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How to cite this thesis

Lean manufacturing as a tool for competitive advantage in South African snack industry

A dissertation submitted in fulfilment of the requirements of the degree
MASTERS TECHNOLOGIAE

in

OPERATIONS MANAGEMENT

in

FACULTY OF ENGINEERING AND BUILT ENVIRONMENT
at the

UNIVERSITY OF JOHANNESBURG

By

Magaly Madeleine Bolipombo
201428548
February 2019

Supervisor: Dr Ndala Yves Mulongo
Co-supervisor: Prof C.O Aigbavboa
DECLARATION

I, MAGALY MADELEINE BOLIPOMBO, do hereby state that this dissertation is the result of my own investigation and research, except to the extent indicated in the references and by comments included in the body of the report and that it has not been presented elsewhere for a similar purpose. It was submitted to the University of Johannesburg (Department of Quality and Operations Management), as a requirement to obtain a MAGISTER TECHNOLOGIAE degree in Operations Management.

Signature                                                                                         Date

University of Johannesburg,
Auckland Park Bunting Road Campus
PREFACE

The work presented in this master’s thesis was conducted at the Department of Quality and Operations Management within the Faculty of Engineering and the Built Environment of the University of Johannesburg under the supervision of Dr Ndala Yves Mulongo and Clinton Aigbavboa. One peer-reviewed conference proceeding was generated out of the content of this master’s thesis

DEDICATION

In silent prayer and head bowed, I dedicate this research work to the memory and honour of my dear mother, Fransisca Isola Ilito.
ACKNOWLEDGMENT

My gratitude goes firstly to my Lord and Saviour Jesus-Christ through whom all things were made possible, The one who allowed me to get to this point in my studies.

I would like to thank and express my gratitude to my supervisor Dr Ndala Mulongo and Co-supervisor Prof Clinton for their valuable input in this project.

To my dad and mom who have always, throughout their whole life, done the best that they could to make sure that, us their children, reach for the best possible goals for our lives.

To my siblings, and friends I would have never made it to this point without your assistance, support and continuous encouragement.

I would like to thank the participants who took their time and answer the surveys.

Finally my appreciation to my fellow masters colleagues and to everyone who participated somehow to the completion of this work.
ABSTRACT

Over the past decade, the snack foods manufacturing industry has been growing and evolving at a fast pace. Due to the fast-paced developments, decision makers within the industry are dealing with the issue of balancing entrenched strategies with short-term solutions. Consumer satisfaction has become crucially imperative for manufacturing operations and consequently product quality has also acquired considerable weight within this sector. To this end, various business organisations in the manufacturing sector have grabbed the advantages linked with the implementation and efficient use of Lean Manufacturing with the goal of improving quality and productivity. However, literature presented in the present study clearly shows that there is a dearth of studies on lean implementation in the small to medium snack manufacturing enterprises. This factor has prompted this study to investigate Lean Manufacturing as a competitive advantage tool for the South African small to medium snack manufacturing industry. To achieve this goal, this study employed two research approaches, firstly the study thoroughly analysed a set of previous studies conducted on lean phenomena within different business organisations during the last twenty years with the aim of identifying gap in the current literature. Secondly, the present study used a single methodology quantitative research to fill the identified gap as presented in the previous paragraph. The results show that the causes behind Lean implementation failure in the South African snack foods manufacturing industry were employees slip back to the old method; high employee turnover; lack of employees’ empowerment; lack of management commitment and leadership; employees are not ready to change to new practices; the investment requirement is high for implementation; no proper training is provided to employees; there is no interest shown from employees; management is not interested in implementing lean techniques; company is not fully aware of lean tools and techniques. Additionally, the results demonstrated that key limitations to lean implementation in the snack foods manufacturing industry were technological challenges; cooperation with suppliers to establish a lean supply chain; coping with change; cultural and social barriers to change; and commitment from top management.

Taking into consideration the factors stated in the previous paragraph, this study reached a conclusion decision makers should start by standardising their processes; developing knowledge sharing culture with employees, providing sufficient training to employees that related to their work and front-line managers should display commitment towards the adoption and implementation of lean through the provision of necessary resources. These have significant impact on the successful lean implementation since Lean phenomena necessitate a profound
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LIST OF ACRONYMS

ABARES: Australian Bureau of Agricultural and Resource Economics and Sciences
AHP: Analytical hierarchy process
APEC: Asia-Pacific Economic Cooperation
CAGR: compound annual growth rate
CIAA: Confederation des industries agro-alimentaires de l’UE
CMB: Cocoa Marketing Board (CMB)
DEA: Data Envelopment Analysis
EC: European Commission
ERP: Enterprise Resource Planning
EU: Europe Union
FAO: Food and Agriculture Organisation
FIC: Food Information to Consumers (FIC)
GDP: Gross Domestic Product (GDP)
GM: Green Manufacturing
GCC: Gulf Cooperation Council (GCC)
IITA: International Institute of Tropical Agriculture (IITA)
LM: Lean Manufacturing
JIT: Just in time
PGP: pre-emptive goal programming (PGP
R: Rank
SBM: Slacks-Based Measure
SCM: Supply Chain Management
SCS: Supply Chain Strategies
SD: Standard Deviation
SFE: Schonberger’s principles of lean
SME: Small and Medium Enterprise
UK: United Kingdom
VSM: Value Stream Mapping
WIP: Work in progress
X: Mean
CHAPTER 1. INTRODUCTION

Over the few past decades, the competition has become more and more fierce. Low quality-goods with long lead times and fewer options are no longer accepted by consumers. Consumers demands have been increasing over time and conventional production methods are failing to keep up with the fluid environment. As a result, using the latest production techniques to manufacture high-quality products with lower prices in a shorter amount of time has become critical for survival in today’s competitive international market. The application of Lean Manufacturing is used as a mechanism for staying in this fierce business. This chapter gives the background of the research, introduces the research problem and briefly explains the aim and objective of the study.

1.1 Research context: Background

Due to globalisation, advancements in technology, business innovation, the degree of creativity and opportunities in the entrepreneurial sector, the world has become a universal business platform. Companies end up having to strive for competitive advantage with their global counterparts and some have adopted the application of Lean Manufacturing as a mechanism to stay in this highly competitive business environment. The success of businesses and managers is also based on their capacity to respond, operate and adjust to change when it comes. (Charron, 2014). Lean Manufacturing is a concept that aims to remove waste in every aspects of production activities. (Womack, 1990).

According to Charron (2014), staying competitive could require considering new means of decreasing costs and improving the quality of the organisation’s products. Lean Thinking was deemed to be one possible technique for improving organisational performance.

Lean Manufacturing or Lean Production, commonly called "lean", is an efficient technique for waste reduction in an assembling framework without sacrificing productivity. Lean Manufacturing was designed by Toyota official, Taiichi Ohno, in1988 during the post-Second World War reconstruction period in Japan and was promoted by James et al. in their book 'Lean Thinking.' (Womack, 1990)

The importance of lean has been in regulating work procedures to highlight issues and develop team members' critical thinking skills for them to resolve those problems and improve work processes. One of the goals of all companies is to improve revenue and productivity while simultaneously decreasing the cost of processes and adding value to the organisation. (Meyer, 2011).

In the current business, there is a fast shift in technology and demand happening (Gleeson, 2016). Companies are trying to keep up with demands to guarantee consumer satisfaction as
consumers are becoming increasingly mindful of the rising standards since they are exposed to a broad variety of items and services to choose from. There is a general increased demand for quality items and services and this global revolution has pushed companies to invest into accepting and implementing new techniques to enable the improvement the organisation’s productivity and competitiveness. Lean Manufacturing has become a broadly implemented and adopted manufacturing strategy among countries and industries (Nordin, 2012). The main aim of lean in a company is to generate an easy optimal framework that can produce, without waste, the high-quality finished items that consumers demand.

A snack is a light meal usually eaten in between main meals (Anon., 2017). The consumption of snacks dates back 2000 years ago and was initially eaten by pre-historic societies in South America (Pineda, 2005). The snack sector has an expected value of R4.2 billion, a market value close to 99.8 tons, a yearly increase rate of 4.6% (Ntloedibe, 2006) and is the fourth largest industry in South Africa. Furthermore, the snack foods manufacturing industry adds value to South Africa’s foreign exchange balances as the country is an exporter of food products.

Taking into consideration that the snack foods manufacturing industry is still expanding and growing, a close investigation of how Lean Manufacturing is utilised will be done for the purpose of this study.

1.2 Problem statement

The global market has significantly changed during the past few decades. And the competition has become stiff. Due to increasing competition low-quality goods with long lead times and less diversity are less favoured by consumers. Consumers demands are constantly rising, and the usual production systems with long lead times and less diversity no longer satisfy this increase in demand. Consequently, using the latest production techniques to manufacture high-quality products with lower prices in a shorter amount of time has become critical for survival in the current competitive international market. The application of Lean Manufacturing is used as a mechanism to remain profitable and competitive in this tight business Environment.

Lean Manufacturing is one of the techniques which was adopted by various organisations all over the world to accomplish competitive advantages. Various investigations have been conducted on the implementation of Lean Manufacturing in different business companies over the past few decades. Literature presented in this thesis demonstrates that few studies attempted to study the implementation of Lean Manufacturing in the small to medium businesses, specifically within the South African context. Considering the lack of studies in the
implementation of Lean Manufacturing, this study seeks to address this gap, using through observation of South African small-to-medium snack manufacturing enterprises.

1.3 Research question

To be able to address the research problem, the following research questions were developed:

- RQ1: To what extent has Lean Manufacturing been approached from a holistic perspective in the current literature.
- RQ2: What are the causes for lean implementation failure in the South African snack industry?
- RQ3: What are the tools and techniques that can be employed in the South African snack industry?
- RQ4: What are the possibilities and limitations of using lean in the South African snack industry?
- RQ5: How is lean able to transform work processes in the South African snack industry?

1.4 Aim of the study

The primary aim is to explore the implementation of Lean Manufacturing as a competitive advantage tool within South African small-to-medium snack manufacturing enterprises.

1.5 Research objectives

To meet the goal of this research, the following emerged:

- RO1: Determining to what extent Lean Manufacturing has been approached from a holistic perspective in the current literature.
- RO2: To identify the causes behind the failure of lean implementation within the South African snack industry.
- RO3: To measure the impact of implementing Lean Manufacturing within the South African snack sector.
- RO4: To perform an evaluation and critique the literature to generate a classification of views on lean and snack foods manufacturing industry components. This will give background to the study and identify the gaps in the literature.
RO5: To understand the tools, techniques and components that are the most appropriate for the implementation of lean within South African snack manufacturing sector.

1.6 Significance of the study

This study tries to identify the basic elements or factors that impact and ultimately dictate the effective implementation of Lean Manufacturing as a business management tool in the South African snack manufacturing companies. The greatest input of this research is that the basic elements or factors that enable the possible success of lean in South African snack manufacturing enterprises are categorised and their relative impact on the success of the lean implementation process thereafter quantified. In this manner, the study contributes to the established body of knowledge especially in terms of the South African snack manufacturing sector. The outcomes of the research will enable practical conclusions to be reached, which could assist snack manufacturing organisations to effectively implement lean to enable the South African snack manufacturing organisations to compete internationally and ultimately contribute positively to the South African economy.

1.7 Overview of chapters

In this section, the main purpose of the various chapters is outlined

Chapter 1: Introduction

The chapter summaries the background of the research, the research problem, objectives and research question as well as the significance of the research.

Chapter 2: Theoretical Framework

The chapter consists of the critical assessment of studies on Lean Manufacturing in various sectors and industries to enable the identification of gaps in the current literature about the concept.

Chapter 3: Overview of Lean Manufacturing

This chapter of the study reviews the literature on Lean Manufacturing. It explores the concept Lean Manufacturing in from a broad perspective to obtain a vast array of information. The chapter presents all the elements of lean, the barriers and challenges.

Chapter 4: Food (snack) from international scale

This chapter reviews literature on Lean Manufacturing as established by scholars and researchers around the globe. It delves into the analysis of the food industry with specific reference to the snack sector from a global perspective by studying the food industries of two countries outside of the African continent.

Chapter 5: Food(snack) industry from African Case
This chapter studies the food sector and SMEs from the point of view of 3 African countries.

Chapter 6: Methodology
This chapter will present the technique used to collect and study the data as well as the reliability and validity of the research tool.

Chapter 7: Data Analysis and interpretation
In this chapter, the results of the data collection will be broken down and analysed using various types of analysis including descriptive analysis and reliability analysis.

Chapter 8: Conclusion and Recommendations
This last chapter summarises, explains the results, and arrives at conclusions about the research objectives. Recommendations are then made.

1.8 Conclusion

This chapter focused on providing background information relating to Lean Manufacturing and the South African snack industry. Furthermore, the chapter presented the problem statement, the objective, the aim, research questions, and research design. In conclusion, the chapter provided an overview of the research undertaken. The next chapter addresses the research methodology issues and explores the South African snack sector.
CHAPTER 2. THEORITICAL FRAMEWORK

2.1 Introduction

To position this work within the body of knowledge on Lean Manufacturing, the main objective of this chapter was to critically review previous studies that were conducted on Lean Manufacturing within the snack sector over the past two decades. This approach helps in identifying gaps that exist in the current literature.

To be able to determine the methodology and points of focus of this study, a critical assessment of 30 studies was conducted on Lean Manufacturing in various industries to highlight the gaps and accurately identify the point of interest of this research.

The studies assessed were generated by the ISI Web of Science database provided by the University of Johannesburg Library. The critical assessment of existing literature reviews on Lean Manufacturing was done for the years 1997-2017. The search focused only on peer reviews and articles published in English, falling under certain subject areas. The result comprised of approximately 600 documents that were studied critically by means of titles and abstracts to create additional boundaries and eliminate unrelated entries (screening phase). Throughout this stage, groups of inclusion and segregation standards were established. Each journal article was individually evaluated, with emphasis placed on articles that focused on lean implementation. It must be noted that studies that did not meet these requirements were not taken in account. This stage generated 441 articles focusing on lean mainly in automotive, aerospace and construction industries. These studies were categorised based on a set of standards. For instance, in this paper the studies that were assessed were selected according to citation. The summaries show the 30 papers studied on lean that were critically reviewed over the past two decades.

Table 2.1 Critical assessment table
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2.2 Critical assessment

Bamber et al. (2000) investigated on the utilisation of Lean Production techniques at a traditional aerospace manufacturing company. They described the method taken to Lean Production, along with what was successful and what was not. The two primary barriers to the adoption were found to be the redundancy plan and the lack of knowledge regarding the notion and standards of Lean Production. Some of the methods for Lean Production were considered not as efficient as in the motor manufacturing case and the causes behind this were found to be the main position of the organisation and the consumers demand attributes. Moreover, both management and the industrial employees agreed that the change from usual manufacturing to Lean Production was difficult to realise. Even though they contributed considerably to the body of knowledge regarding lean, they only focused on the aerospace sector and did not address other sectors and focused on a quantitative approach in large companies and failed to cover small and medium enterprises.

In 2001, King et al. (2001) empirically investigated the ecological performance of 17,499 U.S. manufacturing organisations from 1991 to 1996. Lean Production might have had an important fall which improved by ecological performance. However, empirical evidence of the connection from Lean Production practices and ecological performance has not solved the state of the link. The results suggest that those enterprises that embrace the quality management standard ISO 9000 are expected to take the environment management standard ISO 14000. They also discovered solid proof that Lean Production as estimated by ISO 9000 implementation and low chemical stocks is reciprocal to waste decrease and pollution decrease. Although they contributed considerably to the established body of knowledge by covering various industries in the study, they only focused on large companies and did not cover SMEs.

Rothenberg et al. (2001) studied the link between Lean Manufacturing practices and ecological performance as estimated by air emanations and means implemented. They focused on two interesting reviews of 31 automobile assembly plants in Japan and North America which contained data on manufacturing practices and ecological performance and in addition discussions with 156 plant-level representatives at 17 assembly plants. Their questionnaire and interview results implied that Lean Manufacturing and a decrease in the air emissions of volatile organic compounds (VOCs) are unrelated. Lean Manufacturing practices add to more effective utilisation of paints and cleaning diluents. However, these in-process variations are not adequate to satisfy the strict air guidelines. They also discovered proof to back up the connection between Lean Manufacturing and resource proficiency. They utilised them to define a few instruments by which each of the three parts of Lean Manufacturing (buffer
reduction, work methods and human resource management) might be identified with ecological management practices and performance. They only covered the qualitative approach and failed to do quantitative method.

Crute et al. (2003) discussed the main factors for lean in aerospace and explored the belief that cross-sector transfers might be hard. Lean Manufacturing seemed to have extensive guarantees for fixing a series of synchronised, competitive demands insuring good levels of process and product quality, low prices and minimisations in lead times. These necessities were acknowledged in the aerospace industry and efforts are presently well instituted to implement lean practices. Lean Manufacturing was introduced in the automotive industry. Nonetheless, according to the book, The Machine That Changed the World (Womack et al., 1990) there was an array of specified examples of lean implementation in different industries. Notwithstanding this evidence, Lean Manufacturing is, to an extent recognised as an automotive concept, hard to adopt to different industries especially if there are significant contrasts among them. A lean implementation case contrast explored the idea that complications that occur might have more to do with single plant cases and management than with industry components. In doing so, they only focused on large organisations and failed to cover SMEs by only using a quantitative approach and failing to explore the results from a qualitative approach.

In the same year, Jaideep (2003), by means of a case study, discussed the basics of Lean Manufacturing, the approaches utilised by the organisation for implementing Lean Manufacturing and the major profits that were added in the manufacturing processes. He explained the analytical aspects implicated in the adoption of Lean Management using a business procedure change framework. He obtained the information for this research via consultations, form surveys and archival sources. He focused on a medium-sized automotive industry using a qualitative approach. In doing so he failed to cover the gaps in large industry and other sectors.

Haque et al. (2004) considered that Lean Thinking and its philosophies as expressed by Womack and Jones were effectively adopted to manufacturing and process milieus and examples and investigation related to this have been broadly covered. Nevertheless, when it comes to lean application to the New Product Introduction (NPI) or development processes it is not the case. They planned to define the use of the Womack and Jones principles of Lean Thinking to the NPI process (from theory progress to specified design to consumer distribution). Even though methods like concurrent engineering (or concurrent product advancement) were adopted and were reasonably efficient in increasing NPI, there is a deficit in the anticipated or preferred developments to NPI. They assumed this deficit can be linked
by the implementation of Lean Thinking to NPI; specifically, the five lean philosophies suggested by Womack and Jones. The five lean philosophies are: specify value, determine the value stream and reduce waste, make the value flow, let the consumer pull the procedure and pursue perfection. In their study, every principle is described and categorised in terms of NPI. Their work was established on the Society of British Aerospace Companies’ UK Lean Aerospace Initiative including 40 aerospace enterprises of all ranges from within the UK. Two case studies from the industry were also used to determine characteristics of lean adoption in NPI (specifically, in-product design and development). They concluded with a summary of the main techniques and instruments that allow lean in NPI and by considering the crucial modifications needed for the manufacturing/processes descriptions of waste and value to adjust the demands of efficient and effective NPI. Though they brought very important contributions to the existing body of knowledge, they only covered the aerospace industry.

Seth et al. (2005) found that in recent years most manufacturing industries have been attempting to become ‘lean’. A headlong rush to give a value to the consumers by becoming lean and receptive has made analysts and experts determined to adopt new instruments and strategies to fix different wastes. The way toward mapping the resources and data issues of all parts and sub-assemblies in a value stream that incorporates manufacturing, providers and delivery to the consumers is identified as a Value Stream Mapping (VSM). VSM has demonstrated efficiency in recognising and reducing wastes in a capacity with comparable or same-items routings, such as in assembly capacities. In their study, they tried to make use of VSM as a method to accomplish increased profitability at the supplier end of the auto industry. Both present and future (‘as is’ and ‘to be’) conditions of supplier shop-floor circumstances discuss using value stream concepts. This is broken down with takt time calculations and the utilisation of other gap areas. Lastly, increase in production results per person, decrease of work in process and finished goods inventory impacting productivity are also revealed. They used a quantitative approach in large companies. Even though they brought considerable contribution to the exiting body of knowledge, they only focused on one sector and failed to cover other industries. They only looked at large companies and failed to cover SMEs.

Salem et al. (2006) compared the methods created for lean construction with those produced for Lean Manufacturing. Lean Manufacturing and lean construction methods share numerous normal components notwithstanding the undeniable contrasts in their assembly locations and procedures. Manufacturing plants and construction locations are distinctive from numerous points of view that may clarify why Lean Production theories and practices do not completely fit the construction sector. Despite the numerous lean development instruments and components are still in an emergent phase and lean construction procedures are becoming popular as they can influence the rest of tasks. Furthermore, they investigated a construction
A project in which lean construction components were tried. Every procedure was assessed as far as its effect on the execution of the task. Due to the discoveries of the investigation, another "lean evaluation apparatus" is proposed to measure the consequences of lean usage. The appraisal device assesses six lean development components: last organiser, expanded representation, cluster gatherings, first-run thinks about, Five S’s, and safeguard for quality. They gave a basic and complete approach that is transferrable to any development venture. In so doing, they only focused on large organisations using a quantitative approach and failed to cover SMEs.

Agarwal et al. (2006) studied how the development of a business time that grasps 'change' as one of its real attributes, producing achievement and survival are becoming increasingly harder to guarantee. They stated that accentuation is on versatility to shift in the business condition and on satisfying market and consumer wants proactively. Changes in the business condition is because of varying the consumers’ needs bring to hesitation in the choice parameters. Adaptability is required in the inventory network to counter the hesitation in the choice parameters. A supply chain adjusts the shifts on the off chance that it is adaptable and dexterous in nature. A structure is exhibited in their study, which epitomizes the market affectability, process combination, data driver and adaptability proportions of production network execution. They investigated the relationship between lead-time, cost, quality, and service level and the leanness and agility of a case supply chain in quick moving customer goods market. Although they brought significant contribution to the established body of knowledge, the authors focused on the aerospace sector only, and failed to cover other industries. They used a qualitative method and failed to cover the outcomes from a qualitative method. They used a quantitative method and failed to cover the outcomes from a qualitative method.

Parry et al. (2006) focused on visual process management instruments that were produced by lean professionals as communication helps and are utilised to assist in leading tasks and procedures in real-time. Three case studies from aerospace enterprises described the physical visual devices that were actualised to simplify execution estimation and communication in various engineering procedures. Rolls Royce showed a case of how ERP yields are connected and measured in a Lean Manufacturing procedure. At Airbus UK (Filton), visual procedure sheets are utilised to deal with an intricate information and individual based process, bringing numerous supplier contributions to the production aircraft support guides. Senior manager at Weston Aerospace are utilising visual process regulators to run and report on work packages, assets and procedures throughout their companies. These frameworks work as an augmentation to metrics, and may be seen as a vigorous estimation framework as they give
immediate criticism and can be utilised to anticipate a likely result if no action is made. The learning and topics that have made these implementations successful are displayed and organised into an arrangement of rules for consideration while actualising visual process management tools. Although they brought important contribution to the established body of knowledge, the authors focused on the aerospace sector only, and failed to cover other industries. They used a quantitative method and failed to cover the outcomes from a qualitative method.

Holweg (2007) stated that Lean Production did not effectively test the acknowledged mass production practices in the automotive sector, essentially affecting the relationship between productivity and quality. Yet, it did result in a reconsideration of a variety of manufacturing and services over the high-volume redundant manufacturing condition. The book 'The Machine That Changed the World' which presented the concept of 'Lean Production' in 1990 has become a standout cited reference in operations management during the most recent decade. Even though the Just-In-Time (JIT) manufacturing idea had been introduced for close to 10 years, the book had an important part in spreading the theory outside of Japan. Whilst the specialised parts of Lean Production have been broadly talked about, his study explored the advancement of the examination at the MIT International Motor Vehicle Program (IMVP) that led to the origination of the term 'Lean Production'. Moreover, he explored why – notwithstanding the pre-existing knowledge of JIT – the program was so persuasive in advancing the Lean Production theory. In accordance with a repetitive set of discussions with the key writers, sponsors and analysts of the time, the study exhibited a verifiable record of the examination that resulted to the creation and spread of significant manufacturing standards in recent history. The authors focused on a quantitative approach and therefore failed to elaborate on the results that could have been obtained using a qualitative methodology.

Lander (2007) studied how the Toyota Production System (TPS) has encouraged progress of 'Lean Production' concentrated on eliminating waste from value streams, mostly applied to high volume and standardised items. Using this method, work happens to be very standardised, determining, to the exact time, what the worker must do. Barriers are correctly calculated and measured from pull signals. When doable, usage of one-piece stream cells leads a completely modified production line. The performance advantages of these lean methods are usually outstanding, enormously increasing quality, cost, and delivery. Nevertheless, what about organisations that are not making standardised items at high volume? What is lean offering them? In his study, he argued that there is a basic misconception of TPS, seeing it as a tool kit theoretically applied in a formulaic manner to accomplish pre-indicated outcomes. TPS is a concept that is simply defined as an agreement of common standards of arranging and dealing with an organisation which can allow any firm
to be on-board with constructive learning and change. An example of a low volume, customised artistic clay tile organisation is the process by which the organisation used TPS to find out how to understand its process, improve security and control, enable its workforce, and increase profits. The study’s focus on a qualitative methodology fails to provide the reader on the results issuing from a quantitative methodology.

Sahoo et al. (2008) focused the adoption of lean philosophy in a forging organisation with an attention on radial forging production lines. The prime reason was to advance and test a few methodologies to remove waste on shop floors. In their research, a deliberate tactic is recommended for the adoption of lean principles. They described utilisation of value stream mapping (VSM). Subsequently, the current and future conditions of important value stream maps are made to improve the production process by separating waste and its sources. Moreover, Taguchi’s strategy for a plan of examinations is followed to limit the forging flaws made because of imperfect working situations. A clear elimination in set-up time and Work-In-process (WIP) stock level is verified. They finished up with a dialogue of managerial suggestions and future studies. Even though they brought crucial contributions to the established body of knowledge in that they covered various industries, they only focused on large companies and did not cover SMEs. There is room for further research in this area.

Jayaram et al. (2008), recommended that loyalty to the lean method must go before having close relationship with main supplier chain associates (suppliers and clients). They studied two parts of the lean method, Lean Manufacturing and lean design. They hypothesised that relationship-building decidedly influences the two parts of lean strategy, which thus constructively impacts firm performance. To verify these relationships, they utilised information according to the best 150 auto suppliers to the ‘Huge Three’ unique gear producers (OEMs). The outcomes demonstrated positive connections between (1) building and lean design, (2) building and Lean Manufacturing, and (3) lean design and organisation performance. Their research recommended that connection-building is more significant for improving the ‘product’ features of lean strategy instead of the ‘process’ features of the lean method. Process features of lean strategy seem to be mostly a role of inside attempts. Although they brought significant contributions to the existing body of knowledge, the authors focused on the automobile sector only and failed to cover other industries and only. used a quantitative method.

