CONTINUOUS IMPROVEMENT PRACTICES AND PRODUCT QUALITY PERFORMANCE AT TATA CHEMICALS MAGADI LIMITED

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OCTOBER, 2016

DECLARATION

I hereby declare that this project is my own work and effort and it has not been presented in any other university anywhere for an academic award.

Signed…… Date……

Soita Justus Juma

D61/71327/2014

This research project has been submitted for examination with my approval as the Candidate's University supervisor.

Signed…… Date……

Supervisor Name

Zipporah Kiruthu

DEDICATION

Dedicated to my wife Beatrice and Sons Gift Soita and Fred Soita. Thank you for believing in me and always inspiring me to continue pursuing my dream in the world of academia,

ACKNOWLEDGEMENTS

I am grateful to the following organizations for their contribution to the success of this research: University of Nairobi School of Business and Tata Chemicals Magadi Limited. This case study research was carried out at Tata Chemicals Magadi for both primary and secondary data collection. I am particularly indebted to Mr. Sammy Chepkwony, Director of Human Resources and Mr. Ken Muiruri , Manager Business Systems both from Tata Chemicals Magadi who granted me the permission for this study to be carried out.

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I would like to thank god for giving me the gift of life the power to think and carry on with the project and my family who were patient enough to allow me complete this project.

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LIST OF ABBREVIATIONS AND ACRONYMS

ABB - Asea Brown Boveri

CIP - Continuous Improvement Practices

EI - Employee Involvement

EMS - Effective Management System

FDA - Food and Drugs Administration standards

GE - General Electric

ISO - International Organisation for Standardization

JIT - Just-In-Time

KAM - Kenya Association of Manufacturers

LSS - Lean Six Sigma

SCM - Supply Chain Management

SMEs - Small and Medium Enterprises

TBEM - Tata Business Excellence Model

TPM - Total Productive Maintenance

TPS - Toyota Production System

TQC - Total Quality Control

TQM - Total Quality Management

TICAD - Tokyo International Conference on Africa Development

ANOVA- Analysis of Variance

NPQP- Nissan Product Quality Policy

KNBS - Kenya National Bureau of Statistics

QMS- Quality Management System

ANSAC - American Natural Soda Ash Corporation

ABSTRACT

Continuous improvement practices (CIPs) is a combination of processes that make up a system aimed at achieving improvement in performance. In the manufacturing sector, this system generally include simplifying production process through elimination of waste. Acquiring and utilisation of technical knowledge for process analysis and problem solving are fundamental to continuous improvement practices in the manufacturing sector. The basic principle of continuous improvement practices is the application of multi-problem- solving approaches for establishing and addressing job-based problems. The main aim is for continuous improvement to rise to new benchmarks with every problem that has been solved. The purpose of this research was aimed at establishing the relationship between continuous improvement practices and product quality performance at Tata Chemicals Magadi Limited and the extent to which Tata Chemicals Magadi Limited has implemented continuous improvement practices. The current study applied a longitudinal case study. A self-administered questionnaire was the key data collection instrument. The data collected was analysed by descriptive statistics with the help of probit model. The study established that to achieve product quality performance, Tata Chemicals Magadi must embrace continuous improvement practices which include; Lean Manufacturing, TQM, TPM, ISO, Six Sigma and Lean Six Sigma. The study further established that the company's top management strive to drive and provide actual support to continuous improvement practices aimed to achieve product quality performance by continually improving effectiveness on CIP and is dedicated to the improvement and implementation of continuous improvement practices. The study concludes that For Tata Chemicals Magadi Ltd to achieve product quality performance and remain competitive and profitable, the company should embrace continuous improvement practices. For the firm to maintain these strategies, it is important to embrace the following aspects; top management commitment, constancy of purpose, team work, process orientation, support of customer focus, management reviews, qualified human resource base , infrastructure, inventory reduction and improving production flow and finally, Innovation research and development as well as sufficient strategies like; Lean Manufacturing, TQM, TPM, ISO, Six Sigma and Lean Six Sigma implemented to minimise effects and therefore upgrade product quality performance. This research recommends that considering the hefty resources organisations incur on production, much concentration and focus must be on lean production to help manufacturing companies achieve optimal costs and such companies need to create separate sections dealing with lean continuous improvement functions to enable easy control and monitoring of costs. Tata Chemicals Magadi is advised to increase her resource commitment to staff training so as to develop intellect and skills on continuous improvement practices and as a result professionalism should be encouraged at all levels of the organisation and which should not be restricted to the management only. To achieve product quality performance there must be a strong attention to plant efficiencies and improvement of overall equipment effectiveness .

CHAPTER ONE

INTRODUCTION

1.1.Background of the study

Dynamisms in the business environment have changed management approach towards strategic positioning and performance aimed at quality production and customer satisfaction. Companies are no longer competing on production processes but instead the capability to continue improving the procedures or processes (Teec, 2007). Continuous improvement according to Teec is the strategic effort to innovate or find out new methods of undertaking production or work by constantly making process improvements. Organizations are operating in an era of unpredictable and dynamic technological changes coupled with global competition. For instance Nanda (2013) noted that, on the economical part, Japan is benefiting from high quality production and low cost in many areas. Nanda (2013) argues that Japanese culture had a bad image of poor quality production before World War II. However Daft (2014) observed that the Japanese firms are benefiting particularly from innovative management ideas and more specifically Continuous improvement practices that originated from the U.S.

Goetsch, Lindberg and Berge (2013) in their study pointed out that to ensure that Nissan continually delivers top-quality vehicles, the company developed a global standard called the Nissan Product Quality Policy (NPQP) and that Nissan strictly adheres to the NPQP at all levels of her product development and manufacturing process (Nissan website). The NPQP also strengthens cooperation with her suppliers and enhances all activities. Daft (2014) also argues that with the current steadily growing and ever changing competition, demand quality products is one of the most critical survival elements for most organizations.

Chris and Aguayo (2012) observed that, Kenyan energy sector for instance endeavors to improve their performance through operational efficiency that has led them to adapt Quality Management Practices enshrined in ISO Quality Management Principles that provide guidelines and rules that govern action in organizations. Companies are under tremendous pressure to control their costs and improve their services and products to satisfy the needs of the customers. Quality is indeed vital in determining the economic competitiveness of an organization in the ever expanding global environment, through extraordinary levels of performance by providing quality products with competitive prices as required by demanding customers. The introduction of the Kaizen concept in the African continent has been a center stage on the just ended sixth Tokyo international conference on African development (TICAD) in Nairobi that was held for the first time in Africa (TICAD,2016). According to Adamu (2016) Ethiopia has applied Kaizen not only in the industrial sector and export industry but also in the education system which has even seen the introduction of the Ethiopian Kaizen Institute (EKI).

Goetsch, (2013) indicate that continuous improvement practices occur at various distinct positions in a firm: the top leadership level, departmental level as well as personal level. In the top leadership level, challenges of CIPs concern the firm's strategic position. Goetsch noted that At the Group level, continuous improvement practices includes dealing or addressing problems on a wider scope. Additionally, at personal level, continuous improvement practices are concerned with improvement of low- level day-to-day activities. For an organization to achieve maximum benefits from continuous improvement practices, top management must implement CIPs at all levels mentioned earlier. Goetsch, (2013) concluded that Continuous improvement practices can be employed on various environments in the organization. Top

management should evaluate process choice, product design, and degree of standardization involved in the organization and can then decide the appropriate approach to apply on the implementation of improvement practices.

1.1.1 Continuous Improvement Practices (CIPs)

According to Niven (2012), CIP is a culture which involves a mix of improvement initiatives that leads to success and reduces failure. Additionally, Niven observed that CIPs must address not only improvement results but most fundamentally improving capabilities to achieve better results in the future. Critical areas on capability improvement to be focused on are; demand generation, supply generation, technology, operations and people capability.

However, according to Porter (2014), continuous improvement practices can be referred to as a system of a maintained improvement aimed at the elimination of waste across all processes or systems in a company whereby everyone in the organization is involved in making the improvements without necessarily making hefty investments. According to Cole and Kelly (2014) there are quite a number of continuous improvement practices which have been adopted by organizations including; TQM, Kaizen, Lean Manufacturing, TPM, quality management Systems, Six Sigma and Lean Six Sigma (LSS) among others.

Hashmi (2014) described Total quality management as a form of management whereby top management and junior staff are part and parcel of the continuous improvement process of the production of goods and services. While Hashmi noted that TQM is an integrated quality production and management model basically aimed at increasing business and minimising costs as a result of wasteful practices, TQM has been implemented by companies such as; Ford Motor Company, Philips

semiconductor, SGL Carbon, Motorola and Toyota Company. Porter (2014) defines Lean Manufacturing practice as a systematic process aimed at eliminating waste or non-value adding activities within the process. Lean is a terminology popular with the Toyota automaker. It is a management philosophy derived from the Toyota auto company and it is also known as Toyota Production System (TPS).

Kaizen which is the Japanese word for continuous improvement is derived from two words-Kai-meaning change and Zen-means better and implies that improvement comes from doing 100 things 1% better instead of doing one or two things 100% better. Kim (2010) asserts that the principles of kaizen include such aspects as resourcefulness and building a quality into people.

Total production maintenance(TPM) is an approach of continuously improving and maintaining the standards of production and quality processes through the equipment, machines, processes and human power (manpower) that add value to the organization (Hammer 2015; Sower & Fair 2015). The key focus of TPM is to maximize productivity of a company's plant and equipment with a modest investment in maintenance. Hammer (2015) identifies Quality Management Systems as one of the continuous improvement practices which is closely related to TQM and TPM while Hammer (2015) asserts that the common Quality Management System (QMS) is ISO9000.

Pradeep (2008) explains that ISO is an international federation of national standards bodies from 120 countries. However, Sower and Fair (2015) asserts that Six Sigma (SS) is a continuous improvement practice that includes a number of techniques or tools for product or process improvement first introduced by the cell phone maker; Motorola through Bill Smith in 1986 but quickly adopted by Jack Welch in 1995 at

the General Electric company in the United States and even today it is embraced by various companies all over the world. The main concern of Six Sigma is elimination of process variation and the ultimate improvement of the quality of the process output.

Lean Six Sigma (LSS) is a hybrid of two continuous improvement practices, that is, Lean Manufacturing and Six Sigma that is aimed at reaping the benefits of both Lean Manufacturing which includes elimination of non-value adding activities or waste from the process and Six Sigma which is concerned with the elimination of process variation (Hammer 2015).

Arora (2010) contends that the purpose of CIPs may be conveyed through vision and mission statements as for example, Tata Chemicals Magadi limited (TCML) company mission states, "Serving Society through Science". Tata Chemicals Magadi limited vision states "to be a sustainable company with deep customer insights and engaging relationships with all stakeholders in industrial chemicals, branded agricultural & consumer products, aiming to triple market capitalization by 2020". The major identity of vision statements is a focus on excellence and to stand out as the best within a specific field focusing on customer satisfaction. According to Ishikawa (2013) experience have shown that every organization in Kenya and the rest of the world makes its own choice as to what continuous improvement practices to implement based on several factors such as cost, availability of such practices as offered by certain consulting organizations and whether related organizations which are regarded as best in industry have adopted such practices.

1.1.2 Product Quality Performance

Wanjugu (2012) defines a customer as the community or the target that benefits from what a company is offering in terms of products and services. Wanjugu notes that,

anything that a company does should be focused to customer satisfaction. Muinde (2010) observed that quality has to be a concern from the beginning and must be related to everything a firm does while Careful planning, monitoring, evaluation and adjustments are vital in quality production. Muinde argues that you don't ensure quality by catching mistakes before they reach the customer, you ensure quality by setting up a system in which you don't make mistakes to begin with. Muinde (2010) indicated that everyone in the organization must be aware of this point of view and adopt it if the company is determined to achieve performance in quality.

Similarly, Obado (2015) noted that the work of an organization must be taken as a process that is never ending and that, any process can always be improved and must be reviewed as the demands of the community or the target customer varies. Statistics from Kenya National Bureau of statistics (KNBS, 2013) indicated that quality improvement is significant especially in such fast-growing newly industrialized countries such as Kenya. The question of 'what to adopt?' creates an activity of searching for best practices. The Kenyan economy is now facing significant challenges as the forces of globalization create intense competitive pressures in businesses (KNBS 2013).

Commercial state corporations are now under pressure to formulate strategies for competing successfully in a more liberalized trading environment with new players and rivals (Thompson, Strickland & Gamble 2015). Consequently, organizations are required to place the goal of profitability above other factors (Musa, 2013). Mckellen (2012) indicated that for organizations to continuously improve quality and production, they need to adopt and combine modern manufacturing philosophies such as Kaizen, Lean, Quick response, Agile, and Six Sigma.

According to Garvin (2014), companies may start with a product-based approach which identifies quality characteristics through market research that denote quality by use of tools such as quality function deployment(QFD). This is followed by a user based approach to translate those characteristics into manufacturing based approach as products are being manufactured and finally use a value based approach to offer the customer better value than the competitors.

A measure of product quality performance is therefore based on measurement of product quality characteristics, the number of customer complaints in relation to sales volumes, the amount of money used to compensate for external quality failure and Quality culture change as measured by customer centricity, top management commitment to quality, evidence for quality improvement teams and employee development.

