projects should be monitored and controlled through project planning and control tools such as Gantt charts, milestone charts, project reporting, project closeout and others. In a study conducted by Daraei *et al.* (2015), schedule of implementation (Mean = 6.35) is ranked as the ninth factor among the twelve identified critical success factors, that affected the implementation and sustainability of 5S in Shahid Rajae Power Plant. Saloniis and Tsinopoulos (2016) advocate that a successful implementation of 5S requires timing, setting of realistic timescales for change and to make effective use of commitments and enthusiasm for change.

5.2.6 Resources and costs

Resources as well as cost are other challenges, which affects the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The results of this research also reaffirms existing studies.

Implementation costs have been identified as one of the critical success factors affecting the implementation of 5S. According to Zhang et al. (2012), the sustainability of any system, similar to lean 5S in any organization, requires significant investment; therefore, the financial capability or position of the organisation is considered as a crucial factor. Zhang et al. (2012) discovered that implementation costs comprises of both direct and indirect costs such as training, consulting, salaries and the cost of implementing which include the cost of equipment, process redesign costs, and installation costs. Other costs also include infrastructure or facility, maintenance and fuel (Anand, 2015). Similarly, Daraei *et al.* (2015) finds that costs (Mean = 6.35) is ranked as the tenth among the twelve identified factors that affected the implementation and sustainability of 5S in Shahid Rajae Power Plant. Scholarly literature points to compensation and rewards as being part of the resources required for the successful sustainability of 5S.

5.2.7 Procedures

From the research, procedures for sustainability of 5S tools is found to be an important issue which affects the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The findings from this study is also in keeping with the existing studies discussed in chapter two of this research.

5.3 Objective 2: To assess the extent to which 5S is practiced at Feltex Fehrer (Pty) Ltd – Durban plant

The results of this research, (Mean= 4.15) reveals 5S, as a tool, can be applied in Feltex Fehrer (Pty) Ltd – Durban Plant, to improve productivity as well as production processes. The results of this research also conforms to previous studies on the applicability and contribution of the lean 5S sustainability.

Gapp et al. (2008) argued that the phrase “lean 5S tool” is a Japanese word, which first appeared in the manufacturing sector in the 1950’s. The 5S tool was later implemented by Gunasekaran and Lyu (1997) in a small Taiwanese company that produces a variety of automobile lamps.

Since then, many organisations such as Toyota and other Original Equipment and Component Manufacturers have applied the concept of lean 5S in their production processes. Both past and present studies reveal that the successful sustainability of 5S has a significant impact on organisational activities such as production process, product quality and waste elimination.

This is further affirmed by Sofokleous (2003), who investigated the manufacturing improvements achieved by using lean methodologies in a small agricultural business, which is known as the South American Pineapple Company. The purpose of the research was to ascertain whether lean methods could be adopted in the agricultural setting. The main objective was to determine the type of process that could be used to train the workers in the company to help make a storage room more efficient. The findings from this study show that 5S, as a tool, contributed to improved efficiency in the South American Pineapple Company by reducing time, improved utilisation of space, reduced inventory and enhanced employee morale, which encouraged communication.

Barraza and Pujol (2012) carried out case studies research in three Mexican manufacturing facilities that have utilised the 5S as a tool for at least five years. The case studies involved the data collection from four processes, namely: direct observation, participative observation, documentary analysis, and semi-structured interviews.

The results of this study show that lean 5S, as a tool, is not only useful for improving the working environment, but also enhances processes and product quality, reduces and optimises lead time, minimises operating costs as well as improves process performance.

Moriones *et al.* (2010) also investigated the relationship between the lean 5S tool and contextual factors and performance. This study finds that although the sustainability of lean 5S was very low, the benefits of implementing 5S is positively related to the firms plant size, type of products manufactured, technology adopted, and good quality management programs implemented.

Similarly, Todorova (2013) explored the relationship between the lean manufacturing tools including the lean 5S tool within job shop, batch shop, and assembly line manufacturing settings. The results of the study show that there was a statistical difference in the level of utilisation of the lean 5S tool between the job shop the assembly line group. The overall findings

of the study reveal that the perceived operational performance was significant in assembly line settings but not within the job shop or batch job settings.