Wan et al. (2008) suggested a unit invariant leanness measure with an autonomous benchmark to evaluate the leanness level of assembling structures. Different lean plans and systems have been manufactured for process improvement. Remembering the ultimate objective to follow the evolution of lean, lean metrics were created and incorporated and quantitative amount of total leanness level has not been set up. Advanced from the notion of
Data Envelopment Analysis (DEA), the leanness measure removes the value-adding investments from a production procedure to decide the leanness frontier as a benchmark. A linear program built on Slacks-Based Measure (SBM) determined the leanness score that demonstrates how lean the framework was and how much waste occurred. Utilising the total, effects of different lean activities can be evaluated as optional assistance information balancing the current lean metrics. This study’s approach was mostly quantitative which failed to cover a more qualitative point of view.

Shah et al. (2008) utilised application and performance information from a model of 2511 plants. They aimed to discover associative and exceptive arrangement of application among 15 lean practices and the Six Sigma program. Consolidating lean practices with Six Sigma had received massive recognition in the past decades. Regardless whether a joined Lean-Six Sigma method is the most recent management trend, links to important performance advantages that surpass detached implementation are not yet evident. Their outcomes demonstrated two main discoveries. Initially, adoption of every practice from a wider set of lean practices increase the probability of applying Six Sigma. Moreover, practices generally packaged in quality management anticipate and recognise the group of plants adopting Six Sigma from non-adopters. Secondly, the retrogression outcomes demonstrate an important contrast in the performance levels of the Six Sigma adopters group compared with the non-adopter group. These primary outcomes are initial steps in separating fact from literature. The research adopted a quantitative method for their study and thus failed to give results from a qualitative point of view.

Cooney et al. (2008) embarked to examine the statement made in the Lean Production writing that the Lean Production method is commonly appropriate. The defenders of the Lean Production model demand that it will surpass both large-scale manufacturing and focused mass production; however, his study discussed that, while Lean Production practices have been received and adjusted by numerous manufacturers, mass production has a lasting value from both a work design sign and a manufacturing process plan point of view. The paper audits the proof for the determination of group creation and of skill work techniques in both luxury vehicle manufacture and specialty element manufacture and features the states in which mass production stays reasonable. Although he contributed to the existing body of knowledge, the authors focused on the automobile sector only and failed to cover other industries and only used a quantitative method.

Bayou et al. (2008) looked at the fact that notwithstanding the tremendous research done on Lean Manufacturing techniques in many disciplines in recent years, the idea remains undeveloped for two reasons. Initially, it did not have a generally acknowledged definition. Various authors characterised lean as far as its aims, which change, vary and differ in various
firms. Secondly, no investigation has built up a precise and comparative measurement of Lean Production techniques. Without this type of measurement, two organisations can't be evaluated equally on their advance to becoming lean. His study aimed to characterise Lean Manufacturing as a unifying idea and to build up an efficient, long-term measure of leanness. Manufacturing leanness is a method that aims to bring about less inputs to better achieve the firm's goals by bringing better results. The deliberate measure of leanness has seven qualities: relative, dynamic, long-term fuzzy logical, objective, integrative and comprehensive. The leanness measure uses the fuzzy-logic, objective, integrative and comprehensive. The leanness measure uses the fuzzy-logic method as lean is an average degree. Using the measure to look at the production leanness of Ford Motor Company and General Motors (GM), the study chose Honda Motor Company as the benchmarking organisation. Choosing in the Just In Time (JIT), Kaizen and quality controls as lean properties, the paper utilises surrogates for these traits separated from evaluated budgetary proclamations through 2001 to 2003. The results suggest that Ford's framework is over 17% more lean than GM's framework when compared to the benchmarked organisation's framework. The study was based on a quantitative research methodology thereby failing to provide a qualitative approach to the work.

Browning et al (2009) investigated how curiosity, multifaceted nature, uncertainty and defending influence the link from lean adoption and production costs. A focal precept in the philosophy of Lean Production is that the adoption of lean practices will decrease waste and thus reduce costs. However not every lean implementation has created such outcomes. Evidently this impact is directed by a few components, conceivably even to the point of reversal. It is imperative to build our comprehension of how this may happen. A concern for these components attracted them to research the case of Lockheed Martin's creation framework for the F-22, a great and imaginative product. To generate a hypothesis, they blended their experimental information from the case and different existing philosophy, like concepts of learning and complication. From this investigation, they built up a reconsidered system that reconceptualises the impact of lean on production expenses and utilised it to create 11 recommendations to coordinate more investigation. Contained amongst these are suggestions about how the planning, scale, and degree of lean implementation can manage the advantages of lean. Moreover, when the goal of lean is interpreted as the arrangement of significant worth, we suggest that this value is a new property of a perplexing procedure, not the same as the negligible entirety of the qualities given by its constituent assignments. In this way, the disposal of assignments will not ensure decreasing costs and lean may give much more noteworthy incentive by joining a few parts of nimble assembling. By and large, they built up a broader scope of the impacts of lean practices on generation costs and highlight how activities directors may control key factors to draw more prominent advantages from lean
adoption. The study focused on large companies and utilised a quantitative approach to the methodology thus failing to give an application for SMEs, as well as a qualitative approach. Sacks et al. (2009) demonstrated perspectives of the interaction between BIM and lean construction implementation of evolved production management methods, like lean construction theories like clarifying of work packages to even out work flows, pull flow of groups and resources, and in-process quality control, demands efficient and timely flows of data both to and from the workplace. The key necessity for making the process condition straightforward to all members is harder to accomplish in construction than in manufacturing since work groups move constantly in a physical environment which is itself varying. Novel computer-aided visualisation instruments can fulfil the requirements that easier instruments, like Kanban cards, fulfil in manufacturing. Two models with consumer interfaces made to enable process flow were developed and adopted regarding building information modelling BIM software systems. Considering the vigorous and discrete physical situations and the fractured contracting agreements distinctive of construction, BIM-based visualisation interfaces are crucial tools for offering process clarity. The methodology utilised in this study is quantitative, resulting in a failure to include results that could have been generated by a qualitative method. Yang et al. (2011) did a research on the link among Lean Manufacturing practices, ecological management (e.g., ecological management practices and ecological performance) and business performance results (e.g., market and economic performance). They tested 309 global manufacturing organisations (IMSS IV) by AMOS. The results imply that Lean Manufacturing challenges are totally connected to ecological management practices. Ecological management practices on their own are recognised as damaging to market and economic performance. Nonetheless, developed ecological performance lowers the negative influence of ecological management practices on market and monetary performance considerably. Their investigation gives practical proof with big sample sizes that ecological management practices become a crucial intermediating variable to solve the disagreements among Lean Manufacturing and ecological performance. More suitable investigations express that contrasts exist as far as the strengths and statistical implication of certain suggested connections. To efficiently implement ecological management, organisations should determine ecological performances over which the influence of ecological management on various business performance results is analysed. Despite the fact the authors have contributed considerably to the body of knowledge on Lean Manufacturing in various industries, they did not to address other industry such as snack manufacturing and small and medium enterprise. Eroglu et al. (2011) explored the fact that while firms progressively embrace lean inventory practices, there is limited confirmation that inventory leanness promotes enhanced organisation performance. This investigation re-evaluates this connection by trying to cover a
few of the limitations of past research. With that in mind, a hypothesis from measure of inventory leanness, which considers industry-specific inventory management features, is given. An investigation of a big panel data set of US manufacturing firms uncovered that the importance and state of the inventory-performance connection differs considerably throughout companies. This connection is important in two-thirds of the 54 industries considered. In most of these occasions, the relationship is sunk, proposing that there is an ideal level of inventory leanness above which organisation execution worsens. A post-hoc examination was done to distinguish industry-level features that might define the nature of the inventory–performance link. They considered managerial effects and a few openings for future research. Although they covered many industries, they failed to cover SMEs, and only used a quantitative method.

Vinodh et al. (2012) studied how the manufacturing firms have noticed key progress to the Lean Manufacturing paradigm to eliminate waste. Simultaneously, Six Sigma approach has been broadly utilised for reducing the faults. With the end goal being to accomplish the joined advantages of these two methodologies, the amalgamated Lean-Sigma system has begun. Lean-Sigma structure demonstrates disadvantages, for example, lack of methodical and logical management and feeble lean anchorage. To overcome these inadequacies, this study contributed a refined lean sigma system and its efficiency was tested and implemented in the Indian automobile industry. The authors adopted a quantitative approach to their study and in so doing failed to address the possible qualitative results.

Bhasin (2012) based his study on an in-depth examination to find whether bigger firms adopting lean as a philosophy were truly more effective. Accomplishment was estimated by the effect a firm's lean trip had on its monetary and operational proficiency levels. An adjusted balance record was used which grasped strategy, operational and guides concentrated to the company's future performance. The methodology mainly studied essential information gathered from 68 survey questionnaires in manufacturing companies in Britain, representative of small, medium and large enterprises. Consequently, broad analysis of case studies was done in seven organisations as a comprehensive validating exercise. The outcomes uncovered that the larger firms seeing lean as a philosophy worked better and this was uncovered by applying the adjusted scorecard to the separate lean implementations. A variety of inputs were regarded essential for this circumstance to exist. A study limitation would visibly summon a characteristic expansion by duplicating the examination in a non-fabricating condition. The creation estimation of the exploration shows that the outcomes recommend that extensive venture is needed for associations to regard holding onto lean as a philosophy. The author adopted a quantitative approach to their study thereby failing to address the possible qualitative results.
Soni et al. (2012) studied Supply Chain Management (SCM) procedure which is based on competitive (CS) of the organisation. Three Supply Chain Strategies (SCS) are clear in SCM writing: cost efficiency, time responsiveness and a combination of the two. For every one of these approaches, three types of supply chains are set: lean, agile and leagile. Subsequently, for an organisation to accomplish key arrangement between CS and SCS, it is a matter of absolute necessity to concentrate on important developments. However, there is a lack of standard constructs for these kinds of supply chains in the SCM literature and the authors addressed the problem of the absence of regular constructs in frameworks of lean, agile and leagile supply chains. This was accomplished by assessing reliability and validity of lean, agile and leagile supply chain constructs in the Indian manufacturing sector. A study of the main elements was done on these constructs to discover the supports of every kind of supply chain, thereafter assessing reliability and validity of these supports to determine the fundamental constructs. With the outcomes of the investigation, a framework for lean, agile and leagile supply chains was suggested. The authors adopted a quantitative approach to their study and failed to address the possible qualitative results.

Ramesh et al. (2012) proposed an evaluation framework built on a new design of the integrated Analytical Hierarchy Process (AHP) – Pre-Emptive Goal Programming (PGP) to overcome suggestions regarding some extra VSM instruments to comprehend and increase the value stream by decreasing waste. A single best VSM tool although efficient in dealing with a specific kind of waste turns out to be redundant as various wastes take over and/or the firm’s main concerns shift. This framework not only promises exact variations of a perfect VSM instrument, depending on the actual firm’s main concerns, but also helps the decision-maker to reach the optimal implementation series of a selected series of VSM tools to determine and remove all wastes found in the system thus improving firm performance quicker. The study focused on larger companies and a quantitative method of study thus failing to generate an application for SMEs, as well as a qualitative outcome to the research.

Diaz-Elsayed et al. (2013) found a method for joining both lean and green techniques in a manufacturing framework; from gathering information to the evaluation of a framework. Manufacturing is a resource-intensive and pricey endeavour, still the effects of adopting a mix of lean and green practices into a manufacturing ability cannot be estimated and have often been simulated, upgraded, and valuated freely. Moreover, a contextual analysis was introduced as part of production in the automotive industry, where the adoption of a custom fitted mixture of lean and green techniques led to decrease of around 10.8% of the production expenses. The author failed to cover Lean Manufacturing in other sectors.

Gao et al. (2014) aimed to expand on past studies into lean practices and the related obstacles detailed in different reports to empirically fix the topic of what conceivable barriers exist to hinder the adoption of lean practices in the construction business in China. Notwithstanding
the potential that lean practices need to enhance quality and profitability while decreasing costs, successful stories of lean arrangement are not heard of much of the time. A substantial scale study of Chinese building experts is utilised to determine these barriers. The outcomes propose that the most vital obstructions to the usage of lean practices, as seen by Chinese building experts, incorporate "their absence of a long-haul rationality", "the nonappearance of a lean culture in their associations", "the utilisation of multi-layer subcontracting", etc. This investigation states in addition the discovery of utilising a factor examination that demonstrates the six fundamental components disrupting the usage of lean practices in the Chinese development industry, specifically, individuals and accomplice problems, administrative and hierarchical problems, absence of help issues, culture and theory problems, government issues and acquirement issues. This investigation gives an intensive outline of the obstructions to actualising lean practices in different settings, with an emphasis on development. This examination likewise adds to the learning by suggesting the measures that can be taken to suitably overcome the obstructions determined. This research utilised a quantitative methodology to investigate the matter and consequently failed to yield results from a qualitative point of view.

Susilawati et al. (2015) studied how Lean Manufacturing is increasing popular as a strategy that can accomplish crucial performance improvement change in any sector. Yet, the usage of Lean Manufacturing is not a simple procedure. To achieve the extent of total adoption of Lean Manufacturing requires time, and during that time, there should be continuous improvements. When doing continuous improvement, Lean Manufacturing evaluation is needed. One type of assessment is to determine the level of Lean Manufacturing. However, there is a complication associated with the measure of the level of leanness. This complication emerged because of (1) the intrinsic multi-dimensional idea of leanness, (2) inaccessibility of a manufacturing practice database that can be utilised as a benchmark in surveying the level of leanness, and (3) the need for the use of subjective human judgment on lean practices which include vagueness and inclination because of the variety of an evaluator's information and experience. The authors proposed a strategy to manage the multidimensional idea, inaccessibility of a benchmark and vulnerability, which emerges from the personal and ambiguous individual opinion for the degree of level of leanness. The multi-dimensional idea, including an assortment of parts of lean practices, is estimated with a specific end goal to touch base at a measure for the lean action of a given association. A few outcomes from an initial survey review from an example of participants from the manufacturing sector in Indonesia are showed to delineate the appropriateness and possible quality of the suggested strategy. The authors based their research on a quantitative approach and focused on large enterprises and neglected to provide a use for SMEs and a qualitative point of view.
Zhou (2016) attempted to show a comprehensive investigation and looked at different variables related with the adoption of lean in SMEs in the US. Lean as a method procedure is applied to increase quality and service, remove waste, diminish time and prices, and increase organisational efficiency. The increasing difficulties in competition in the past years have pushed a lot of small and medium-sized enterprises (SMEs) to embrace lean to improve organisational competitiveness. The outcomes recommend that most SMEs have a comprehension of overall lean terms and idea. The essential motivations to implement lean are for the most part internal, including decrease in costs, increase in overall revenue, enhanced use of plant/office, and keeping up competitive position. A hierarchical cluster study was done to explore lean position. It was found that both advanced implementors and learners of lean are found. ANOVA test revealed that there is a very large contrast as far as the extent of lean adoption in SMEs goes. Changed lean tools and plans have been connected and they are positively linked with an organisation’s performance. Their work is mostly qualitative and although they made a major contribution to the body of knowledge they failed to cover the quantitative aspect of the results.

2.3 Lessons learnt

After reviewing 30 different studies from the period 1997 to 2017, from various countries on Lean Manufacturing from various industries, it was found that most of the studies focused on large companies, mainly in the automobile and aerospace industries. There are few studies of lean in the snack foods manufacturing industry and other sectors. Furthermore there is a considerable gap in terms of studies based in South Africa on Lean Manufacturing specifically on the snack industry.

2.4 Conclusion

The analysis revealed that there is a lack of studies in the South African snack industry. This thesis will thus focus on Lean Manufacturing in the South African snack sector and try to cover the gap and to contribute to the established body of knowledge. The outcome of the research will allow feasible conclusions to be taken, which could help the snack manufacturing sector to effectively execute lean, keeping in mind the end goal to empower the South African snack manufacturing organisations having the capacity to compete internationally and ultimately contribute to the development of the South African economy.
CHAPTER 3. OVERVIEW OF LEAN MANUFACTURING

3.1 Introduction

As expressed by Hart (2018), the purpose of the literature review is to acquire information to find out the current reasoning behind the chosen subject. The writing gives a foundation on how to improve the exploration inquiries, and how to gather and analyse the data. In accordance with Webster (2002), the review of the literature provides a stand to support the questions generated by the research and helps in gathering and breaking down of the data. As per Gillham (2009), getting a general view of the topic of research is vital as it leads to the specific end goal of gaining an understanding and later going further into the area of interest. Andersen (1994) proceeds by underlining that the study of the subject must first be expansive, so a more profound investigation on the subject can be made. In this way, first wide-ranging and loose sources ought to be checked and more particular sources be utilised. The research began with a wide exploration to gain a broad foundation of knowledge in Lean Manufacturing.

3.2 Lean Manufacturing (LM)

Lean Manufacturing (LM) concentrates on removing a wide range of waste inside production systems to improve manufacturing lead time and product quality by generating a framework which enhances fabricating lead time and item quality (Womack, 1990). Womack, Jones and Roos' identified in their book (1990) 'The Machine That Changed the World' when the lean idea picked up force in the West. The concept 'lean' was characterized by Pavnaskar et al. (2003) when he distributed his paper 'Triumph of the Lean Production System'. Womack, Jones and Roos' noticed that in manufacturing, large scale manufacturing was changed to lean generation and was called Lean Manufacturing. Mason-Jones, et al. (2000) noticed that large scale manufacturing had presented a gigantic measure of ‘waste’ with little ‘consumer value’. Paez et al. (2004) called attention to that ‘consumer value’ is made through evacuating wastes and improving administration highlights without additional cost. Cumbo et al. (2006) contended that lean is a thought regarding 'accomplishing more with less', utilising the ideal grouping with an insignificant handover/human mediation (where conceivable). Along these lines, it enhances the stream of procedures in the most minimal way. Womack and Jones (1996) delineated a guide for how lean can be executed and cautioned that it can take quite a long while for there to be a practical accomplishment. They divided the guide into four primary stages:

1. Begin by obtaining a change operator, acquiring lean learning, mapping esteem streams and growing organisation scope.
2. Making a lean function, conceiving a development technique and imparting a "flawlessness" outlook.

3. Introduce business frameworks through presenting lean bookkeeping, relating pay to firm execution, started approaching organisations and presenting lean learning.

4. Finish the execution by applying past strides to providers/clients, creating worldwide methodology, changing from top-down to base up change. To help this guide, they identified the five main standards of lean, and guaranteed that these standards are generally appropriate to every industry part and could be changed to fit in with beneficial qualities.

3.3 Lean principles

The next five sections record and clarify the five standards and examines its pertinence for carrier administrations.

3.3.1 Principle – 1

Value - indicate esteem. This guideline characterises an incentive from the end-client point of view. Esteem implies what client see as critical, and he or she will pay for. Womack and Jones (1996) clarified that the esteem is created for items/benefits that have capacities with costs at a time. With regards to the aircrafts, this implies giving what a traveller is searching for (fulfilling their necessities) by limiting expense and delivery time at a needed area.

3.3.2 Principle – 2

Value Stream - recognize the esteem stream and waste. An esteem stream is characterised by Womack and Jones (2005) as "the procedures of making, creating, and conveying a decent or administration to the market." The comprehension of the esteem stream is vital for two reasons. First, it empowers us to group items by the procedures that make them. Secondly, having knowledge on the esteem stream enables us to center around an arrangement of connected procedures and averts diversion in investigation. This rule focuses around distinguishing, arranging and disposing of 'Muda' (squander) with the esteem stream. Womack and Jones (2005) first ordered seven sorts of waste, then included one more waste to suit administrations. The most well-known acronym utilised is 'DOWNTIME' (Piercy and Rich, 2009). These squanders are recorded in the following paragraphs with their appearance inside the carrier administrations:

1. Imperfections allude to the missteps which need correction. For example, late work, wrong data, clashing data, directions that must be elucidated, inadequate data, entirely incomplete
work or data, incorrectly named capturing, lost records or data., and all the things that need to be revised.

2. Over-generation of products that are not needed or producing more than is promptly needed. For instance, composing official records or substance where just the table is required and regularly perused.

3. Holding up alludes to products anticipating preparing or utilization. For example, individuals are holding up in a line at various areas.

4. Non-used assets/abilities. Sadly, this happens for the most part in aircrafts as they have a tendency for semi-vast association and in that, the aptitudes and foundation of everybody are not basic information. This results in underusing capacities, designating assignments with improper preparation.

5. Transportation of merchandise between forms without reason. Signs incorporate where the work is exchanged starting with one individual then onto the next.

6. Stock half-finished items which are holding up to be handled are considered as superfluous stock. Stock is a typical outcome in aircraft administrations of un-adjusted workloads. Stock can be obtained in email, to-do lists, and item advancement pipelines.

7. Movement is the pointless development of representatives and items - individuals shifting or working without creating. Assemblies are movement considering they are work without distributing, except if a choice is made or data is created among the groups.

8. Overabundance preparing for merchandise and ventures that do not meet the client requirements. In an aircraft association with a multilevel chain of command of administration structure, quantity handling appears in extra mark endorsements, information passage at levels and generation of complex structures.

3.3.3 Principle- 3

Flow - influence an incentive to stream. This rule guarantees persistently taking a shot at every item/benefit necessity, so it makes a stream between the means of significant worth creation. With regards to aircrafts, client registration at the air terminal is immediately moved from security, traditions, boarding lines, as easily as could be allowed making a stream in end-to-end registration procedure.

3.3.4 Principle – 4

Pull - client pulls esteem Womack and Jones (1996) determine that this standard empowers the client to pull the item/benefit from the association’s esteem stream. For the carriers, this rule infers that the creation of an item/administration ought not be activated if the client has not communicated any need. Nonetheless, Fullerton et al. (2009) noticed that adopting the
idea of stream and draw as a guideline of lean is often troublesome for benefit forms. They recorded that individuals search for clever half-and-half arrangements that copy the idea of draw as found in assembling organisations. For instance, making Andon or a cell design for carrier administrations requires realising totally new possibilities, which might be bolstered with innovation. A fly-up message from the forefront staff to the obligation supervisor who might be situated in the back office would practice Flow and Pull standards.

3.3.5 Principle- 5

Perfection - seek after perfection. This rule urges companies to put its sights on flawlessness. It necessitates consistent endeavouring, having in mind the final objective to characterise client esteem and a nonstop arrangement of procedures/strategies and structures. In the aircraft setting for nonstop change, the esteem made at every progression of the esteem stream needs a test to build the stream, speed and robustness, distinguish and take out hidden squander from their business forms. Dickson et al. (2009) remarked that lean standards comprises of little advances and exhorted that an organisation ought to take after these five standards to actualise lean reasoning. Various researchers have concurred that utilising the lean approach in an administrations setting is marginally not the same as in lean assembling (Detty et al., 2000). In any case, they all agree that lean standards are yet substantial for administrations. Moreover, they recognised that these five standards can be adjusted for administrations without altering the standards. Womack and Jones (2003) clarified that while these standards are thoughtfully pertinent to any area, these must be custom fitted to fit to the segment where they were received. They outlined that for instance, for the administration part these standards with regards to administrations do present a few difficulties.

Attempting to comprehend the purposes behind lean's low achievement rate, various researchers in the writing put over a few reactions and counter contentions that are saved as takes after:

-Human viewpoints: Wan et al. (2008) watched that Lean can be viewed as abusive and making it heavy on forefront specialists. They remarked that lean's long-haul supportability has reliance on the general population (inspiration, strengthening). Ghosh (2012) supported this idea and included that lean is based on regard for individuals. Lean is not mean.

-Scope and absence of vital point of view: Ghosh (2012) featured that lean is utilised as a change program and results in unjustifiable change. He contended that lean is not an administration prevailing fashion, lean philosophy is attempted and tried, and it enhances day-by-day movement.

-Coping with fluctuation and over-institutionalisation: Furlan et al. (2011) contended that Lean can oversee changeability and use resources more adequately. Notwithstanding, they
contended that in administrations, as requests shift, lean’s capacity to oversee supply chains can turn into the primary inhibitor for lean selection. Rahani et al. (2012) watched that administration associations meet individual client needs. Along these lines, the institutionalisation of administration forms does not suitable for a lean standard approach. He contended that this points to assertions of "McDonaldisation".

-Incapable of managing vulnerabilities: Lean can kill the requirement for some layers of administration (making a Lean structure), which are needed to manage vulnerability Herron et al. (2008). Liker (2004) expressed that lean gives higher inclination to effectiveness over unwavering quality. Modarress (2005) have watched that Lean has been perceived as a business change technique and is spreading into administrations and different divisions. In any case, through an audit of writing, this writer has observed that lean application in administrations is at the essential stage since most of the lean writing is directed by cases identified with assembling or constrained to wellbeing administrations and exceptionally inconsistent for carrier administrations (applying a modest bunch of devices and systems). Specifically, lean connected as a coordinated way to deal with the business methodology is exceptional. It is seen that the lean client-focused approach is clearly appealing for the carrier administrations and, along these lines, an explorative examination is required to comprehend the manner in which a lean reasoning is connected in this administration division. This point has all the earmarks of being under-inquired about. Since the review of writing featured the use of lean in services concentrates on the utilisation of devices and procedures, the fundamental focuses are incorporated into the accompanying area.

3.4 Lean tools and techniques

In 2003, Womack and Jones portrayed lean as an arrangement of interlocking practices, and instruments. They noticed that lean supports various devices/methods, for instance: Kanban, Kaizen, 5S, Pull booking, Waste Analysis. Various researchers have noticed that lean application has overwhelming conditions on apparatuses and procedures (Modarress et al.,2005). They cautioned that lean is not a tool compartment that provides instruments for a business or process issue where one apparatus/method can be chosen by change group and utilised with a supposition that everything will be settled. In an outline, the basic logic of these business change strategies has one purpose - to enhance business productivity and viability to build consumer loyalty for the benefit of the association, still every philosophy has an alternate approach. The second component of this investigation is to recognise the administration attributes and thereafter inspect the administrations measurements utilising a few statistics.
3.5 Lean Thinking

In practice, Womack and Jones (1996), Furlan et al. (2011), Liker et al. (2004) and a few different researchers have identified that company administration groups see 'lean' as an optimistic strategy and accept that it is not pragmatic in 'this present reality', overlooking various cases made by organisations who have clearly demonstrated that they have profited essentially from it. Hines et al. (2004), Melton (2005), have detailed that most administrations start with lean through simple tests with an intention to enhance profitability in their activities. In any case, Krafcik (1988) watched the degree to which lean standards and practices have been conveyed and referred to these qualifications as 'Genuine Lean' and 'Impersonation Lean'. He characterised 'Genuine Lean' as the legitimate appropriation of lean over a venture permitting a few alterations that suits organisations' individual conditions yet is predictable with lean standards. He clarified that 'Impersonation Lean' happens when an organisation chooses a modest bunch of lean standards and practices with utilising instruments and strategies, keeping in mind the end goal to acquire instant improvements. These organisations disregard the 'Ceaseless Improvement' as well as 'Regard for People' standards Krafcik (1988). A few different researchers reverberated this right and included that if the only thing the organisation is doing is 'Impersonation Lean', it will bring about lean disappointments. They have shared some similar worries and featured impacts as takes after:

- The consequences of 'Real Lean' are better monetary and non-money related execution and its concentration takes as long as possible. While 'Impersonation Lean' focuses on instant improvements (Pascal, 2007).