1.1.3 Tata Chemicals Magadi Limited

Tata Chemicals Magadi Limited (TCML) was established and incorporated in the UK in 1911 as a Soda ash and Salt manufacturing company in Kenya under the then British conglomerate known as Bruner & Mond Company. The company is now over 100 years old manufacturing soda ash as its main product for both local and international markets. With a capacity of about 1000 metric tons of Soda Ash per day with 90 percent as export through the port of Mombasa to international markets such as South East Asia and Indian sub-continent. Soda ash is used in the manufacture of Glass (about 70 percent of its use) but has other applications in water treatment, detergent manufacture and manufacture of pulp, paper and other chemicals. the company's manufacturing plant is situated at Lake Magadi in the Kenyan southern rift valley just about 40km to the Tanzania border and 120 km from Nairobi. The company changed its name to Tata Chemicals Magadi Limited under the new

ownership of Tata Chemicals Limited as a parent company domiciled in Mumbai, India. Magadi soda was acquired by Tata Chemicals in 2006 and soon became a wholly owned subsidiary of Tata Chemicals. This was followed by Magadi soda re-branding itself including change of name to Tata Chemicals Magadi Limited.

TCML has six major departments including Human resources, Finance, Manufacturing, Quality, Supply Chain and Engineering. Quality department with the sub functions of Quality Control, assurance and Continuous improvement is charged with the responsibility of driving the continuous improvement program across all the company's departments. This includes ISO 9001:2008, TPM, Lean Six Sigma and Tata Business Excellence Model.

1.2 Research Problem

Tata Chemicals Magadi has been in existence for over a hundred years and the company has had a firm grip on its market share for Soda Ash until the recent global recession that played a major role in the economic downturn in the global economy. The major customers in Africa are in South Africa, Nigeria & Tanzania and it is worth noting that there has been a higher competition in the South African market from ANSAC (American Natural Soda Ash Corporation). Competition from the Chinese market as well as the global recession necessitated the revision of continuous improvement practices by global soda ash producers including TCML in order to remain competitive. The implementation of Continuous improvement practices is expected to yield increased benefits however; studies have revealed that majority of companies drop the program after the second or third year of implementation.

Muinde (2010) did a case study to find out the continuous improvement practices employed by the National Housing Corporation in Kenya to achieve competitive

advantage. His study focused on quality performance and the findings showed that the basic factor to keep in mind about maintaining quality performance is that you can never stop working at it. His study concludes that there is no effort in maintaining product quality that will operate for longer than it is applied. While Kimari (2010) also did a comparative study in the mobile sector in Kenya on sources of sustainable continuous improvement practices his study did not touch on the manufacturing sector and his findings showed that in order to achieve quality, the company must do regular training to all staff members in the company. Whereas Gakumo (2014) did a longitudinal sampling on application of Porter's generic strategies, his focus was on the 42 Commercial banks in Kenya while Obado (2015) studied the continuous improvement practices employed by Sugar manufacturing firms in Kenya and his study focused on the Concept of Continuous Improvement by focusing on TQM, the findings showed that TQM is majorly tasked with continuous improvement in all levels of work right from strategic planning and decision making through to detailed execution of work aspects on the shop- floor. It is however, evident that these studies did not focus on continuous improvement practices and product quality performance in manufacturing firms in Kenya, hence it is against this background that this particular study attempted to answer the following research questions: to what extent has Tata Chemicals Magadi ltd implemented continuous improvement practices? And what is the relationship between continuous improvement practices and product quality performance at Tata Chemicals Magadi Limited?

1.3 Research Objectives

This research was aimed at establishing the influence of continuous improvement practices on product quality performance at Tata chemicals Magadi Limited.

Specific objectives of the study are:

i. To find out the extent to which Tata Chemicals Magadi Limited has implemented continuous improvement practices

ii. To determine the relationship between continuous improvement practices and product quality performance at Tata Chemicals Magadi Limited.

1.4 Value of the Study

The results of this study will provide Tata Chemicals Magadi Limited with a good understanding and knowledge of the various continuous improvement practices in terms of choice, key success factors and benefits in product quality improvement as well as identification of CIPs implementation gaps .With this proper understanding, policy makers in Tata Chemicals Magadi limited will set appropriate policies affecting implementation of continuous improvement practices. The results of this study will also introduce new knowledge to other manufacturing firms who will be given new opportunities for evaluating and improving their own continuous improvement practices.

This study will also provide operations consultancy firms with information on continuous improvement practices which will help them to offer balanced consultancy services in various industries with the aim of identifying gaps in the system with respect to continuous improvement in addition to helping organizations make decisions on the type and implementation requirements for the various CIPs. This study will also be of use to professional bodies in government especially in the area of policy formulation in relation to adoption of continuous improvement practices while Scholars and academicians will find this study as a source of secondary data for future studies in the field of continuous improvement.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The section focused on reviewing the past studies on basic principle of continuous improvement. It is organized into various sections including theoretical literature review, continuous improvement practices, empirical literature review, summary of literature review, knowledge gaps and the conceptual framework.

2.2 Theoretical Literature Review

This particular study was founded on two theories; systems theory and theory of constraints. Savolainen (1998) indicated that most surveys and studies reveals that there exists no theoretical foundation for continuous improvement practices while Gilomore (1999) maintains that continuous improvement Practices happen to be applied as a basic terminology which borrows majority of the descriptions from product quality processes like; total quality management and L.M. and though many studies have been carried out concerning continuous improvement practices, more perspectives are required.

Jha (1996) noted that there is a likelihood of existence of a close relationship between continuous improvement practices and product quality. Similarly, a significant percentage of studies relate CIPs and product quality, simply because continuous improvement practices aim to maximise performance there is a likelihood of a close relationship between them in one way or another. The duty of an organization must be seen as an activity that is unlimited as any project can be improved and changed as the needs of the customers change.

2.2.1 Systems Theory

Bertalanffy (1968) developed the systems theory which basically gives an analysis framework looking at an organization in general. It is a theory of emergent – actions and outcomes at the collective level which emerge from the actions and interactions of the individuals that make up the collective laws that govern an organization. Systems theory according to Bertalanffy (1968) is the interdisciplinary study of systems generally aimed at discovering patterns and explaining the principles that can be used in all types of systems at all levels in all fields of research. Pheng and Wee (2001) observed that Systems theory offers a more substantive view of organizations and recognizes product quality as a process concerned with comprehensive and complex skills. This theory according to Pheng & Wee, (2001) also confirms that constant improvement of a process to suit the intended purpose is a fundamental principle to change and calls upon for standardization in product quality. It recognizes that an organization cannot exist without interaction with its immediate environment.

Based on the definitions above, today systems theory have been widely applied to the study of organizations and is used to explain 4 processes in the organization: productive processes including input—throughput-output mechanisms that result in the production of products and services going to the customer, energizing processes including the ways in which the organization affects and is affected by its environment through the semi-permeable systems boundary to allow free interaction between the system and its environment hence giving rise to open systems, enabling processes including the mechanisms that control and measure the relationships and interactions among the organization's subsidiary parts including individuals and groups meaning that something that affects one part also affects all other parts or

levels and no single part of the organizational system can be allowed to sub-optimize. Last is the developing processes including systems and programs that provide for the differentiation of the organization's subsidiary parts as differentiation must precede integration meaning that the individuals and groups within the organization must themselves have the opportunity to operate as open systems before the whole organization can also do so.

2.2.2 Theory of constraints

The theory of constraints (TOC) is a systems-management philosophy developed by Eliyahu in the early 1980s. Eliyahu (1980) noted that TOC emphasizes on the maximization of quality performance within a set of variations of the existing systems and product offerings. Theory of constraints regards systems as consisting of the following aspects: Scheduling, performance evaluation, problem-solving/thinking process, project management and market division.

Christophe (2005) notes that the theory of constraints has widespread use in the manufacturing sector and as a result, its benefits cross multiple boundaries and functions, resulting to benefits like: decreased production lead times, improved quality production, increase in profitability, low inventory levels, low bottlenecks, minimum constraints, checking statistical fluctuations, improved competitive edge, supporting strategic marketing and performance decisions, introduction of the marginal pricing approach and implementation of continuous improvement practices at the supply chain level. One characteristic of the Theory of constraints is the ability to prioritize improvement activities just like the continuous improvement practices used in industry. According to Christophe (2005) TOC tools can dramatically, systematically and routinely smoothen the transition and reduce discomfort. Similarly

according to Blocker, Chen and Lin (2008) firms using TOC can achieve the benefits of reduced lead time, improved operations, fall in inventory and increased return on investment. Ngeta (2009) asserts that in a continuous improvement environment workers have the knowledge about detecting constraints, how to improve processes and reduce costs.

2.3 Continuous Improvement Practices

Hudson and Bourne (2013) observed that, the best known continuous improvement practices are: TQM, ISO, TPM, Six Sigma, lean Six Sigma and Lean Manufacturing With an organization's performance being critical for survival in the fiercely contested market, organizations should focus on continuous improvements in order to prevent waste which include, waste of time, underutilization of intellect, or other resources spent producing a product or service that doesn't make sense on production quality.

Hudson & Bourne (2013) also noted that effective and efficient operational systems are made up of unique tools, techniques, and methods that can help an organization to minimize costs and achieve just-in-time. Similarly, Bourne, (2013) indicated that Lean Manufacturing is a continuous improvement system to product quality originating from the automaker: Toyota by the close of the Second world war. The constant growth of the Toyota automaker from a small enterprise to the largest automaker in the whole world has concentrated the attention on how Toyota has met this tremendous success as is evident from acronyms like 'Toyotism", Lean Manufacturing is focused on maintaining value with minimum work (Hudsan, 2013).

Hudson, (2013) regarded Lean Manufacturing procedure as an organized strategy to establish or eliminate wastes by continuous improvement with an aim to satisfy

clients through quality. This term: waste, refers to aspects that does not make sense to a system or Customer and therefore have to be eliminated as non-value adding activity and includes waste of rework, excess inventory, over-processing and waiting, among others advocated by most of the Lean Manufacturing tools such as Just-In-Time (JIT). Additionally, Hudson (2013) indicated that Lean Manufacturing was meant to keep a constant production and to appropriately check variations.

A recent study by the Kenyan media, the Standard Digital News (SDN 2016) shows that Kenya can reduce production costs if the government adopts the Japanese management philosophy of Kaizen, which emphasizes on continuous improvement in all sectors of the economy. Kazuhiro, (2016) also indicated that Kenya has vibrant public and private sectors which provides a significant potential of economic growth if it adopts management productivity models like Kaizen.

According to Psirmoi (2016) Kaizen is a continuous improvement philosophy for quality production and performance improvement largely credited for providing a foundation for the economic prosperity of Japan, way back in the 1960's. Psirmoi (2016) also observed that as a result of Kaizen's introduction to Ethiopia, its benefits have been significant leading to the saving of over Sh.10 Billion over the past five years and he observed that there has been an increase in the production of quality products and services with the introduction of this CI practice.

Cannon (2012) observed that, Motorola brought about Six Sigma in the 1980s to improve process performance and Linderman et al., (2003), observed that Motorola Company was committed to quality performance tremendously. Six Sigma is described as an organized model to continuous improvement practices which depends on scientific methods for a significant decrease in defects and minimizing variations is

key to this system, and it concentrates on minimizing defects in the production process and in the provision of services.

Hammer (2015) notes that applying a hybrid model of Lean Manufacturing and Six Sigma leads to higher value than when using a single model such as Lean Manufacturing alone or Six Sigma alone. According to Zimmerman (2010), TQM involves a coordinated effort by an organization aimed at improving quality at all levels within the production process and it involves "performance to standards" or adherence to specifications, fitness for use, and value for money. Zimerman also notes that almost everyone has had experiences of poor product or service quality when dealing with an organization.

Crosby and Philip (2013) in their study about total productive maintenance found out that poor quality experience is made when the internal customers of the company either are not empowered through training to correct the various quality mistakes or are not willing to do so. Their findings indicate that companies which are successful do understand the significant effect customer- oriented quality can have on the organization. They concluded that most competitive organizations continually improve their standards of quality.

2.4 Empirical Literature Review

Grant (1998) in his study about differentiation argued that CIP is not about pursuing uniqueness for the sake of being different but it is about understanding the product or the service and the customer and found out that CIPs usually arises from one or more practices in the value chain that creates a unique value important to the customer. Grant (1998) concluded that firms that perform exceptionally well as compared to competitors often have the following internal strengths: access to leading scientific

research achieved through highly trained and skilled production team, a strong sales team with capability to successfully communicate the perceived performance of the product and corporate reputation for quality and innovation.

Ahuja and Khamba (2008) did a random sampling on 10 manufacturing firms concerning Just-in-time production to address the implications brought about by stiff competition in the sector in Kenya. They contend that firms in the manufacturing industry emphasize on the value of product quality. Similarly, Ahuja and Khamba (2008) in their findings observed that in the manufacturing sector, a unique approach should be developed. Their study concluded that for any manufacturing firm to achieve effectiveness, continuous improvement practices should be treated crucial.
Oakland (2009) in his study on competitive advantage in the soft drinks industry did a cross section survey and his study found out that, the basic product quality principle for competitive advantage was CIP practices.