Singh and Ahuja (2014) also studied the impact of the 5S methodology on manufacturing performance. The study suggests that the lean 5S tool is a business improvement technique or method, with the purpose of determining and reducing the causes of defects in business processes, through focusing on process outputs that are of critical importance to customers. The results of the study shows that the lean 5S tool enhances process performance, improves customer satisfaction and affects bottom-line through cost savings and increases in revenue. The study further reveals that the true lean 5S tool helps with achieving manufacturing excellence.

Filip and Marascu-Klein (2015) explored the 5S lean method as a tool of industrial management performance. The study adequately describes the effects of the 5S lean method in the organisation. The findings from the study suggests that the lean 5S tool improved activities such as storage, cleaning and production in the organisation.

Gupta and Jain (2015) in their study investigated the application of the 5S concept to organise the workplace at a scientific instruments manufacturing company. The purpose of this study was to adopt the 5S tool to help small-scale manufacturing organisations become more productive and more efficient. This study used a simple approach to create the teams to implement 5S and adopted the cause-and effect diagram to study the shop floor analysis. The results of the study indicate that the implementation of the 5S tool had resulted in the overall improvement of the organisation. The study recommends that 5S is a useful tool and can be implemented in various industries whether micro, small, medium or large.

Rahman *et al.* (2008) studied the “essential quality practices in Indonesian manufacturing SMEs”. The principal aim of the study was to assess whether essential quality practices such as 5S have a significant contribution to the successful implementation of TQM. This study sampled 36 Indonesian manufacturing SMEs, which formed a total of 78% who are applying 5S in their business environment. The focus of the study was to evaluate the development, implementation and evaluation of 5S in the selected firms. The research instruments used were questionnaires and personal interviews with the purpose of collecting background information, namely ownership, existing staff and management, perception of existing systems, methods

used for improving quality, quality training frequency, the 5S rule practice and TQM. The overall findings from the study shows that the 5S tool supports an essential quality environment, which is an important base for successful TQM implementation.

Thakkar *et al.* (2014) in their study carried out a detailed review of the implementation of the 5S tool in various organisations. This study explains the methods and techniques of 5S as a tool to increase the efficiency of all processes in the various organisations. The findings from the study suggest that the implementation of the 5S leads to an improvement in quality, reduction in physical efforts, less industrial injuries or accidents during production process and better organisational activities.

5.4 Objective 3: To recommend ways to improve the sustainability of 5S initiatives using Research and Case Studies.

This research further investigated ways in which the implementation and sustainability of 5S can be improved within Feltex Fehrer (Pty) Ltd – Durban Plant. The recommendations provided by the respondents as measures of improving the sustainability of 5S include employee training, top and middle management support and commitment, awareness about 5S implementation and financial support and rewards. Similar recommendations were also made by various research literature on how 5S can be well sustained in organisations. The recommendations provided by the respondents in this research are not far from those contained in existing studies.

Patel and Thakkar (2014), in their study on the topic “5S sustainability in ceramics manufacturing company” made the following recommendations to improve the 5S system. According to Patel and Thakkar (2014), in order to make 5S practices more influential, top and middle management should fully support this activity throughout the organisation. Further, in order for top management to become aware of the effectiveness of the 5S, they have to be shown the performance of the organizations’ product quality through the use of this approach. In addition, Patel and Thakkar (2014) also recommends that firms should implement a system of benchmarking with other companies, internal or external, including competitors. Finally, Patel and Thakkar (2014) suggest that employee involvement is also key to the successful sustainability of the lean 5S tool.

Hirano (1995) in his book, titled “5 pillars of the visual workplace” recommends the following strategies for the sustainability of 5S, namely: establish 5S promotion in the organisation, establish 5S promotion plan, establish 5S campaign materials, in-house education and awareness, 5S implementation, and 5S evaluation and follow up.

Singh and Ahuja (2014), in their study, also made the following recommendations to management to improve the implementation of 5S, which includes: the announcement of top management’s decision to implement 5S, training of staff on 5S sustainability and data collection, establish organisational culture, formulate basic 5S policies and goals, 5S plan for deployment, feasibility study and its presentation, conduct a pilot study on the 5S implementation and installation, plant wide installation, progress audit, and 5S certification and award.