- 'Real Lean' is considerably more robust for contenders to duplicate as it has lean standards woven into its way of life, while the 'devices and methods' approach (Imitation Lean) is anything but difficult to recreate by contenders, diminishing the opportunity to gain an upper hand. (Emiliani et al., 2003).

- 'Real Lean' supports both methodologies (top-down and base up) and it is vital in nature. 'Impersonation Lean' can accomplish much bad than good since it is a blend of lean and non-lean standards, practices and measurements. This can be perplexing and a great many people inside the association could lose interest and differ along these lines.

- 'Real Lean' is about individual's engagement and regard for them. Conveying 'Impersonation Lean' is conflicting with the 'Regard for People' rule that incorporates workers, providers, clients, speculators and the group. (Liker, 1998). A huge numbers of these researchers prescribed that senior administrators/change specialists ought to have an unmistakable comprehension of how to convey lean into their association (Liker, 1998; and MacDuffie et al. 1997). They have identified that the perspective of some pioneer's is that it is smarter to have a few changes than none. They also expressed that there is an impulse to scramble for lean
application with a specific end goal to acquire fast outcomes, and they cautioned that pioneers ought not neglect to consider the expectation of lean. They included that this will maintain a strategic distance from poor outcomes or unexpected delayed consequences (Liker, 1998; and MacDuffie et al. 1997). Additionally, Conti et al. (2006) concurred that if lean is conveyed inaccurately from the earliest starting point, it will debilitate future lean endeavours. To add to this view, Cooney (2002) remarked that the mistakes should be fixed and this will require some investment, exertion and cash to redress the mistakes which may not be conceivable. contemplated various associations who received lean and created a few rules for associations that wish to apply lean.

They are as follows:

- Top administration support - Guarantee full and on-going help from top administration.
- Lean champions – Enable supporters to lead change activities and look after the workforce.
- Single thread - Guarantee arrangement and procedure support for changing current states of mind, practices and practices.
- Engagement - Engage workers however much as could reasonably be expected in the arranging, starting, actualising and assessing result of progress activities.
- Trust – be transparent and put stock in condition by conveying and sharing data regularly.
- Time factor - Lean is a journey. Everybody should understand that it will require a long investment. Despite these rules, Womack and Jones (2005) detailed that most honing associations had a fundamental comprehension of lean (i.e. apparatus based) as opposed to an entire downplaying of lean rationality that incorporates standards and practices. Concurred with this perception, various researchers added that because of this, these associations frequently miss lean's plan and make subtleties, for example:

- They characterise their partnership’s motivation is ‘to augment investor esteem’ regularly in a demanding sense (Ahlstrom, 2004 and Oliver et al.,1996). They included that this powers zero-entirety exchange offs between key partners and makes squander, which is contradictory with lean guidelines. Riezebos, (2009), suggested that senior administration ought to receive a commercial mission to even out both human and financial destinations.
- Toyota (2001) guaranteed that the suitable routine with regards to lean results in cutbacks. He focused on that this is not the plan of lean, since it causes inefficient irregular characteristics. He asserted that lean's concentration is to give positive aftereffects of change activity and support stable long-haul development (Toyota, 2001).
- Various researchers contended that having just a fundamental scholarly comprehension of lean is not enough (Kochan et al. 2018 and Ballé, 2005 . They added that lean is intended to enable specialists to understand their maximum capacity; subsequently, lean standards and practices ought to be learned at work. Riezebos, (2009) identified that since lean standards are not generally comprehended between lean experts it is subsequently not surprising that
this reasoning is not extended to other key partners such as providers, clients, or speculators, bringing about an inability to understand the advantages of lean. Different researchers, such as Alison and Dean (2000), Chun Wu, (2003) and Putnik (2012) broadcasted that Lean is the overall 'mother-of-all-consistent change programs'. Chun Wu, (2003) included that lean can be another combination of projects and it is helpful to combine the best highlights in one activity to convey the incentive to clients while maintaining quality as the focus. They included that this will at that point enable clients to develop and loyalty to develop, and that will then affect the association’s development and place in the overall industry Feld, (2000). Abdulmalek, et al. (2007) concurred with this conclusion and remarked that if an association embraces lean, it will insure the success of a profitable association for a long time to come.

3.6 Green manufacturing

The fast consumption of regular assets, developing vitality request, expanding consumer mindfulness about naturally cognisant items and requirement for consistence with ecological enactment through improvement of green procedures prompted the advancement of a green assembling worldview. GM worldview limits the ecological effect of assembling forms and guarantees change in contamination control, decrease in utilization of regular assets, green brand picture (Mittal et al.,2016). Ferdousi, (2009) performed a study of 198 Indian SMEs and investigated the quantitative and subjective advantages of GM. Gurumurthy et al. (2011) revealed that usage of GM in SMEs can upgrade piece of the overall industry, offer an upper hand, and give a green brand picture. Likewise, Dhandapani et al. (2004) have recommended that SMEs' administrator ought not see GM as a budgetary depletion but rather as a non-lamenting fabricating rationality. Chauhan et al. (2012) discovered green inventory network administration (GSCM) hones with meagre level of reception in most Indian assembling ventures and proposed a positioning of GSCM techniques to guarantee monetary and ecological executional change. Later Nallusamy et al. (2015) dissected the fundamental leaders of GM usage by looking over 120 driving Indian companies, yet research contends that the leaders may fail if there should be an occurrence of Indian SMEs on grounds that they do not know the finer details GM. In addition, a few scientists have requested true endeavours to receive GM in Indian settings considering the present condition isn’t exceptionally evident (Alblawi et al., 2015). The dialogue on top prompts the assumption that GM usage brings about general execution change yet solid endeavours are expected to urge SMEs to receive GM systems (Anand et al.,2009). Chowdary et al. (2011), considered leaders of earth cognisant assembling with regards to developing nations like India and Germany, uncovered that flow and future enactment and green brand esteem are among very positioned sparks. Mehta et al. (2012) inferred that green brand picture and intensity are the most fundamental GM leaders
in SMEs. Additionally, Mittal et al. (2016) discovered that aggressiveness, motivating forces and authoritative assets are the best positioned leaders chosen between thirteen GM leaders for the investigation.

With the competitive circumstances in business today, taking care of consumers requests of giving precisely what the consumers need and when they need it challenges organisations. Furthermore, the item ought to be of high quality and an acceptable cost (James et al. 2014). Consumers requests are fundamental to satisfy the specific end goal to maintain an upper hand. Hence, more adaptable and quick procedures are required with a specific end goal to diminish delivery time and increment quality (Nallusamy, 2016). During the 1950s, the Japanese auto producer Toyota began to center around adaptable and quick generation frameworks, which has turned into the establishment for the theory of what we now call Lean Manufacturing. The focal point of Lean Manufacturing is to dispense with non-esteem included exercises and make a predictable stream by working with constant upgrades. The establishment of Lean Manufacturing can be represented like a building, held up by the two columns; Built-in Quality (Jidoka) and Just-in-time (JIT) (Marudhamuthu et al., 2011). The rooftop speaks to the objectives of the association of providing excellent quality, lowest expenses and shortest lead-time, while the establishment is spoken to institutionalisation and significance of having steady and solid procedures. (Mohanty et al., 2007).

The objectives of the organisations are accomplished by having ‘Kaizen’, coming from the Japanese word which means ‘persistent’. The theory of kaizen respects having constant changes in the association, implying that it is constantly conceivable to enhance items, procedures and strategies, at the same time utilising fewer materials (Naylor et al., 1999) implies that institutionalisation is the establishment for the entire development framework. With no institutionalisation in the association, it is like building a house in the sand and every day the sand moves and can obliterate every upgrade that has been made (Mathew et al., 2012). Thus, the establishment of the house should be solid and unaltering. Jidoka is an idea of working with the interface amongst man and machinery. The idea originates from never giving an imperfection a chance to go to the following position by liberating individuals from machineries, which means computerisation with human insight. In this way, quality is incorporated within the entire generation process (Hallgren and Olhager, 2009). On the off-chance that an issue of quality occurs, the issue ought to be solved promptly (Naylor et al., 1999). Behrouzi et al. (2011) implies that it is more important and less exorbitant to prevent issues from happening than to repair issues of quality at a later stage. Besides, Just-In-Time is an idea that alludes to having the right thing at the right position at the right time with the correct quality and quantity to accomplish the ideal work process. (Bhamu et al., 2014).
3.7 Types of wastes

Liker (2009) implies that actions in a procedure could be value-adding or non-value adding. Value-adding actions are described as actions that increase value to an item from the customer perception which the customer will willingly pay for. Non-value adding action is defined as waste which additionally can be considered in one of the seven types; transport, inventory, unnecessary motion, waiting time, over-producing, over-processing and flaws, like explained in figure (Hodge et al., 2011).

Liker (2009) additionally implies that there are exercises that do not improve the value of the item but are simultaneously basic for the procedure and the everyday work. Those exercises are alluded to as essentially non-esteeem, including exercises which ought to be acknowledged and decreased, however cannot be eliminated. This can be exercises which make representatives more agreeable and thus increment productivity of the workers, however, does not specifically increase the value of the item. It can likewise be steps that are pivotal for the generation procedure, yet don’t enhance the item as such.

3.8 Implementation of lean

Implementation of Lean Manufacturing is not a direct procedure. Surprisingly, there isn’t a formula that if utilised can ensure effective usage. Moreover, unsuccessful execution can greatly affect an association’s assets, and considerably more critical, influence representatives and their trust in lean theory. Various "guides" were created to help an association move from their current activity to one that completely executes a lean theory. Shingo proposed the recommendation of the key lean "components" that ought to be executed within one year. He recognised 15 instruments and methods, for example, SMED, jab burden, Kanban, and so forth to be actualised. Furlan et al. (2011), correspondingly, recommended a 10-step approach centered around outline and format arranging. Jorgensen et al., (2008) explored the current lean guides (examining 80 applicable distributions) for similitudes. They showed that the lean guides considered three noteworthy stages (planning, outline and execution) made of various "lean" steps. One of their primary decisions is that there is no one of a kind guide to "leanness", and that it should be customised for each unique association to represent their conditions. Lean Aerospace Initiative venture built up the alleged "Undertaking Level Roadmap" able to be followed by the major administration for the progress of the endeavour to larger amounts of lean execution. The guide starts with a depiction of an ideal stream level of essential exercises. In this manner, it gives depictions of key assignments required inside every essential movement. Lastly, it prompts exchange of issues, empowering agents, boundaries,
contextual investigations and reference resource significant to each undertaking. Lian et al. (2007) additionally displayed a system for lean assembling usage comprising four stages and 22 components. The stages are characterised as applied, usage plan, execution and assessment, and final lean change stage. Observations and controls are incorporated to all stages to guarantee that the normal outcomes towards lean changes are conveyed. Clearly, this is not a broad rundown of the different lean implementation structures and types displayed in the writing. However, because the goal of the writing survey is not to capture the full depth at this point, the can be considered as an agent and serve for achieving conclusions. Be that as it may, it ought to be noticed that various lean execution models have been similarly created outside the academic world, principally by consultancy firms. Demonstratively, two will be introduced in the future. Wright displayed a twenty-advance execution design as a guide, saying that it isn’t to be adjusted as-is, yet expects adjustment to the requirements of the association experiencing the lean change. In any case, the author specifies that there is a consistent arrangement to a large number apparatuses. Esteem stream mapping is quite often directed immediately simultaneously. The 5S framework gives an establishment to most different instruments. TPM is vital and assumes a critical part in OEE change and, subsequently, must be begin early. Reviews in different nations with respect to the achievement of lean usage, the basic achievement factors and the obstructions, were accounted for. Lean execution ideas were found in the writing from 16 nations. In any case, no investigation of lean usage centered in Greek manufacturing areas was done. As it has been featured in the presentation, execution of lean in Greek manufacturing areas can possibly be one of the arrangements that would permit the manageability of the area under the strict measures. The investigation of the significant overviews in different nations considered shared characteristics to be distinguished and the main lean practices, achievement components and hindrances were recognised for giving the premise to the definition of the survey. Predetermined quantity of concentrates on lean assembling usage failures are accounted for, principally because of the way that organisations wish to ensure and not uncover their speculations that fell through. Nonetheless, numerous executions do come up short. In the few investigations found regarding executions coming up short, the normal underlying drivers are identified with: lean providers; initiative; representative inclusion; instruments and strategies; and business frameworks. The obstructions in the execution of lean assembling, can be connected to administration, absence of vital assets, protection from change, and so forth. Administration can be both an obstruction and a driver for lean usage. While considering administration as an obstruction, it can be identified by attitudes and practices, for example, applying absence of support for lean assembling activities, neglecting to make mention importance, and does not have long haul image, to name few. Absence of fundamental assets forbid the usage of lean assembling. Various organisations depend on
experts for presenting lean. In this manner, assets for consultancy are vital. The nature of the
expert is basic, and by and large limited education on the subject and absence of execution
practice comes about into disarray about lean assembling and can turn into an obstruction in
usage. Nonattendance of information on Lean Manufacturing rationality and the different
apparatuses can be a staggering boundary in the usage. Refusal to go along with change by
the workers is a typical hindrance, too. This protection can be linked to the fear of the obscure,
fear of disappointment and pride.

The literature was based on distinguishing the states of lean, the different apparatuses and
practices, the leaders, and lastly, the obstructions. Numerous similarities can be distinguished
between the specialists, and although at times there is distinction in the phrasing, the
semantics are similar: key Lean Manufacturing devices and practices. (Xiaoqing et al. 2010)
The Lean Manufacturing practices and instruments have been featured by the clear majority
of analysts. Clearly the rundown isn't thorough, yet the attention is on the ones that are most
often studied in the academic sources.

Key points for actualising lean assembling:
The key points for an organisation to connect with lean assembling that were featured by most
experts are summarised into the accompanying list:
  ✓ To build adaptability
  ✓ The requirement for survival from inward imperatives
  ✓ Development of key execution pointers
  ✓ Need to utilise world-class practice
  ✓ Part of the association's nonstop program
  ✓ Drive to focus around consumers
  ✓ Requirement/motivation by consumers
  ✓ Requirement by mother organisation

Key achievement factors
The writing revealed an extensive variety of elements identified with the effective execution of
lean, that are compressed into:
  ✓ Organisational culture and possession
  ✓ Building authoritative status
  ✓ Management duty and capacity
  ✓ Providing enough assets to sustain change
  ✓ Outside help from advisors in the beginning
  ✓ Efficient correspondence and engagement
  ✓ Strategic ways to deal with changes
Timing to put reasonable timeframes for change and to make powerful utilisation of duties and eagerness for change. (Gonçalves, 2017)

3.8.1 Scope and basic principles of lean

3.8.1.1 Introduction

Lean joined the common dialect of tasks - to such an extent that an entire scope of operational change programs is, appropriately or inappropriately, commonly named as lean. Subsequently, lean has different meanings to different individuals. In 1999, Wickens (1999) cautioned that organisations often embrace a program of change without fully understanding what it is about or what it involves, and, therefore, they are surprised by the amount of hard work it needs to actualise, and cannot imagine how the results of the program are not what they thought they would be.

It would in this way give the idea that a sound comprehension of the degree and fundamental standards of lean, that is the hypothetical reinforcing, is basic. With the end goal of this examination, nonetheless, a point-by-point understanding of lean is not thought to be necessary, as the essential goal of the writing is to recognise the possible or hypothetical achievement elements that can impact effective execution of lean for experimental trials. The lean reasoning, extension, standards and strategies will in this manner be portrayed in simply adequate facts to distinguish the possible or hypothetical achievement elements, and to perceive how it evolves into the more extensive idea of lean.

In this section, lean will immediately be characterised, where after it will be a focused business procedure. The essential standards of lean created by Womack and Jones (2003) in their fundamental work Lean Thinking will be displayed, followed by the model created by Liker (Liker, 2004) and the perspectives of various developers.

3.8.1.2 Lean defined

As stated by Nordin et al., (2010) lean is an alternative option to large scale manufacturing (which is the Henry Ford way), not a replacement for it. Lean requires a totally extraordinary method for working, and for an original approach to tasks. Lean is not made perfect with various organisations; rather the pace, blend and nature of generation is set by the client. Mass producers set themselves limited objectives: a worthy number of abnormalities, an average level of stocks, and a limited range of established products. Lean producers, then again, go for perfection: consistently decreasing costs, zero imperfections, zero stocks and interminable item assortment. Toyota decided to build up a working framework that did not rely upon the economies of size of gigantic financial markets. Rather, Toyota built up a culture,
association and working framework that persistently sought after the end of waste, changeability and firmness. To accomplish this end, Toyota concentrates its working framework on reacting to requests only. This implies that the frameworks must be adaptable; when there are changes, the working framework must react quickly. According to Nordin et al., 2010, "...lean is an incorporated arrangement of standards, practices, instruments and systems intended to address the underlying drivers of operational underperformance. It is a methodical way to deal with disposing of the sources of failure from whole esteem streams, keeping in mind the end goal to close the gap between genuine execution and the necessities of clients and investors. Its goal is to advance cost, quality and conveyance while enhancing securely. To meet this goal, it tries to take out three key sources of failure from the working framework: waste, fluctuation and rigidity."

Womack and Jones (2003) portrays lean as: "The most effective instrument accessible for developing esteem, while wiping out waste in any association". Lean helps to identify esteem, line up esteem-developing actions in the top management, coordinate these activities with no disruption at any point someone needs them, and perform them more efficiently. Briefly: "Lean reasoning is lean since it furnishes an approach to accomplish more with less and less - less human exertion, less hardware, less time, and less space - while coming closer and nearer to giving clients precisely what they need." For Womack (2005), lean dependably starts with the client in need of esteem, that is, the best administration at the ideal time, position, and cost, with the highest quality. To augment this client esteem, the means in the procedure should be done with no waste. To accomplish this without waste, each progression in an esteem-making procedure should include esteem, ability, accessibility, satisfaction, and adaptability, and the means should flow easily and rapidly from one to the following at the draw of the downstream client: "A genuinely lean process would thus be able to be viewed as an immaculate procedure: splendidly fulfilling the client's want for an incentive with zero waste." Still, no such flawless process happens. Despite this, lean scholars continue to have faith in perfection, an endless journey to genuinely lean procedure.

Jones (Jones, 2004) depicts lean as a business framework concentrated on overseeing forms and enhancing them by packing time instead of keeping every one of the benefits occupied. For Wickens (1998), lean is substantially beyond just dispensing with waste. The entire esteem stream must be incorporated and sorted out on lean standards, bringing items and administrations from introductory ideas to conveyance to the client, over all the diverse associations, exercises and capacities that might be included. Lean requires building up the idea of organisation sourcing, prompting substantially more prominent provider ability, especially in the domain of item improvement and designing. Lean necessitates a sharing of the gain and the loss; being set up for open-book costing and cooperating towards a common advantage. The equal standards stretch beyond the dissemination bind and in the-end-to-end
client orders, with the goal that the entire framework is led by end-client requests which are immediately included in the creation plans. It would consequently give the impression that lean is more a lifestyle than a program.

3.8.1.3 Lean as a competitive advantage tool

Vaughan-Jones (2003) defines lean like having a straight vital connection. Pattanaik et al., (2009) agrees and is unyielding that the results of not receiving lean as a business procedure are pricey to the point that lean ought to be a high-need vital target. Workmanship Byrne, in Womack and Jones (2003), is of the idea that presenting lean methods in each business movement ought to be the center of any association's methodology, as lean gives both the opportunity and the steps taken to produce and maintain successful development. Liker (2004) states that lean has an unmistakable key effect: "Toyota has transformed operational magnificence into a key weapon." Lean is operationalised in a vital setting by methods for the idea of arrangement sending, or Hosni Kanri in Japanese. (Diekmann et al., 2004). Technique organisation began with Hoshin Kanri, which was a centrepiece of the authority control practices of Total Quality Management. In recent years, Hoshin Kanri, has turned into the main critical connection between change methods of insight/practices and the association's business procedure. For Wahab et al., (2013), approach or methodology sending is a compelling administration process for associations which joins change practices to the association's business system on a yearly premise with a month-to-month rhythm of surveys, clearing up the degree and pace of change, and in addition, expected focuses to help adjust and interface action over the scope of the association. As indicated by Manotas Duque et al., (2007), the system of arrangement organisation is what is basically required achieving lean usage. The thought is for upper-level management to agree on a couple of basic objectives for changing from mass to lean, to choose a couple of undertakings to accomplish these objectives, to assign the general population and assets for completing the tasks and at last to build up numerical change focuses to be accomplished by a certain point in time. Jones (2004) is of the conclusion that it is top administration's business to direct an arrangement sending procedure, to organise the assets to execute the esteem stream designs, and to adjust the programmes to the general needs of the association. Wickens (1999) presents that the objectives of an association are the substantial articulation of its esteems and methodology. In any case, qualities and methodology are fine, unless associations create shared, unmistakable objectives which are commonly known and often restated, the quality and technique may well disappear. All things considered, a basic task is to share objectives and to get everybody cooperating to accomplish them; in short, to guarantee that the objectives are adjusted all through the association. Objective arrangement happens when individuals at all
levels of the association and in all capacities and divisions cooperate to characterise and accomplish their mutual objectives. Arrangement is altogether different from simply dropping objectives down the chain of importance; it is tied in with moving the perception, so the objectives of the organisation and the objectives of the individual are identical. Promoting the dedication of everybody, to the highest objectives, as well as to the objectives of their area of the association, is the goal of objective arrangement. In synopsis, vital arrangement happens when individuals at all levels of the association and in all capacities and distributions cooperate to characterise and accomplish their mutual objectives. Objectives that are known and adjusted turned out to be powerful to the point that their accomplishment turns into an unavoidable outcome. Bicheno (2004) battles that arrangement sending tries to clarify why in successful Japanese associations, the basic leadership procedure is slower, yet usage is considerably quicker and easier, as generally strategic organisation is about ‘nemawasi’ or accord building, and ‘ringi’ or shared basic leadership. In this way, it creates the impression that there should be a reasonable connection, or circumstances and objectives, among the hierarchical objectives, main targets, and exercises. From the above, the accompanying hypothetical achievement factor components (SFE) are defined:

SFE 1: Lean implementation should be perceived like an indispensable part of the association’s technique organisation procedure.
SFE 2: The objectives and targets of the association should be adjusted and shared by everyone in the association.
SFE 3: An unmistakable connection from organisation objectives, main destinations and lean actions should be there.

3.8.2 The five basic lean principles

The innovators of lean, Womack and Jones (2003), recognised five essential standards of lean in their original work, Lean Thinking. The lean principles are outlined hereunder. Where appropriate, in every standard situation, lean devices and methods will be made accessible to help with the execution of the guideline.

3.8.2.1. Specify value

The first stage for lean is esteem, which should be described by a universal consumer. This esteem is only important once it is communicated as far as a specific item (a great or benefit, and frequently both) which fixes the consumer’s issues at a certain cost at a precise point in time. Esteem is consequently what the consumer will pay for. Lean in this manner should begin with a mindful endeavour to correctly categorise an incentive as far as specific capacities
offered at specific costs through an exchange with a set of clients (Mårtensson, 2000). The best approach to do the former is to overlook existing resources and advancements and to re-examine associations on a product offering premise with solid, committed specialised experts. It is subsequently important to reconsider each change in the business procedure with a view to make esteem, and to characterise an incentive as far as the entire item. Esteem creation frequently moves through numerous associations; everyone tends to characterise an incentive distinctively to fit their personal requirements. (Jones et al., 2006)

The most essential undertaking in indicating esteem, when the item is characterised, is to decide an objective cost considering the measure of assets and effort needed to produce an outlined result of given, if all the present obvious wastes were expelled from the procedure. Doing this is the way to eliminate the waste. After the objective cost is done for a specific item, it turns into the focal point for inspecting each progression in the esteem stream for item advancement, order, and creation.

After the underlying reconsideration of value is made, the association should persistently return to the esteem question with their focus groups to inquire as to whether they truly found the best solution. The accompanying achievement factor components are suggested:
SFE4: Value should be characterised by a definitive client.
SFE5: The association should persistently return to the meaning of value to guarantee it is as the best definition.

3.8.2.2 The value stream

The value stream is the planning of every precise activity needed to take a certain product by the three fundamental management assignments of every association: the critical thinking task of running ideas through point-by-point planning and designing to item distribution, the data management undertaking running from order through purchase to delivery, and the delivery from basic resources to finished product in the hands of the consumer. Determining the esteem stream for every item (or now and again for every item category) quite often uncovered large measures of waste. Similarly, as exercises that can't be estimated can't be legitimately dealt with, the efforts essential to make, request, and deliver an item which cannot be correctly characterised, examined, and connected can't be tested, enhanced (or eliminated), and, in the end, actualised. The immense greater part of administration consideration has verifiably gone to overseeing totals - process, offices, and associations - regulating numerous items without delay. However, what is essential is to oversee entire esteem streams for products and ventures. (Hines et al., 1997)
The underlying goal in making an esteem stream outlines each activity required to configure, request and make a particular item is to sort these activities into three classes: those which really make an incentive as seen by the customer; those which do not make esteem yet are right now required by the item improvement, arrange filling, or generation frameworks (sort of waste one) thus cannot be wiped out presently; and those activities which do not make an incentive as saw by the client (sort of waste two) and in that capacity can be dispensed with quickly. After the wastes have been evacuated, it is possible to deal with the rest of the non-esteeem making ventures by utilisation of the stream, draw, and perfection methods.

The focal point of lean is not going up against contenders, yet rather on going up against flawlessness by distinguishing all exercises that are viewed as waste and by disposing of them. In any case, to give this reprimand something to do, the association must perfect the key lean procedures for dispensing with waste. A positive component for this could be:

SFE6: The recognisable proof and administration of an entire esteem stream for a specific item.
SFE7: Classification of all exercises seen as waste and eliminating them.

**3.8.2.3 Flow**

When value has been accurately determined, the value stream for a specific item mapped out by the company, and obvious inefficient advances dispensed with, it's the ideal opportunity for the following stage in lean change: making the rest of the esteem making steps flow. The contention is that the association would work better when the emphasis is on the products and its requirements, as opposed to on the organisation or gear, with the goal that the activities projected to configure, arrange, and deliver a product is in ceaseless flow (Reinertsen, 2009).