Oakland (2009) observed that the most important predictor of product quality improvement was as a result of continuous improvement (CIP) and concluded that total quality is a management philosophy that has developed drastically over time, and continues to do so using CIP as an important factor. As both quality and maintenance go hand in hand in a manufacturing set up, total quality management (TQM) and TPM share many areas of commonalties like employee involvement, cross-functional approach and continuous improvement.

Chang (2011) did a census on sugar manufacturing firms in Kenya to establish the continuous improvement practices adopted by these firms and observed that CIPs entails determining customer needs and wants (internal or external), meeting their requirements, evaluating success, and constantly checking customers' requirements to

determine areas in which improvements can be made. Their findings showed that continuous improvement practices is described as a mix of approaches and programs that assist a company to improve on performance. Chang (2011) observed that various processes are considered important if continuous improvement is to be achieved and developed to its full capacity in a company such as learning from past experiences, capturing and deployment of individual learning, among other initiatives. Lakhal et al., (2014) in his study about the relationship between continuous improvement practices and Product quality performance within the sugar sector in Kenya identified a positive relationship between firms in this sector. Similarly, various studies have also identified the significance of CIPs as part of product quality performance, in the sense of its contribution to the organizational performance.

Hyland and Boer (2015) in their study of the implications of continuous improvement practices on the automobile sector in Japan argues that changing a classic batch-and-queue production process to continuous improvement helps an organization to achieve the following results for manufacturing; labor productivity is doubled down through the process for direct management and technical staff as well as from raw materials to the delivered product. They found out that production throughput times are cut by up to 90% with a subsequent reduction in inventory. They concluded that manufacturing firms operating in the today's rapidly changing and highly competitive market have been pressured to improve all aspects of operational performance, quality, flexibility and customer response time as well as to reduce costs of manufacturing and have retorted by adopting a set of practices that is fast becoming the dominant paradigm in manufacturing: Lean Manufacturing.

2.5 Summary of Literature Review and Knowledge Gaps

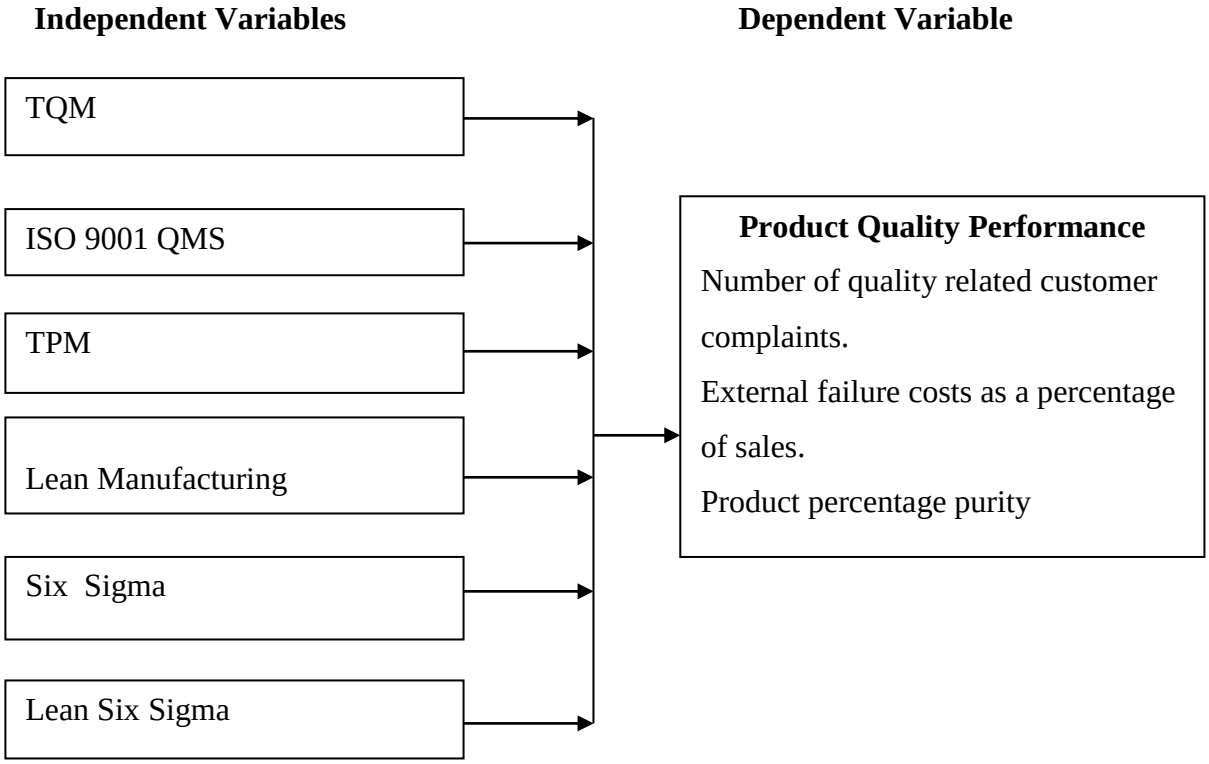
It is evident from the literature review that continuous improvement is a gradual never-ending change whereas continual improvement practices is incremental change and involves aspects such as TQM, Lean Manufacturing/ lean thinking, JIT delivery of services, benchmarking, innovation and creativity, global sourcing, best industry practices and lean supply chain management.

The literature also contend that Total quality management is an integrative management philosophy for continuous improvement of product quality and processes while Six Sigma is aimed at improving the quality of processes by determining and controlling the causes for errors and bringing down variations in the manufacturing and business process. Just in time (JIT) is a production approach that strives to improve business returns on investment by minimizing the in-process inventory and carrying costs. It is also clear from the existing literature that Lean Logistics is the continuous improvement of the value stream to the customer and continuous elimination of waste in the internal and external logistics through lean practice. The literature review indicates that, firms that have excelled and are 'best in class today, employ some of the CIP elements within their operations. It is also evident that most of the studies cited in the literature are conducted in developed countries whose strategic approach and financial footing is different from that of Kenya. There is therefore a literature gap on the adoption of continuous improvement practices and product quality performance in Kenya with specific reference to Tata Chemicals Magadi limited which this study seeks to fill.

2.6 Conceptual Framework

A conceptual framework forms a simplified familiar structure which is meant to help gain insight into a phenomenon that one needs to explain. This is a brief description of a phenomenon under investigation alongside a graphical description of the key variables under investigation (Mugenda and Mugenda, 2003).

Figure 2.1: Conceptual model



Source: Author, (2016)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section gives the methodology that was applied to carry out the study. The chapter describes the research design, data collection instruments and data analysis.

3.2 Research Design

A longitudinal case study was applied which was ideal for this particular study because the researcher was able to obtain data on product quality performance for a period of ten years. Tata Chemicals Magadi Limited was chosen because the firm has implemented Continuous improvement practices and it is in the manufacturing sector.

3.3 Data Collection

The data was both qualitative and quantitative. The researcher used a self - administered questionnaire as the instrument for data collection to interview the key respondents from the company. Judgmental sampling was applied in this study to interview the following categories of people; team leaders, head of operations, managers and senior staff. In addition secondary data was collected from the company's customer complaints, marketing and product quality control databases which served as the basis for secondary data analysis.

3.4 Data Analysis

This study used both quantitative and qualitative methods of data analysis. To ensure easy analysis, the items were coded according to each variable of the study to ensure the margin of error was minimized and to ensure accuracy during analysis while the coded data was analyzed using descriptive statistics. The descriptive statistics utilized in the study included frequencies and percentages. Coded data was used to generate

statistics such as mean scores and percentages. The descriptive statistics gave the characteristics of the CI practices adopted and the effects on Product Quality performance. Content analysis was applied in the interpretation of data from tables. According to Florian (2006) content analysis is the best approach in the qualitative case study and it is used as an interpretation method for qualitative interviews Primary data analysis was also done with the help of probit model using the average of mean scores from each independent variable (Tables 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10 and 4.11) while secondary data was analyzed with the help of tables and time series plots.

CHAPTER FOUR

DATA ANALYSIS, FINDINGS AND INTERPRETATIONS

4.1 Introduction

This chapter presents the analysis of the data collected from the respondents and discusses the research findings on the continuous improvement practices and product quality performance in Tata Chemicals Magadi Limited. All the completed questionnaires were edited for accuracy, uniformity, consistency and completeness. The chapter gives summaries of data findings together with their possible interpretations presented by use of means, percentages, frequencies, variances, standard deviations and tables.

4.2 Demographic Data

Table 4.1: Demographic data

Variable	Frequency	Percentage
Number of years worked at Tata chemicals		
Less than 5yrs	3	30
5-10	3	30
11-15	2	20
More than 15	2	20
Job position		
Engineer	4	40
Team leader	2	20
Head of department	3	30
Subordinate staff	1	10
Duration the company has been in operation	0	0
Less than 50 years	0	0
50-100	10	100
More than 100		
Number of employees working in the company	0	0
Less than 200	1	10
200-500	9	90
More than 500		

From table 4.1 most of the respondents have worked in the company between 0 and 10 years with a score of 60 per cent and most employees work as engineers with a score of 40 percent. This shows that they are competent enough to have the requisite understanding to respond to the issues related to continuous improvement practices in the organization.

4.3 The extent to Which Continuous Improvement Practices have been Implemented by Tata Chemical Magadi Limited.

The coded data was subjected to calculation of mean scores for each of the 10 independent variables including top management commitment, constancy of purpose, teamwork, process orientation, support of customer focus, management reviews, human resources, infrastructure, reduction of inventory and improvement of production flow then innovation, research and development. To calculate the mean scores under top management support variable for instance, the average of all mean scores for the various sub-variables X1, X2 , X3, and X4 was considered. In each of the four cases the number of respondents who said yes to the variable (with yes being coded as 1) divided by the total number of respondents considering the six CIPs results to a mean score for the particular sub-variable. As indicated then, the average of the four variables gives the average score for the main variable (top management support in this case). This equally applies to 9 other main independent variables. The average mean scores of all the ten variables were used later in the probit model whose output is as in table 4.12. Tables 4.2 to 4.11 in the later sections of this study will show the mean scores for the various independent variables.

Table 4.2: Top management commitment

	Variable	Unit	Definition	Mean
X 1	Top management is committed to the development and implementation of CIPs	BINARY	1, if top management is significant 0, if otherwise	0.5433
X 2	Commitment include continually improving the effectiveness of CIPs	BINARY	1, if the statement is significant 0, if otherwise	0.5672
X 3	Commitment include continually establishing continuous improvement policy	BINARY	1, if the statement is significant 0, if otherwise	0.57988
X 4	Commitment include continually conducting management reviews	BINARY	1, if the statement is significant 0, if otherwise	0.67211
X 5	Commitment include continually ensuring availability of resources	BINARY	1, if the statement is significant 0, if otherwise	0.5476

The study sought to establish the respondents' level of agreement with statements on continuous improvement practices with respect to top management support. From the study findings, majority of the respondents were in agreement that top management commitment included continually conducting management reviews as shown by a mean score of 0.67211. The respondents also noted that management commitment included continually establishing continuous improvement policy as shown by a mean

score of 0.57988, the Commitment also included continually improving effectiveness on CIP as shown by a mean score of 0.5672, and included continually ensuring availability of resources as indicated by a mean score of 0.5476 and that Top management is committed to the development and implementation of CIP as shown by a mean score of 0.5433. This depicts that top management is keen on checking whether employees are in fact seriously trying to fulfil the firm's quality goals.

The findings of this study reveal that top management of Tata Chemicals Magadi has understood the continuous improvement message, which is a crucial condition for making and realizing new, meaningful quality production. Such active participation by the top leadership also makes its commitment highly visible which will have an extremely positive impact throughout the organization when new action plans are drawn up-among other things as shown by the findings. These findings concurs with a study done by Cannon (2012) who observed that a significant role for any top leadership is to make clear product quality objectives.

Table 4.3: Constancy of purpose

	Variable	**Unit**	**Definition**	**Mean**
X 1	Top management at Tata chemicals ensures that CIPs goals are in line with the functions of the firm	BINARY	1, if the statement is significant 0, if otherwise	0.5762
X 2	Commitment include continually improving effectiveness on CIP	BINARY	1, if the statement is significant 0, if otherwise	0.6421
X 3	CIP objectives are measurable and are consistent with CIP policy	BINARY	1, if the statement is significant 0, if otherwise	0.8742
X 4	CIP deployment in the organization follows a top-down approach	BINARY	1, if the statement is significant 0, if	0.6459

	starting from the top level executive		otherwise	
X 5	Top management implements practices that support top-down implementation of CIPs	BINARY	1, if the statement is significant 0, if otherwise	0.6439
X 6	Top management has a performance evaluation system to check CIPs performance,	BINARY	1, if the statement is significant 0, if otherwise	0.5436
X 7	Each manager or employee at Tata Chemicals Magadi Limited has been trained in CIPs and each has applied CIPS to the processes in one's section.	BINARY	1, if the statement is significant 0, if otherwise	0.7211

On constancy of purpose with respect to continuous improvement practices, majority of the respondents reported that CIP objectives in the company are measurable and are consistent with CIP policy and that each manager or employee at Tata Chemicals Magadi Limited have been trained in continuous improvement practices and have each applied CIPs to the process in one's section as shown by a mean score of 0.8742 and 0.7211 respectively. The respondents also revealed that Continuous improvement process is employed in the organization through a top-down approach starting from the top leadership and that the top leadership implemented practices that support top-down implementation as revealed by the mean score of 0.6459 and 0.6439 respectively. The findings also revealed that Commitment include continually improving effectiveness on CIP and that Management ensures that CIP goal is in line with the functions of the firm as shown by the mean scores of 0.6421 and 0.5762 respectively. This implies that the company has employed different continuous improvement approaches. This concurs with Oakland (2004) who observed that three

things that are required for a successful kaizen program include operating practices, total involvement and training.

