LEAN MANUFACTURING PRACTICES AND OPERATIONAL PERFORMANCE OF UNGA GROUP LIMITED

BY

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DECLARATION

This research project is my original work and has not been submitted for another degree of this or any other university or institution of learning.

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DEDICATION

This research paper is dedicated to my friends and family members. Their encouragements and advice gave me the courage and the motivation to continue studying to the highest possible academic level. Above all, I dedicate all to the Almighty God for showering me with his blessings during the entire MBA program.

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ABSTRACT

The objectives of this study included identifying lean practices employed in manufacturing process, establishing the extent of adoption of Lean manufacturing practices and operational performance for which Unga Group Limited was taken as the case for study. The main objectives were; to determine the effects of Lean manufacturing practices on the operational performance of Unga Group Ltd, to document the extent to which Lean manufacturing practices have been adopted at Unga Group Ltd and to find out the challenges faced by Unga Group Ltd in their quest of implementing lean manufacturing practices. The goals for lean manufacturing practices are to improve quality. To stay competitive in today's marketplace, a company must understand its customers' wants needs and designs processes that meet their expectations and requirements. Along with the areas highlighted include the various lean manufacturing practice tools that are being adopted; the benefits derived from the adoption of these practices and the challenges encountered in the implementation of the practices. Primary data was collected by use of questionnaire with both closed and open ended questions. The closed ended questions enable the collection of qualitative data for analysis the Likert scale while the open ended questions enable the researcher to collect qualitative data on the respondents view on lean manufacturing practices at Unga Group Ltd. The study found out the firm believes that lean manufacturing practices enhance the long term business and operational performance and success. The study established less process waste, reduced inventory, reduced lead time, less rework, financial savings and increased process understanding as the benefits emanating from the implementation of lean manufacturing practices. The study also established the following barriers to lean manufacturing practices implementation: external obstacles, logistic issues smaller supplier's difficulties and global issues. These findings should help in encouraging the widespread adoption of lean manufacturing practices in Kenya.

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LIST OF ABBREVIATIONS

LM:	Lean Manufacturing
JIT:	Just In Time
OP:	Operational Performance
OEE:	Overall Equipment Efficiency
UGL:	Unga Group Limited

CHAPTER ONE

INTRODUCTION

1.1Background of the Study

Global competitions in the manufacturing sector mirrors Darwin's theory of survival of the fittest and organizations that can meet or exceed customer's expectation have a higher chance of survival (Kumar and Kumar, 2012). Businesses have to find a strategy that will help them survive, as the past strategies seem not to be working today (Aly and Mullen, 2010). Tourki (2010) noted that many organizations have realized the essential need to adopt the lean philosophy instead of the traditional mass production concepts in order to stay competitive and survive in the global rivalry situation. Hence, adoption of production standards and strategies such as lean manufacturing has become a key survival technique for many companies across the world.

One way to stay competitive in the globalized market is to become more efficient. Lean manufacturing has been receiving a lot of attentions and the effects claimed after implementing it are enormous (Wong, Wong & Ali, 2009). Researchers have recognized lean manufacturing as the key to improving competitiveness for manufacturing companies. Muslimen, Yusaf and Abidin (2011) noted that lean manufacturing has become a widely acceptable and adoptable best manufacturing practice across countries and industries. Lean manufacturing not only reduces operational costs but also targets to boost, restore and significantly raise the competitiveness of a company (Mehta, Mehta & Mehta, 2012).

The milling industry in Kenya comprises of two levels of private players i.e., the small-scale and large-scale players with no government owned milling firm. Majority of the large milling firms are confined to the major Kenyan towns and the current market allows for free entry and exit by various milling firms in to the market. Shortages of the raw material coupled with surging wheat prices at the world market are adversely affecting the operations of flour milling industry. The Milling Industry is characterized by many key features which distinguish it from other sectors of the economy. With turnover and earnings driven primarily by market share and capacity utilization, the major determinant of success among its players is organic growth and cost leadership (Owuor, 2009).