The initial phase in making stream is to focus around the real issue - the specific plan, the request, and the item itself. The next phase, which allows the initial step to be possible, is to disregard customary limits of employments, professions, capacities (frequently composed into offices), and associations to shape a lean association expelling all obstructions to the persistent stream of the specific item or item family. The third step is to re-examine work practices and apparatuses to dispense with reverses and stoppages of various kinds, so the plan, request and creation of the item can continue constantly. These three stages must be taken together. It would thus be said that:

SFE 8: For shelter be effectively actualised, the item should be fabricated in one consistent flow in an esteem stream. In making stream, the accompanying boundaries in the assembling procedure should be considered:

**3.8.2.4 Design**
The lean approach is to make dedicated item groups with every one of the aptitudes expected to direct particular esteem, general outline, precise building, obtaining, tooling, and generation arranging in one room in a brief timeframe utilising a demonstrated group basic leadership technique, allowing advanced groups to institutionalise work so a group takes after a similar approach without fail. Since each group in an association takes after this method, it is conceivable to precisely gauge turnout time and to consistently enhance the outline system itself. (Freire, 2002).

3.8.2.5 Order taking

A definitive objective of lean is to allow no stoppages in the generation framework and items being developed. With just a couple of hours slipped between the principal task on crude resources and deliveries of the finished, requests can be looked for and acknowledged with a reasonable and exact learning of the framework’s abilities. A key method in actualising this method is the idea of takt time, which accurately synchronises the proportion of creation to the proportion of offers to clients. (Buzby, et al., 2002).

3.8.2.6 Production

The final aim of flow thinking is to absolutely dispense with all stoppages in a whole creation procedure and not to rest in the territory of hardware plan until the point when this has been accomplished. The methods utilised to guarantee flow of the creation framework incorporates Just-In-Time, lessen set-up times, multi-talented workers, Total Productive Maintenance, poka-burden, visual control, 5S, and kaikaku. (Karlsson, 1996)

3.8.2.7 Right location

Together the design and the physical generation should be situated in the proper position to help the consumer. In case an association utilises lean methods only to influence undesirable merchandise for faster flow, only waste will result. In what manner can the companies make sure that they are giving the administrations and products clients truly need when they truly need it? Furthermore, by what means can the association tie every one of the parts of an entire esteem stream together when they cannot be led in one persistent stream cell in one room? The appropriate response lies in pull.

3.8.2.8 Pull

At the point when flow is presented, items expecting a long time to configuration are arranged in months, orders taking days to process are finished in hours, and the weeks or periods of
turnout time for customary physical creation are lessened to minutes or days. This capacity to configure, plan, and manufacture specifically what the consumer needs, right when the consumer needs it, implies the association can basically make what the clients really tells the association they require. That is, the clients pull the item from the association as required instead of the association pushing items, often undesirable, onto the client. The requests of clients turn out to be substantially steady when they know they can get what they need immediately and when associations stop occasional cost marking down battles intended to move merchandise officially made which nobody needs. Draw in least complex terms implies that nobody upstream processes or delivers a decent or administration until the client downstream requests it. This means, do not make anything until the point when it is required; at that point, make it rapidly. A positive component is:

SFE9: A draw framework must be presented, implying that nobody upstream should create a decent or administration until the point that it is required by somebody downstream. Be that as it may, a great part of the capability of lean is lost unless the association actualises the last standard of leans to perfection.

3.8.2.9 Perfection

As the companies start to specifically indicate value, classifying the all esteem stream, make the esteem making ventures for particular items stream persistently and let consumers pull an incentive from the company, it ends up clear that there is no conclusion to the way toward decrease effort, time, space, cost, and mistakes when giving a product which is always about what the client really needs. Regardless of how frequently the company enhances an offered movement to make it less expensive; the company could simply discover more approaches to expel waste by taking out exertion, time, space, and mistakes. The action additionally turns out to be continuously more adaptable and receptive to client-pull based on that the four introductory standards collaborate with each other in an idealistic circle. Also, the tougher one insists, the more the obstacles to stream are discovered so they can be evacuated. Dedicated product groups in corresponding discourse with consumers dependably uncover methods to determine more specifically and regularly learn of methods to upgrade stream and draw. (Anvari et al., 2011)

Flawlessness along these lines implies the entire disposal of waste through unlimited advances, which is the crucial standard or goal of lean. The most essential incentive to flawlessness is transparency, the way that in lean everybody - subcontractors, first level providers, framework integrators (constructing agents), wholesalers, customers, and representatives - can see anything, as it's important but difficult to get nicer methods to make esteem. There is likewise about time and exceptionally positive criticism for employees making
changes - a crucial factor of lean and an effective incentive to proceed with endeavours to make strides. Each association must have both ceaseless drastic and incremental change. The instruments and methods generally utilised are kaizen and kaikaku.

To successfully seek after both this radical and incremental change, the association’s administration should firstly frame a view in their minds of what perfection would be. For this, the association must use the four lean standards of significant worth determination, esteem stream recognisable proof, stream, and draw (remember the association needs to contend with perfection, not only the present contenders, so the association should have the capacity to measure the gap from present reality to perfection). Also, the administration must choose which types of waste (or Muda) to start with, connecting back to the vital focal point of lean (or strategy sending).

The two stages are presently depicted in more detail:

**The picture of perfection**

At each progression portrayed so far, the requirement for directors to figure out how to see it has been noted: to see the esteem stream, to see the stream of significant worth and to see esteem being pulled by the client. The last type of seeing is to bring flawlessness in perfect image so the goal of change is unmistakable and genuine to the entire association. Incomprehensibly, no picture of flawlessness can be great. Flawlessness resembles vastness. A reasonable ability to read a compass - the learning that items must be produced adaptably in smaller volumes in proceeds with stream - gives basic direction to technologists in the capacities creating non-specific outline instruments. Notwithstanding picturing a photo of flawlessness with the fitting advances, directors must put a strict schedule for ventures along the way (McManus, 2005). The best contrast among those associations that have completed a lot and those that have achieved close to nothing or nothing with lean is that the high achievers set specific schedules to achieve apparently unimaginable assignments, and after that, normally meet or surpass them. The low achievers, in comparison, approached what might be sensible for their present association and separated esteem streams to achieve, and by and large destroyed themselves before they began.

**Focusing energy to banish waste**

Numerous companies launch brimming with vision, energy, and with high expectations, yet gain next to no ground of lean since they went pursuing after flawlessness and never had the assets to get anywhere with the lean method. What is required rather is to picture a goal, pick a few of the most vital strides to get the company there, and concede alternate strides until some other time. The thought is for top administration to concede to a couple of basic objectives for changing from mass to lean, to choose a couple of ventures to accomplish these
objectives, to assign the general population and assets for completing the activities and at long last to build up numerical change focuses to be accomplished by a certain point in time. The best lean associations have figured out how to reject ventures despite the excitement of parts of the association, with the end goal to align the quantity of activities with the accessible assets. (Mossman, 2009)

Against the above foundation various achievement factor components can be defined:
SFE10: Total disposal of waste with unlimited advances.
SFE11: Transparency so everybody can see everything.
SFE12: Constant drastic incremental change.
SFE13: A goal of what the association needs to be (approach organisation).
SFE14: To choose a couple of activities to deal with rather than everything all at once.

3.8.3 The 4P model of lean

Given the five essential standards of lean examined and years of reasonable involvement with Toyota, Liker (2004) created what he terms the 4P model of the Toyota Way and additionally the 14 standards of every single of the P's. These 14 standards that as indicated by Liker (2004) represent the Toyota Way could be of an incentive in the recognisable proof of the hypothetical basic achievement elements for success lean execution they are condensed hereunder, sorted out in the four wide P's.

3.8.3.1 P 1: Philosophy

**Principle 1** - Base administration options on a long-haul logic, even to the loss of immediate monetary goals.

- Set a theoretical sense of motive that overtakes every fleeting fundamental leadership. Work, extend and modify the whole organisation to usual motive that is better than benefiting. Appreciate the historical backdrop of the association and work to pass it on to the following phase. The theoretical aim is the establishment for the various standards.
- Make esteem for the consumers, society and the finances - it is the initial stage. Assess all capacity in the association with regards to its aptitude to accomplish this esteem.
- Be dependable. Work inside freedom and trust in claim abilities. Recognise duty concerning own lead and preserve and improve the capacities that empower the association to deliver included esteem.

**Principle 2**: Process- Process flow must carry the imperfections to the top
✓ Restructure work procedures to achieve high value comprised, constant flow. Endeavour to reduce to nothing the total of time that every work project is sitting inert or sitting tight for somebody to improve.

✓ Produce flow to shift resource and data rapidly and to interface processes and person at the same time with the aim that issues surface immediately.

✓ Make flow apparent all through the hierarchical culture which is the way to a genuine ceaseless change process and to create individuals.

**Principle 3 - Utilise pull frameworks to keep a tactical space from overproduction.**

✓ Resource renewal started by utilization is the fundamental guideline of Just-in-time

✓ Reduce work-in-process and warehousing inventory by keeping small portion of every item and regularly replacing considering what the client really uses.

✓ Be receptive to the everyday shifts in consumer demand contrary to depending on PC schedules and frameworks to follow unproductive stock.

**Principle 4 – Balance the amount of work**

Reducing waste is simply one-third of the condition for having lean success. Wiping out overload to individuals and gear and wiping out inequality in the generation plan are similarly as imperative - yet for the main part, not understood at associations endeavouring to perform lean

**Principle 5 – Create a culture of ending to manage the issues, to get quality right the first time.**

✓ Quality for the consumer leads the association's incentive.

✓ Utilise all the cutting-edge quality affirmation strategies available.

✓ Build into gear the ability of distinguishing issues and ceasing itself. Build up a visual framework to caution group or venture innovators that a machine or process needs help.

✓ Build into the association's emotionally supportive networks the capacity to rapidly tackle issues and set up countermeasures.

✓ Build into the company's way of life the rationality of ceasing or backing off to get quality accurate the first run-through and to improve efficiency over the long haul.

**Principle 6 – Standardised activities are the basis for continuous improvement and worker empowerment.**

✓ Utilise fixed, repeatable techniques to keep up the constancy, general planning and consistent yield of processes - the establishment for stream and force.

✓ Take the amassed finding out on a procedure up to a point in time by institutionalising the present best practice. Enable inventive and personal articulation to increase the
standard; at that point, consolidate the change into the new standard with the objective that when an individual goes forwards, the learning can be passed on to the individual.

**Principle 7 – Utilise visual control so no issues are unseen.**

- Utilise fundamental illustrative pointers to allow people to choose instantly if they are in a standard state or going astray from it.
- Avoid utilising a PC screen when its shifts the labourer’s concentration far from the working environment.
- Design straightforward visual frameworks at where the work is done, to support stream and draw.

Decrease reports to one bit of paper at whatsoever point feasible, nevertheless for the most imperative financial options.

**Principle 8 – Utilise only consistent, systematically used innovation that assists individuals and the processes.**

Utilise invention to assist people, not to substitute them. Regularly it is preferable to work out a procedure physically prior to adding innovation to help the procedure. Latest innovation is regularly inconsistent and hard to institutionalise and therefore jeopardises stream. A demonstrated process that works by and large overshadows new and untested innovation.

Conduct genuine tests previously receiving innovation in business forms, fabricating frameworks, or items.

Reject or alter advancements that contend with the association's way of life or that may disturb soundness, unwavering quality, and consistency.

Nevertheless, urge the general population to consider new innovations when investigating new ways to deal with work. Rapidly actualise a completely considered innovation in case it has been demonstrated in trials and it can enhance stream of the procedures.

**3.8.2 P3: Individuals and Partners.**

**Principle 9 – Build leaders who absolutely grasp the work, live the Lean Thinking, and communicate the lean philosophy to the rest.**

- Build leaders from inside, instead of getting external ones.
- Do not see the leaders’ activity as essentially achieving undertakings and having great relationship-building abilities. Pioneers must be good examples of the association's reasoning and method for working together.
- A great leader should comprehend the everyday work in extraordinary features, so he can be the top educator of the association's rationality.
**Principle 10 – Build extraordinary individuals and teams who follow the companies’ thinking.**

- Make a solid, resilient philosophy where hierarchical standards and morals are generally shared and lived out over many years.
- Teach extraordinary people and groups to work inside the corporate reasoning to accomplish excellent outcomes. Work hard to strengthen the way of life ceaselessly.
- Utilise cross-useful groups to enhance quality and profitability and improve stream by taking care of troublesome specialised issues. Strengthening develops when individuals use the association’s apparatuses to enhance the association.
- Make a progressing push to teach people how to collaborate as teams towards similar objectives. Cooperation is something that should be taught.

**Principle 11 – Respect the companies’ expanded network of partners and suppliers by challenging them and helping them increase.**

- Have regard for accomplices and providers, and regard them as an expansion of the association.
- Push external business collaborators to develop and create. It demonstrates that the company values them. Set testing targets and help the accomplices in accomplishing them.

**P4: Problem Solving**

**Principle 12 – Go and analyse with your own eyes to completely comprehend the circumstance.**

- Solve problems and increase forms by heading off to the foundation and particularly inspecting and checking evidence instead of hypothesising according to what people or the PC screen says.
- Consider and discuss checked data.
- Even unusual state chiefs and administrators ought to go and view things for themselves to have a broad understanding of the event.

**Principle 13 - Make choices gradually by accord, taking in account all alternatives; actualise choices quickly.**

- Do not pick a private bearing and go down that one way until the point when the all choices have been completely considered. As soon as a choice has been made, move rapidly yet mindfully down the way.
- Nemawashi is the approach to analysing issues and possible agreements with those impacted, to keep their ideas and get agreement on a way ahead. This agreement looking for process, though tedious, expands the scan for arrangements, and when a choice is made, the stage is set for fast usage.
**Principle 14 - Become a learning association through persevering reflection (hansei) and nonstop change (Kaizen).**

- As soon as the association has set up a steady procedure, utilise constant change instruments to decide the main driver of wasteful aspects and apply powerful countermeasures.
- Design forms that need no stock. This will set apart a few minutes and resources unmistakable for everyone. When waste is discovered, workers utilise a nonstop change procedure to dispose of it.
- Keep the authoritative information base by creating a stable work force, moderate advancement, and extremely watchful progression frameworks.
- Utilise hansei (reflection) at key turning points and after an undertaking has been done to recognise every one of the limitations of the task. Create countermeasures to maintain a strategic distance from a similar oversight once more.
- Learn by institutionalising the prescribed procedures, instead of reinventing the wheel with every new task and every new supervisor.

**BICHENO’S CHARACTERISTICS OF LEAN**

Bicheno (2004) has recognized what he named the 20 attributes of lean or regular subjects refined from the works of Womack and Jones, Schongerger, Hall, Goldratt, Juran, and Ohno.

- **Consumer:** The outside consumer is the beginning and completion purpose of lean. Try to boost an incentive to the client. Improve around the client. Comprehend the client's actual request, in value, delivery and quality.
- **Simplicity:** Lean is not basic, yet transparency wins. Transparency in activity, in framework, in innovation and in control is the objective.
- **Waste:** Waste is common, figure out how to recognise it, and dependably try to decrease it.
- **Process:** Organise and think by the procedure. Focus on how the item moves, not on how the machines or individuals or administrations move. Follow to comprehend the procedure.
- **Visibility:** Aim to make all activities as unmistakable and straightforward as could be expected under the circumstances. Control by locate. Receive the visual processing plant.
- **Consistency:** Consistency makes for noun foreseen circumstances.
- **Flow:** Aim to keep it moving at the client speed and direct stream production. Synchronise tasks with the goal that the streams meet without wasting time.
Pull: Aim for activities to work at the client's speed of interest. Maintain a strategic distance from overproduction. Have pull-based request chains, not push-based supply chains.

Prevention: Seek to anticipate issues and waste, as opposed to assess and settle. Move the accentuation from disappointment and examination to counteractive action. Examine the procedure, not the item.

Time: Aim to diminish general time to make, to convey, and to present new items. Utilise concurrent, parallel, and covering tasks in activities, outline, and support administrations. Never look to defer an esteem including advance by a non-esteem including step. Time is the best general estimation. When there is a time constraint, the association tends to do all the correct things - waste, stream, force, and flawlessness.

Improvement: Improvement and persistent change specifically is everybody's concern.

Partnership: Aim for co-operative working connections both inside with functions, and outside with suppliers. Aim to utilise groups, not people, inside and outside. Aim to create trust.

Value networks: The best open door for cost, quality, conveyance and adaptability lie within co-worked systems. Supply chains contend, not associations.

Gemba: Go to where the activity is going on and look for the realities. Oversee by strolling around.

Variation diminishment: Variation in time and quantity is noticed in each procedure from inventory network request intensification to dimensional variety. Variety is the colossal adversary of lean.

Participation: Give administrators the principal chance to take care of issues. All representatives should share duty regarding achievement and for disappointment. Genuine support suggests full data sharing.

Think small: Specifically, the least skilled machine, and after that, manufacture limit increases. Get a good incentive from current engine before gaining another one. Stop the economy of scale idea by adaptable work and engines.

Trust: Trust permits awesome swathes of administration and time to be expelled inside and outside. Creating trust with providers gives them the certainty to make speculations and offer learning. Inside, trust permits a de-layered, streamlined and more creative association.

Knowledge: Develop information into a framework, develop both express learning yet in addition implied information (including milder and more difficult abilities). It is the inferred learning that is difficult to duplicate and gives manageable favourable position.
Richard Schonberger has created 16 Principles of World Class Manufacturing (Bicheno, 2004). World Class Manufacturing is thought to be like lean.

- Team up with consumers; sort out by client/item family.
- Take/utilise client, focused and best practice data keeping in mind the end goal to drive change endeavours.
- Continual, quick change in all-inclusive client needs.
- Whole work compel contribution in change and vital arranging.
- Cut to the few best segments, tasks and providers.
- Cut add-up to stream time, stream separation and start-up/changeover times.
- Work near client's rate of utilisation or request.
- Constantly prepare everyone for their new roles.
- Increase assortment of acknowledgment, compensation and salary.
- Constantly diminish inconsistencies and accidents.
- Front-line groups should record and possess process information at the work put.
- Control main drivers and cut inward exchanges and detailing.
- Align execution measures with widespread client needs.
- Improve show limit before purchasing new hardware and automation.
- Seek basic, mobile, versatile, minimal effort and focused hardware.
- Promote market and offer each change.

From the identified principles the following success factor elements are developed:

**SFE15**: Lean ought to be viewed as a long-term theory, even to the detriment of immediate monetary profits.

**SFE16**: Evaluate each capacity or movement in the association as far as its capacity to make an incentive for the client.

**SFE17**: Redesign procedures to accomplish high value, including nonstop stream.

**SFE18**: Allow clients to pull whatever and whenever they need it in the quantities they need it.

**SFE19**: Be responsible in everyday moves in client requests.

**SFE20**: Level out workload of all procedures.

**SFE21**: Create culture of halting the line to settle issues.

**SFE22**: Problem recognition and understanding capacity incorporate with engines and culture.

**SFE23**: Standardised errands and procedures.

**SFE24**: Culture of consistent change.

**SFE25**: Simple visual control frameworks to convey issues to the fore.

**SFE26**: Utilise just solid, completely tried innovation that helps the general population and the procedures.

**SFE27**: Build pioneers who comprehend and take after the lean logic.
SFE28: Teach and create individuals in lean reasoning and standards - assemble information.
SFE29: Utilise cross-practical groups to tackle issues and make strides.
SFE30: Build a culture of shared esteems and objectives.
SFE31: Appreciate providers and regard them as accomplices.
SFE32: Manage on the floor by strolling the floor, see things for yourself.
SFE33: Consent basic leadership.
SFE34: Persistent end of waste.
SFE35: Aim to forestall issues and waste, instead of to examine and settle.
SFE36: Utilise time as the greatest general measure.
SFE37: Real investment by all, counting administrators.
SFE38: Trust among all partners.
SFE39: Simple, mobile, versatile, minimal effort and focused equipment.

3.9 Factors in implementing Lean

3.9.1 Change strategy targeted and holistic:

It is agreed that Lean Thinking and methods necessitate the implementation of the whole system in a holistic way instead of adopting methods in a piecemeal way. Womack and Jones (1996) recommend that managers master the methods when they adopt isolated portions of lean system without grasping everything. Meanwhile this more provisional or piecemeal tactic is being used principally because of resistance from the workers to the new concepts. The training provides proof of better knowledge amongst employees of the main elements of waste reduction and flow of value. (Kundu, 2012)

3.9.2 Impacts of organisation culture:

Changes of attitude helps employees with a goal in their working life and have the possibility to change behaviours, so that the workers start to think in a different way and are more eager to participate to organisation’s improvement plans. Better management control makes the company structure bureaucratic, which does not facilitate the change from the current methods of doing things.

3.9.3 Product focus:

Lean changes should be concentrated around precise product value stream to allow the power on assets to be determined mostly by the improvement team.

3.9.4 Senior management commitment
Steadiness in management commitment is highlighted as a crucial factor in efficient implementation of changes in companies. (Annampedu et al., 2005)

3.9.5 Timing for performance improvements:

It is viewed as an important element for company change. The organisations must be ready for the lean change, still simultaneously managing change necessitates quick response with the adoption tasks even taking a risk and afterwards face the results. (Bass et al., 2009)

3 major elements for the successful Lean implementation.

1. Sharing the vision of the new idea to the whole organisational
2. Essential change in the organisational culture
3. Consistently adopting new practices and principles.

Most successful change behaviours start whenever certain people or certain groups decide to look hard at an organisation’s competitive condition, business state, technological developments, and monetary performance. Cameron et al. (2011). The vision clears up the direction in which a company needs to move. (Motwani, 2003). States that every process change needs the following success elements:

1. Tactical plan of top managers working as leaders in determination and spreading the vision of change. This process starts with tactical plan. The participation of senior management is required.
2. Willingness to learn

The aim of learning is to give a positive effect results of effective adaption which lead to effective implementation to environmental changes and improved effective in the process of learning. Implementation contains suitable activities to answer to technological development and learning from other companies who accomplished the best practices in the industry.

3. Culture

The culture of a company helps the incorporation of personal learning by impacting the companies’ capacity to learn, communicate data and make decisions.

4. Balanced network relationship

In general conditions cooperative, relational and group attitude is bringing better performance. Open communication encourages shared culture and creative change inside the company.
5. Knowledge sharing
6. Fixed process management and change management practices

3.10 Barriers to lean implementation

3.10.1 Lack of management commitment and leadership

Management commitment is a major element for the realization of every new idea. Lack of management commitment brings many issues, like limited access to assets, interruptions in decision-making procedures and inappropriate communication (Soltani et al., 2005). Lean implementation needs complete constant participation, help and guidance of the top management (Gill, R., 2002). Top management needs to set vision, strategy, objectives and a direction to keep the project (Gilkey et al., 2003). Particularly in terms of SMEs, this element is very applicable because of the direct participation of top management in normal operations, direct supervision and deliveries.

3.10.2 Organisational culture

The culture of a company can be described as guidelines and characteristics such as cover trust, grading, working condition and fellow-feeling (Martins et al., 2003). The organisational culture of an SME shows the character or behaviour of top executives. In accordance with Antony et al. (2012), organisational culture is important for lean implementation. Participative organisational culture work as an inspiring platform for the lean adoption (Nordin et al., 2012). On the other side, if the trust, working condition and fellow-feeling are inadequate in the company then organisational culture becomes a main lean implementation barrier.

3.10.3 Lack of communication

Good communication throughout the whole organisational hierarchy and among internal and external shareholders is compulsory for every management idea as well as lean. It goes like cement between bricks. A good communication inside the company and among its stakeholders is the major success element for lean implementation (Antony et al., 2012).

3.10.4 Lack of resources

Inadequate monetary, technical and human assets is an also a significant barrier in lean barrier. In accordance with Jadhav et al. (2014), insufficient time, labour and finances have been linked to the little implementation of lean in SMEs.
3.10.5 Resistant to change

The unexpected introduction of innovative approaches makes workers uncomfortable considering the fact they are used to the old techniques. The middle management and shop floor employees give a “resistance to change” during lean adoption. The reasons for resistance to change, on the other hand, can differ for managers and employees. Fear of failure was discovered to be one worry between managers when employees were more anxious about their jobs (Sim et al. 2008). The same observations were made in all the case SMEs. Lack of knowledge regarding lean might as well create a negative attitude of workers.

3.10.6 Lack of employees’ involvement

Successful lean change necessitates direct contribution of workers in establishing organisational vision, objectives and ethics. Contribution of workers enhances the flow of knowledge and information and adds to problem-solving as well. Involvement of workers and management acts as cement in the wall. Lack of employees’ involvement make lean adoption process dull and unsuccessful. (Worley et al., 2006)

3.10.7 Lack of training and skills

Trained and experienced workers represent an asset to the organisation. For the successful adoption of lean, training of managers and employees is needed to increase the fundamental knowledge of lean (Čiarniené et al., 2013). As well as SMEs, lack of training and skills was deemed to be one of the causes for a low rate of lean implementation. The case SMEs don not do certain training because of monetary and time constraints. (Panwar et al., 2015)

3.10.8 Lack of understanding of lean advantages

It is discussed that when the advantages of every new plans are clear to the shareholders, they become interested in implementing the initiative. Furthermore, measurement of improvements also encourages the investors (Almeida Marodin et al., 2015). Directors of case organisations agreed that they did not have enough knowledge about the advantages of lean adoption. It was also showed in the cases that motivation was low in the beginning stage of lean adoption, but it improved after improvements were seen.

3.10.9 Backsliding to old methods

Another barrier of adopting lean is backsliding to traditional techniques in hope that the improvement in the productivity leads to unemployment (Worley et al., 2006). In accordance to
Sarhan et al., (2013), the main issue in lean implementation is the tendency to go back to old ways when problems were faced.

3.10. 10 Lack of supplier involvement

To stay and expand in the current’s competitive market, suppliers must act as seamless expansion of the company (Sahwan et al., 2012). It is important to spread the lean adoption to their supply chains partners, yet (Bhasin, 2012), it is complex for SMEs to grow a lean supply chain. SMEs suffer from a lack of cooperation with their suppliers.

3.11 Conclusion

This chapter defined terms that appear throughout the study, such as Lean Manufacturing, small and medium enterprises, snack sector etc. Crucial concepts and principles were also explained. These are frequently used terms and concepts and are therefore important to the study. The following chapter will review the food (snack) industries of two countries outside the continent of Africa, the problems they face as well as the lessons that can be learnt from these countries.
CHAPTER 4: REVIEW OF SNACK MANUFACTURING INDUSTRY FROM A GLOBAL SCALE

4.1 Introduction

This chapter of study will review the literature relating to two international countries, Germany and The United State of America. Firstly, the chapter focus on the overview of global food followed by the overview of the global snack manufacturing industry. Secondly, a review of the snack industry in each country will be given, and an overview of SMEs.