Table 4.4: Team work

	Variable	Unit	Definition	Mean
X 1	Tata chemicals Magadi has a top-down structure consisting of a number of cross-functional and special teams	BINARY	1, if statement is significant 0, if otherwise	0.5421
X 2	Tata chemicals Magadi has a clear approach to ensure that staff are involved in process improvement activities appropriate to their level on a continuous basis	BINARY	1, if the statement is significant 0, if otherwise	0.5542
X 3	Tata chemicals Magadi is committed to staff motivation through a reward and recognition system.	BINARY	1, if the statement is significant 0, if otherwise	0.5123

Regarding team work, majority of the respondents indicated that the organization has a way to engage staff on activities appropriate on an on-going model as shown by a mean score of 0.5542, while Tata Chemicals Magadi has a top down structure consisting of a number of cross functional and special teams as shown by a mean score of 0.5421, and that the organization has a staff motivation strategy as shown by a mean score of 0.5123. This shows that the company adopts best industry practices as part of the continuous improvement approaches. This is consistent with Beretta (2002) who indicated that in manufacturing, continuous improvement practices basically deal with easing of processes to address defects.

Table 4.5: Process orientation

	Variable	Unit	Definition	Mean
X 1	The organization has trained all personnel in Process analysis	BINARY	1, if statement is significant 0, if otherwise	0.6431
X 2	Tata chemicals Magadi personnel are conversant with the processes for which they work and are responsible.	BINARY	1, if the statement is significant 0, if otherwise	0.5733
X 3	Tata chemicals Magadi has documented its processes by use of process flow diagrams and written procedures.	BINARY	1, if the statement is significant 0, if otherwise	0.6321
X 4	Tata chemicals Magadi has a means of using product and process data in a systematic way to control and improve performance	BINARY	1, if the statement is significant 0, if otherwise	0.7431
X 5	Tata chemicals Magadi has a procedure of applying process measurements	BINARY	1, if the statement is significant 0, if otherwise	0.5422
X 6	The organization keeps track of plant efficiencies on a continuous basis	BINARY	1, if the statement is significant 0, if otherwise	0.2521
X 7	The organization tracks and improves overall equipment effectiveness (OEE) on a continuous basis	BINARY	1, if the statement is significant 0, if otherwise	0.2672
X 8	The organization uses engineering change requests before undertaking any equipment/process modification	BINARY	1, if the statement is significant 0, if otherwise	0.5678

On process orientation, the respondents reported that the organization has correctly defined system evaluation to determine performance as per expectation and that the organization has trained all personnel in Process analysis as shown by a mean score of 0.7431 and 0.6431 respectively. They were however neutral of the fact that the

organization keeps track of plant efficiencies on continuous basis and that the organization tracks and improves overall equipment effectiveness (OEE) on continuous basis as shown by a mean score of 0.2521 and 0.2672 respectively. Findings also show that the company has a procedure of applying procedures as well as evaluation of information to upgrade product quality and have trained all the work force in processes as shown by mean scores of 0.5422 and 0.5733 respectively. This indicates that the company adopts a Total quality management (TQM) approach which is aimed at achieving product quality. This is in line with Zimmerman (2010) who observed that total quality management is a comprehensive organizational effort designed to improve quality at every level. The findings are further amplified by Crosby and Philip (2013) in their study about total productive maintenance who found out that experience of poor product quality is at a maximum when employees of the company either are not fully trained or empowered to correct quality challenges or do not seem willing to do so.

Table 4.6: Support of customer focus

	Variable	Unit	Definition	Mean
X 1	Tata chemicals Magadi puts satisfaction of customers at the centre of its operations and improvement strategies	BINARY	1, if statement is significant 0, if otherwise	0.6744
X 2	Tata chemicals Magadi emphasizes customer satisfaction through training.	BINARY	1, if the statement is significant 0, if otherwise	0.5614
X 3	Tata chemicals Magadi develops employee exchange programs with major customers where possible	BINARY	1, if the statement is significant 0, if otherwise	0.5120
X 4	The organization creates response channels for customer communication and feedback	BINARY	1, if the statement is significant 0, if otherwise	0.5799
X 5	The organization shares survey information within the workforce for both supplier evaluation and customer feedback	BINARY	1, if the statement is significant 0, if otherwise	0.9010
X 6	Tata chemicals Magadi ensures that duties are communicated accordingly.	BINARY	1, if the statement is significant 0, if otherwise	0.7510

Majority of the employees interviewed agreed that the organization shares survey information within the workforce for both supplier evaluation and customer feedback as shown by a mean score of 0.9010. Tata chemicals Magadi leadership ensures that duties are communicated accordingly throughout the firm and that the organization puts satisfaction of clients at the centre of its operations as shown by mean scores of 0.7510 and 0.6744 respectively. Further findings also show that the organization creates response channels for customer communication and feedback and the firm ensures through education the significance of customer satisfaction as shown by mean scores of 0.5799 and 0.5614 respectively. This shows that the approaches of

continuous improvement practices undertaken by the Tata Chemicals are aimed at product quality performance with the customer in mind. This finding is in line with Grant (1998) in his study about differentiation argued that CIP is not about pursuing uniqueness for the sake of being different but it is about understanding the product or service and the customer.

Table 4.7: Management review

	Variable	**Unit**	**Definition**	**Mean**
X 1	Tata chemicals Magadi reviews the CIPs regularly.	BINARY	1, if statement is significant 0, if otherwise	0.9142
X 2	The reviews are majorly on policies and CIP objectives.	BINARY	1, if the statement is significant 0, if otherwise	0.47218
X 3	Records of management reviews are maintained	BINARY	1, if the statement is significant 0, if otherwise	0.5720

In relation to management review, the results indicate that Tata Chemicals Magadi leadership reviews continuous improvement practices regularly. Records of management reviews are maintained as shown by mean scores of 0.9142, 0.5720 and 0.47218 respectively. These findings are in line with a study done by Chang (2011) whose findings revealed that CIPs is a continuous activity.

Table 4.8: Human resources

	Variable	Unit	Definition	Mean
X 1	Personnel performing work-related to CIPs are qualified and competent for the job.	BINARY	1, if the statement is significant 0, if otherwise	0.7841
X 2	Tata chemicals Magadi determines the necessary competency levels for personnel performing work dealing with CIPs	BINARY	1, if the statement is significant 0, if otherwise	0.6734
X 3	Tata chemicals Magadi provides training or takes other actions to achieve the necessary competence among its staff	BINARY	1, if the statement is significant 0, if otherwise	0.7933
X 4	Tata chemicals Magadi evaluates the effectiveness of the actions taken.	BINARY	1, if the statement is significant 0, if otherwise	0.1045
X 5	Tata chemicals Magadi makes sure that staff are knowledgeable in meeting continuous improvement goals in the organization	BINARY	1, if the statement is significant 0, if otherwise	0.5621
X 6	Tata chemicals Magadi maintains appropriate records of education, training, skills and experience	BINARY	1, if the statement is significant 0, if otherwise	0.0041

On human resources, majority of the employees interviewed indicated that the organization provides training or takes other actions to achieve the necessary competence among staff as shown by mean scores of 0.7933. They added that Personnel performing work-related to CIP are skilled and knowledgeable as shown by mean score of 0.7841. However it was not clear whether the organization keeps appropriate records of education, training , skills and experience as shown by a mean score of 0.0041. The results further show that the organisation determines the necessary competency needs for personnel performing work dealing with CIPs and

ensures that personnel are aware of the relevance & importance of their activities & how they contribute to the achievement of CIP objectives as shown by mean scores of 0.6734 and 0.5621 respectively. The respondents were however neutral on whether the organization evaluates the effectiveness of the actions taken as shown by a mean score of 0.1045. This indicates that the company is keen in employing continuous improvement practices aimed at reducing variation in all the processes of the organization. This finding is in line with Opondo, (2010) who observed that TQM as one of the continuous improvement approaches is based on the premise that the quality of products and processes is the responsibility of everyone involved with the creation or consumption of the products or services offered by an organization, requiring the involvement of management, the workforce, suppliers, and customers, to meet or exceed customer expectations.

Table 4.9: Infrastructure

	Variable	Unit	Definition	Mean
X 1	The organisation determines, provides and maintains the infrastructure needed for the achievement of CIP objectives	BINARY	1, if the statement is significant 0, if otherwise	0.4567
X 2	The infrastructure include buildings, workspace and associated utilities	BINARY	1, if the statement is significant 0, if otherwise	0.5178
X 3	The Infrastructure include Process equipment (both hardware and software	BINARY	1, if the statement is significant 0, if otherwise	0.8912
X 4	The infrastructure include plant, logistics and IT.	BINARY	1, if the statement is significant 0, if otherwise	0.7590
X 5	Financial resources allocated to implement CIPs are inadequate.	BINARY	1, if the statement is significant 0, if otherwise	0.3120

Regarding infrastructure, most of the respondents interviewed noted that Infrastructure included plant machines, logistics, IT, buildings, workspace and associated utilities as shown by mean scores of 0.8912, 0.7590 and 0.5178 respectively. Additionally the results indicate that the organisation establishes and maintains a system aimed to meet objectives of CIP as shown by a mean score of 0.4567. However the employees interviewed were neutral on whether the financial resources allocated to implement CIP are adequate as shown by the a mean score of 0.3120.

Table 4.10: Reducing inventory and improving production flow

	Variable	Unit	Definition	Mean
X 1	The organization has developed a clear policy dealing with inventory management and improving production/work flow?	BINARY	1, if statement is significant 0, if otherwise	0.4511
X 2	Tata chemicals Magadi provides training in production flow improvement and inventory reduction	BINARY	1, if the statement is significant 0, if otherwise	0.5931
X 3	Tata chemicals Magadi involves suppliers in its plan to improve production flow and improve inventory management	BINARY	1, if the statement is significant 0, if otherwise	0.4531
X 4	Tata chemicals Magadi has established useful measurement systems to accurately reflect process flow and inventory performance improvement	BINARY	1, if the statement is significant 0, if otherwise	0.6731

On reducing inventory and improving production flow, the respondents indicated that the organization has established useful measurement systems to accurately reflect process flow as shown by a mean score of 0.6731. Results also reveal that the organization provides training in production flow improvement as shown by a mean score of 0.5931. However employees were neutral on whether the organization involves external suppliers in its plan to improve production flow as shown by a mean score of 0.4531 and whether the organization develops a clear policy dealing with inventory management and improving production/work flow 0.4511.

Table 4.11: Innovation research and development

	Variable	Unit	Definition	Mean
X 1	Tata chemicals Magadi have developed an improvement strategy to integrate and stimulate incremental changes using innovation	BINARY	1, if statement is significant 0, if otherwise	0.5673
X 2	Tata chemicals Magadi is receptive to even the smallest ideas and suggestions	BINARY	1, if the statement is significant 0, if otherwise	0.5312
X 3	Suggestions for improvement are vetted by a special committee	BINARY	1, if the statement is significant 0, if otherwise	0.7841
X 5	The organization has the ideas implementation committee	BINARY	1, if the statement is significant 0, if otherwise	0.7891
X 6	Reward and recognition is available to the idea owners	BINARY	1, if the statement is significant 0, if otherwise	0.9741

On innovation, research and development, the findings reveal that a reward and recognition system is available to the idea owners and that the organization has the ideas implementation committee as shown by a mean score of 0.9741 and 0.7891 respectively. Similarly, respondents indicated that Suggestions for improvement are

vetted by a special committee and that the organization has established an improvement strategy to integrate and stimulate incremental changes using innovation as shown by mean scores of 0.7841 and 0.5673 respectively. This depicts that the company adopts innovation and creativity as one of the continuous improvement approaches. Earlier studies had indicated that continuous improvement is important because it seeks to improve products, services or processes so as to improve a competitive position (Cohen &Prusak, 2001). This can be achieved by improving quality, efficiency, innovation or any component that is vital to any system.

4.4 The Relationship between Continuous Improvement Practices and Product Quality Performance at Tata Chemicals Magadi Limited

Having shown from the above trend analysis of the key continuous improvement indicators and product quality performance as employed by Tata Chemicals Magadi Ltd. The researcher now sought to test and determine the relationship between continuous improvement practices (TQM, ISO, TPM, Lean Manufacturing, Six Sigma, Lean Six Sigma and product quality performance at Tata Chemicals Magadi Limited. This involved use of the probit regression model that links product quality performance variables to continuous improvement practices and secondary data analysis to test the second objective of this study.

The probit regression model

Green (1990) used the probit model to analyse election data to predict the Carter/ Ford Vote in the 1976 presidential election to determine whether people like Carter or not using the binary yes/no approach and basing on six socio economic and regional variables. Christian (2000) also used the probit model in classifying people as Christian or non-Christian. In their research paper to determine the factors influencing customer satisfaction in choosing housing location, McFadden and Daniel (1973)

indicated that the probit model is developed to analyze qualitative variables or variables which are non-observable or latent.