1.1.1 Lean Manufacturing Practices

Lean manufacturing is defined by Smith and Hawkins (2004) as a practice of eliminating waste in every area of production including customer relations (sales, delivery, billing and product satisfaction), product design, supplier network, production flow, maintenance, engineering, quality assurance and factory management. In lean manufacturing, waste is identified as anything that does not add value to the process or service delivered to the customer. The resounding principle of lean manufacturing is to reduce cost through continuous improvement that will eventually reduce the cost of services and products, thus growing more profits as Womack et al, (1990) notes.

Lean focuses on abolishing or reducing wastes and on maximizing or fully utilizing activities that add value from the customer's perspective. According to Ohno (1997), from customer's perspective, value is equivalent to anything that the customer is willing to pay for in a product or the service that follow. Lean manufacturing is about creating more value for customers by eliminating activities that are considered waste. This implies that any activity that consumes resources, adds costs or time without creating customer value is a target for elimination. So the elimination of waste is the basic principle of lean manufacturing.

1.1.2 Operational Performance

Customers demand quality products, implying the need for various actions undertaken by the company involving production deliveries in small lots within short deadlines (Christopher, 1999). Companies with mass production generally have over-aged equipment in terms of market competitiveness (Fullerton & Wempe, 2009). Consequently many companies seek the flexibility and efficiency resulting to lean manufacturing. Lean manufacturing mechanisms provide reduced costs of quality failures.

Kinney and Wempe (2002) re-examined the effect of lean manufacturing adoption on operational and financial performance. They found that adopters of lean systems produced increases in inventory turnover that were six to eight times greater than their non-adopting counterparts, with a corresponding decrease in inventory-to total- assets. The Return On Asset (ROA) response for JIT adopters improved, on average, more than non-adopters, and no significant difference in ROA was found between firms of varying customer base concentration. They explored the ROA response further by

assessing the effect of lean implementation on both the profit margin and asset turnover (ATO) measures. The data revealed a stronger association between increases in profit margin and ROA, indicating that the removal of non-value-added costs is a greater boon than the mere increase in asset turns due to inventory reductions.

1.1.3 Lean Manufacturing Practices and Operational Performance

Lean manufacturing is based on the rationale of removing activities that do not add value to the productive system especially those associated with elapse times, methods, processes, places, people and movements (Womack et al., 1992). The elimination of activities that do not add value allows a densification of work and a better match of activities that generate wealth. Accordingly, the increase in profit comes from the reduction of costs, which improves business performance of the company (Shingo 1996). However, to achieve the goal of improving performance, it is necessary to develop competitive skills (Dyer & Singh, 1998; or operational capabilities associated with quality, flexibility and costs (Flynn & Flynn, 2004).

Customers demand quality products, implying the need for various actions undertaken by the company involving production as, for example, deliveries in small lots within short deadlines (Christopher, 1999). To meet these demands, manufacturers have adopted initiatives aimed at reducing the setup time of equipment, making manufacturing cell manufacturing more flexible and improving quality. The production of small lots, for instance, requires frequent adjustments in the equipment and thereby reducing the setup time allows improvement of competitiveness by diminishing costs.

Moreover, companies with mass production generally have over-aged equipment in terms of market competitiveness (Fullerton & Wempe, 2009). Consequently, many companies seek the flexibility and efficiency resulting from cell manufacturing. The design of a lean manufacturing system depends on attributes that may influence the behavior of the buyer. According to Chase, Jacobs and Aquilano (2006), different clients are attracted by different attributes. For example, some customers are more sensitive to the price of a product or service and therefore, in this case, companies should emphasize cost reduction.