4.2 Overview of the global food

4.2.1 Global food security and food production

Theoretically the aim of international food is to satisfy demands and wants of the population’s food expenditure and food consumption. The settled estimation of these frameworks’ performance is the idea of global food security. The meaning of international food security basically from the FAO has persistently shifted after some time (Schreinemachers et al. 2010), for the most part considering supply readiness and steadiness to unequivocally underlining parts of utilisation and food practices. The FAO's latest description suggests that "Food security exists when all individuals, constantly, have physical, social and financial access to adequate, safe and nutritious sustenance which meets their dietary needs and sustenance inclinations for a dynamic and sound life. Family food security is the utilisation of this idea to the family level, with people inside families as the focal point of concern (Thomas, 2009)." In its most recent description in 2001, the FAO included public approach to the initially established physical and monetary approach and more essentially extended the meaning of nourishment quality from only adequate to adequate, safe, and nutritious nourishment and the people's need of nourishment from simply dietic needs to dietic needs and nourishment inclinations. The advancement of food security descriptions has slowly moved; in any case, it didn't influence considerably the way scientists see international food systems. Operationally, this description has four components of international food security: accessibility, steadiness, entrance, and usage (Schmidhuber & Tubiello, 2007), and real study judgements and pointers of factors that estimates course of action toward food security were grouped within these four components. The latest list of pointers truly ignores one of populace's nourishment and request which the description of food security has accentuated.

4.2.2 Global food production and climate change
There is examination of different aspects that could revise production techniques which assists comprehending how changes in the production system impact food security. Specifically, this part tackles the link among weather change and food security, as weather change, specially increased weather changeability, is one of the biggest issues of food systems (Rosenzweig et al, 1994; Lal, 2004). A resume of the various views coming from diverse literature is presented. The worldwide farming production can be hypothetically portrayed by components like arable land, accessible clean water, and expert workers, given consistent physical resources of agricultural, appropriate weather states and land quality, landscape and geographical position, and types of yields and livestock (Brander, 2007 and Lobell, et al, 2011). High temperature affects farming in lots of ways, for example, changes in rainfall, variation in crop’s progress patterns, and severe climatic incidents, all affecting the level of food security from local to international level (Darwin et al.,1995 and Fischer et al,2002). For instance, Rosenzweig and Parry’s international farming model (1994) stated that results of global warming from rising carbon dioxide in the atmosphere will only result to a minor reduction of food manufacturing yet produce huge gaps of food accessibility among developed and developing nations, and modification efforts cannot do much at the farm level (Rosenzweig & Parry, 1994). Internationally, empirical researches prove that evolutions of farming and weather change impacts on many foods are allocated unequally through nations and food industries (Nelson, 2009). Further studies tackle production systems, especially concentrating on production technology. Production technology is a technique to adjust to weather environmental shift, though they change extensively within regions. Turral et al. (2011) recent report observes how results of weather variation on production systems influence food security by both classifying areas with many undernourished people and classifying the significance of crops, found by the quantity of day-to-day calorie consumption it gives to an average individual (Lobell et al., 2008). The results recommend that weather influences could change considerably amongst separate areas depending on various biophysical resources, management, and other elements.
These outcomes demonstrate important risks to food security if the status quo holds and propose that if there is no adjustment of individual actions, the physical feature of food production systems would ultimately be unable to satisfy international desires. These outcomes show the necessity of further study that spreads to social parts, specifically the functions of market, technology development, and equality of accessibility to food.

Universities, governments, and global establishments are conscious about this necessity. From the previous 20 years, another aspect for measuring international farming manufacture has developed in the form of international agriculture models that incorporate biophysical and financial features together. These models enable academics and legislators to inspect results from outlined or planned ecological, monetary, and society situations. They furthermore argue and measure a broad variety of problems, such as:

1. how crop yields react to different socio-economic situations under different weather situations (Lipper et al., 2014);
2. how financial development that expands production throughout upsurge demand and how poverty delays it (FAO, 2012; Kang et al., 2009);
3. how to do investment on technology development which improves farming productivity, and on adjustment, which protects living from undesirable food security effects (Herrero, 2010).
4. how exchange boosts production (Tol, 2002); and

Figure 4.1. The varying state of main research problems and commonly asked questions range from diverse scales moving from crop production to food security. (Lal, 2004)
5. how weather influences on farming impact poverty (McMichael, 2003. & Lobell, 2010). Though research on international food production until today analyses that forecast international farming and food production for 2050 in particular social and weather situations stay unusual and are only in two printed reports, World Agriculture about 2030/2050, the 2012 Revision by the FAO and Global food production and costs to 2050 by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) (Challinor, 2012).

Despite the way that the above researches answered various issues, they stay focused on the production part. These researches additionally share three basic suspicions. Firstly, at international level, demand matches production. Secondly, production takes care of the demand of those with financial access, and concerns related with financial matters get to are settled through monetary improvement, estimated by increment of per-capita Gross Domestic Product development or wage. Thirdly, machinery expansion is generally alluded to expanding or maintaining productivity. For starters, since there is about 800 million individuals that are undernourished today, genuine interest for nourishment and horticulture ought to essentially be bigger than generation. How would we reclassify worldwide sustenance request? Second, when request is estimated in money related terms, genuine requirements for sustenance are discounted, given absence of financial access. What might be a superior measure? Third, bigger rural yield does not really relate to bigger nourishment use. At the point when worries on innovation have concentrated on efficiency viewpoints to adjust to negative atmosphere impacts, innovation headways that enhance usage of agrarian create towards sustenance are excluded. What ought to be the correct part for innovation in worldwide nourishment frameworks? This research will audit and address these inquiries.

4.3 Overview of snack manufacturing industry

Global Savoury Snacks industry was estimated at US$96.6 Billion in 2016 and is projected to have a compound annual growth rate of 6.0% from 2016 to 2021 to attain US$129.3 Billion by 2021. North America was the most important area in the international Savoury Snacks sector holding a worth share of 37.6% in 2016 while Asia-Pacific is estimated to become the fastest value increase internationally at a compound annual growth rate of 8.0% from 2016 to 2021. A developing populace, increasing urbanisation rate, and increasing economy will stay the main macroeconomic elements leading the industry internationally. Extended working time and customers' busy timetables will additionally add to the tendency to consume snacks as they snack more regularly than expected to get a fast energy lift. Processed Snacks was the main market with a worth share of 36.4% in 2016. Share of Savoury Snacks as a percentage of the international food sector is predicted to grow from 2011 to 2021. (Nikolaou, 2006).
Every area, excluding the Middle East & Africa, will observe an increase in share at the same time. Divided meal times because of increasing occupied routines throughout the areas will lead to an expansion in snacking times. A lot of customers in the Middle East & Africa are changing their eating routines to incorporate more dairy and bakery in their everyday schedule, which will support the share of the Dairy & Soy Food and Bakery & Cereals industries as opposed to Savoury Snacks in the area. Top 10 high possible nations contained Japan, China, the US, Mexico, Brazil, Colombia, the UK, France, Russia, and Turkey. The US is put to keep driving the international Savoury Snacks sector, when China is projected to reach the quickest increase internationally from 2016 to 2021. Russia is projected to rise as the quickest-developing market for Savoury Snacks in the Eastern European area with a CAGR of 8.5% from 2016 to 2021. Brazil was the biggest market in Latin America, accounting for 48.3% of total value sales, when the UK was the biggest market in the Western European area with 33.7% worth share in 2016. Savoury Snacks with Health & Wellness features counted for 15.4% of the total international sector sales in 2016, a growth over 14.7% in 2011. This can be credited to the solid interest for low-fat snacking possibilities, which producers are providing to attract health-conscious customers. Moreover, with intensified concentration on healthy elements like hemp seed and flaxseed, which are a natural foundation of amino acids and omega-3, there is strong demand from time-pressed customers who aim for appropriate but healthy snacking choices during short-breaks or when moving. The total worth for private market items in the international Savoury Snacks sector remained at 9.1%, esteemed at US$8.7 Billion in 2016, an improvement from 8.7% in 2011. Western Europe had the biggest worth share for private market Savoury Snacks with 18.4% of the total sales in 2016, and North America after with a worth share of 10.5%. Hypermarkets & Supermarkets were the main delivery channel for the international Savoury Snacks industry, with a worth share of 52.2% in 2016, followed by Convenience Stores with 32.2% share. The big share of the Hypermarkets & Supermarkets channel in the delivery of Savoury Snacks can be linked to the advanced organized retail sector in most nations, where most customers choose to buy Savoury Snacks. (Nikolaou, 2006).

4.3.1 Background

The original snack food goes back to more than two thousand years ago. The Inca civilisation in South America ate the potato similarly like individuals today eat snacks. Potatoes became a part of the eating routine of the American and European life and developed for some years until the introduction of the potato chips. (McIntyre et al., 2009)

The introduction of potato chips comes from 1853. George Crum, a New York chef, cooked a platter for a railroad industrialist who criticised the volume and whole cooking of the chips,
leading to an irritated cook. Subsequently, Mr. Crum attempted to show the consumer a thing or two, so he cut potatoes into small slices and tossed them into oil until the potatoes got crispy. This brought a wonderful triumph and birth of the potato chips. Chips are among the trendiest snacks in America. Yet, the snack sector has various type of snacks. Overall, more than 21$ billion yearly is sold in the retail sales of snack foods in the United States (Mounir, 2011).

4.3.2 Diversity of goods

From the invention of the initial potato chip in 1853, the snack group has developed considerably, providing a new complete range of snacks. To deal with every snack within food sectors, the supervisors should have an extensive knowledge of the exact snack food they are making. (McCarthy, 2001)

Few of the main salty snacks are:

- Potato chips: the world’s preferred snack for the past 150 years. The principal way chips are made has evolved a bit in recent years. A potato chip is still a normal potato, sliced, fried or baked and sprinkled with flavor. (Burhans, 2008)
- Peanuts or Ground Nuts: The peanuts were brought in the old continent by the Spanish. They are made in numerous ways to give various types of peanuts. (Burhans, 2008)
- Corn Curls: Were introduced in 1930’s. Fundamentally, they are puffed corn snacks, with a crunchy cheese flavour. They are made from a procedure called extrusion. (Burhans, 2008)
- Pretzels: Introduced in Austria and Germany, they are produced from a special kind of wheat flour into a dough and a specific shape. (Burhans, 2008)
- Tortilla Chips: Are made from corn dough, rolled into an exact form. (Archer, 2016)
- Popcorn: Also, initially from the Inca civilization in 300A.D. Corn kernel in natural form is transformed into the finished product. (Burhans, 2008)
- Vegetable Chips: Were produced in reply to the demand for natural snack products.

4.4 Overview of SMEs

4.4.1 Defining SME by number of employees

When explaining SME, a difference should to be made between small and medium businesses. What comprises a small or medium business is based on the quantity of workers
in a company. Various investigators have explained small and medium enterprise in various manners. Abimbola, (2007) emphasised the distinction taking into consideration a research done in 1997 on SME in Europe. He said that “a company having 10-99 employees is considered to a small” while, “a company having 100 to 499 employees is a medium size enterprise”. Schmiemann, (2008) stated that the literature has been divided on how to describe small and medium size business. They described small business as, “any firm with fewer than 100 full time paid employees” and divided it into three sub-groups:

• Micro enterprises: 2 - 9 workers

• Mid-sized enterprises: 10 - 49 workers

• Larger small enterprises: 50 – 99 workers.

In accordance with Angela, (2011), SMEs are enterprises of less than 200 workers, described in the following groupings:

• From 1 to 4 employees can be considered “micro”

• From 5 to 20 employees can be considered “small”

• From 20 to 199 workers can be seen “medium”

Nevertheless, Angela, (2011), also said that in North America and Europe, groupings are viewed otherwise, as follows:

• 1-19 workers as “micro”

• 20-49 workers as “small”

• 50-249 workers as “medium”

• Over 250 workers as “large”

Lewis, (2014) emphasized on a necessity for evaluation among SME and Large Enterprise (LE), describing SME as any business with 100-500 full time workers and an LE organisation with more than 500 workers.

In accordance to the European Commission [EC] (1996), “a business must have less than 250 salaried workers to be considered as SME, or an organisation that has 49 to 250 paid employees can be considered as Medium sized organisation. If a business is operating with less than ten employees, it will be considered as a very small enterprise”.


The Asia-Pacific Economic Cooperation (APEC) (2003) gave a standardised description that can be considered around all markets. In accordance with APEC (2003), “SMEs employ less than 100 people whereas, medium sized SME employs between 20 and 99 people and a small firm employs between 5 and 19 and micro firm employs less than 5 people and includes self-employed managers”. APEC (2003) additionally describe SME as a business with less than 100 workers, still there have been some exclusions, for example, no hard and fast rule that differentiates a micro firm from a small and medium sized company, yet overall a micro business must should have less than five workers.

4.4.2 Defining SME by economy

APEC (2003) has separated information from various sources to investigate the views with regards to SME in various economies. The meanings of SME vary broadly. These descriptions could be utilised mostly for two specific reasons: statistical and policy or program purposes. The descriptions could differ by business depending on their aim and the shared belief of quantity of workers. Different countries also utilise capitalisation, possessions, sales or revenue and manufacture ability to describe SME. The EC (1996) explained SME, taking into consideration the yearly profit of a business.

The last fundamental conditions for deciding if a business is small or medium size is based on its freedom that suggests that an organisation cannot have 25 percent or more of its control in hands of a large enterprise or mutually held by many big companies. (EC, 1996). Minarelli, (2013) described SMEs in the Malaysian condition as “a firm with annual sales turnover not surpassing RM25 million (AU$8 million) and/or full-time employees not exceeding 150.” There is a significant variety in describing SME. Usually, SME is described as a company with less than 100 workers, however in certain cases (specifically when it comes to larger economies), the number of workers grows considerably, for example from 300 to 500 workers.

The descriptions of SME comprise a variety of factors in different nations. For example, in Canada, the number of workers would be taken into consideration alongside with the sort or type of organisations (for example a company focusing in goods would be classified as small where there are 101-500 workers, same as a business providing services would be considered as a small business if the amount of workers is from 51 to 500). In Chile, the overall yearly profit or annual sales is deemed crucial when describing SME. In Indonesia, assets and yearly sales are taken into consideration together with the quantity of workers. In Vietnam, the quantity of workers alongside with the capital of a company is considered crucial. In Korea, the kind of company (for example mining manufacturing, construction and services) is deemed vital, with the index for the quantity of workers varying for every sort of company. Similarly in
Mexico, Russia, Thailand and the USA, the type of organisation and the quantity of workers are considered to describe SMEs.

4.5 Germany

4.5.1 EU food industry economy

As indicated by Confederation des industries agro-alimentaires de l'UE (CIAA), the food and drink sector are limited to food and drink processing and manufacturing part. As per FoodDrinkEurope (2011), the food and drink sector are the only biggest manufacturing industry in the EU with a revenue of Euro 954 billion and employment of 4.2 million persons. It is also the second principal manufacturing part about value added and amount of businesses. Figure 4.2 shows the shares of food and drink industry in the EU in the manufacturing side in terms of revenue, value added, employment and amount of businesses (CIAA, 2010).

![Figure 4.2 Shares of food and drink industry in the EU in manufacturing sector (CIAA, 2010).](image-url)
Amongst different industries in the EU food industry, the meat sector, drink sector and dairy products are three main divisions and they indicate 20%, 15% and 14% of the overall revenue and 22%, 10% and 9% of the total quantity of workers correspondingly. Germany, France, Italy, Spain and UK are the biggest EU food and drink manufacturers. The sales in food and drink sector of every five participating nations are presented in figure 4.3. Whilst Germany sales were 147.7 billion Euros in 2009, Finish food and drink sector net sales were 10.4 billion Euros. (CIAA, 2010)

Figure 4.3 Top five member countries of EU in terms of food and drink sector sales, (CIAA 2010)

4.5.2 SMEs in food industry

Food and drink sector in EU represent a varied industry because of the number of SME found in this sector compared to other manufacturing segments. It contains close to 310 000 enterprises of which small and medium size companies leads 99.1%. In EU, SMEs are organisations comprising micro-sized business, small-sized business and medium-sized business (Braun et al. 2011). SMEs have an important part in food and drink sector with share of revenue calculated for 48.2% and the employment for 62.8%. Nevertheless, inside the SMEs, medium-sized enterprises comprise the main part with 27% in revenue and 25% in employment when indicating only 3.6% of food and drink organisations. Inputs of small and micro businesses are classified as second and third place with small enterprises’ 14% in revenue and 22% employment, and micro enterprises’ 7% in revenue and 16% in employment (Saguy et al., 2014). Like in different sectors, as bigger organisations have larger resources, SMEs in food industry are usually seen as entrepreneurial and acknowledged as the startup of fresh items (usually they are obtained later by bigger organisations). Sahakijpicharn, (2007) recommends that to enable an increase in performance involving item and process invention, SMEs should focus on regulating inside resources like the abilities of the staff, knowledge and the usage of outside sources of data.
4.5.3 Tendencies in European food sector

The food sector has changed dramatically in recent years. The information of EU's inside market has made an ideal atmosphere so that food can be exchanged within the EU with small or non-tariff. With the assistance of information and communication technology (ICT), the competitions among food organisations have been more augmented. To cite some, new innovations have made long distance transport of food items financially realistic; electronic business has facilitated to localise global businesses and makes acquirement internationally feasible. In an international market, those organisations which were already secured by the states policies are currently confronting new trials. Yet for companies with global purposes, it means more opportunity. Then again, globalisation prompts to more concern in regional and national values, to protect uniqueness and keep what may turn out to be lost. Remarkable variations are also occurring in customer tastes, which is going far from common items to high value-added items. There is a serious necessity for producers to invent efficiently to enable staying in the competition in that market. In the meantime, strategy makers are worried about the impact of every shift on companies and how they can help companies to thrive. (Van de Vrande, 2009)

4.5.4 Trade with non-Eu countries

The EU is the biggest exporter and importer in the food and drink sector on the planet. In 2009, EU sent out 77.2 billion Dollars and imported 72.0 billion Dollars food and drink items. Yet, the EU share of international exports of food and drink items has gradually gone down, slowly decreasing during the previous years from 20.4 % in 2000 to 18.6% in 2009, which is generally because of couple developing countries: China, Brazil, Malaysia, Indonesia and Argentina. Figure 4.4 displays trade partners of EU by areas.
4.5.5 Finnish food industry

The food and drink sector have a main financial and manufacturing significance in Finland. The industry is classified as fourth-biggest in the nation with staff of more than 34,000 persons and making 10.4 billion Euros in GDP in 2009 (Reuber, 1997). Micro and small-sized food companies lead the Finnish food sector with a worth of 91% amongst all the firms. However, SMEs have a small part in globalisation; only 15% of these organisations participate in exporting behaviors (Reuber, 1997). Finish food exports have been developing gradually over the past few years, until 2007 getting 1.2 billion Euros. The nations in EU have been primary focus of Finnish food export, for example Sweden (17.4%), Estonia (10.8%) and Germany (5.4%). Overall 55.6% export to EU nations. The principal terminus of food exports outside EU is Russia with 24.7%. Only 1.90% of food exports goes to China (Kähkönen, 2010). After looking at few Nordic nations such as Denmark, Iceland, Norway and Sweden, Finnish total value of exports goes in food sector classified as the bottom. Finnish food industry has developed significantly in past decades. Serious R&D has complemented this growing into new products and approaches, a more sophisticated extend of administering and justifications. A few organisations have used big scale processes and reduce production costs to be able to stay competitive in the business (Einarsson, 2007). With regards to area, Finland is the eighth biggest country in Europe and the most lightly occupied nation in the EU. With a minor national market and roughly 5.4 million people found in vast area, these circumstances indicate a small buying power per km2, little quantity and great transport prices. Thus, some items are not capable of acquiring adequate capacity to boost production. Nonetheless, transport prices do not work as a blockade to exchange. Organisations can have economies of scale to fix this issue by union and possession. Many Finnish food organisations have started procurements since 2000. The obtained organisations are from Sweden, Russia and Baltic nations. Few other Finnish food organisations took greenfield or obtaining of current production facility in Baltic Sea region nations to reposition production and therefore reduce the price of the work. Though the production ability is lesser in those nations, the distinction in prices of incomes and social security can still make it worthwhile to produce goods there (Einarsson, 2007). Since the food market quantities are just growing marginally in the domestic market, the Finnish food organisations are left with not many options on how to develop and increase. They can also export additional products to make more markets or increase by union and possession. The last option is to create new items (Einarsson, 2007).

4.5.6 Overview of market in Germany
Germany holds the biggest food and beverage market in Europe with 82 million people having made an overall income of 230 billion Euros in 2010. In 2010, the biggest sector parts by production value were: meat and sausage items with 22.7 per cent, dairy items with 15.4 %, confectionery with 9.4 per cent and alcoholic beverages with 8.7 %. The German food market is dominated by SMEs. (Jacobi, 2006). The major exchanging associates in the food and beverage industry are other EU nations, after is Russia, the United States and Switzerland (Germany business portal, 2009), even though Europe’s second largest manufacturer of food, Germany, is a net importer in important groups of food and drink products. A portion of the domestic demand is fulfilled with locally manufactured goods, still, in 2010, products to the value of 60.7 billion EUR were imported, and the majority was processed foods and agricultural commodities (Einarsson, 2007). From the last decade, food imports have gradually augmented, hence the growing demand for foreign as well as exotic foods.

4.5.6.1. Snack market in Germany

The German savoury snacks market has been growing at a moderate rate. This pattern is expected to keep going forward. The German savoury snack market had a total income of $2,288.4m in 2015, indicating a compound yearly development rate (CAGR) of 3.3% from 2011 to 2015. Interestingly, the French and UK markets developed with CAGRs of 4.2% and 6.1% individually, amid a similar period, to achieve separate estimations of $1,659.3m and $6,583.3m in 2015. Market utilisation volume enlarged with a CAGR of 2.5% from 2011 to 2015, to get an entirety of 154.1 million units in 2015. The market's volume is anticipated to increment to 174.4 million units toward the finish of 2020, demonstrating a CAGR of 2.5% for the 2015-2020 period. There is an inclination to increase personalisation of snacks to give specific and exceptional sensory experience. It can be flavour-related personalisation – when customers can propose their flavour to be produced for the market, or event-related, i.e. for the upcoming European football championship. The potato chips portion was the market's most productive in 2015, with overall profits of $865.1m, equivalent to 37.8% of the market's general esteem. The processes snack part added profits of $477.6m in 2015, comparing to 20.9% of the market's total esteem. As from January 2015, the new EU Food Information to Consumers (FIC) regulation obliged the description of vegetables fats utilised in food products. The performance of the market is estimated to pursue a comparable example with an expected compound annual growth rate of 3.4% for the five-year time frame 2015 - 2020, which is anticipated to lead the market to an estimation of $2,704.0m toward the finish of 2020. Relatively, the French and UK markets will increase with CAGRs of 5.3% and 6.7% separately, amid a similar time, to get to individual estimations of $2,148.6m and $9,095.0m in 2020. (Hillocks et al., 2012)
Market value
The German savoury snacks market showcased expanded by 3.5% in 2015 to get an estimation of $2,288.4 million. The compound yearly increase rate of the market in the period 2011–15 was 3.3%.

Table 1. Germany savory snacks market value: R Million 2011-2015 (Profile, 2017)

<table>
<thead>
<tr>
<th>Year</th>
<th>$R million</th>
<th>R-Euro million</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>16 280,828</td>
<td>20 334,264</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>14 625,763</td>
<td>20 749,285</td>
<td>3.1%</td>
</tr>
<tr>
<td>2013</td>
<td>23 882,492</td>
<td>26 799,211</td>
<td>3.2%</td>
</tr>
<tr>
<td>2014</td>
<td>24 022,34</td>
<td>27 942,297</td>
<td>3.3%</td>
</tr>
<tr>
<td>2015</td>
<td>29 227,674</td>
<td>33 951,84</td>
<td>3.5%</td>
</tr>
</tbody>
</table>

Figure 4.5: Germany savory snacks market value: $ million, 2011-2015 (Profile, 2017)
Table 2: Germany savoury snack market volume: millions units (Profile, 2017)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Millions unit</th>
<th>% Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>139.8</td>
<td></td>
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<tr>
<td>2012</td>
<td>143.1</td>
<td>2.4%</td>
</tr>
<tr>
<td>2013</td>
<td>146.6</td>
<td>2.4%</td>
</tr>
<tr>
<td>2014</td>
<td>150.2</td>
<td>2.5%</td>
</tr>
<tr>
<td>2015</td>
<td>154.1</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

Figure 2: Germany savory snacks market volume: million units, 2011–15
4.6 United states of America

4.6.1 Consumer demand for local food

Different customers can decide to give greater individual principles to transport than does the market, acknowledging that market costs do not show actual costs to people. Fulfilment might be resulting from the fact that own purchasing choices could assist to keep local plantations or the earth. Customers may decide to also give importance to assisting a local economy and to the improved cleanliness that they can obtain from local foods.

One extent of local food concern is the growth in straight advertising within the United States. Straight advertising contains items cultivated by farmers to customers at roadside farm standpoints, farmers’ markets, CSA, etc., as defined above. Straight advertising is growing: generally, the 2002 Census of Agriculture discovered that overall direct sales developed to $812 million in 2002, an increase of 23% from the 1997 census (after regulating for rise). The quantity of U.S. agriculturalists’ markets upgraded 63% from 1994 to 2000, with a stated 915,774 consumers per week. CSA raised from only two processes in 1986 to over 1,000 in 1999 (Conner, 2009). Although there is customer need in local foods what encourages customers to purchase local?

A 2002 analysis of 1,600 customers in four various areas of the United States that all had buy-local operations discovered it essential to 58% of those questioned that food originates from farms and spreads in their part, and 84% believed it significant that food come from the U.S. (Timmons, 2008). Because direct sales are a significant pointer of local food importance and
endeavor, it is beneficial to grasp how and why direct food sales might change throughout the United States.

4.6.2 Introduction

Across the United States, there is increasing need for local foods, and an equivalent increase in food sales from agriculturists’ markets, farm stands, society supported agriculture. From 1992 to 2002, U.S. coordinate deals improved over half in real (swelling balanced) terms. At the point when such direct deals from agriculturists to customers still characterise just 0.4% of all out U.S. agricultural deals, the occurrence of direct deals changes broadly inside the nation. In many areas, coordinate deals are exceptionally critical: in Massachusetts, for instance, coordinate deals indicate 8.1% of every single agriculture deal, a vital part of the farming economy. (Low, 2011)

Customers buying food directly from agriculturists might be the best pointer of customer enthusiasm for local nourishments overall. Various writers studied potential advantages linked with local food production and utilisation (Dimara et al., 2005; Pearson, 2011), what (Low, 2011) calls another urban agriculture: "a privately based agrarian and nourishment generation framework that is firmly associated with a general public's social and monetary improvement." Features of this municipal agribusiness comprise: 1) cultivate creation focused at local utilisation rather than fare, 2) esteeming farming for supporting rural societies and delivering products, 3) all the more featuring on item quality and less stress for diminishing creation costs, 4) littler, more work escalated cultivating than is regular in merchandise generation, 5) reliance on nearby, site-explicit practices rather than comparative creation models, and 6) coordinate promoting connects among makers and clients (Low, 2011). In this manner a zone's immediate deals may indicate something of the structures of both agriculture and rustic culture.

The quintennial Census of Agriculture initially assessed direct deals in 1978, and again in 1982. The immediate deals addresses were then dismissed from the 1987 statistics, however showed up again in 1992, 1997, and 2002. These USDA coordinate deals information portrays one of only a handful couple of intends to quantify separations and propensities in neighborhood sustenance action all through the United States agriculture (CSA), etc.