This model is a type of multiple linear regression model where the dependent variable (product quality performance) or Y could only take two variables yes or no. The 'yes' responses were coded as 1 while the 'no' responses were coded as 0 (Tables 4.2 to 4.11) representing independent variables: Top Management support, Constancy of purpose, Teamwork, Process orientation, Support of customer focus, Management review ,human resource, Infrastructure, reducing inventory and improving production flow and finally innovation, research and development . The average mean scores from each independent variable was used to calculate the parameter estimates (table 4.12) using SPSS software.

The eleven variables were subjected to probit estimation to determine the extent to which they influence the product quality performance.

The probit function is represented as:

$F(Y) = Y = \mathbf{X}\beta + \varepsilon$

Where-: $F(Y) = \Phi{-}1(Y)$ and is known as probit link

Φ –Is the Cumulative Distribution Function (CDF)

ε - N (0, 1) known as latent variable-variables that are not directly observed.

Y - an indicator for whether this latent variable (ε) is positive

X- vector of repressors which influence the outcome of Y.

β- the measure of volatility-typically estimated by maximum likelihood or probability.

Y- denotes dependent variable which in this case is; product quality performance while

X- denotes the observable variables example , top management commitment with respect to continuous improvement practices (TPM, Lean Manufacturing, Six Sigma, Lean Six Sigma, TQM and ISO 9001 QMS).

N- is the sample size.

In this study the average mean scores for the 10 independent variables were used, example to calculate the probit estimates (or probability of each parameter in table 4.12) the average mean score for top management support was calculated by taking the average of the four sub-variables under top management support. This gives the CDF value or Cumulative Distribution Function of the first parameter. Then probability is given as 1- CDF where the higher the probability value, the more likely the response was accurate or true. The ranking of probabilities was done with higher probability being assigned a value of 1 which indicates that most respondents have a positive attitude towards parameters with a higher ranking in probability.

Asymptotic error was calculated as mean score for a particular variable for example top management commitment(squared) considering only yes responses divided by the square root of the sample size . This error is a measure of statistical accuracy as the smaller it is the more accurate the probit estimate of each parameter.

Cumulative mean score divided by asymptotic error gives the probit estimate for a particular parameter

The intercept or 0.5 mid -point is decided by looking at the behavior of mean scores or getting the average of all the mean scores of all the key parameters. The intercept will give guidance in interpreting the probit output as any mean scores above 0.5 would indicate a positive or high response to a particular parameter while a mean score below 0.5 would indicate a negative response to the parameter.

The main independent variables were as follows; top management commitment, constancy of purpose, team work, process orientation, support of customer focus, management reviews, human resources, infrastructure, Reducing inventory and improving production flow and finally, Innovation research and development.

Table 4.12: The effect of continuous improvement practices on product quality performance

Parameter	**Parameter estimate**	**Asymptotic Error (s)**	**Probability**	Rankings
Top management commitment	0.0590	0.9865	0.739	3
Constancy of purpose	0.1584	0.8318	0.6965	4
Team work	0.6321	0.9865	0.3617	8
Process Orientation	0.4321	0.6433	0.9881	1
Support of customer focus	0.7643	0.4239	0.3411	7
Responsibility and authority	0.4319	0.3316	0.2569	10
Management review	0.7123	0.5824	0.6791	5
Human resource	0.4431	0.6034	0.2967	9
Infrastructure	0.7453	0.6473	0.1636	11
Reducing inventory and improving production flow	0.8711	0.9092	0.8742	2
Innovation research and development	0.3211	0.8541	0.4178	6

Source: Researcher (2016)

Table 4.13 Probability (Likelihood) ranking

Term	Likelihood
Virtually significant	0.99-1 probability
Very significant	0.9-0.98 probability
Likely significant	0.66-0.89 probability
Neutral	0.33-0.65 probability
Unlikely significant	0-0.32 probability
Very unlikely significant	

Source: Researcher (2016)

The results in table 4.12 above indicate that process orientation has a higher ranking (1) by employees interviewed in comparing other parameters as indicated by the probability of 0.9881 and asymptotic error of 0.6433. This means that management is willing to drive and provide actual support to continuous improvement practices aimed to achieve product quality performance. For example, the organization has a clear description on the improvement procedures as shown by a mean score of 0.7431 in table 4.5. On the other hand, the results also show a positive ranking (2) on inventory reduction and improving production flow as revealed by the response shown by a probability of 0.8742 and asymptotic / margin of error of 0.9092. Top management commitment was ranked third (3) with a probability of 0.739 and asymptotic error of 0.9865 indicating that management has a clear vision of the final product quality performance as indicated by respondents interviewed that management Commitment included continually conducting management reviews shown by mean score of 0.67211 in table 4.2.

The results showed that constancy of purpose is a key driver as a continuous improvement practice aimed at improving quality product performance as shown by the probability of 0.6965 and ranked fourth (4) with asymptotic error of 0.8318. The results revealed that CIP objectives are measurable and are consistent with CIP policy and all managers and employees have been trained in continuous improvement practices and has each applied CIPs to the processes in one's section as shown by a mean score of 0.8742 and 0.7211 in table 4.3 respectively. Besides the above high positive responses on continuous improvement approaches in the company, some responses were not strong and active, such as infrastructure as shown by the probabilities of 0.1636 and 0.2569 ranking 11 and 10 respectively. On infrastructure the respondents gave a neutral response on whether the financial resources allocated to implement CIP are adequate as shown by a mean score of 0.3120 in table 4.9.

The results also reveal that teamwork as a key success factor in the implementation of continuous improvement practices has not been properly embraced in the company aimed at product quality performance as shown by the probability of 0.3617, rank (8) with asymptotic error 0.9865. Respondents were neutral on all the three statements on team work that the organization has a clear communication as shown by a mean score of 0.5421. Tata chemicals Magadi has an approach to ensure staff are involved in CIPs activities as indicated by the mean scores of 0.5542 and 0.5123 respectively.

The results show that the responses from employees were positive with respect to top management commitment, constancy of purpose, team work, process orientation, support of customer focus, responsibility and authority, management reviews, human resource, infrastructure, Reducing inventory and improving production flow, Innovation research and development although some of the parameters are not strong

(Team work, responsibility and authority, infrastructure and human resource) as shown by the probabilities of 0.36170, 2569, 0.1636, and 0.2967 respectively. McKellen (2012) suggests that in order to continuously improve quality and productivity, organizations need to adopt and combine modern CIPs such as Kaizen, Lean Manufacturing, TQM, TPM, ISO, Six Sigma and Lean Six Sigma. According to the above findings, it is therefore safe to say that the measure of product quality performance is therefore based on measurement of top management commitment, constancy of purpose, team work, process orientation, support of customer focus, responsibility and authority, management reviews, human resource, infrastructure, reducing inventory and improving production and finally, Innovation research and development.

4.5 Secondary Data

The focus was to determine the relationship between continuous improvement practices and product quality performance at Tata chemicals Magadi Limited. The researcher wanted to find out the extent to which the aforementioned Continuous improvement practices have influenced product quality performance in the company for a period of eight (8) years.

Table 4.14: External Failure Costs as a Percentage of Sales

SERIAL NUMBER	YEAR	SALES (KSHS MILLION)	EXTERNAL FAILURE COST KSH MILLION	COST AS A % OF SALES
1	2009	9231.1	17.233	0.187
2	2010	6892	10.55	0.153
3	2011	7944	4.1697	0.052
4	2012	10560	6.2624	0.059
5	2013	9027	10.735	0.119
6	2014	9048	4.52033	0.050
7	2015	7799	15.666184	0.201
8	2016	7475	28.163847	0.377
6	2014	9048	4.52033	0.050
7	2015	7799	15.666184	0.201
8	2016	7475	28.163847	0.377

Source: Researcher (2016)

Figure 4.1 External Failure costs as a percentage of sales

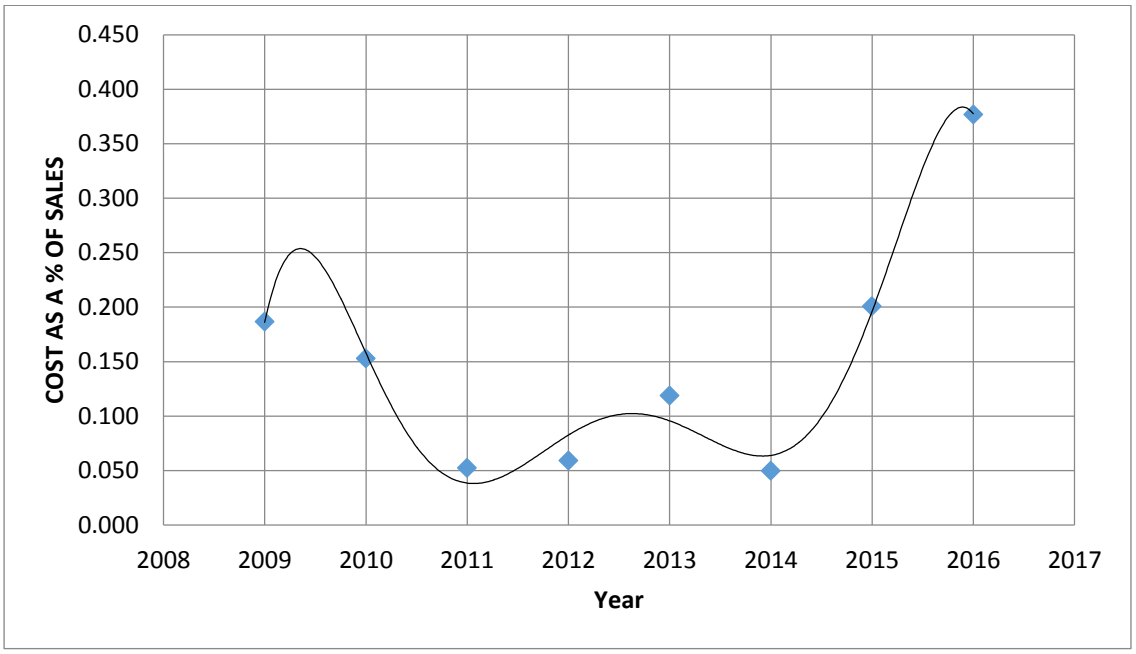
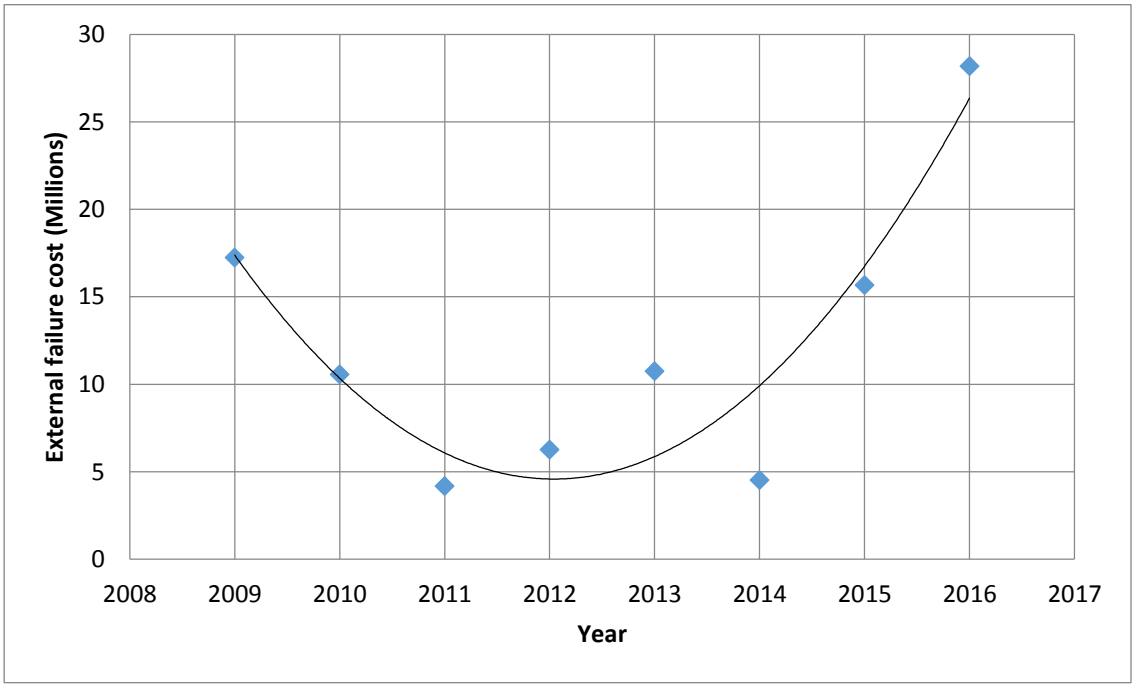


Figure 4.2 External Failure costs



According to table 4.13 the external failure costs increases with time. This is in line with the neutral stand taken by the respondents and the fact that the organization does

not keep track of plant efficiencies on continuous basis and that the organization does not track and improves overall equipment effectiveness (OEE) on continuous basis as shown by a mean score of 0.2521and0.2672 respectively.