Lean manufacturing management mechanism linked to the principle of the Toyota Production System, in which increasing profits come from reducing costs, contrasts with the focus on margin, in which costs are unquestionable and added up to a desired profit level. The Toyota System favors larger gains emphasizing activities and processes that reduce costs, given a price set by consumers. From this perspective, the profit is the difference between price and cost (Shingo, 1996). This approach was innovative, since it confronted be common sense associated with price as the sum of costs and margin, which implied the transfer, to the consumer, of the additional costs of inefficiencies in the production processes. Whereas the sustained profit should be a relevant goal of any company, there is a growing concern that, if profit is an end, the means by which it is obtained should be further explored. This perspective is similar to the Toyota Production System approach that emphasizes the role not only of profits but also of costs. From a practical standpoint, in many organizations, board meetings begin with a review and analysis of the financial position, showing that the financial result is a relevant element.

The functional relationships, the use of plant capacity and the production efficiency may be variables which generate results and therefore represent metrics by which business is evaluated and consequently controlled. The rationale behind this view is that performance is related to profitability and, therefore, management's attention to issues such as customer satisfaction, empowerment and commitment of employees (Christopher, 1999), i.e., competitive skills may influence performance.

1.1.4 Unga Group Limited

Unga Limited, a Group operating company and is one of the oldest companies in Kenya, registered on 28th December 1908 with the aim of serving the milling needs of the fledgling wheat growing industry that had established itself in the Rift Valley region. By the 1970's, Unga Limited had become the largest grain miller in East Africa with operations in Nairobi, Eldoret, Nakuru, lringa, Dar es Salaam, Arusha and Jinja. Unga Group Limited has been a publicly listed company in Kenya since 1956. Today, Unga Group is headquartered in Nairobi and is the holding company for four operating companies - Unga Limited (human nutrition), Unga Farm Care (EA) Limited (animal nutrition and health), Unga Millers (Uganda) Limited (human and animal nutrition) and Bullpak Limited (paper packaging). Unga Limited has mills in Eldoret and Nairobi; Unga Farm Care has manufacturing facilities in Nakuru and Nairobi. These facilities are supported by well-equipped analytical laboratories (Mutai, 2013).

Unga Limited's major Maize brands are Jogoo, Hostess, Hodari and Jogoo Extra; these were joined in May 2011 by Jogoo Wimbi, targeted at the emerging market for healthy foods. In the Wheat category there is the EXE family of specialty home baking flours All Purpose, Chapati, Mandazi, Self Raising, Atta Mark 1 and Brown Bread, supported by Kenya's Pride Bakers flour, Tower whole meal flour, Biscuit Flour, Pure Patent flour, Cracker Flour and Paa home baking flour. Unga Limited maintains market leadership in the uji porridge category with its range of natural and high quality products sold under the Famila name, namely Ujimix the original sour porridge, Pure Wimbi and Infant Weaning (Mutai, 2013).

There has been a lot of competition in the flour milling industry and the industry has been experiencing a lot of challenges among which include the high cost of doing business. Unga Group Limited is also facing the same challenges and it has formal practices which were formulated with the view of remaining relevant in the industry. Even after implementing the lean practices formulated, the company continued performing dismally despite the fact that it had relevant and good practices, the poor performance could probably be attributed to the disconnect between lean practices and operational performance.

1.2 Statement of the Problem

Implementation of lean manufacturing helps many organizations to improve their productivity and efficiency (Tourki, 2010). Lean manufacturing practices such as continuous improvement, JIT, production smoothing, standardization of work and "*poka yoke*" are used to reduce waste in the manufacturing process. Reduced cost, reduced lead time, waste reduction, improved productivity, reduced inventory, lower

cycle times, improved flexibility, multiskilled worker, better utilization of equipment and space and reduced defects are some of the advantages of lean manufacturing highlighted by Kumar and Kumar (2012).

Lean manufacturing is therefore an essential strategy for companies to continue being competitive in the globalized market. An organization that ignores the lean manufacturing strategy would not be able to stand a chance against the current global competition for higher quality, faster delivery and lower costs (Nordin, Deros and Wahab 2010).