4.6.3 Market analysis of snack

The US savoury snacks market recorded relative increase from 2012 to 2016. The advancement of the market is anticipated to accelerate over the forecast time of 2016-2021.
The change to foods seen to be better is moving the US food sector, and this is mainly the situation in snacks. Amid the survey timeframe, customers have been progressively conscious about the kinds of food they eat among a national obesity and diabetes emergency. The basic for food manufactures is to differentiate snacking behaviors to distinguish a brand or find a private label opportunity. Though, increasing disposable revenue amongst millennial customers, included with busy lives, is predicted to lead the interest for savoury snacks items over the estimate time frame.

The US savoury snacks market had an overall profit of $32,073.0m in 2016, indicating a compound yearly increase rate (CAGR) of 3.7% from 2012 to 2016. Interestingly, the European and Asia-Pacific markets developed with CAGRs of 4.8% and 7.9% respectively, amid a similar time, to accomplish specific approximations of $23,022.0m and $29,335.7m in 2016.

Market expenditure size grew with a CAGR of 1.7% somewhere from 2012 and 2016, to achieve a sum of 3,117.5 million kilograms in 2016. The market's volume is projected to increase to 3,439.8 million kilograms before the finish of 2021, indicating a CAGR of 2.0% for the 2016-2021 period.

Prepared snacks sales represented the most noteworthy incentive in the US savoury snack market in 2016, with overall sales of $13,692m, equal to 42.7% of the market's overall esteem. In contrast, sales of potato chips went to an estimation of $7,427.4m in 2016, likening to 23.2% of the overall market esteem.

The performance of the market is estimated to accelerate, with a projected CAGR of 5.2% for the five-year time frame 2016 - 2021, which is foreseen to lead the market to an estimation of $41,409.3m before the finish of 2021. Moderately, the European and Asia-Pacific markets will increment with CAGRs of 5.2% and 7.1% separately, amid a similar period, to accomplish specific approximations of $29,685.0m and $41,367.0m in 2021.

MARKET DATA

Market esteem

The United States savoury snacks market by 4.4% in 2016 to achieve an estimation of $32,073 million. The compound yearly increases rate of the market in the period 2012–16 was 3.7%.

Table 4.3: United States savory snacks market value: $million, 2009-2013 (Profile, 2017)
### Table 4.1: United States savory snacks market value: $ million, 2009–16

<table>
<thead>
<tr>
<th>Year</th>
<th>Rand million</th>
<th>R-$ million</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>176 227,516</td>
<td>16 217,46</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>166 544,9</td>
<td>177 414,727</td>
<td>5.1%</td>
</tr>
<tr>
<td>2011</td>
<td>213 374,806</td>
<td>222 643,358</td>
<td>4.7%</td>
</tr>
<tr>
<td>2012</td>
<td>191 263,567</td>
<td>226 667,745</td>
<td>2.9%</td>
</tr>
<tr>
<td>2013</td>
<td>315 290,85</td>
<td>252 020,33</td>
<td>4.2%</td>
</tr>
</tbody>
</table>

![Figure 4.6: United States savory snacks market value; $ million, 2012–16 (Profile, 2017)](image)

### 4.7. Conclusion

This chapter presented a review on the literature relating to the German and USA’s snack industries. Furthermore, the chapter provided an overview of the global food and global snack industry.
CHAPTER 5. SNACK MANUFACTURING INDUSTRY FROM AFRICAN CASE

5.1 Introduction

This chapter will review the literature regarding two African countries, Ghana and Tanzania. This chapter will start off by providing an overview of the African food and each country. The chapter will also provide each country’s snack industry, as well as the challenges that they face. Lastly, the lessons that can be learnt from these snack industries will be identified.

5.2 Overview of the African food

5.2.1 Definition and scope of food security

Food security emerged as an international matter after the first meeting of food and farming in 1943, which defined food security as a “secure, appropriate and suitable supply of food for everyone” (Gross et al., 2005). Consequently, agricultural surplus from donor countries such as the U.S.A and Canada began to be shipped to overseas countries in the 1940s and 1950s (Gross et al., 2000, Weingärtner, 2005). Following this, the understanding of food aid as a barrier to the development of food self-sufficiency (Obilana, 2003) transformed the idea into improvement for food in the 1960s. From the 1970s, the idea of food assurance to keep a supportable food supply during food crises persisted until the 1980s. This idea was expanded in the 1980s to consolidate demand side factors, due to the realisation that food availability alone did not necessarily guarantee food security (Gross et al., 2000). In the 1990s, a worldwide and national commitment was proposed to cancel or diminish hunger, and recently the debate shifted to food preferences and nutritional security (Moore, 2011; Kirsten, 2012). Devereux & Maxwell, (2001) argue that, until the turn of the millennium, the concept of food security showed three paradigm shifts. The first was the move from the worldwide and national level to household and individual level. The second was the move from a sustenance first point of view to a job viewpoint. What’s more, the latter was the move from target pointer to subjective discernment, which incorporates issues related with food quality and safety (Devereux and Maxwell, 2001; Maxwell, 1996). Through its development and the changing perspectives on it, the meaning of food security has additionally indicated dynamic changes. The first meaning of food security in 1974 fundamentally centred around food accessibility and stability issues: Availability constantly of enough world food supplies of essential foodstuffs to cope a stable development of sustenance usage and to evaluate change underway and costs. Afterwards, a breakthrough in famine and food security analysis was brought into picture in the seminal work of Sen’s entitlement approach (Sen, 1981). The approach taken was unique, as it took into consideration both the supply-and demand-side factors of the food security.
equation. Therefore, it empirically showed demand variables, which are a lack of efficient demand or individuals not being able to lead the market can bring in drastic food insecurity and famine (Sen, 1981). Additionally, the perceived result of the green development, which came in an adequate food supply, did not result in a big regression in malnutrition and poverty, which needed the adjustment of the definition of food security (Cornforth, 2012). Thus, by 1983, the FAO had enlarged the description of food security to include access of available food for vulnerable groups through a consideration of both the supply and demand sides of the food security equation, as follows: making sure that everyone, every time has both physical and financial access to the fundamental food they need (FAO, 1983 cited in Clay, 2002). The description of food security was again revised after the report on poverty and hunger, which said that food security amounted to “access of all people at all times to enough food for an active, healthy life.” (Fowler, 2001).

Furthermore, the description addressed the idea of the temporal dynamics of food insecurity, which include constant and transitory food insecurity circumstances. The former is connected to proceeding or structural poverty, and the latter to periods of strengthened weight coming because of catastrophic events, financial fall or conflict (Fowler, 2001). In the mid-1990s, the meaning of food security extended to incorporate food safety and dietary adjust. Thus, the 1996 World Food Summit reclassified food security to incorporate nutrition, nutrition safety and inclination, as takes after: Food security happens once everyone, consistently, have physical and financial accessibility to appropriate safe and nutritious sustenance that satisfies their nutritional wants and food preferences for a vibrant and strong life (Crush ,2011). Bijman, (2008) explained the definition advance by fusing the social perspective, as “food insecurity is a condition that exists when individuals don't have physical and efficient access to adequate, sheltered, nutritious and socially satisfactory nourishment to meet their dietary needs to lead a dynamic and sound life”. Accordingly, food security is said to be accomplished "if satisfactory sustenance (quality, amount, wellbeing, sociocultural agreeableness) is accessible and available for and attractively used by all people constantly to carry on with a healthy and happy life" (Van der Meer et al.,2011). This meaning of food security incorporates physical and transient determinants. The physical determinants are the accessibility, availability and usage of food, and the transient determinant is called dependability, which incorporates dangers, for example, climatic variances, struggle, work misfortune and plague ailments that may influence any of the three physical components (Berazneva,2013). The three physical determinants of food security have a progressive nature, as accessibility is an essential yet not adequate
condition to guarantee access, while availability is a vital however not adequate condition for successful usage (Anandajayasekeram, 2007).

5.2.2 Overview of African food security status

The overall picture of Africa concerning food and nutritional security remains negative. The countries with a high level of undernourishment and with the lowest level of food security are highly intense in the sub-Saharan Africa region (EIU, 2012). The region is also known by chronic and transitional food insecurity. In accordance to the FAO (2008), chronic food insecurity means a state in which people are suffering from a lack of the minimum food they should get for a healthy life over a prolonged period.

The fundamental background factors incorporate delayed poverty, absence of advantages or lack of capital, for example, lessened access to beneficial or money related assets. Temporary food insecurity is a quick fall in the ability to deliver or get to adequate nourishment to maintain an appropriate nutritious condition (FAO, 2008a). It might come about because of immediate stuns and variations in sustenance accessibility and access, including year-to-year shifts in domestic food production, food costs and household income (FAO, 2008a). Globally, as suggested by the FAO’s gauges, around 12.5% of the overall population is evaluated to be incessantly food insecure in terms of dietary vitality supply (FAO, 2012). Of this, 97.7% or 852 million undernourished individuals live in creating nations and 234 million of these live in the sub-Saharan Africa district (FAO, 2012). The commonness of lack of healthy sustenance likewise fluctuates topographically crosswise over Africa, with the most reduced level, of around 4%, in Northern Africa, and 14% in Western Africa; the largest amount, of 40%, is found in Central Africa (Dube, 2013 and Chakraborty, 2013). As per Wiggins and Keats (2009) pervasiveness of undernourishment has been ascending in Central Africa and partially in North Africa, while it is declining in different parts, and particularly West Africa is destined for success of accomplishing the MDG hunger decrease objective (Sifri, 2002). The current FAO report, then again, uncovered that there has been more stamped advance in the decrease of yearning than it was already trusted (FAO, 2012). It expresses that creating nations could accomplish the MDG focus of decreasing the extent of individuals experiencing perpetual craving significantly in the vicinity of 1990 and 2015 (FAO, 2012). In a similar manner, if the rate of decay proceeds at an indistinguishable pace in the creating district from in recent years, gauges put undernourishment at 12.5% by 2015, which is nearer to the MDG objective of 11.6% from 23.2% of every 1990/92. Conversely, Africa demonstrated a lazy rate of decrease, from 27.3% to 22.9%, amid the period from 1990/92 to 2010/12, with unquestionably the quantity of undernourished individuals expanded from 175 million to 239 million in a similar period (FAO, 2012).
There are three main levels of food security: availability, accessibility and utilisation as used in EIU (2012). Though food availability study ideally is limited to the food supply side of the food security equation, it has vital implication for the comprehension of the whole food security situation of a region. Nevertheless, to get a clearer idea of national food security, a comprehensive analysis of food supply, access and utilisation is crucial. The Economist Intelligence Unit (EIU) utilised such a tool for its international food security index analysis, in which food availability was weighted to be 44%, and affordability and utilisation represented 40% and 16% of the weighted national food security analysis, respectively. Food accessibility can be understood as “the availability of sufficient amounts of food of appropriate quality, supplied through domestic production or imports (including food aid)” (FAO, 2006). It can be expressed through the two concepts of food self-sufficiency and food self-reliance. In accordance to the FAO, 48 out of 63 lower income countries (per capita incomes of US$785 or less) are net food importers (Wheeler and Von Braun, 2013.), which means that trade plays a greater role in food availability in regions such as SSA. Consequently, even though Africa’s per capita agricultural production has been going up for the past years (Vink, 2012; Wiggins & Keats, 2009), the growth in calorific food intake has displayed slow progress; it was only 2 150 kcal/day in 2003 compared to 2 050 kcal/day thirty years ago (Panagariya, 2002). Nonetheless, since the mid-1990s, the per capita availability of food has increased and this intake reached 2 500 kcal/person in 2009, which is a big change (Wiggins & Keats, 2009). In accordance, the performance of agricultural increase is a vital dimension of whole food security in Africa. Researchers have exhibited that agriculture in SSA plays a very crucial role in employment and gross domestic product (GDP) share (Devereux, 1999; FAO 2012a). With that, small-scale farmers account for more than 90% of agricultural production in Africa. Moreover, they represent four-fifths of the developing world’s food production (FAO, 2011 cited in (Sasson, 2012). Yet, the proportion of food insecurity is also higher among poor subsistence farmers and landless tenants in rural areas, who collectively account for about 80% of the undernourished (Wheeler, and Von Braun, 2013). In such manner, an itemised examination of African food security as for the agrarian segment and its measurements was embraced by Vink (2012). The creator broke down the execution of African agribusiness regarding the four mainstays of sustenance security and featured the weight on the accomplishment of little scale cultivating to accomplish nourishment security goals. He contended that as to horticultural profitability, there is a higher prospect to huge scale cultivating depending on cultivating land extension in Africa, since it permits defeating institutional and infrastructural limitations which couldn’t be effectively taken care of by small-scale ranchers (Vink, 2012). As far as nourishment openness (moderateness), the district indicates critical variety from nation to nation. The current worldwide sustenance security list of the EIU positions South Africa, Botswana and Uganda the most noteworthy, though Nigeria, DRC and Chad were positioned
the minimum nourishment reasonable nations in SSA (EIU, 2012). The expression "nourishment reasonableness" implies the interest in sustenance and is influenced by monetary components, physical framework and customer inclinations (Burchi and De Muro, 2012). As indicated by an investigation by Sala-i-Martin and Pinkovskiy (2010), Africa demonstrated a quick decrease in neediness from 1970 to 2006, a circumstance that is delighted in by an essentially bigger number of nations, including mineral rich and asset poor, landlocked and seaside, and even those that have been geologically or verifiably impeded (Vink, 2012). In a similar manner, if this pace of monetary development proceeds, there is the likelihood of accomplishing the MDG of dividing the extent of the populace living on short of what one dollar for every day by 2015 (Sala-i-Martin and Pinkovskiy, 2010).

The third measurement of nourishment security is sustenance usage, which is generally an organic point of view that includes the capacity of the human body to ingest and utilise nourishment (Mwaniki, 2006). Great care and sustaining practices and sustenance arrangement, a various eating regimen and great intra-family conveyance of nourishment influences the individual’s wholesome admission (FAO, 2008a). The sustenance usage measurement of nourishment security is likewise a factor of other non-sustenance parameters, for example, sanitation, access to a perfect water supply and greater wellbeing (Pinstrup-Andersen, 2009). Africa’s advance regarding these non-sustenance dietary markers has likewise demonstrated change in recent decades. Likewise, drinking water scope expanded to 61%, demonstrating a 12% expansion from 1990 to 2010, and sanitation scope expanded to 30%, demonstrating a 4% expansion in a similar period. The fourth measurement of sustenance security is called "steadiness". Dependability alludes to the idea of access to satisfactory nourishment constantly, or not being in danger of losing access to sustenance because of regular nourishment weakness or sudden stuns, for example, financial or climatic emergencies (FAO, 2006a). Along these lines, as indicated by the FAO (2006a), strength incorporates both the accessibility and availability measurements of nourishment security. In such a manner, the parts of security, to be specific, sustenance generation instability and nourishment value unpredictability, are incorporated into the sustenance accessibility and nourishment openness investigation segments of this exploration.

In this regard, a close study of African food security as for the agricultural sector and its measurements was done by Vink (2012). The author broke down the execution of African agribusiness regarding the four pillars of food security and featured the weight on the accomplishment of small-scale farming to accomplish food security goals. He contended that as to agriculture profitability, there is a higher prospect to huge scale cultivating depending on cultivating land extension in Africa, since it permits defeating institutional and infrastructural limitations which couldn't be effectively taken care of by little scale ranchers (Vink, 2012). As far as food accessibility (affordability) is concerned, the district indicates critical variety from
nation to nation. The current international food security list of the EIU positions South Africa, Botswana and Uganda the most noteworthy, though Nigeria, DRC and Chad were ranked the least affordable nations in SSA. The expression "food affordability" implies the demand for food and is influenced by economic components, physical infrastructures and customer preferences (Zbib et al., 2010). The idea of affordability began from Sen’s Stellenbosch University 8 qualification approach and has developed further to survey the main drivers of food insecurity utilising the capability approach (Sala-I-Martin and Pinkovskiy, 2010). Africa’s financial development over the previous decade has been impressive and has turned the consideration of the worldwide media from their typical negative reports to positive photos of the mainland (Vink, 2012). As indicated by an investigation by Sala-I-Martin and Pinkovskiy (2010), Africa demonstrated a quick decrease in poverty from 1970 to 2006, a circumstance that is delighted in by an essentially bigger number of nations, including mineral rich and asset poor, landlocked and seaside, and even those that have been geographically or historically underprivileged (Vink, 2012). If this pace of economic development continues, there is the chance of accomplishing the MDG of dividing the proportion of the population living on less that one dollar for every day by 2015 (Sala-I-Martin and Pinkovskiy, 2010). The third measurement of food security is food usage, which is generally an organic point of view that includes the capacity of the human body to ingest and utilise food (Gross et al., 2000). Great care and feeding practices and food arrangement, a various diet and great intra-household distribution of food influences the individual’s nutrition intake (FAO, 2008a). The food usage measurement of food security is likewise a factor of other non-food parameters, for example, sanitation, access to a perfect water supply and great health (Pinstrup-Andersen, 2009). Africa’s advance regarding this non-food dietary nutrition has likewise demonstrated change in the recent decades. Likewise, drinking water coverage expanded to 61%, demonstrating a 12% expansion from 1990 to 2010, and sanitation coverage expanded to 30%, demonstrating a 4% expansion in a similar period. The fourth measurement of food security is called "steadiness". Dependability alludes to the idea of access to satisfactory nourishment constantly, or not being in danger of losing access to sustenance because of regular nourishment weakness or sudden stuns, for example, financial or climatic emergencies (FAO, 2006). As indicated by the FAO (2006), strength includes both the accessibility and availability measurements of food security. In such manner, the parts of security, to be specific, sustenance generation instability and nourishment value unpredictability, are incorporated into the sustenance accessibility and nourishment openness investigation segments of this exploration

5.3 Overview of the African snack industry
Despite the Middle East and Africa areas representing the bottom of the worldwide savoury sector, having a 2.5% esteem share in 2016, a few tendencies are rapidly shifting customers ways in the region. As South Africa and a few Gulf Cooperation Council (GCC) countries experience rapid industrialisation and urbanisation, customers wind up with more cash and less extra time, which makes them go after bites that suit their latest way of life. There are three fundamental customer tendencies that are leading the savoury snack market in the area.

The market for savoury snacks in the Middle East and Africa area is predicted to increase at a CAGR of 1.8% around 2021, progressively jumping back from a fall from 2011 to 2016. South Africa is number one in the area, with a volume share of 42.3% in 2016, but Saudi Arabia and the United Arab Emirates are undergoing strong increase and projected to attract few of that share by 2021. Potato chips represent the biggest value share at 44.3%, after that the processed snacks with 26.9%, and nuts and seeds at 19.8%. The Middle East and Africa have a large youth market who are changing eating habits and, in the next years, will assist lead demand for savoury snacks.

Tendency 1: Portability and Suitability

“Half of customers do not have a lot of time to cook as they would like…pushing them to look for products that can save precious time for more favourable activities”

The Middle East and Africa are changing to be more Westernised and industrialised, which implies customers have less time to cook and are on-the-go more frequently. Accordingly, profit and comfort are having a bigger impact in purchasing choices. Additionally, developing levels of extra cash, especially in South Africa and GCC countries, and customers are needing to snack more every now and again – between dinners, as a feast substitution, and as somewhat of a recompense following a hectic, occupied day – so they need snack choices that easily enjoyable anywhere and whenever. (Williams,2011)

Tendency: Healthy Snacking

“In the Middle East and Africa regions, savoury snacks with ‘Weight & Shape Management’ benefits were most popular at 89% share of overall health and wellness benefits”

Throughout the Middle East and Africa, customers need more suitability in their snack foods, they are likewise maintaining healthfulness on top of their view. An increasing number of customers are organising more healthier, more adjusted weight control plans. Many consumers search for items with natural flavours and components that are not processed while at the same time trying to diminish or maintain a strategic distance from the intake of sodium, sugar and fat. Specifically, more youthful ages, for example, recent college graduates, are
progressively mindful of how eating routine affects medical problems like stoutness and diabetes. A few governments in the district are additionally doing their part to support good dieting. In 2016, South Africa executed a run limiting the sodium content in prepared nourishments, for example, potato chips to 650mg. At the same, many countries in the Middle East are executing an expense on sugary food and beverages. Subsequently, manufactures are witnessing a developing interest for snacks that are tasty yet low in fat, oil, non-natural components, sugar, as well as calories. (Francis et al., 2003)

Tendency 3: Original and new

“52% of consumers in Africa and the Middle East are willing to try new and novel foods when grocery shopping.”

Customers in the Middle East and Africa are progressively attracted to explore by purchasing new or original snacks foods, particularly items that are reinventions of conventional food, Western snacks, and darker foreign food. This pattern has two main factors: Firstly, the region’s developing wealth is providing customers more flexibility in their shopping decisions, as their discretionary cashflow empowers them to purchase unique and new items. Secondly, the area’s substantial youth populace will probably try different things with new flavours, which is forcing snack manufactures to produce new and creative snacks choices. (Francis et al., 2003)

Looking ahead

Studies by Oliveira (2018) show that the region’s share of the dairy/soy food and bakery/cereals sectors will raise through 2021, when its savoury snacks share stays stable. The changes in economics of numerous countries inside the Middle East and Africa exhibit a few open doors for snack producers. As these customers develop progressively healthier, with more extra cash and less leisure time, they are searching for products that make snacking guilt-free and simple. However, they need to feel like they are giving themselves to something unique and extraordinary. The test and opening – for makers will recognise the correct items for satisfying these various and quick developing requests.

5.4 Ghana

5.4.1 Overview of Ghana’s economy

5.4.1.1 The political background of Ghana’s economic development
The initial part clarifies the principal political components accountable for the nation’s fail from independence until the beginning of basic economic changes in 1983. The following part explains what activities were made in the monetary change plan to switch Ghana’s financial fall.

5.4.1.2 The political economy of Ghana until 1983

Ghana’s present monetary structure is essentially ruled by the actions and structures that were set up with the start of colonialism in the nineteenth century and the structures have been fortified all through independence to date. (Amidu, 2006)

5.4.1.3 Specialisation on cocoa during colonial rule

West Africa was annexed to be a settler’s colony and the British administered their West African colonies indirectly, by shaping tight connections with the neighbourhood leaders. The West African states were a magnificent area to deliver profitable yields such as a cocoa, espresso, cotton, and elastic, in return for made things from Europe. The Gold Coast turned into the main maker for cocoa and gold, and by 1911, the nation was the earth’s biggest cocoa exporter, creating around 40% of the aggregate World supply in the vicinity of 1920 and 1940. The cocoa manufacture itself stayed completely in African possessions, is still today ruled by smallholder agriculture. In any case, cocoa exchange was solidly managed by European exchanging homes and the provincial government. Due to enhanced transport and correspondence, organisations such as Cadbury’s could build up their own offices, dislodging most African trading companies. These trading oligopolies likewise had one import and circulation privileges for some British products and drove little beginners far from the market by ruinous value cutting. (Hymer, 1970)

The British run gave a moderately stable lawful and political structure and prompted a wonderful increase in agricultural output and interests in framework and training. When the British started the formation of infrastructures to carry the money harvests to the drift, they kept the improvement of native businesses to maintain the states as an ensured showcase for their own produced sends out. In a few enterprises, exchanging licenses must be obtained from the administration, making most sorts of business unlawful for Africans. By prohibiting or permitting the import of hardware, and with trade bans on things, for example, privately woven fabric, the administration intentionally braced down all real industrialisation endeavours. Ghanaians had constrained entry to funding because of the trouble of having a guarantee to protect bank credit, as the greater part of the territory was yet to be claimed mutually. Accordingly, African business people and merchants were limited to conventional exercises in
which the European organisations had no business benefits. This was generally an inward exchange of foodstuffs among the timberland and Savannah regions of West Africa, or small-scale business wanders at the base of the European exchanging progression. At the point when the British left the Gold Coast, the province was centred around the mining and the creation of money yields. Whilst the Africans had strong exchanging knowledge, there was no mechanical foundation, and constrained entrepreneurial familiarities to oversee expansive modern partnerships. (Amanor, 1994)

5.4.1.4 The basis for decline: Nkrumah’s industrialization program

As Nkwameh Nkrumah assumed control as the first leader of Ghana, he decided that evolution and growth in Ghana will come from huge investment in the automation of farming and manufacture expansion. His monetary aim was to expand Ghana’s economic base by mechanisation, in that way decreasing the country’s contact to World products costs variations.

Mechanisation was to be accomplished with two tools: a protectionist exchange framework, and state-owned companies. Ghana’s entrepreneurial class was seen too little to replace a driving part in a huge automation effort, and a solid domestic entrepreneurial class was perceived as a political risk. In accordance with Nkrumah’s communist foundation, it was the government that needed to accept accountability for the choice of suitable segments and the management of the state-owned companies. The principle source of profits for this huge automation system was the export incomes from farming products, principally cocoa. (Amanor, 1994)

From 1939, colonial legislatives promoting sheets managed the export of cocoa and other cash yields. Initially, the aim of these produce-buying sheets was to remove the connection among varying World costs and local costs. The Cocoa Marketing Board (CMB) would purchase the items from the manufacturer at a set cost and offer them at the World cost. Based on the course of progress, it may either cause damage or result in extra yield. The extra yield would be saved as an adjustment to fund shortage of different periods. Still, the legislative control sheets had already, in colonial days, made a great amount of imposed and collectivised investments, and performed nearly never to plan. The marketing sheets played the role of monopolies, giving set costs to African agriculturists far beneath World market export costs. The collected cash was either put in British government safeties – resulting in big expenses of capital to fund the British wars or were utilised for funds in infrastructure building. The CMB was a focal tool to move assets from the rural people to the urban ones. To encourage mechanised growth, the government was ready to give up the benefits of the agriculturists,
since its political being was based mainly on the contentment of urban employees, and as just small opposition was predicted from the rural people.

The price of arranged opposition is considerably superior for the rural people compared to the urban people. Their connection to their territory retraining their chances to take part in national politics and being divided there was no efficient way to defend what was theirs. Consequently, farmers utilised the market as a less pricey option, and moved production to different items.

**5.4.2 The structure of Ghana’s economy**

**5.4.2.1 Ghana’s macroeconomic development after the ERP**

Ghana’s reform system was executed in three stages: In the initial stage from 1983 to 1986, the main point was on setting costs right, and on diminishing the government’s financial plan shortage by augmenting profits. From 1987 to 1990, labourers were focused on the opening of operational variations, for instance, the liberalisation of the exchange rate and the trade, the beginning of the State-owned Enterprises (SOE) divestiture method, and civil service reforms. Last stage, after 1990, the government began to pay attention at the more demanding structural and official reforms.