Eckhardt (2001) suggests that employee involvement or participation is part of the 5S concept and plays an important role in gaining employee commitment towards the success of 5S. Gapp et al. (2008) recommends that employee involvement is required if the benefits of 5S are to be reaped. Gapp et al. (2008) further argues that Japanese companies have placed much emphasis on employee involvement, not only in organisational aspects of development but also in the strategic and long-term application of the system.

Singh et al. (2015) suggests that awareness is a critical success factor affecting the implementation of 5S. Therefore, this recommends that awareness should be created about the implementation of 5S in an organisation, which includes: what is 5S? the pros and cons of 5S implementation, the steps involved in the implementation of 5S, and how to apply the 5S systematically in respective industries.

Ghodrati et al. (2015) also finds that the failure of 5S implementation in most organizations’ is as a direct result of poor awareness. Ghodrati et al. (2015) claims that most employee and managers are not fully aware of the 5S principles. Ghodrati et al. (2015) advocates that without awareness, how exactly is one able to develop an action plan and steps to implement 5S?

5.5 Chapter Summary

This chapter of the study discussed the findings which emerged from the research. The chapter begun by providing a comprehensive discussion on the factors that affect the implementation and sustainability of the 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. The discussion focused on the factors such as real employee commitment, inventory system, employee training and development, employee health and safety, implementation costs, resource availability, top management support and commitment and organisational communication. This chapter also discussed the extent to which 5S is practiced at Feltex Fehrer (Pty) Ltd – Durban Plant. The research confirms that 5S can be implemented in Feltex Fehrer (Pty) Ltd – Durban Plant based on the outcomes such as improvement in product quality, improved production processes, improved productivity and reduced waste. This chapter concluded with the discussion on the various recommendations that will help to improve the implementation and sustainability of 5S in the focal organisation.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

Chapter five rendered a full discussion on the research findings. This chapter proceeds to draw the conclusion as well as provides the recommendations in respect of the research findings. The limitations and the directions for future studies are also contained in the latter part of this chapter. The research objectives, which guided the entire investigation, were:

- To gain an understanding into the various factors that affect the sustainability 5S within Feltex Fehrer (Pty) Ltd – Durban Plant
- to assess the extent to which 5S is practiced at Feltex Fehrer (Pty) Ltd – Durban plant; and
- To recommend ways to improve the sustainability of 5S initiatives at Feltex Fehrer (Pty) Ltd – Durban plant using research and case studies

6.2 Conclusion of the Study

The aspect of this chapter contains the summary of the research findings as per each objective.

6.2.1 Objective 1: To determine the factors that affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant

Following discussions on this objective in chapter four and five, the principle aim of this research is to investigate the factors that affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. This research identifies the individual factors which affect the implementation of 5S in Feltex Fehrer (Pty) Ltd – Durban Plant. These factors include: employee training and development, real employment commitment, employee involvement, top management support and commitment, resources and implementation cost, time management or schedule of implementation, employee health and safety, and implementation procedures.

The findings presented in this research are also supported by existing studies.

Daraei et al. (2015) in their study on the topic “identifying and ranking the critical success factors affecting implementation of 5S” identified and ranked twelve critical success factors that affected the implementation and sustainability of 5S in Shahid Rajae Power Plant, which includes: situational analysis; perseverance; knowledge, acceptability and authority of leader; belief, commitment and support of top management; employee training and development, team

working spirit; employee job satisfaction; real commitment from employees; organisational culture; schedule of implementation or time management; 5S implementation costs; suitable methods of rewards; and conscientious work ethic.

Similarly, Singh et al. (2015) identified some critical success factors which influenced the sustainability of 5S in SME's of Vadodara Region, including less awareness about what constitutes the 5S, the advantages and disadvantages of the 5S implementation, the steps involved in the implementation of 5S, and the application of the 5S tool. Further, in a study conducted by Todorovic and Čupić (2017), it was discovered that the main factors which influence the sustainability of 5S includes: increases in the prices of the raw materials, a decrease in purchasing power of demand and strong investment activity of the subsidiary.

6.2.2 Objective 2: To assess the extent to which 5S is practiced at Feltex Fehrer (Pty) Ltd – Durban plant

This research further investigates the extent to which 5S is practiced at Feltex Fehrer (Pty) Ltd – Durban Plant. The study therefore concludes that the 5S tool could be applied at Feltex Fehrer (Pty) Ltd – Durban Plant as it contributes to improved product quality, increases productivity and production process and eliminates waste. The conclusion of this study is in line with similar conclusion drawn by previous researchers.