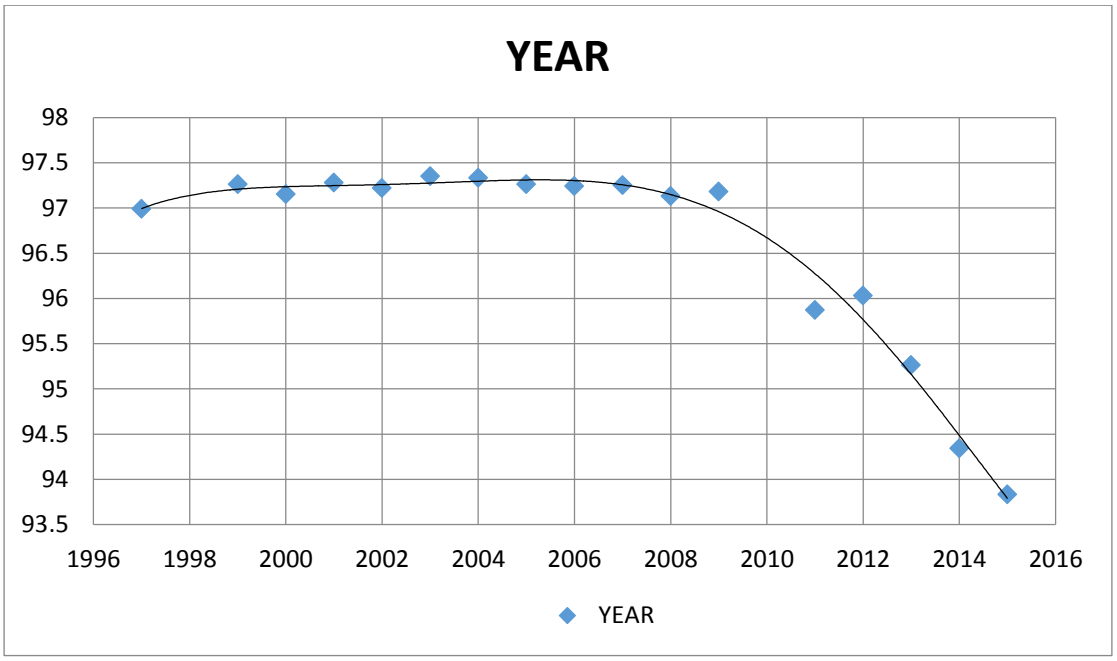
The results in table 4.13 above reveals that the annual customer compensation costs have been going down for a period of seven (7) years from 2009 to 2015 then peaked in 2016. This depicts that the company has not implemented Lean Manufacturing appropriately. The finding is supported by our earlier findings in this study that financial resources allocated to implement CIPs in the organization are inadequate as shown by the mean score of 0.3120. However the finding contradicts with earlier findings in this study that the organization has defined for each process stage performance measures to indicate whether each stage is operating correctly as shown by a mean score of 0.7431 in table 4.5.The results also show that annual sales have not been consistent throughout for a period of 8 years. The 2016 sales had gone to Kshs 7475 million down from Kshs 7799 million the previous year. The reason could be that the product is not selling due to low demand by the unsatisfied customer because of low quality product. This is a clear indication that there is a significant relationship between CIPs and product quality performance. The findings are in line with Opondo, (2010) who observed that Lean Manufacturing is aimed at elimination of waste. He noted that waste is any activity that does not add value to the customer (Waiting time, over production, over processing, re-work, excess inventory, lack of human intellect, and transport).

Table 4.14: Soda Ash Product Purity against Specification

SERIAL NUMBER	YEAR	ACTUAL PURITY	SPECIFICATION (MIN %)
1	1997	96.99	97
2	1999	97.26	97
3	2000	97.15	97
4	2001	97.28	97
5	2002	97.22	97
6	2003	97.35	97
7	2004	97.33	97
8	2005	97.26	97
9	2006	97.24	97
10	2007	97.25	97
11	2008	97.13	97
12	2009	97.18	97
13	2011	95.87	97
14	2012	96.03	97
15	2013	95.26	97
16	2014	94.34	97
17	2015	93.83	97

Source: Researcher (2016)

Figure 4.3 Soda Ash Product Purity Against Specification



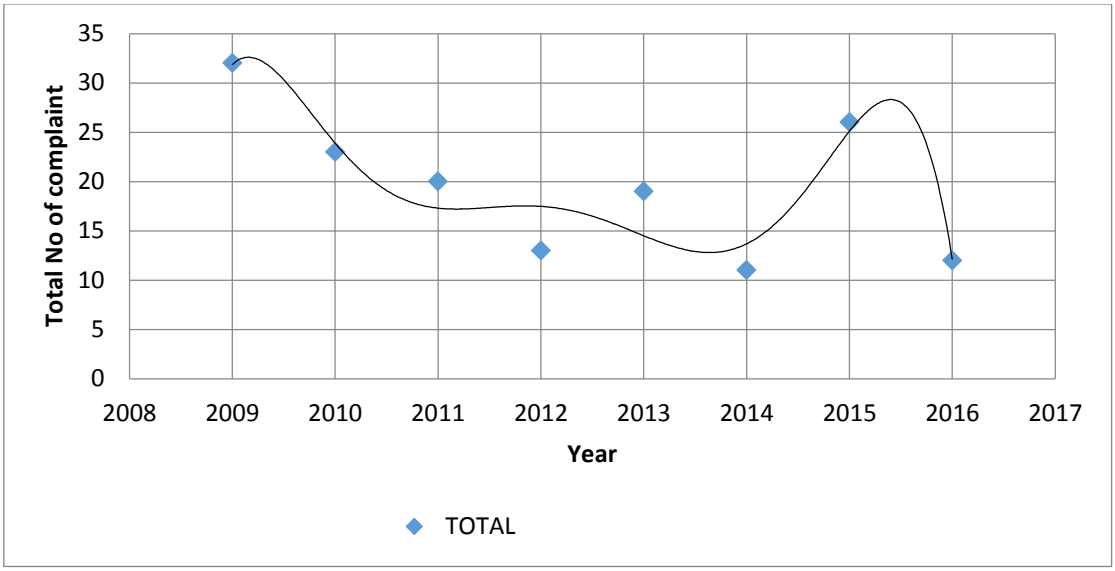
According to table 4.14 it is evident that that the Soda ash product purity has been consistently going down in the last seven years as indicated by the average percentage in table 4.14 above. The average percentage in 2015 alone was 93.8% down from 94.4% the previous year. This finding disagrees with earlier findings in this study that the organization has defined for each process stage performance measures to indicate whether the stage is operating correctly as shown by the mean score of 0.7431 in table 4.5. This depicts that the organisation has not been keen on minimisation of variations as measured by standard specifications. Sower and Fair (2015) observed that Six Sigma's focus is elimination of process variation and involves improving process capability to achieve the desired process or product quality. This also reveals that the organisation has not put much emphasis on process orientation especially in keeping track of plant efficiencies and overall equipment effectiveness

TABLE 4.15 NUMBER OF EXTERNAL CUSTOMER COMPLAINTS

SERIAL NUMBER	YEAR	POOR PRODUCT QUALITY	UNDER WEIGHT	SERVICE AND DOCUMENTATION	SUPPLIED LESS THAN ORDERED	POOR PACKAGING QUALITY	TOTAL
1	2009	5	18	4	5	0	32
2	2010	3	7	3	10	0	23
3	2011	5	11	2	2	0	20
4	2012	1	4	5	3	0	13
5	2013	3	5	10	0	1	19
6	2014	4	4	3	0	0	11
7	2015	14	6	2	4	0	26
8	2016	10	2	0	0	0	12
TOTAL		**45**	**57**	**29**	**24**	**1**	**156**

Source: Researcher (2016)

Figure 4.4 Number of External customer Complaints



According to table 4.15 the customer complaints shows an erratic pattern and complaints on underweight are leading with 36.5 percent followed by poor product quality with 28.8 percent meaning that the company needs to put more emphasis on customer Support which had a low probability of 0.3411 in terms of significance (Table 4.12).

Customer complaints have been summarised as follows; poor product quality, under-weight, service and documentation, less supply and poor packaging as shown by the pie chart below.

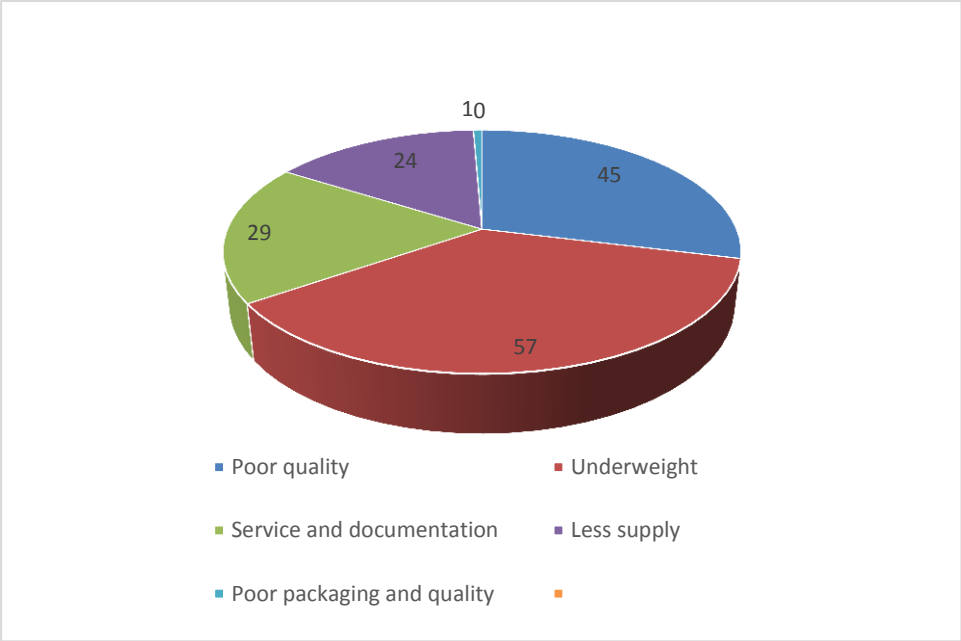
Table 4.16: Customer complaints distribution

	Poor product quality	Underweight	Service and documentation errors	Supplied less	Poor packaging quality	Total
Number	45	57	29	24	1	156
percentage	28.8	36.5	18.58	15.3	0.0006	100

Source: Researcher (2016)

Table 4.16 as for table 4.15 clearly indicates a high percentage of under weights with 36.5 percent and poor product quality at 28.8 percent. This is consistent with the earlier finding on process orientation where respondents were neutral on whether the organization keeps track of plant efficiencies on a continuous basis with a mean score of 0.252 in table 4.5 and whether the organization tracks and improves overall equipment effectiveness (OEE) with a mean score of 0.2672 in table 4.5.

Figure 4.5: Customer complaints



The results show that customer complaints have been going down in the last seven (7) years as indicated by the available secondary data (2009=32, 2010=23, 2011=20, 2012=13, 2013=19, 2014=11, 2015=25, and 2016=12). These results are supported by our earlier findings that the organization makes customer focus a cornerstone of its business and improvement strategies as shown by the mean scores of 0.6744 and with the top management in the organization sharing survey information within the workforce for both supplier evaluation and customer feedback.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study, conclusions drawn from the findings highlighted and recommendations made there-to. The conclusions and recommendations drawn were focused on addressing the purpose of this study which was to determine the relationship between continuous improvement practices and product quality performance at Tata Chemicals Magadi Limited.

5.2 Summary of the Findings

This study sought to determine the relationship between continuous improvement practices and product quality performance at Tata Chemicals Magadi Limited. To achieve product quality performance, Tata Chemicals Magadi Limited must embrace continuous improvement practices which include: Lean Manufacturing, TQM, TPM, ISO, Six Sigma and Lean Six Sigma. The study established that the company's top management strive to drive and provide actual support to continuous improvement practices aimed at achieving product quality performance by continually improving the effectiveness of continuous improvement practices and is committed to the development and implementation of CIPs. It was clear that CIP objectives in the company are measurable and are consistent with CIP policy and that each manager or employee has been trained on continuous improvement practices and has each applied CIPs to the process in one's section. Tata chemicals Magadi aspire to minimize variations during production, the organization has clearly defined for each process stage performance measures to indicate whether the stage is operating correctly, The organization has trained all personnel in Process analysis and has a means for using

product and process appraisal data systematically to control and improve performance.

On team work, the study revealed that Tata chemicals Magadi has a mechanism to ensure that all the teams engage in process improvement activities appropriate to their level on an on-going basis. The organization has a top-down structure of interrelated process improvement teams including cross functional and special teams and has a reward and recognition system that reflects team performance. This shows that the company adopts best industry practices as part of the continuous improvement approaches. Regarding support on customer focus, the organization shares survey information within the workforce for both supplier evaluation and customer feedback. On innovation, research and development, the study established that the company is keen to encourage creativity and innovation and determined to have cost effective production processes. The findings showed that the organization has the ideas implementation committee and that reward and recognition is available to the idea owners. However, the results showed that financial resources allocated to implement CIP are inadequate. The study also revealed that the company determines meaningful evaluation systems to accurately reflect process flow and inventory performance improvement on reducing inventory and improving production flow. This study also established that there was a positive and significant relationship between continuous improvement practices (Lean Manufacturing, TQM, TPM, ISO, Six Sigma and Lean Six Sigma) and product quality performance in the company. This is indicated by the analysis trend showing the effect of our key performance parameters (top management commitment, constancy of purpose, team work, process orientation, support of customer focus, responsibility and authority, management reviews, human resource, infrastructure, reducing inventory and improving production flow and

finally, Innovation research and development). Process orientation had the highest influence on product quality performance, followed by inventory reduction, then top management commitment, then constancy of purpose, then management reviews, then Innovation research and development, support of customer focus, team work, and human resources in order of decreasing magnitude while responsibility and authority and infrastructure had the least performance in the company.