The execution of these strategies brought a significant shift from 1983 to 1991. Inflation decreased, the total balance of payment position even out, and GDP increase improved from negative amount to close to 5.5 percent p.a., and the real GDP per capita increased by 4.2 percent p.a. After 1991, Ghana’s macroeconomic performance experienced an evident recession. In 1992, for its election campaign, the government gave big raises in incomes and advantages for public sector workers. This financial surprise facilitated inflation and resulted in a growth in government debt. (Amanor, 1994)

**5.4.3. Food production in Ghana**

Farming, specifically cocoa, represent the foundation of Ghana’s economy, accounted for 36% of GDP in 2001. Cocoa exports in 2001 added 16% ($246.7 million) to total exports. Close 23% of the overall area, or 5,300,000 ha (13,096,000 acres), was farmed in 1998. Close to 85% of holders of agricultural land are small scale workers who mainly cultivate with hand equipment.

Cereal crops, fruits production, oil harvests, and tuber yields have been cultivating in Ghana by regular yearly increase rate of 1.5%, 1.35%, 0.13%, and 1.10% individually. Tuber and root production faced two sharp drops in Ghana. The first happened in beginning 1970’s, and the
second in beginning 1980’s. Luckily, yields have improved and kept a rising trend to an all-time high. Fruits yields began to develop in the end 1980’s, however the actual development happened towards the end of 2000’s as Ghana severely spent in fruit export with pineapple leading. Oil crop yields have faced two sharp drops. The first happened in the beginning of 1970’s and the second more recently in the early 2000’s. Amid those times, the economy encountered various changes with a high increase during the 1990’s. If it were not for the sharp drop in yields of 1983, cereal yields in Ghana would have had an ideal continuous upward development. However, Ghana rapidly regained from the drop and stayed up with the increase rate.

![Ghana crop yields](image)

**Figure 5.1 Ghana crop yields (Quaye, 2008)**

Tuber yield increase is generally related to the perfected cassava diversity brought by the International Institute of Tropical Agriculture (IITA) that is more resilient to dry situations, although, oil crop yield has been reducing as said below. This is partially because of the aging palm oil trees as palm oil is the main oil crop with an average yield of 6 ton/ha. The decrease in cereal production is mainly credited to the main deficiency Ghana faced in 1983.

### 5. 5 Tanzania

#### 5.5.1 Importance of the Agro-Processing Sector

The sector remains on being the acknowledgment that agro-industrial growth, even at the little and cottage sector levels, is very vital to the advancement and change of the farming industry. Agro-industrial growth would have an important impact to the change of farming and, by growth, rural and national growth. Strong agro-industrial actions can enlarge the businesses for basic farming items, contribute through vertical integration of main manufacture and food
processing methods and reduce post-harvest damages. Additionally, these behaviours could decrease seasonality of expenditure of a variety of processed foods, boost the feasibility, benefit and sustainability of production techniques by their effect on rising farm revenues, rural employment and foreign exchange wages, at the same time decreasing marketing risks (Sautier, 2006).

Agro-industry gives capital and services to agriculturists (e.g. seeds and tools, teaching, manufacture and market data) encourages entrepreneurship, increases request for farming items and links agriculturists with businesses by the management, processing, marketing and delivery of farming items. Subsequently, output and quality of farming production revenues, financial constancy for rural homes, food security and invention through the value chain can be improved. Effective agro-industry can then spur agricultural development and, complemented by a robust connection with smallholders, decrease rural poverty. (Mutalemwa, 2009).

Nonetheless, with a couple of exemptions, the agro-industrial industry stays elementary, infantile and mostly without important official, technological and monetary aid. Hence being conscious of the tricks and challenges to agro-industrial growth, it might then be helpful to re-assess few of the issues and limitations which have continuous to plague this industry. (Sautier, 2006)

### 5.5.2 Food Processing

Food processing be post-harvest actions that contribute to farming items before marketing (Wilkinson, 2009). Additionally, to the principal processing of food components, it contains final food production on the one hand and the preparation and wrapping of new items, particularly agriculture and fish (Wilkinson, 2009). Food items are categorised into main and value-added items depending on the contribution (Fellows, 2009). Main processed items contain cleaning, grading, sorting and packaging. The goods manufactured usually play as inputs for value-added products. Value added items include usage of processing methods such as blending, high temperature heating and boiling, chilling etc, where the utilisation of technology is crucial (Fellows, 2009):

<table>
<thead>
<tr>
<th>Main Processed Products</th>
<th>Value Added Products</th>
</tr>
</thead>
</table>

Table 5.1 Food processing in Tanzania (Amdt, 2012)
5.5.3 Food Processing in Tanzania

Tanzania’s economy is mostly based on farming. Main food harvest contains maize, rice, pulses, cassava, sorghum, millet, sweet potatoes and bananas (Diao, 2010). A broad range of fruit, both tropical and temperate, and vegetables are also manufactured. Fruit produced are pineapples, papayas, mangoes, oranges, passion fruit, avocados, guavas, peaches, plums, pears, apples and strawberries. The diversity of vegetables produced have potatoes, tomatoes, peas, cabbages, carrots, peppers, onions and mushrooms.

A large portion of the food harvest, fruit and vegetables cited before are eaten in their raw state without being processed because of the absence of efficient processing and protection innovations and insufficient post-harvest storing leading to high food crop waste (Rutere, 2009). These crop deficits are primarily post-harvest losses happening on farms and in transportation. These serious deficits are suggestive of lack of decent transportation and proper food-processing and storage capacities. As indicated by Tiisekwa et al, (2005) the food-processing sector in Tanzania is in its early stages, even by the requirements of the developing countries. Yet the sector hires from 12 to 31.5 per cent of the work force, both rural and urban.
Most food-processing companies are found in urban places specifically in Dar es Salaam, where more than 50 per cent of them are found and in different big cities like Arusha city. (Diao, 2010). As stated by Tiisekwa et al. (2005), out of the variety of processed food products in the food-processing sector, the leading commodity-based groupings of processed food products are water (13.33%), fruit (11.11%), baking (11.11%), and milling (9.9). The rest of the groups have a share of between 1% and 9% in the industry contain fresh vegetables, vegetable oils, brewing, wine, fish and sea food. Other groups are salt, milk, meat, tea, coffee and distilleries. (Tiisekwa, 2005)

In terms of the levels of interest in the food-processing sector, it is usually low. For instance, the level of interest in dairy processing goes from USD 60,000 to 2 million just with a production ability going from 4,500 to 120,000 litres per day (Ruteri, 2009). Regardless of the prominent small production ability, it is not completely used.

5.5.4 Constraints Faced by Food Processing SMEs

Limitations experienced by small-scale and micro food processors are poor quality of equipment; low processing skills; little exposure; restricted market because lack of custom of eating processed fruit and vegetable products, and inadequate packaging materials (Arndt, 2012). As per Tiisekwa et al., (2005) limitations experienced by the food processing sector in Tanzania include: unpredictable and insufficient supplies; absence of quality raw materials; lack of solid choices by customers; absence of capital and undynamic market. Other limitations are: high production costs and taxes; poor transport infrastructure; absence of cold chains; lack of power and portable water, as well as high tariffs for power and water. (Tiisekwa, 2005)

5.5.5 Food production in Tanzania

Tanzania’s farming is controlled by smallholder agriculturists (peasants) cultivating a regular farm size of between 0.9 hectares and 3.0 hectares each. Close to 70 per cent of Tanzania’s crop land is farmed by hand hoe, 20 per cent by ox plough, and 10 per cent by tractor. It is rain fed agriculture. Food crop production controls the agriculture economy. 5.1 million hectares are cultivated yearly, of which 85 per cent is under food crops. Women represent the major portion of agricultural workforce. The main restriction encountering the agriculture industry is the decreasing work and land productivity because of the use of poor technology, reliance on inaccurate and random weather states. Both crops and livestock are badly influenced by periodical deficiencies. Irrigation holds the key to stabilising agricultural
production in Tanzania to increase food security, improve farmers productivity and revenues, and to make better valued crops like vegetables and even flowers. (Rowhani et al., 2011)

In Tanzania, cereal and fruit outputs have been cultivated at a minor yearly increase rate of 0.67% and 0.88% individually. Nonetheless, oil crops and tuber outputs have increased by a bad increase rate of 0.35% and 0.39%, individually. Cereal production had been facing a continuous rising until a main drop happened in the beginning of 2000’s. Fruit outputs suddenly grew in the beginning of 2000’s as the Tanzanian agriculture sector developed. Not like the majority of SSA countries, tuber/roots yields have been decreasing from the mid-1980. This descending pattern seems to reveal the end of the impacts of a good shock that initiated a quite fast increase of tuber/root yields in the late 1970’s as present yields have achieved the all-time low levels of that period. Finally, oil crop yields did not encounter any sharp change as it has been diminishing at a smooth rate. (Rowhani, et al., 2011)

Figure 5.2 Tanzania crop yields (Rowhani, et al., 2011)

The large part of oil crop is from sunflowers seed which are mostly made in the Kilimanjaro region. Nevertheless, during the last years, the Kilimanjaro region has been facing late rain onsets which thus impacted sunflower outputs. Tubers and roots have also been diminishing from the beginning of 1980’s because of climate. Luckily, interventions from the IITA enabled Tanzania to begin a production improvement process. (Chauvin, 2012)

5.6. South Africa

The part reviews the literature that is focused within the South African snack industry, as well as an overview of the South African’s economy. And lastly, this chapter will study the lessons that can be learnt from the South African snack industry.
5.6.1. South African’s economy

South Africa has a well-built and independent fresh produce and processing industry, where potatoes are the absolute main essential vegetable good in South Africa with an overall output of 1,853,000 tons in 2008 (Anon., n.d.). The approximated gross value for the 2008 potato crop was R2 billion (Statistics SA, 2008). The potato industry has functioned in open market states for quite a while. Therefore, the deregulation system of agricultural marketing during the 1990’s did not have a significant effect on potato marketing, rather than to grain products boards which deregulated totally. The South African potato crop is sold as seed potatoes, table potatoes and potatoes earmarked for processing (Ronquest-Ross, 2015). There is an estimation of 1700 independent potato manufacturers in South Africa, of which 400 include seed growers. It is additionally expected that close to half this number of manufactures comprises developing small-scale farmers. The South African potato processing industry has considerably increased during the past decade. Currently, the processing industry utilises 380 000 tons of new potatoes of which 320 000 tons are coming from manufacturers and the rest obtained from the fresh produce markets. (Ronquest-Ross, 2015)

The expansion in the potato manufacturing sector could be attributed to numerous features like the extension of the fast food industry in South Africa, better average revenue of the South African people, expanding number of state-of-the-art processing capacities, and the fast rate of urbanisation which raises demand for processed foods. Comprehension and learning of the performance of the potato processing sector is therefore turning out to be crucial since its importance is growing regarding the potato sector and the fresh produce industry.

The goals of the tactics are to concentrate on local marketing, advertising and foreign market development. Sustainable development is done by the rise in per capita consumption, which eventually exceeds to profit of the whole increase of the industry. (Guenthner, 2001) Assessing the main leaders inside the industry is efficiently done by expressing an inside and outside environmental study on the South African Potato Value Chain. This study is known as the SWOT study, and perceptions identified will be strengthened into an understanding investigation to reinforce competitiveness and effectiveness dynamics. Apart from considering the vegetable sector by institutional view, it will be examined utilising the Structure-Conduct-Performance (SCP) paradigm. This way was initially utilised by Bain (1951) to account for inter-industry changes in profits. The fundamental principle of the SPC is that structure (number of agriculturalists and agents, number and composition of vegetable markets, quality and quantity of infrastructure support) impacts conduct (production and marketing performances counting costs), and lastly, conduct impacts performance (costs,
quantities and revenues). This technique gives a better reference framework for research, since it allows a direct measure of market proficiency.

5.6.3. South African snack manufacturing industry

The South African snack market includes three clear best groups that overtake the rest when it comes to quantities made. They are: Naks, Potato chips and puffs. Naks usually have a 40% addition share of the market, while potatoes chips taking a fifth of the total quantities, and puffs between 10% to 15%.

The rest of the market is equally divided and includes the likes of peanuts, popcorn, pretzels and corn chips. The patterns underlined are restricted to the best three snacks groups. Naks are the are the best performers. Naks, or hard extrudes, keep on being the biggest group in the whole snack market as far as the volume is concerned. Naks overtook potato chips and puffs in 2009, with an 11.4% increase for that year. The group got a higher increase rate compared to the rest of the snack groups during same time. This is meaningful because customer expense was at its lowest in 2009 due to the serious recession.

Group increase for Naks can be credited to:
- Decent costs approach, therefore giving customers constantly good value-for-money
- Continual growth in production ability by main actors in the market
- A broad range target market specifically compared to alternative snack groups

Positive outlook for potato chips

While potato chips do not dominate as a big a share of the market as Naks, the group provides a bigger average yearly increase rate (7.2%). This emphasises that potato chips have seen more prominent increase than Naks, and should the circumstance stay like that, might take over the Naks in share conditions, making them a profitable option for producers.

Potato chips significantly increased in 2007 and 2008 yet did not fall well during 2009. Problems with opposing crude material supply damaged possible market increase for the year when this converted into a constrained 0.4% volume growth for the initial year. The group is supposed to improve with 8.3% increase in 2010. It is projected that volumes will be reinforced by main potato chips manufacturers to lead enlarged quantities in the market.

Negative future for puffs

The puffs market has been on the rising increase pattern for the past 10 years, with an increase rate of 4.2 since 2002. Still, quantity increase was projected to slow down in 2010 with expected decrease of 5.9% for the year.

It is assumed that the market might have touched saturation and hence a natural levelling off increase is presumed. Additionally, puffs might suffer in terms of quantity because manufacturers concentrate on alternative, more profitable options. Soft extrudes keep on
being a wholesale-driven item, with wholesale occupying a 51.8% volume share in 2009. The retail store accomplished second place with a 40.3% volume share; this channel encountered the biggest increase of 16.1 since 2008.

The impulse market kept its bottom position with 7.8 volume share.

5.7 Conclusion

This chapter has reviewed the food industry and SMEs of three African countries, Ghana, Tanzania and South Africa. The chapter also outlines the problems and challenges they face.
CHAPTER 6. RESEARCH METHODOLOGY

6.1 Introduction

This chapter of the study clarifies the research methodology used in doing this research, in accordance to the problem statement, to be meet the research goals of the study. Additionally, the chapter defines the geographical area where the research was done, as well as the research design and population sample. Lastly, the instrument utilised in collecting the data, including approaches applied to keep legitimacy and reliability of the instrument are explained in this chapter.

6.2 Research approach and strategy

A quantitative approach was adopted for this study, using a survey as the measurement instrument. Johnson, (2000) describes quantitative research as the numerical demonstration and analysis of inspections with the intent of defining and clarifying the phenomena that those inspections indicate. It is applied in a broad range of natural and social sciences, such as physics, biology, psychology, sociology and geology.

The research method had the aim to identifying the causes behind lean implementation failure, measuring the impact of implementing Lean Manufacturing, carrying out a review and criticising the literature to generate a classification of views on lean and snack foods manufacturing industry basics, as well as understanding the tools, techniques and elements that are the most appropriate for the implementation of lean manufacture in the South African snack manufacturing sector.

The primary data were acquired by a questionnaire survey; these were the main data used for the analysis in this study. This method of primary data collection was selected due to the following reasons: (1) it gives a precise record of the descriptions, for instance behaviour, views, skills, convictions and knowledge of a specific person, condition or group; (2) a large portion of the samples population on the selected site can be covered in a relatively short period; and (3) this approach uses a standardised research design according to a fixed procedure and can be replicated.

6.3 Research area

The research was done in the Gauteng Province of South Africa specifically in Johannesburg because it is home to various snack companies. The study was not extended throughout Gauteng as it will not be feasible due to time constraints and financial consideration.
6.4 Targeted population

A ‘population’ consists of all the people to be investigated. The targeted population is the group or the people to whom the survey applies. Likewise, Kitchenham, (2000) defined a target population as those groups or people who are in a place to respond to the questions and to whom the results of the survey apply. The target population for this research comprised professionals in the South African snack industry.

6.5 Sampling

Kothari, 2004 describes sampling like the action, process, or mean of selecting an adequate sample, or an illustrative portion of a population for the intent to determining parameters or features of the entire population. Two standard types of the sampling techniques exist and these are probability sampling, also referred to as random sampling, and non-probability sampling, also known as non-random sampling. Ritchie et al. (2013) further explain that a sample is a little portion of a population chosen for inspection and investigation. This study therefore utilised a random sampling approach, since it is the purest form of probability sampling and every participant of the ‘population’ has an even possibility of being chosen.

6.6 Sample size

The sample selected comprised professionals in the snack industry, such junior management, senior management etc. that are working or have been involved in the snack foods manufacturing industry in Gauteng, South Africa.

From of the 125 questionnaires distributed, 98 were collected fully answered back which indicates 78% of the overall return rate; these formed the basis of this study. According to Krejcie et al. (1970) results of a questionnaire can be deemed as biased or meaningless if the return rate is lower than 30% to 40%. Consequently, based on this notion, the return rate for this study was considered adequate for analysis.

6.7 Data collection

According to Sapsford et al. (2006), data collection is considered as a fundamental part in collecting all needed data from the basic sources in realizing the major goals of the research. The data for this study was gathered via primary and secondary sources. The primary data gathered for the study were acquired through the administration of structured questionnaires, which is commonly used for formal quantitative research, according to McDaniel and Gates (2012). The questionnaire was made based on data originating from reviewed literature. Data
collection was by self-administered questionnaires, which were delivered by hand and by e-mail in the research environment, the Gauteng Province. Secondary source data were derived from a literature search, including books, specialised international journals, publications, the Internet and literature from similar fields.

### 6.8 Instruments of data collection

A questionnaire was selected as a mean of data collection in this research. A questionnaire is a research instrument containing a set of questions and other prompts with the aim of collecting data from participants. This type of instrument (questionnaire) was selected for the following motives: (a) a questionnaire is the major way of gathering quantitative primary data; (b) a questionnaire allows quantitative data to be gathered in a standardised way so that the data is more objective; (c) a questionnaire guarantees regulations and comparability of the data among respondents, improves speed and exactness of recording, and helps data processing; (d) questionnaires give the option of anonymity, since the participants do not have to put in their names or contact details; (e) questionnaires require less time and energy to administer; (f) questionnaires provide results which can be condensed to statistics; (g) they give participants time to think about their answers prudently without interference from, for instance, an interviewer; and (h) questionnaires can focus on a considerable number of matters and questions of concern in a quite effective manner way, with the possibility of a high response rate. (Kielhofner, 2006)

The questionnaire had five sections, namely A, B, C, D and E. Section A was on demographic data such as sex, age, level of education, etc.; Section B aimed to identifying the causes behind lean implementation failure in the snack industry. In section C, the aim was measuring the impact of implementing Lean Manufacturing. Section D carrying out a review and criticising the literature to generate a classification of views on lean and snack foods manufacturing industry components, and lastly, Section E understanding the tools, techniques and components that are the most appropriate for the implementation of lean in the South African snack manufacturing sector

On section B, C, D, and E, the respondents had to rate the importance of each criterion on a scale of 1-5, with 1 (strongly agree), 2 (agree), 3 (neutral), 4 (disagree) and 5 (strongly disagree). Instructions and directions were attached to the questionnaires to show the participants on how to respond the questionnaires.

### 6.9 Ethical consideration
Ethical considerations in the field of research are important, not only to protect the researcher, but also to ensure the integrity of the researcher (Gajjar, 2013). Ethical standards in research entails that prospective research participants be fully informed of the nature, procedures, risk and benefits involved in a research study and that their participation in the research not be coerced or forced. (Gajjar, 2013)

In this research, agreement from participants was acquired before starting the completion of the questionnaires. The participants were told about their rights to voluntarily agreement or decline to take part, and to pull back participation whenever they feel, with no consequences. Participants were told of the aim of the research, the processes that would be followed to gather the data and guaranteed that there were no possible dangers or charges included in participating in this research.

Anonymity and privacy were kept through the research. In this research anonymity was guaranteed by not revealing the participant’s personal information on the questionnaire and research reports and detaching the printed agreement from the questionnaire. When research participants are assured privacy meaning the data they give will not be openly reported in a manner that discloses their personality (Mack, 2005). In this research privacy was kept by maintaining the gathered information private and not disclosing the participants' identities when reporting or publishing the study. No recognition information was needed on the questionnaires, and questionnaires were only numbered after the information had been gathered.

Finally, a letter of authorisation to complete this research was taken from the University of Johannesburg, Department of Quality and Operations Management and was attached to the sent-out questionnaires.

6.10 Reliability

To test the reliability, the filled questionnaires were sent to an expert statistician to verify the reliability of the items to guarantee a high-quality measure. A questionnaire must measure something numerous times and still result in the same outcome to be reliable (Larsson, 2015). A questionnaire is considered reliable when the similar result will be achieved after being used repetitively on the identical study with the identical sample (Santos, 1999). Reliability can be associated to the stability, consistency, or dependability of a measuring tool. (Gajjar, 2013)

Cronbach’s alpha was utilised for reliability measurement. According to Bonett et al., (2015) the purpose of Cronbach’s alpha is to find out how well the item in a set positively
correlates to one another. The Cronbach’s coefficient alphas were determined for each section B, C, D and E of the questionnaire.

6.11 Conclusion

In this chapter, the research methodology adopted was explained regarding the population, the sample size, data collection instruments, data analysis methods, limitations of the study and approaches made to guarantee ethical standards and explain why questionnaires were adopted for use. The following chapter of this study gives the data analysis and discussion of the data.
CHAPTER 7. DATA ANALYSIS AND INTERPRETATION

7.1 Introduction

This chapter gives the results of data from the structured questionnaires, that were administered to people working in different snack organisations within Johannesburg. The analysis of the data and interpretation of the results were obtained from the questionnaire study and served as the basis of this quantitative data collection. The questionnaire comprises 5 section of questions which were all answered. The analysis was based on 98 fully completed questionnaires out of the one hundred and twenty five (125) that were administered, representing an seventy-height percent (78%) response rate.

7.2 Section A: Biographical data analysis

The first section provides background information of the participants with respect to their demographics, namely gender, age group, employment status and years of experience.

7.2.1 Distribution of Sample According to Gender

The distribution of the sample according to gender reveals that 53.8 % of the participants are male, while females accounted for 31.6 %. This is presented in the Figure 8.1

![Figure 7.1: Respondents’ demographic per gender](image)

7.2.2 Distribution of Sample According to Age Group

The distribution of the sample according to age group is presented in Figure 8.2. This shows that 22.4 % of the respondents were under 25 years old age group, 49 percent of the
respondents were in the 26-34 years old age group, 20.4 % were in the 35-44 years old age group, 7.4% were in the 45-54 years old age group, 1 % of the respondents were above the 55 years old age group.

![Figure 7.2 : Respondents demographic per age group](image)

7.2.3 Distribution of Sample According to employment status

The distribution of the sample according to the respondents’ employment status in the snack industry is shown in Fig 8.3. This reveals that 41.8 % are non-management employees, 30.6 % junior management, 20.4 % Middle management and 7.2 % senior management.

![Figure 7.3: Respondents demographic per employment status](image)

7.2.4 Distribution of Sample According to number of years serving in the current position
The distribution of the sample according to the respondents’ number of years serving in the current position is shown in Figure 8.4. This reveals that close to half of the participants have worked for less than 5 years. Followed by people who worked for 6 to 10 years.

Figure 7.4: Respondents demographic per work experience

### 7.3 Section B: Lean practices

This section presents the results of section B of the questionnaire which determines the causes behind lean implementation failure in the South African snack industry. The mean item score (MIS) of the questions and standard deviation of the results are presented. The descriptive results reveal the ranking of all the factors from the highest to the lowest, with the table also showing the individual mean and standard deviation of the factors. As well as the results of the reliability analysis. The results of the MIS of the questions and skewness of the data are presented and discussed below.

#### 7.3.1 Results from descriptive analysis

The results reveal the respondents’ ranking on lean practices. It shows that ‘supply chain management’ was ranked first with a mean score of 4.11 and standard deviation (SD) of 0.929; ‘poka yoke/error proofing’ was ranked second with a mean score of 4.06 and SD of 0.906; ‘agile manufacturing’ was ranked third with a mean score of 4.02 and SD of 0.919; ‘cycle time reduction’ was ranked fourth with a mean score of 4.00 and SD of 0.908; and ‘scrap reduction’ was ranked fifth with a mean score of 3.96 and SD of 0.994. Furthermore, ‘zero defects’ was ranked sixth with a mean score of 3.95 and SD of 1.019; ‘cellular manufacturing’ was ranked seventh with a mean score of 3.89 and SD of 0.994; ‘preventive maintenance’ was ranked eighth with a mean score of 3.78 and SD of 1.041; ‘JIT/continuous flow production’ was ranked...
ninth with a mean score of 3.70 and SD of 0.965; and lastly ‘single piece flow production/on piece flow’ was ranked tenth with a mean score of 3.61 and SD of 0.948.

Table 7.1: Lean practices to determine the causes behind Lean implementation failure

<table>
<thead>
<tr>
<th>Lean practices</th>
<th>X</th>
<th>σX</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply chain management</td>
<td>4.11</td>
<td>0.929</td>
<td>1</td>
</tr>
<tr>
<td>Poka yoke/error proofing</td>
<td>4.06</td>
<td>0.906</td>
<td>2</td>
</tr>
<tr>
<td>Agile manufacturing</td>
<td>4.02</td>
<td>0.919</td>
<td>3</td>
</tr>
<tr>
<td>Cycle time reduction</td>
<td>4.00</td>
<td>0.908</td>
<td>4</td>
</tr>
<tr>
<td>Scrap reduction</td>
<td>3.96</td>
<td>0.994</td>
<td>5</td>
</tr>
<tr>
<td>Zero defects</td>
<td>3.95</td>
<td>1.019</td>
<td>6</td>
</tr>
<tr>
<td>Cellular manufacturing</td>
<td>3.89</td>
<td>0.994</td>
<td>7</td>
</tr>
<tr>
<td>Preventive maintenance</td>
<td>3.78</td>
<td>1.041</td>
<td>8</td>
</tr>
<tr>
<td>JIT/continuous flow production</td>
<td>3.70</td>
<td>0.965</td>
<td>9</td>
</tr>
<tr>
<td>Single piece flow production/on piece flow</td>
<td>3.61</td>
<td>0.948</td>
<td>10</td>
</tr>
</tbody>
</table>

X= mean time score; σX= standard deviation; R= Rank

7.3.2 Results from reliability analysis

The closer the reliability coefficient gets to the value of 1.0, the better the reliability of the measure (Sekaran, 2007; Humaidi & Said, 2011). This section of the questionnaire was therefore suitable for the purpose of this study, as a value of more than 0.7 is considered as excellent.

Table 7.5 Reliability table for lean practices

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Cronbach’s Alpha based on standardized items</th>
<th>Mean</th>
<th>Variance</th>
<th>Standard deviation</th>
<th>N of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.72</td>
<td>.746</td>
<td>39.08</td>
<td>27.973</td>
<td>5.289</td>
<td>10</td>
</tr>
</tbody>
</table>

From the table above, we can see that for the factor related to lean practices had a value 0.72 which is acceptable.
7.4 Section C: Tools and techniques

This section presents the results of section C of the questionnaire which determines what are the tools and techniques that can be employed in the South African snack industry. The mean item score (MIS) of the questions and standard deviation of the results are presented. The descriptive results reveal the ranking of all the factors from the highest to the lowest, with the table also showing the individual mean and standard deviation of the factors.