In a study conducted by Sofokleous (2003), it was discovered that the 5S tool was applicable in a small agricultural business which is known as the South American Pineapple Company because it contributed to improved efficiency by reducing time spent, provided extra space, reduced inventory and enhanced employee morale, which encouraged communication. Similarly, Barraza and Pujol (2012) in their study conclude that that the lean 5S tool is not only useful for improving the working environment, but rather it enhances processes and product quality, reduces and optimises lead time, minimises operating costs as well as improves process performance.

Moriones et al. (2010) in the study also conclude that the 5S technique is positively related to a firm's plant size, type of products manufactured, technology adopted, and good quality management programs implemented. Furthermore, Singh and Ahuja (2014) conclude that the lean 5S tool enhances process performance, improves customer satisfaction and affects bottom-line through cost savings and increase in revenue. The study further reveals that the true lean

5S tool helps in achieving manufacturing excellence. According to Filip and Marascu-Klein (2015), the lean 5S tool improves activities such as storage, cleaning and production in the organisation. Gupta and Jain (2015) also propose that the implementation of the 5S tool has resulted in the overall improvement of the organisation. The study recommends that 5S is a useful tool and can be sustained in various industries whether micro, small, medium or large.

6.3 Objective 3: To recommend ways to improve the sustainability of 5S initiatives within Feltex Fehrer (Pty) Ltd – Durban Plant using research and case studies.

The last objective of the study explores ways to improve the sustainability of 5S initiatives within Feltex Fehrer (Pty) Ltd – Durban Plant, using research and case studies. This study concludes that 5S could be sustained more effectively by instituting measures such as employee training and development, schedule of implementation, employee commitment, a good reward system, awareness about the 5S tool, top management support and commitment, cost-benefit analysis, situational analysis, resource availability, technology and employee involvement.

6.4 Recommendations of the Study

Part of this study also aims to provide recommendations to management on how to improve the implementation of 5S. The following recommendations are very necessary based on the findings, which emanate from this study.

6.4.1 Employee training and development

The results of this study as well as existing studies reveal that a lack of training and development is an important critical success factor, which influences the sustainability of 5S in many organisations'. In this study, employee training was ranked the third factor amongst seven factors, which affects the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. It is against this background that this research advocates adequate employee training and development towards the implementation and sustainability of 5S.

6.4.2 Awareness of the 5S tool

Most initiatives in organisations' fail because of the lack of proper awareness. This study also finds that the lack of awareness hinders the successful implementation of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant – it is for this reason that that this research recommends creating extensive awareness about the implementation of 5S.

6.4.3 Top management support and commitment

The results of this research shows that a lack of top management support and commitment are some of the crucial factors, which affect the implementation of 5S in the focal organisation. It is against this background that this study recommends that the 5S tool is a strategic technique, which requires full support and commitment from all levels of management in every organisation. Without the support and commitment, especially from the top management, 5S cannot be implemented and sustained successfully.

6.4.4 Employee involvement

Employee involvement has been considered an important organisational variable, which influences most activities in an organisation. The researcher is of the opinion that the implementation of 5S will be unsuccessful without employee involvement. It against this background that the study recommends that employees should be involved in the 5S implementation process. For example, Japanese companies have placed much emphasis on employee involvement; not only in organisational aspects of development, but also in the strategic and long-term application of the system.

6.4.5 Adequate budget to support the sustainability of 5S

Costs represents a very important factor, which affects the implementation of 5S in many organisations, including Feltex Fehrer (Pty) Ltd – Durban Plant. This research observes that the sustainability of 5S in the focal organisations is a huge challenge because of the significant costs associated with it. It is in line with the finding that this research recommends adequate funding in order to support the sustainability of 5S.

6.4.6 Real employee commitment

The success of implementing 5S partially depends on employee commitment. Employee commitment is the degree to which an employee identifies his/herself with the organisation and wants to continue active participation in it. Employee commitment is one of the most important variables in management and organisational behaviour, which affects the sustainability of 5S. The researcher also believes that the sustainability of 5S requires full commitment from employees. Total commitment from the employees will enable them to work more effectively and efficiently towards the sustainability of 5S in the focal organisations.