5.3 Conclusion

For Tata Chemicals Magadi Ltd to achieve product quality performance and remain competitive and profitable, the company should embrace continuous improvement practices. In order to sustain such practices, it is of paramount importance that several approaches like; top management commitment, constancy of purpose, team work, process orientation, support of customer focus, responsibility and authority, management reviews, human resource, infrastructure, inventory reduction and improving production and finally, Innovation research and development as well as sufficient strategies like; Lean Manufacturing, TQM, TPM, ISO, Six Sigma and Lean Six Sigma implemented to help mitigate their effects and thus improve product quality performance. Where such practices are implemented, as previous literature have illustrated, significant savings are attainable, resulting in reduction in number of quality related customer complaints, External failure costs as a percentage of sales, customer satisfaction Index and Product purity goes up. There are significant approaches and strategies influencing CIPs, and from the findings, it was clear that Process orientation had the highest influence on quality product performance, followed by inventory reduction, then top management commitment, then constancy of purpose, then management reviews, then Innovation research and development, support of customer focus, team work, and human resource. This study established

that there are several challenges encountered in employment of the CIPs, and among the challenges include inadequate finance to implement the CIPs, determining, providing and maintaining the infrastructure needed to achieve the objectives of CIPs. The findings secondary data shows that the company sales have been on the decrease and this is attributed partly to challenges in the implementation of CIPs. Customer complaints are seen to be on decrease and the reason for this is supported earlier in the findings that the organisation has made the customer focus a cornerstone with top management in the organization sharing survey information within the workforce for both supplier evaluation and customer feedback. However, external failure costs have increased significantly over the years as the company has not met its quality targets since 2012. This is attributed to failure of the organization to put more emphasis on plant efficiencies and ensuring overall equipment effectiveness on a continuous basis

5.4 Recommendations

Owing to the huge resources companies spend on production, much emphasis and attention should be given to CIPs to enable firms to achieve the best optimal cost structures, and as such firms need to create a section specifically dealing with CIPs function to enable easy control and monitoring of costs. The company is encouraged to increase its resource commitment to staff training so as to develop skills and to update knowledge on CIPs and as such, professionalism should be encouraged at all levels of the organization. It should not be restricted to the top management only.

Quality consciousness through process capability surveillance, that is, constant touch with suppliers/factory to ensure manufacturing conforms to product specification and quality, should be constantly advocated. This can further be necessitated by adopting the continuous improvement practices such as Lean Manufacturing, TQM, TPM, ISO, Six Sigma and Lean Six Sigma with strong emphasis on staff involvement.

Furthermore, the company should integrate the supporting functions like human resources into the CIPs rollout and build internal customer and supplier relationships to work as a team.

As continuous improvement practices are fully integrated in management philosophy it is recommended that the idea of continuous improvement is also transferred into those organizational functions which support manufacturing and operations. It is therefore relevant that all departments understand their role in the CIPs transformation process. The best way to do that is by creating internal customer and supplier relationships through meeting the requirements as specified in the Service Level Agreements (SLAs) between internal suppliers of services and customers and come up with sectional service charters that defines service delivery to customers. Ensure that the top management actively drive and support the change with strong leadership especially the top management support during the whole change process. Strong top leadership availability on the CIPs processes, regular training in CIPs are mandatory if the company seeks to implement the CIPs successfully aimed at product quality performance.

Further I recommend that many firms which have implemented more than one Continuous improvement practices ought to merge them into a single practice to help reduce duplication of effort as all the practices in this study reveals that they share common characteristics. Merging these practices into only one or just a few standard practices will lead to elimination of non-value adding activities within the process and hence lead to competitiveness. Ultimately this will lead to achievement of world-class status which is the ultimate goal of implementation of CIPs in organizations.

5.5 Limitations of the Study

The study was limited to Continuous improvement practices and product quality performance in Tata Chemicals Magadi Ltd which is a manufacturing company. Secondly, there was biasness in filling some of the questions by the respondents. Many respondents attributed this to their busy schedule in the workplace and they did not have much time in reading through the questions keenly. Future research focusing on this particular topic should research on a single continuous improvement practice instead of the current six practices.

5.6 Suggestions for Further Research

The study was limited to Continuous improvement practices and product quality performance in Tata Chemicals Magadi Ltd which is a manufacturing company. Forthcoming research must put emphasis on other sectors like learning institutions or the banking sector within the service industry.

Similarly, there is also need for research in the field of the hybrid of continuous improvement practices that have been developed in the recent past and to determine their significance to large and small firms in the market.

Future studies should also attempt to explore the reasons behind the low adoption of CIPs in smaller manufacturing companies in Kenya. Researchers should go ahead and establish the reasons behind the low adoption of CIPs among smaller manufacturing firms in Kenya. A further study should be conducted on the effect of continuous improvement practices on product quality performance of large firms to allow for comparison with the small firms. However, much research has been conducted on the individual continuous improvement practices methodologies and evaluation tools have been developed to establish and determine the progress of the continuous

improvement practices' initiative, to the author's knowledge, little research has been done towards developing a framework or system that would enable an organization to identify the continuous improvement practices methodology that best suits its needs, given a certain budget for such programs. Thus, an interesting topic to pursue in the field of continuous improvement practices is how to establish the appropriate continuous improvement practices methodology for an organization to achieve product quality performance as many firms currently continue to embrace more than one CIP at the same time often operating in parallel or as hybrid models. The implications of this is that there is a lot of wastage of resources in terms of lost man hours as well as massive financial losses in hiring many consultants to offer training to staff and investments in software and hardware to support many such practices.

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APPENDICES

APPENDIX I – UNIVERSITY AUTHORISATION LETTER

UNIVERSITY OF NAIROBI
SCHOOL OF BUSINESS

Telephone: 020-2059162
Telegrams: "Varsity", Nairobi
Telex: 22095 Varsity

P.O. Box 30197
Nairobi, Kenya

DATE 01-10-2016

TO WHOM IT MAY CONCERN

The bearer of this letter SOITA JUSTUS JUMA

Registration No D61/71327/2014

is a bona fide continuing student in the Master of Business Administration (MBA) degree program in this University.

He/she is required to submit as part of his/her coursework assessment a research project report on a management problem. We would like the students to do their projects on real problems affecting firms in Kenya. We would, therefore, appreciate your assistance to enable him/her collect data in your organization.

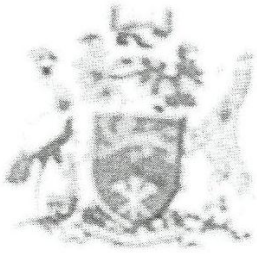
The results of the report will be used solely for academic purposes and a copy of the same will be availed to the interviewed organizations on request.

Thank you.

UNIVERSITY OF NAIROBI
SCHOOL OF BUSINESS
01 OCT 2016
P.O. Box 30197 – 00100, NAIROBI

PATRICK NYABUTO
SENIOR ADMINISTRATIVE ASSISTANT
SCHOOL OF BUSINESS

APPENDIX II: COMPANY AUTHORISATION LETTER



University of Nairobi
School of Business

3/10/16

3rd Oct 2016

Dear Sir,

RE: DATA COLLECTION

I am a postgraduate student at the University of Nairobi, school of business.I am undertaking a management research project on **Continuous Improvement Practices and Product Quality Performance at Tata Chemicals Magadi Limited**. Your organization has been selected to participate in this study, which is a fairly new area of study. The respondents will be those staff involved in strategic Quality Management, Continuous improvement Coordination ,Quality Assurance, Marketing and Supply Chain functions of your organization. The information you provide will be purely for academic purposes, and will be treated with confidence. I am appealing to the organization to allow me carry out data collection to enable compile final report due in October 2016. A copy of the final report can be availed on request.

Attached is a letter from the University and an interview guide. Your participation will be highly appreciated.

Warm regards

Soita Justus Juma

3/10/16

Tata Chemicals Magadi Limited

APPENDIX III: QUESTIONNAIRE

1. The information to be given in this interview will be confidential and will be used for academic purposes only.

2. The interview guide will seek to establish: - the extent to which Tata Chemicals Magadi Limited has implicated continuous improvement practices.

SECTION A: Demographic Data

1. For many years have you worked at TATA Chemicals Magadi?.....

2. What is your current position at TATA Chemicals Magadi?.....

3. For how long has the company been operating? ……..

4. Approximately how many employees work in the company? ……..

SECTION B: The Extent to which continuous improvement practices have been implemented by Tata chemicals Magadi.

So that we find your observation on the perceived factors behind successful adoption and implementation of continuous improvement practices and identify gaps in the implementation, kindly pick a response (either yes or No) that suits your view on the following statements regarding continuous improvement practices implemented by Tata Chemicals Magadi.

Note: Continuous improvement practices include: Lean Manufacturing whose focus is elimination of non-value adding activities(waste) from the supply chain), Six Sigma whose focus is on elimination of process variation in either manufacturing or service processes, Lean-six-sigma is a combination of Lean Manufacturing and Six Sigma,

ISO 9001 Quality Management system(QMS) is based on International Organization for standardization and derives its principles from TQM, TQM –Total Quality Management which is based on the view that the entire organization has to participate in the improvement of quality with the ultimate goal of delighting the customer and TPM-Total Productive Maintenance which focuses on equipment health with the idea of Overall Equipment Effectiveness being the driver of quality performance.

<u>For the following questions please complete column(s) 2, 3, 4 ,5&6 as appropriate.</u>

	CONTINUOUS IMPROVEMENT PRACTICES(CIPs)					
TOP MANAGEMENT COMMITMENT	**Lean Manufacturing**	**Six Sigma**	**Lean Six Sigma(LSS)**	**ISO 9001 QMS**	**TQM**	**TPM**
Is top management committed to the development and implementation of the CIP	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does commitment include continually improving its effectiveness on CIP by:- a)establishing the Continuous Improvement policy	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
b) conducting management reviews	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
c) Ensuring the availability of resources?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

CONSTANCY OF PURPOSE	**Lean Manufacturing**	**Six Sigma**	**Lean Six Sigma(LSS)**	**ISO 9001 QMS**	**TQM**	**TPM**
Does top management ensure that CIP objectives are established at relevant functions and levels within the organisation?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Are the CIP objectives measurable and consistent with the CIP policy?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Has top management mandated through policy that Continuous improvement process be deployed into the organization through a top-down approach starting from the top level executive?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Has top management implemented practices that support top-down implementation?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

Has top management created a performance measure that tracks the deployment of CIPs into the organization?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Has each manager or employee been trained in CIPs and has each applied CIP to the process in one's section	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

TEAM WORK	**Lean Manufacturing**	**Six Sigma**	**Lean Six Sigma(LSS)**	**ISO 9001 QMS**	**TQM**	**TPM**
Does the organization have a top-down structure of interrelated process improvement teams including cross functional and special teams?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization have a mechanism to ensure that all the teams engage in process improvement activities appropriate to their level on an on-going basis?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization have a reward and recognition system that reflects team performance?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

PROCESS ORIENTATION	**Lean Manufacturing**	**Six Sigma**	**Lean Six Sigma(LSS)**	**ISO 9001 QMS**	**TQM**	**TPM**
Has the organization trained all personnel in Process analysis?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
With the processes in which they work and for which they are responsible?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Are all personnel familiar	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Has the organization documented all processes by process flow diagrams and written descriptions?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Has the organization defined for each process stage performance measures to indicate whether the stage is operating correctly?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization have a means for using product and process measurements data systematically to control and improve performance?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization keep track of plant efficiencies on continuous basis?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

Does the organization track and improve overall equipment effectiveness (OEE) on continuous basis?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization use engineering change requests before undertaking any equipment/process modification?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

SUPPORT OF CUSTOMER FOCUS	**Lean Manufacturing**	**Six Sigma**	**Lean Six Sigma(LSS)**	**ISO 9001 QMS**	**TQM**	**TPM**
Does the organization make customer focus a cornerstone of its business and improvement strategies?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization emphasize through training the importance of understanding and responding to customer needs?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization develop employee exchange programs with major customers where feasible?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization create response channels for customer communication and feedback?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization share survey information within the workforce for both supplier evaluation and customer feedback?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

RESPONSIBILITY AND AUTHORITY	**Lean Manufacturing**	**Six Sigma**	**Lean Six Sigma(LSS)**	**ISO 9001 QMS**	**TQM**	**TPM**
Has top management ensured that responsibility and authority are defined and communicated within the organisation?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐		**Y** ☐ **N** ☐

MANAGEMENT REVIEW	**Lean Manufacturing**	**Six Sigma**	**Lean Six Sigma(LSS)**	**ISO 9001 QMS**	**TQM**	**TPM**
Does top management review the CIPs, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the review include assessing opportunities for improvement and the need for changes to the CIPs, including policies and objectives?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Are records of management reviews maintained	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