7.4.1 Descriptive analysis

The results reveal the respondents’ ranking on challenges implementing lean tools and techniques. It shows that ‘in some area employees slip back to the old method’ was ranked first with a mean score of 4.02 and standard deviation (SD) of 0.799; ranked second was ‘implemented but cannot continue due to high employee turnover’ with a SD of 1.182 and ‘employees are interested but not empowered’ with a SD of 0.906, both with a mean score of 3.72; ‘implemented but cannot continue due to high employee turnover’ was ranked third with a mean score of 3.70 and SD of 1.186; and ‘employees are not ready to change to new practices’ was ranked fourth with a mean value of 3.69 and SD of 1.040. Additionally, ‘the investment requirement is high for implementation’ and ‘no proper training is provided to employees’ were ranked fifth with a mean score of 3.67 and SD of 1.040 and 1.033; ‘There is no interest shown from employees’ was ranked sixth with a mean score of 3.49 and SD of 1.246; ‘Did not know where to start’ was ranked seventh with a mean score of 3.48 and SD of 0.944; ‘management is not interested in implementing lean techniques’ was ranked eighth with a mean score of 3.42 and SD of 0.965; and lastly ‘company is not fully aware of lean tools and techniques’ was ranked ninth with a mean score of 3.40 and SD of 1.314.

Table 7.6.challenges in implementing lean tools and techniques

<table>
<thead>
<tr>
<th>Challenges in implementing the tools and techniques</th>
<th>X</th>
<th>σX</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>In some area employees slip back to the old method</td>
<td>4.02</td>
<td>0.799</td>
<td>1</td>
</tr>
<tr>
<td>Implemented but cannot continue due to high employee turnover</td>
<td>3.72</td>
<td>1.182</td>
<td>2</td>
</tr>
<tr>
<td>Employees are interested but not empowered</td>
<td>3.72</td>
<td>0.906</td>
<td>2</td>
</tr>
<tr>
<td>Lack of management commitment and leadership</td>
<td>3.70</td>
<td>1.186</td>
<td>3</td>
</tr>
<tr>
<td>Employees are not ready to change to new practices</td>
<td>3.69</td>
<td>1.040</td>
<td>4</td>
</tr>
<tr>
<td>The investment requirement is high for implementation</td>
<td>3.67</td>
<td>1.110</td>
<td>5</td>
</tr>
</tbody>
</table>
No proper training is provided to employees & 3.67 & 1.033 & 5 \\ There is no interest shown from employees & 3.49 & 1.246 & 6 \\ Did not know where to start & 3.48 & 0.944 & 7 \\ Management is not interested in implementing lean techniques & 3.42 & 1.139 & 8 \\ Company is not fully aware of lean tools and techniques & 3.40 & 1.314 & 9 \\ 

X= mean time score; σX= standard deviation; R= Rank

### 7.4.2 Results from reliability analysis

The closer the reliability coefficient gets to the value of 1.0, the better the reliability of the measure (Sekaran, 2007; Humaidi & Said, 2011). This section of the questionnaire was therefore suitable for the purpose of this study, as a value of more than 0.7 is considered as excellent.

Table 7.7 Results of reliability for tools and techniques

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha based on standardized items</th>
<th>Mean</th>
<th>Variance</th>
<th>Standard deviation</th>
<th>N of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.815</td>
<td>0.815</td>
<td>32.85</td>
<td>39.739</td>
<td>6.304</td>
<td>10</td>
</tr>
</tbody>
</table>

From the table above, we can see that for the factor related to the challenges in implementing the tools and techniques had a value 0.815 which is excellent.

### 7.5 Section D. Possibilities and limitations

This section presents the results of section D of the questionnaire which determines the possibilities and limitations of using lean in the South African snack industry. The mean item score (MIS) of the questions, skewness as well as the reliability of the results, are presented. The descriptive results reveal the ranking of all the factors from the highest to the lowest with the table also showing the individual mean and standard deviation of the factors. As well as the reliability analysis results.

#### 7.5.1 Descriptive analysis
The results reveal the respondents’ ranking on the possibilities of lean manufacturing. It shows that ‘the percentage of rework and scrap reduction through the introduction of lean’ was ranked first with a mean score of 4.10 and standard deviation (SD) of 0.936; ranked second was ‘the work in progress was reduced by the introduction of lean’ with a mean of 4.05 and SD of 0.878; ‘you have increased your machine availability through the introduction of lean’ was ranked third with a SD of 0.895 and ‘you have increased your inventory turnover through the introduction of lean’ with a SD of 0.918 were both ranked third with a mean score of 3.89; ‘you have reduced your set-up times through the introduction of lean’ was ranked fourth with a mean of 3.74 and SD of 0.865; followed by ‘you have increased the proportion of common items in your products as a results of lean’ was ranked fifth with a mean value of 3.63 and SD 0.804 and lastly ‘there is enough qualified staff to implement lean production’ with a mean value of 3.43 and SD 1.212.

Table 7.8 Possibilities of lean manufacturing

<table>
<thead>
<tr>
<th>Possibilities</th>
<th>X</th>
<th>σX</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>The percentage of rework and scrap reduction through the introduction of lean</td>
<td>4.10</td>
<td>0.936</td>
<td>1</td>
</tr>
<tr>
<td>The work in progress was reduced by the introduction of lean</td>
<td>4.05</td>
<td>0.878</td>
<td>2</td>
</tr>
<tr>
<td>You have increased your machine availability through the introduction of lean</td>
<td>3.89</td>
<td>0.895</td>
<td>3</td>
</tr>
<tr>
<td>You have increased your inventory turnover through the introduction of lean</td>
<td>3.89</td>
<td>0.918</td>
<td>3</td>
</tr>
<tr>
<td>You have reduced your set-up times through the introduction of lean</td>
<td>3.74</td>
<td>0.865</td>
<td>4</td>
</tr>
<tr>
<td>You have increased the proportion of common items in your products as a results of lean</td>
<td>3.63</td>
<td>0.804</td>
<td>5</td>
</tr>
<tr>
<td>There is enough qualified staff to implement lean production</td>
<td>3.43</td>
<td>1.212</td>
<td>6</td>
</tr>
</tbody>
</table>

X = mean time score; σX = standard deviation; R = Rank

Table 7.8 reveals the respondents’ ranking on the limitations of lean manufacturing. It shows that ‘technological challenges’ was ranked first with a mean score of 4.31 and standard deviation (SD) of 0.765; ‘cooperation with suppliers to establish a lean supply chain’ was ranked second with a mean value of 4.20 and SD of 0.786; ‘coping with change’ was ranked...
third with a mean value of 4.14 and SD of 0.942; ‘cultural and social barriers to change’ was ranked fourth with a mean value of 4.12 and SD of 0.777 and lastly ‘commitment from top management’ was ranked fifth with a mean value of 4.06 and SD of 0.784.

Table 7.9 Limitations

<table>
<thead>
<tr>
<th>Limitations</th>
<th>X</th>
<th>σX</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological challenges</td>
<td>4.31</td>
<td>0.765</td>
<td>1</td>
</tr>
<tr>
<td>Cooperation with suppliers to establish a lean supply chain</td>
<td>4.20</td>
<td>0.786</td>
<td>2</td>
</tr>
<tr>
<td>Coping with change</td>
<td>4.14</td>
<td>0.942</td>
<td>3</td>
</tr>
<tr>
<td>Cultural and social barriers to change</td>
<td>4.12</td>
<td>0.777</td>
<td>4</td>
</tr>
<tr>
<td>Commitment from top management</td>
<td>4.06</td>
<td>0.784</td>
<td>5</td>
</tr>
</tbody>
</table>

X = mean time score; σX = standard deviation; R = Rank

7.5.2 Reliability analysis

The closer the reliability coefficient gets to the value of 1.0, the better the reliability of the measure (Sekaran, 2007; Humaidi & Said, 2011). This section of the questionnaire was therefore suitable for the purpose of study as a value of more than 0.7 is considered as excellent.

Table 7.10 Reliability results for possibilities and limitations

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Cronbach’s Alpha based on standardized items</th>
<th>N of items</th>
<th>Mean</th>
<th>Variance</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>.811</td>
<td>.819</td>
<td>7</td>
<td>26.73</td>
<td>20.197</td>
<td>4.494</td>
</tr>
<tr>
<td>.712</td>
<td>.717</td>
<td>5</td>
<td>20.84</td>
<td>7.684</td>
<td>2.772</td>
</tr>
</tbody>
</table>

From the table above, we can see that for the factor related to possibilities and limitations of lean had a value 0.811 and 0.712 which is excellent.

7.6 Section E: Lean benefits
This section presents the results of section D of the questionnaire which determines How is Lean manufacturing able to transform work processes in the South African snack sector. The mean item score (MIS) of the questions, skewness, as well as the reliability of the results are presented. The descriptive results reveal the ranking of all the factors from the highest to the lowest with the table also showing the individual mean and standard deviation of the factors. And the results of the reliability analysis are also presented.

7.6.1 Descriptive analysis

The results reveal the respondents’ ranking on lean benefits. It shows that ‘decrease in waste/scrap and rework’ was ranked first with a mean score of 4.30 and standard deviation (SD) of 0.776; ranked second was ‘increase in productivity’ with a mean value of 4.21 and SD of 0.803; ‘decrease manufacturing cost/unit cost of manufacturing’ was ranked third with a mean score of 4.17 and SD of 0.718; and ‘increase in sales per employee’ was ranked fourth with a mean score of 4.15 and SD of 0.842. In addition, ‘decrease in delivery speed/delivery lead time’ was ranked fifth with a mean score of 4.12 and SD of 0.865; ‘increase in annual sales revenue’ was ranked sixth with a mean score of 4.10 and SD of 0.845; ‘decrease in total cost of production’ was ranked seventh with a mean score of 4.09 and SD of 0.838; ‘increase in turnover’ was ranked eighth with a mean score of 4.02 and SD of 0.812; ‘decrease in changeover time/setup time’ was ranked ninth with a mean score of 3.84 and SD of 0.992 and finally ‘increase in market share’ was ranked tenth with a mean value of 3.78 and SD of 0.969.

Table 7.11 Lean benefits

<table>
<thead>
<tr>
<th>Lean benefit</th>
<th>X</th>
<th>σX</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease in waste/scrap and rework</td>
<td>4.30</td>
<td>0.776</td>
<td>1</td>
</tr>
<tr>
<td>Increase in productivity</td>
<td>4.21</td>
<td>0.803</td>
<td>2</td>
</tr>
<tr>
<td>Decrease manufacturing cost/unit cost of manufacturing</td>
<td>4.17</td>
<td>0.718</td>
<td>3</td>
</tr>
<tr>
<td>Increase in sales per employee</td>
<td>4.15</td>
<td>0.842</td>
<td>4</td>
</tr>
<tr>
<td>Decrease in delivery speed/delivery lead time</td>
<td>4.12</td>
<td>0.865</td>
<td>5</td>
</tr>
<tr>
<td>Increase in annual sales revenue</td>
<td>4.10</td>
<td>0.845</td>
<td>6</td>
</tr>
<tr>
<td>Decrease in total cost of production</td>
<td>4.09</td>
<td>0.838</td>
<td>7</td>
</tr>
<tr>
<td>Increase in turnover</td>
<td>4.02</td>
<td>0.812</td>
<td>8</td>
</tr>
<tr>
<td>Decrease in changeover time/setup time</td>
<td>3.84</td>
<td>0.992</td>
<td>9</td>
</tr>
<tr>
<td>Increase in market share</td>
<td>3.78</td>
<td>0.969</td>
<td>10</td>
</tr>
</tbody>
</table>

X= mean time score; σX= standard deviation; R= Rank
7.6.2 Reliability analysis

The closer the reliability coefficient gets to the value of 1.0, the better the reliability of the measure (Sekaran, 2007; Humaidi & Said, 2011). This section of the questionnaire was therefore suitable for the purpose of study as a value of more than 0.7 is considered as excellent.

Table 7.12 Reliability of lean benefits

<table>
<thead>
<tr>
<th>Cronbach's Alpha based on standardized items</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>N of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.610</td>
<td>16.05</td>
<td>2.374</td>
<td>4</td>
</tr>
</tbody>
</table>

From the table above, we can see that the benefits of lean had a value 0.610 which is acceptable.

7.7 Values of Cronbach’s Alpha

Table 7.12 Values of Cronbach’s Alpha.

<table>
<thead>
<tr>
<th>Section</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section B</td>
<td>.742</td>
</tr>
<tr>
<td>Section C</td>
<td>.815</td>
</tr>
<tr>
<td>Section D</td>
<td>.712</td>
</tr>
<tr>
<td>Section E</td>
<td>.610</td>
</tr>
</tbody>
</table>

Cronbach’s alpha coefficients of all the variables in the questionnaire ranged between 0.610 and 0.811, which indicated that the internal reliability of the individual was fine. The questionnaire was therefore suitable for the purpose of study, as a value of more than 0.7 is considered as excellent. The closer the reliability coefficient gets to the value of 1.0, the better the reliability of the measure (Weir, 2005).

7.7 Conclusion

This chapter analysed the data obtained from the structured questionnaire, which was distributed amongst professionals who work in different snack companies in the Gauteng Province. The analysed information was further displayed using tables and graphs for easy
interpretation of the data. The following chapter will provide a discussion of the data analysis in relation to the research questions and research objectives, as mentioned in the first chapter.
CHAPTER 8. CONCLUSION AND RECOMMENDATIONS

8.1 Introduction

This chapter presents and discusses the conclusions and recommendations of the research study in relation to the research objectives. A general research conclusion is also presented, based on the conclusions drawn from each of the research objectives.

8.2 Conclusions

Below are the research objectives and an explanation on how these objectives were met in order to achieve the aims of the research study:

1. To determine to what extent lean manufacturing has been approached from a holistic perspective in the snack manufacturing industry.
2. To measure the impact of implementing lean manufacturing in the South African snack sector.
3. To identify the causes behind lean implementation failure in the South African snack industry.
4. To carry out a review and criticize the literature to generate a classification of views on lean and snack industry elements. This will provide background to the research and highlight the gaps within the literature.
5. To understanding the tools, techniques and components that are the most appropriate for the implementation of lean in the South African snack manufacturing sector.

8.2.1 Conclusion for Research Objective 1

- To determine to what extent lean manufacturing has been approached from a holistic perspective in the snack manufacturing industry

In order to achieve this objective, this study critically reviewed a set of studies that were conducted over the last two decades. An analysis of 30 studies from the period of 1997 to 2017 was performed from a number of countries on lean manufacturing from various industries. The results showed that there are very few studies of lean in the snack industry than in other sectors, particularly in the South Africa. Hence it can be inferred that this research objective of the study was met.

8.2.2 Conclusion for research objective 3
In order to achieve this research objective lean practices were taken into consideration. The results of the descriptive analysis from the questionnaire survey reveal the respondents’ ranking on lean practices implementation in their organisations. It shows that ‘supply chain management’ was the first practice that is mostly implemented, with a mean value of 4.11. The second practice that was most implemented is ‘poka yoke/error proofing’. And ‘agile manufacturing’ was ranked third. Those were the top 3 lean practices. Thus, the third research objective was met.

8.2.3 Conclusion for research objective 2

- Identifying the causes behind Lean implementation failure in the South African snack industry.

In order to answer this research objective the challenges in implementing lean tools and techniques were taken into consideration. Wong et al. (2009) stated that, one of the main problem in lean implementation is the tendency to go back to the old to practices when complications or challenges were faced. The results from the questionnaires the showed that the most critical challenge that is preventing the adoption and implementation of lean as an advantage competitive tool in snack industry is due to the fact that most of employees preferred to use old methods with a mean value of 4.02 and a standard deviation of 0.799. One possible explanation to this, is because of the fear to change since they are used to conduct tasks or handling processes the same way for many years. The second most critical challenge, the experts state that lean can be implemented but cannot continue due to high employee turnover with a mean value of about 3.72. The third challenge according to the survey is the fact that ‘employees are not ready to change to new practices’. Those were the top 3 challenges in implementing lean tools and techniques. Hence the research objective was achieved both from the literature and the structured questionnaire.

8.2.4 Conclusion for research objective 4

- Carrying out a review and criticize the literature to generate a classification of views on lean and snack industry elements

In order to answer this research objective the possibilities and limitations of lean were taken into consideration. From the literature, a list of possibilities and limitations of the
implementation of lean manufacturing was established. The results reveal the respondents’ ranking on the possibilities of lean manufacturing. According to the survey, the first possibility of lean is that ‘the percentage of rework and scrap reduction through the introduction of lean’. The second possibility is that ‘the work in progress can be reduced by the introduction of lean’. Thirdly, ‘you have increased your machine availability through the introduction of lean’. Those were the top three possibilities of lean implementation.

The results reveal the respondents’ ranking on the limitations of lean manufacturing. The results states that the most important limitations of lean manufacturing is ‘technological challenges’, with a mean value of 4.31. The second most critical limitation of lean is ‘cooperation with suppliers to establish a lean supply chain’. The third limitation is ‘coping with change’. Those were the top three limitations when implementing lean manufacturing.

8.2.5 Conclusion for research objective 5

- Understanding the tools, techniques and components that are the most appropriate for the implementation of Lean in the South African snack manufacturing sector

In order to achieve this goal lean benefits were taken into consideration. Findings from the literature revealed various benefits of implementing such as increase in productivity, decrease in market cost etc. The results reveal the respondents’ ranking on benefits of lean. It shows that ‘decrease in waste /scrap and rework’ was ranked as the first benefit of implementing with a mean value of 4.30. The second main benefit of lean implementation according to the questionnaire ranked second was ‘increase in productivity’. And the third most critical benefit of lean based on the survey is ‘decrease manufacturing cost/unit cost of manufacturing’ was ranked third. Hence the last research objective was meet.

8.3 General conclusion

Lean manufacturing is among the most efficient productivity improvement techniques of our time. Companies who have adopted lean are seeing the results that comes with it. Many industries struggle with productivity, accordingly , the implementation of lean goes on meagre speed. The goal of this research was to investigate the adoption and implementation of lean manufacturing in the South African snack industry to improve their competitiveness. The results suggest that they are few reasons why it is not fully implemented in that sector. The main challenges linked with the implementation of lean manufacturing in the South African sector were found as lack of staff with knowledge , lack of management support, not familiar with the tools and lack of resources.
8.4 Recommendations

- The government and the firms that supports the Manufacturing industries, principally SMEs, should create policies and awareness plans to help them.
- The companies should plan to have productivity improvement tools, to make sure they have sufficient resources (staffs, financial) whenever they want to implement them. This will ensure that resources are set aside for lean implementation.
- To avoid the problem of non-familiarity of the tool, workers must have training in numerous productivity techniques prior to invest in training for lean elements.
- To ensure gradual learning, organizations should consider starting with the implementation of basic lean tools before moving to more advance tools. This will allow them to see immediate benefits of lean and will motivate them to further investment in lean.

8.5 Recommendations for further studies

Further research can be conducted into achieving a larger research area and number of respondents. This can give a deeper comprehension of how lean manufacturing is seen by snack professionals in order to optimise their competitiveness.
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Dear sir/ Madam

The Faculty of Engineering and Built environment of University of Johannesburg is conducting a research on lean manufacturing as a tool for competitive advantage in the South African snack industry. To this end, we kindly request you to spare few minutes of your time to complete the following questionnaire. Your honest and sincere responses are highly appreciated and will stay confidential.

The survey consist of 5 sections and should not take you longer than 20 minutes to complete. Please read carefully and indicate the extent to which you agree with the statement by ticking the number which best represent your view. The information will remain strictly anonymous and confidential.

I thank you in advance for your cooperation in this matter. Should you require more information please feel free to contact us magalybolipombo02@gmail.com or +27792477699

Thank you in expectance of your response

Yours sincerely

University of Johannesburg
APPENDIX 2: Questionnaire

Section A. Background
This section asks for background and demographic information. Where response options are provided please choose the response option which applies to you. Where a written response is required

1. Age group:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 25 years</td>
<td>1</td>
</tr>
<tr>
<td>Between 25 and 34 years</td>
<td>2</td>
</tr>
<tr>
<td>Between 35 and 44 years</td>
<td>3</td>
</tr>
<tr>
<td>Between 45 and 55 years</td>
<td>4</td>
</tr>
<tr>
<td>Above 55 years</td>
<td>5</td>
</tr>
</tbody>
</table>

2. Gender:

<table>
<thead>
<tr>
<th>Gender</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>2</td>
</tr>
</tbody>
</table>

3. Employment status:

<table>
<thead>
<tr>
<th>Employment Status</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-management</td>
<td>1</td>
</tr>
<tr>
<td>Junior management</td>
<td>2</td>
</tr>
<tr>
<td>Middle management</td>
<td>3</td>
</tr>
<tr>
<td>Senior management</td>
<td>4</td>
</tr>
</tbody>
</table>

4. Number of years serving in the current position?

<table>
<thead>
<tr>
<th>Years Serving</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 5 years</td>
<td>1</td>
</tr>
<tr>
<td>6 to 10 years</td>
<td>2</td>
</tr>
<tr>
<td>11 to 15 years</td>
<td>3</td>
</tr>
<tr>
<td>16 to 20 years</td>
<td>4</td>
</tr>
<tr>
<td>21 years or more</td>
<td>5</td>
</tr>
</tbody>
</table>
# Section B: LEAN PRACTICES

Please rate the following lean practices related to *process and equipment, manufacturing planning and human resources* in context to lean implementation in your organization on a five point Likert scale i.e. 1- Strongly agree, 2- Agree, 3- Not sure, 4- Disagree, 5- Strongly Agree

<table>
<thead>
<tr>
<th>Lean practices</th>
<th>Strongly Agree</th>
<th>Disagree</th>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP1 Preventive maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LP2 JIT/continuous flow production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LP3 Cycle time reduction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LP4 Cellular manufacturing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LP5 Single piece flow production/ one piece flow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LP6 Zero defects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LP7 Poka yoke/error proofing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LP8 Scarp reduction</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>LP9 Agile manufacturing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LP10 Supply chain management</td>
<td></td>
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</tr>
</tbody>
</table>

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Section C. TOOLS AND TECHNIQUES

1. I have received training on the following lean tools

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 5S</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Kaban</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1.3 Kaizen</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1.4 Continuous improvement</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1.5 Autonomous maintenance</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1.6 Preventive maintenance</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1.7 Other, please specify</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

2. I believe the implementation of lean tools in my organization could add value to the organization

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>1</td>
</tr>
<tr>
<td>Disagree</td>
<td>2</td>
</tr>
<tr>
<td>Not sure</td>
<td>3</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
</tr>
</tbody>
</table>

3. The following tools of lean principles have been implemented in your organization:

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 5S</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3.2 Kaban</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3.3 Kaizen</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3.4 Continuous improvement</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3.5 Autonomous maintenance</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3.6 Preventive maintenance</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3.7 Other, please specify</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

What are the reasons for not implementing Lean or the obstacles faced by the company while implementing Lean techniques?
| TT1          | Company is not fully aware of lean tools and techniques | 1 | 2 | 3 | 4 | 5 |
| TT2          | Management is not interest in implementing lean techniques | 1 | 2 | 3 | 4 | 5 |
| TT3          | No proper training is provided to employees | 1 | 2 | 3 | 4 | 5 |
| TT4          | Implemented but cannot continue due to high employee turnover | 1 | 2 | 3 | 4 | 5 |
| TT5          | There is not interest shown from employees | 1 | 2 | 3 | 4 | 5 |
| TT6          | Lack of management commitment and leadership | 1 | 2 | 3 | 4 | 5 |
| TT7          | Employees are interested but not empowered | 1 | 2 | 3 | 4 | 5 |
| TT8          | Employees are not ready to change to new practices | 1 | 2 | 3 | 4 | 5 |
| TT9          | In some areas, employees slip back to the old method | 1 | 2 | 3 | 4 | 5 |
| TT10         | The investment requirement is high for implementation | 1 | 2 | 3 | 4 | 5 |
| TT11         | Did not know where to start | 1 | 2 | 3 | 4 | 5 |
| TT12         | Others (Please specify) |
Section D. POSSIBILITIES AND LIMITATIONS

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

<table>
<thead>
<tr>
<th>Reason</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Management not trained enough</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Employees not trained enough</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1.3 Lack of leadership</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1.4 Lack of communication within the company</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1.5 Timeframe for transformation not appropriate</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

2. Thorough training and support decreases the implementation challenges?

<table>
<thead>
<tr>
<th>Level</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>1</td>
</tr>
<tr>
<td>Disagree</td>
<td>2</td>
</tr>
<tr>
<td>Not sure</td>
<td>3</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
</tr>
</tbody>
</table>

3. In your view the most important aspect to successfully implement lean is:

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>1</td>
</tr>
<tr>
<td>Communication</td>
<td>2</td>
</tr>
<tr>
<td>Management commitment</td>
<td>3</td>
</tr>
<tr>
<td>Union-management relationship</td>
<td>4</td>
</tr>
</tbody>
</table>

To what extend do you agree with the following statement

<table>
<thead>
<tr>
<th>Possibilities</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 There is enough qualified staff to implement lean production</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>P2 You have increase the proportion of common items in your products as a results of Lean</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>P3 You have reduced your set-up times through the introduction of lean</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>You have increase your inventory turnover by the introduction of lean</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>P4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>You have increase your machine availability through the introduction of lean</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P5</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>The percentage of rework and scrap reduction through the introduction of lean</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>The work in progress was reduced the introduction of lean</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P7</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Limitations</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>Coping with change</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>L2</td>
<td>Commitment from top management</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>L3</td>
<td>Cooperation with suppliers to establish a lean supply chain</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>L4</td>
<td>Cultural and social barriers to change</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>L5</td>
<td>Technological Challenges</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
**Section E: LEAN BENEFIT**

Please rate the following lean benefits related to *business/finance performance* in context to lean implementation in your organization on a five point Likert scale i.e.

1- Strongly agree, 2- Agree, 3- Not sure , 4-Disagree, 5-Strongly

<table>
<thead>
<tr>
<th>Performance parameter</th>
<th>Strongly agree</th>
<th>Disagree</th>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB1 Increase in productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LB2 Decrease manufacturing cost/unit cost of manufacturing</td>
<td></td>
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<td></td>
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<tr>
<td>LB3 Increase in market share</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>LB4 Increase in turnover</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>LB5 Increase in annual sales revenue</td>
<td></td>
<td></td>
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<tr>
<td>LB6 Increase in sales per employee</td>
<td></td>
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<td></td>
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<tr>
<td>LB7 Decrease in total cost of production</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LB8 Decrease in delivery speed / delivery lead time</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>LB9 Decrease in changeover time/ setup time</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>LB10 Decrease in waste/scrap and rework</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thank you