Based on these arguments, the research will aim at seeking to investigate whether lean manufacturing system has a direct and positive relationship with operational performance at UGL. Unga Group Limited philosophy of continual improvement has seen them strengthen their core business through the adoption of the Hoshin Kanri tool in powerful component of methodologies for continual improvement. The Hoshin Kanri discipline has extraordinary useful in enabling to develop and deploy strategies that ensure the goals are aligned and that they measure and manage their performance regularly and transparently throughout the organization. Improved production efficiency and reduced cost not only through plant modernization but the continued evolution and embedding of lean manufacturing (Isabella Ochola-Wilson 2013).

UGL has modernized and expanded milling and production facilities such as: Refurbishment of Nairobi feeds plant, additional wheat milling capacity commission at the Nairobi plant. To justify the lack of improvement in operating performance, Schonberger (2009) blames administrators and engineers who, because they have

multiple functions, do not give appropriate attention to basic activities. One way to avoid the performance variability that results from contextual factors involves developing manufacturing practices that add value to the customer. Through competitive skills established jointly with customers, companies can support initiatives that enable lean manufacturing (Boyer and Lewis 2002).

The search for answers to the research problem will contribute to the advancement of knowledge about lean manufacturing. The analysis of UGL is also a contribution since it will evaluate results of LM in an environment that is not often studied in the literature of business management. According to Kaynak (2003), the available literature does not provide a definite answer about how and what elements of lean manufacturing influences operational performance.

Overall, very good systems and structures exists that support lean manufacturing which if religiously implemented will greatly improve the performance of the organization. It is important that the management implements a system of tracking the effectiveness of each technique and ensure that there is a consistent follow up of the systems and structures in place to ensure they are implemented as required.

1.3 Research Objective

i. To determine lean manufacturing practices adopted by UGL.

ii. To determine the relationship between adoption of lean manufacturing and operation performance.

iii. To investigate the challenges faced in implementing lean manufacturing practices at UGL.

1.4 Value of the Study

The findings of this research will contribute to the realization of Unga's Group significance; superior, premium, consistence, quality, value and availability. This will be through identification of lean manufacturing practices used in the company, determine to what extent they are utilized and what other lean manufacturing tools and techniques that can be employed to enable improvement in the company's operations performance. In addition, by highlighting the challenges faced in lean manufacturing, the study could help the management of UGL to brainstorm on how they could overcome them. Other milling companies in Kenya will also find this study very useful in terms of understanding the benefits of adopting lean manufacturing practices and what challenges they are likely to face.

To the policy makers, the findings will provide insight into the practices of lean manufacturing in the milling industry in Kenya. This understanding will help during formulation of polices regarding regulation of the milling operations. Scholars and academicians will also find this study an invaluable source of secondary data for future studies in the field of lean manufacturing. This research will build into the knowledge of lean manufacturing in a manufacturing (milling) industry in Kenya. The research will also provide insights into the implementation of lean practices in the milling industry in Kenya. It will also help in identifying the challenges faced in implementation of lean manufacturing to a milling industry in Kenya.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on a review of literature on lean manufacturing. The chapter begins by a discussion of the concept of lean manufacturing and then highlights the lean manufacturing practices. The benefits and barriers to adoption of lean manufacturing and competitive advantage by organizations are then discussed. A summary of the chapter discussing some issues raised by researchers in this field is given at the end.

2.2 Lean Manufacturing

The concept of lean manufacturing was pioneered by a Japanese automotive company, Toyota, during 1950's which was famously known as Toyota Production System (Tourki, 2010). The term "lean" refers to a systematic approach of identifying and eliminating waste (non-value added activities) through continuous improvement by moving the product at the pull of the customers in pursuit of perfection.

Erfan (2010) categorized waste into eight categories: over production, waiting, including time in queue, work in progress, transportation between workstations or between supplier and customers, inappropriate processing, excess motion or ergonomic problems, defected products, and underutilization of employees. Waste sources are all related to each other and getting rid of one source of waste can lead to either elimination of, or reduction in others. The most significant source of waste is inventory (Abdullah, 2003).