HUMAN RESOURCES	**Lean Manufacturing**	**Six Sigma**	**Lean Six Sigma (LSS)**	**ISO 9001 QMS**	**TQM**	**TPM**
Are personnel performing work-related to CIP competent on the basis of appropriate education, training, skills and experience?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organisation: a) Determine the necessary competency needs for personnel performing work dealing with CIP?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
b) Where applicable does the organization provide training or take other actions to achieve the necessary competence?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
c) Does the organization	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

evaluate the effectiveness of the actions taken?						
d) Does the organization ensure personnel are aware of the relevance & importance of their activities & how they contribute to achievement of CIP objectives?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

e) Does the organization maintain appropriate records of education, training, skills and experience ?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

INFRASTRUCTURE	Lean Manufacturing	Six Sigma	Lean Six Sigma(LSS)	ISO 9001 QMS	TQM	TPM
Does the organisation determine, provide and **maintain** the infrastructure needed to achieve the objectives of CIP?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the infrastructure include as applicable:- a) Building, workspace and associated utilities?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
b) Process equipment (both hardware and software)?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
c) Supporting services (such as transport & communication or information systems)?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

d) The financial resources allocated to implement CIP are inadequate.	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

REDUCING INVENTORY AND IMPROVING PRODUCTION FLOW	**Lean Manufacturing**	**Six Sigma**	**Lean Six Sigma(LSS)**	**ISO 9001 QMS**	**TQM**	**TPM**
Has the organization developed a clear policy dealing with inventory Management and improving production/work flow?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization provide training in production flow improvement and inventory reduction techniques.	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

Does the organization involve suppliers in its plan to improve process flows and reduce inventories?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Has the organization established meaningful measurement systems to accurately reflect process flow and inventory performance improvement	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

INNOVATION, RESEARCH AND DEVELOPMENT	**Lean Manufacturing**	**Six Sigma**	**Lean Six Sigma(LSS)**	**ISO 9001 QMS**	**TQM**	**TPM**
Does the organization have an improvement strategy to integrate and	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

stimulate incremental changes using the innovation process						
Is the organization sensitive to and eager to listen to even the smallest ideas or suggestions for improvement?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Are suggestions for improvement vetted by a special committee?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization have ideas selection committee?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Does the organization have the ideas implementation committee?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐
Is reward and recognition available to the idea owners?	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐	**Y** ☐ **N** ☐

APPENDIX IV EXTERNAL FAILURE COSTS

MONTH/YEAR AVERAGES	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
JANUARY	0.4274	1.13721	0	0.22425	1.79716	0	7.80245203	0
FEBRUARY	3.24715	0.02516	0.0071	2.18426	0.48563	0	0.0721	9.215423
MARCH	0.13524	1.04225	0.261	1.6149	0.8248	0	0.00781654	0.699113
APRIL	1.59804	0.53445	2.19473	0.2384	0	0.5317	0.118606	0
MAY	0.01341	0.19961	0.19378	0	0	0.279457	0.075746	9.26208711
JUNE	0.0144	0.03216	0	0	0	0.0434	0.0625	4.49346
JULY	10.25	0.38874	0.06163	0.23211	5.0443	0.044712	4.741921	0.00027235
AUGUST	0.0074	0	0.18564	1.76847	1.19975	0.096285	0.09509166	4.493492
SEPTEMBER	0.81118	1.00309	0.23545	0	0	0.89247	1.029584	0
OCTOBER	0.03139	6.12228	0.2848	0	1.0053	0	0.00036328	0
NOVEMBER	0.04568	0	0.54274	0	0.18658	0.33488	0.30818775	0
DECEMBER	0.65177	0.06516	0.2028	0	0.19197	2.297425	1.35181557	0
TOTAL COST (MILLION KSHS)	**17.233**	**10.55**	**4.1697**	**6.2624**	**10.735**	**4.52033**	**15.666184**	**28.163847**
ANNUAL SALES(MILLION KSHS)	**9231.1**	**6892**	**7944**	**10560**	**9027**	**9048**	**7799**	**7475**
TOTAL COST AS PER OF NO. SALES	**0.1867**	**0.1531**	**0.0525**	**0.0593**	**0.1189**	**0.04996**	**0.2008743**	**0.3767739**

APPENDIX V - SODA ASH PRODUCT PURITY (PERCENT)

						TARGET PERCENT: 97 MINIMUM							
MONTH/YEAR AVERAGES	**1997**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
JANUARY	96.44	97.37	97.3	97.22	97.12	97.33	97.26	97.32	97.21	97.38	97.28	96.84	97.32
FEBRUARY	96.83	97.18	97.23	97.34	97.18	97.33	97.33	97.22	97.23	97.26	97.2	97.05	97.12
MARCH	96.75	97.25	97.19	97.38	97.26	97.32	97.41	97.38	97.36	97.14	97.21	97.19	97.25
APRIL	96.88	97.36	97.36	97.5	97.37	97.36	97.43	97.35	97.22	97.24	97.23	97.2	96.8
MAY	96.96	97.31	97.21	97.33	97.32	97.49	97.28	97.48	97.28	97.31	97.26	97.25	96.06
JUNE	97.29	97.23	97.22		97.35	97.5	97.31	97.42	97.48	97.27	97.22	97.27	96.26
JULY	97.16	97.2	96.99	97.2	97.33	97.35	97.26	97.4	97.43	97.29	97.17	97.16	96.05
AUGUST	96.88	97.33	96.96	97.3	97.2	97.36	97.27	97.1	97.42	97.18	97.17	97.18	96.99
SEPTEMBER	97.26	96.99	97.08	97.19	97.11	97.32	97.36		95.96	97.27	97.15	97.16	96.03
OCTOBER		97.4	97.15	97.2	97.17	97.36	97.37	96.9	97.43	97.23	97.08	97.26	96.77
NOVEMBER		97.25	97.11	97.19	97.12	97.33	97.31	97.22	97.39	97.22	96.81	97.32	96.75
DECEMBER	97.42	97.35	97.18	97.22	97.13	97.14	97.38	97.03	97.41	97.26	96.76	97.24	96.3
AVERAGE %	**96.99**	**97.26**	**97.15**	**97.28**	**97.22**	**97.35**	**97.33**	**97.26**	**97.235**	**97.25**	**97.13**	**97.18**	**96.64**

	Percentage Purity				
JANUARY	**2011**	**2012**	**2013**	**2014**	**2015**
FEBRUARY	95.93	96.48	94.1	95.19	94.86
MARCH	96.39	96.41	95.66	94.64	94.05
APRIL	96.64	95.96	95.79	94.62	94.04
MAY	96.12	95.57	95.85	94.65	94.64
JUNE	96.46	95.83	96.34	94.5	93.43
JULY	95.8	96.37	95.47	94.26	93.67
AUGUST	96.04	96.53	95.15	94.72	94.38
SEPTEMBER	94.52	96.33	95.13	94.2	93.12
OCTOBER	95.27	95.9	94.85	93.73	93.36
NOVEMBER	95.15	95.55	94.66	94.21	92.83
DECEMBER	95.86	95.64	95.22	93.44	

APPENDIX VI – NUMBER OF EXTERNAL CUSTOMER COMPLAINTS

MONTH/YEAR	2009					
	POOR PROD.QUALITY	UNDER WEIGHT	SERV AND DOC	SUPPLIED LESS	POOR PACK QUALITY	TOTAL
JANUARY	0	4	0	0	0	4
FEBRUARY	1	4	1	0	0	6
MARCH	0	1	0	0	0	1
APRIL	1	1	0	0	0	2
MAY	0	1	0	0	0	1
JUNE	1	0	0	0	0	1
JULY	2	1	1	0	0	4
AUGUST	0	0	0	1	0	1
SEPTEMBER	0	4	1	1	0	6
OCTOBER	0	0	1	1	0	2
NOVEMBER	0	1	0	0	0	1
DECEMBER	0	1	0	2	0	3
TOTAL	**5**	**18**	**4**	**5**	**0**	**32**

MONTH/YEAR	2010					
	POOR PROD. QUALITY	UNDER WEIGHT	SERVAN D DOC	SUPPLIED LESS	POOR PACK QUALITY	TOTAL
JANUARY	2	0	0	1	0	3
FEBRUARY	0	0	0	3	0	3
MARCH	0	1	1	2	0	4
APRIL	0	1	0	0	0	1
MAY	0	1	0	0	0	1
JUNE	0	2	0	0	0	2
JULY	0	1	1	0	0	2
AUGUST	0	0	0	0	0	0
SEPTEMBER	1	0	0	3	0	4
OCTOBER	0	0	1	0	0	1
NOVEMBER	0	0	0	0	0	0
DECEMBER	0	1	0	1	0	2
TOTAL	**3**	**7**	**3**	**10**	**0**	**23**

MONTH/ YEAR	**2011**					
	POOR PROD. QUALITY	**UNDER WEIGHT**	**SERV AND DOC**	**SUPPLIED LESS**	**POOR PACK QUALITY**	**TOTAL**
JANUARY	0	0	0	0	0	0
FEBRUARY	0	1	0	0	0	1
MARCH	0	1	0	0	0	1
APRIL	2	2	0	1	0	5
MAY	0	1	0	0	0	1
JUNE	0	0	0	0	0	0
JULY	1	0	0	0	0	1
AUGUST	1	2	0	1	0	4
SEPTEMBER	1	2	0	0	0	3
OCTOBER	0	1	0	0	0	1
NOVEMBER	0	0	2	0	0	2
DECEMBER	0	1	0	0	0	1
TOTAL	**5**	**11**	**2**	**2**	**0**	**20**

MONTH/YEAR	2012					
	POOR PROD.QUALITY	UNDER WEIGHT	SERV AND DOC	SUPPLIED LESS	POOR PACK QUALITY	TOTAL
JANUARY	1	1	0	0	0	2
FEBRUARY	0	0	1	2	0	3
MARCH	0	0	0	1	0	1
APRIL	0	0	1	0	0	1
MAY	0	0	0	0	0	0
JUNE	0	0	0	0	0	0
JULY	0	1	1	0	0	2
AUGUST	0	2	2	0	0	4
SEPTEMBER	0	0	0	0	0	0
OCTOBER	0	0	0	0	0	0
NOVEMBER	0	0	0	0	0	0
DECEMBER	0	0	0	0	0	0
TOTAL	**1**	**4**	**5**	**3**	**0**	**13**

MONTH/YEAR	2013					
	POOR PROD. QUALITY	UNDER WEIGHT	SERV AND DOC	SUPPLIED LESS	POOR PACK QUALITY	TOTAL
JANUARY	0	1	2	0	1	4
FEBRUARY	0	1	3	0	0	4
MARCH	0	0	2	0	0	2
APRIL	0	0	0	0	0	0
MAY	0	0	0	0	0	0
JUNE	0	0	0	0	0	0
JULY	1	2	1	0	0	4
AUGUST	1	0	0	0	0	1

SEPTEMBER	0	0	0	0	0	0
OCTOBER	0	0	2	0	0	2
NOVEMBER	0	1	0	0	0	1
DECEMBER	1	0	0	0	0	1
TOTAL	**3**	**5**	**10**	**0**	**1**	**19**

MONTH/YEAR	**2014**					
	POOR PROD. QUALITY	**UNDER WEIGHT**	**SERV AND DOC**	**SUPPLIED LESS**	**POOR PACK QUALITY**	**TOTAL**
JANUARY	0	0	0	0	0	0
FEBRUARY	0	0	0	0	0	0
MARCH	0	0	0	0	0	0
APRIL	0	0	3	0	0	3
MAY	1	1	0	0	0	2
JUNE	0	1	0	0	0	1
JULY	1	0	0	0	0	1
AUGUST	0	1	0	0	0	1
SEPTEMBER	1	0	0	0	0	1
OCTOBER	0	0	0	0	0	0
NOVEMBER	0	1	0	0	0	1
DECEMBER	1	0	0	0	0	1
TOTAL	**4**	**4**	**3**	**0**	**0**	**11**

MONTH/YEAR	2015					
	POOR PROD. QUALITY	**UNDER WEIGHT**	**SERV AND DOC**	**SUPPLIED LESS**	**POOR PACK QUALITY**	**TOTAL**
JANUARY	2	1	0	0	0	3
FEBRUARY	0	0	0	0	0	0
MARCH	0	1	0	0	0	1
APRIL	1	0	0	0	0	1
MAY	1	1	0	1	0	3
JUNE	0	0	0	1	0	1
JULY	5	1	0	0	0	6
AUGUST	2	1	0	0	0	3
SEPTEMBER	1	0	1	0	0	2
OCTOBER	0	0	0	1	0	1
NOVEMBER	1	1	1	0	0	3
DECEMBER	1	0	0	1	0	2
TOTAL	**14**	**6**	**2**	**4**	**0**	**25**

MONTH/YEAR	**2016**					
	POOR PROD. QUALITY	**UNDER WEIGHT**	**SERV AND DOC**	**SUPPLIED LESS**	**POOR PACK QUALITY**	**TOTAL**
JANUARY	0	0	0	0	0	0
FEBRUARY	3	0	0	0	0	3
MARCH	1	0	0	0	0	1
APRIL	0	0	0	0	0	0
MAY	4	1	0	0	0	5
JUNE	1	0	0	0	0	1
JULY	0	1	0	0	0	1
AUGUST	1	0	0	0	0	1
SEPTEMBER	0	0	0	0	0	0
OCTOBER	0	0	0	0	0	0
NOVEMBER						
DECEMBER						
TOTAL	**10**	**2**	**0**	**0**	**0**	**12**