6.4.7 Team spirit

This research further recommends that team spirit is necessary if 5S is to be sustained in the organisation. Team spirit as the collaboration between functions, between suppliers and customers, and between managers and non-managers. The employees as well as management in the organisation must be willing to work together.

6.4.8 Schedule of implementation

Evidence suggests that the schedule of implementation is one of the most important factors, which affects the sustainability of 5S in many organisations. When companies are preparing for lean transformation, a combination of both quick reaction times and risk taking is necessary with the implementation activities. Every project required a well-written and approved Project Charter, Scope Statement, and a Work Breakdown Structure (WBS). It is against this background that this research also recommends that a schedule of implementation be drawn up when implementing 5S in any organisation.

6.5 Limitations and Directions for Further Research

This research investigated the factors affecting the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant. This means that the study was limited to staff at Feltex Fehrer (Pty) Ltd – Durban Plant. The findings, therefore, could be applied to South African Automotive Component Manufacturers. Therefore, further studies should be conducted amongst Automotive Component Manufacturers in two or more provinces or cities within South Africa. Another limitation of this research was the methodology (quantitative research) that was adopted. By implication, a single research method is impossible for the triangulation of the results. Further studies should therefore adopt the mixed method research to provide more room for the triangulation of the results.

6.6 Chapter Summary

This chapter contained the conclusion, recommendations and directions for future research. From this research, it was concluded that the main factors that influences the sustainability of 5S within Feltex Fehrer (Pty) Ltd – Durban Plant were: employee training and development, real employment commitment, employee involvement, top management support and commitment, resources and implementation costs, time management or schedule of implementation, and employee health and safety and procedures. This chapter also recommends

the following measures to improve the implementation and sustainability of 5S, namely: employee training and development; awareness on the implementation of 5S; top management support and commitment; employee involvement; adequate financing for the implementation of 5S; real employee commitment; team spirit; and schedule of implementation. This chapter concludes with the directions for further research. It is therefore recommended that future studies should be conducted amongst Automotive Component Manufacturers in two or more provinces or cities within South Africa. It is also recommended that future research should adopt the mixed method research to provide more room for the triangulation of the results.

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Appendix A: Questionnaires

FACTORS AFFECTING THE SUSTAINABILITY OF 5S

Dear Respondent

Kindly complete the questionnaire below with regards to 5S in your working environment. Your responses will be treated with the strictest of confidence.

SECTION A: DEMOGRAPHICS

1. Name and Surname

2. What is your current Job Title?

3. How many years have you been employed at Feltex Automotive?

4. What percentage of your time is spent working in teams?

5. Does your plant supply a manufactured product to the South African Automotive Industry?

YES	NO
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SECTION B:

The following questionnaire is based on a Likert scale for factors that influence the sustainability of 5S:

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Plant management is committed to the success of 5S					
2	Outdated materials, tools and equipment are cleared from your work area					
3	Inventory is organized and easily identified					
4	Adequate training on 5S is provided for employees					
5	Adequate training on 5S is provided for management					
6	Communication within the plant is excellent					
7	A 5S implementation and sustainability procedure is documented and utilised					
8	5S schedules are implemented and are put into place					
9	5S policies and procedures are continuously reviewed and monitored					
10	Adequate time is given for 5S implementation					
11	Adequate resources are provided for 5S implementation					

12	Visual aids are in place and, promoted and unobstructed					
13	Workstations are clean and neatly organized					
14	Following a proper 5S system improves productivity in the workplace					
15	I would recommend that this 5S system be implemented in other companies					

Do you have any suggestions regarding 5S manufacturing? If yes, provide suggestions below.

Thank you for taking time to complete this questionnaire.

Ethical Clearance



16 October 2019

Mr Andrew Lionel Pillay (213569333)
Graduate School of Business & Leadership
Westville Campus

Dear Mr Pillay,

Protocol reference number: HSSREC/00000251/2019

Project title: Factors that affect the sustainability of 5S within Feltex Fehrer (Pty) Ltd Durban Plant

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 20 August 2019 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. **PLEASE NOTE:** Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid for one year from 16 October 2019.

To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

Yours sincerely,



Professor Urmilla Bob
University Dean of Research

/ms

Humanities & Social Sciences Research Ethics Committee
Dr Rosemary Sibanda (Chair)
UKZN Research Ethics Office Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
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