It is thus clear that the elimination of waste is an essential ingredient for survival in today's manufacturing world. A lean organization can make twice as much product with twice the quality and half the time and space, at half the cost, with a fraction of the normal work-in process inventory (El-Namrouty & AbuShabaan, 2013). One of the ways to decrease wastages can be elimination of nonproductive activities that can result in drop in time, cost, and lead time. Results from previous studies vary; some research have indentified that the adoption of lean practices tools do not improve profitability (Hudson & Nanda, 1995). Other studies suggest a positive association between modern manufacturing practices and financial performance (Kinney and Wempe, 2002).

2.3 Lean Manufacturing Principles

Toyota has advanced as a global leader in the automotive market. Toyota's achievements were first noticed in 1980, when it was clear that there was something special in terms of quality and efficiency in Japanese manufacturing (Liker, 2005). Toyota's characteristics resulted from several scars from the Second World War, forcing the search of innovative alternatives for growth amidst chaos in post-war times. That is why Toyota became the biggest automotive manufacturer of the 21st century and one of the most profitable companies in the world. For Liker (2005), Toyota's success is, essentially, based on its aptitude to cultivate leadership, teams and culture to create strategies, build relationships with suppliers and foster a learning organization. For Womack and Jones (2004) there are five Lean principles: Precisely determining the value of each specific product in the eyes of the end client, identifying the value flow of each product, making the value flow continuously, letting the customer pull value from the manufacturer and seeking perfection.

Womack and Jones (2004) state that is necessary to keep focus in eliminating waste. This focus requires actions taken by process managers, since every human activity absorbs resources but some do not create value. For a company to be lean, it is necessary to reconsider all processes, allowing for the flow of material land information, and also adding value aimed at unit flow and client (internal and external) restock only when required.

2.4 Lean Manufacturing Practices

Elimination of waste is the basic principle of lean manufacturing. Erfan (2010) explained that the lean manufacturing practices are used to identify and remove wastes from the system continuously. These lean manufacturing practices include: Kaizen-Continuous Improvement, Six Sigma, Just in Time, Five Ss, Hoshin Kanri and Overall Equipment Effectiveness.

2.4.1 Kaizen- Continuous Improvement

Kaizen is the continual pursuit of improvement in quality, cost delivery and design. It ensures organization achieve competitive advantage. Kaizen could be seen as a culture of sustained improvement aiming at eliminating waste in the entire organization and involves everyone in a common aim to improve work without huge capital investments (Bhuiyan and Baghel, 2005). Efforts focused on the reduction of waste are pursued through continuous improvement or kaizen events, as well as small incremental improvements.

2.4.2 Six Sigma

Six Sigma is a process improvement method that relies on customer feedback and fact based data gathering and analysis techniques to drive process improvement. Motorola and General Electric are closely identified with the emergence of the Six Sigma movement. Technically, the term Six Sigma refers to a process that generates no more than 3.4 defects per million opportunities. Because this rate of defects is so low, Six Sigma is sometimes associated with the term *zero defects.*

The most common framework used to guide Six Sigma process improvement efforts is known as DMAIC which stands for Define, Measure, Analyze, Improve, and Control. The Define stage of the process focuses on defining the scope and purpose of the project, the flow of the current process, and the customer's requirements. The Measure stage is used to gather baseline performance data concerning the existing process and to narrow the scope of the project to the most important problems.

The Analyze stage focuses on identifying the root causes of the problems that were identified during the Measure stage. The Analyze stage often reveals that the process includes many activities that do not add value to the product or service. Activities that customers are not willing to pay for because they add no value are known as non-value-added activities and such activities should be eliminated wherever possible. During the Improve stage potential solutions are developed, evaluated, and implemented to eliminate non-value-added activities and any other problems uncovered in the Analyze stage. Finally, the objective in the Control stage is to ensure that the problems remain fixed and that the new methods are improved over time. (Brewer and Bagranoff, 2004).

2.4.3 Just in Time (JIT)

Just-in-time manufacturing is a Japanese management philosophy applied in manufacturing field. It involves having the right items with the right quality and quantity in the right place at the right time (Paneru, 2011). The primary goal for all the companies is customer's satisfaction and if a company cannot reach perfection in this area then all the processes are worthless. JIT is a tool if well implemented, improves business performance and efficiency through reduction of costs, better quality products and increased production. A study of companies that adopted just-in-time (JIT) in comparison to a control group that did not adopt JIT, found that the JIT adopters improved their ROIs more. The JIT adopters' success resulted from improvements in both profit margins and asset turnover. The elimination of inventories in JIT reduces total assets, but more important, it leads to process improvements as production problems are exposed. When production problems and non-value-added activities are eliminated, costs go down (Kinney and Wempe 2002).

2.4.4 Five (5) Ss

The 5S has its origins in the Toyota system and refers to the words that describe the steps to be completed for each stage or phase. Moore and Scheinkopf (1998) explained 5S as follows; Seiri (Separate) to separate the necessary things from the unnecessary and discard the unnecessary. Eliminating all that is not needed to complete the tasks-straighten and configure. Seiton (Sort) refers to arranging neatly and identifying things for ease of use. Identifying the stages of production and the elements necessary for the performance of the tasks required in those stages, which are organized in the optimal manner in order to avoid wasting time on handling-clear out and classify.

Seiso (Sweep and shine) means to always clean up; to maintain tidiness and cleanliness, to clean your workplace thoroughly. Seiketsu (Standardize) is to constantly maintain the 3Smentioned above. It means keeping a clean workplace without rubbish. Standardization of the processes through efficient organization of the working equipment while programming them in order to have maximum efficiency-consistency and conformity. Shitsuke (Sustain) to have workers make a habit of always conforming to rules. Taken together; 5S means good housekeeping and better workplace organization such as Maintaining discipline, reducing production and handling time which leads to lower costs.

2.4.5 Overall Equipment Effectiveness (OEE)

Overall Equipment Effectiveness (OEE) is a "best practices" way to monitor and improve the effectiveness of your manufacturing processes (i.e. machines, manufacturing cells, assembly lines). OEE is simple and practical and takes the most common and important sources of manufacturing productivity loss, places them into three primary categories and distills them into metrics that provide an excellent gauge for measuring where you are and how you can improve.OEE is frequently used as a key metric in TPM (Total Productive Maintenance) and Lean OEE is frequently used as a key metric in TPM (Total Productive Maintenance) and Lean Manufacturing programs and gives you a consistent way to measure the effectiveness of TPM and other initiatives by providing an overall framework for measuring production efficiency.

The cornerstone of OEE is providing employees with the tools they need to aggressively attack the Six Big Losses. If you can display the underlying data in real-time, in one stroke you have empowered the operators and maintenance staff to understand how they can improve their OEE numbers and plant productivity. In any fast-paced manufacturing environment, it is of paramount importance that operators spend their time effectively operating equipment not manually recording data).

2.4.6 Hoshin Kanri (Policy Deployment)

Hoshin Kanri is a method of ensuring that the strategic goals of a company drive progress and action at every level within that company. This eliminates the waste that comes from inconsistent direction and poor communication. Hoshin Kanri strives to get every employee pulling in the same direction at the same time. It achieves this by aligning the goals of the company with the plans of middle management and the work performed by all employees.

It is powerful tool that can help organizations shape their futures instead of just reacting to internal or external influences. The method can keep organizations on track with what they have identified as important and keep them focused on the best use of resources to reach their goals. The most effective way to get the future you want is to envision this future and continually take steps toward it. Hoshin Kanri process somewhat resembles Management by Objectives (MBO), but adds a significant element in the goal setting process, called "catchball". Use of these Hoshin techniques by U.S. companies such as Hewlett Packard have been successful in focusing and aligning company resources to follow stated strategic goals throughout an organizational hierarchy (Ficalora and Cohen, 2009).

2.5 Benefits of Adopting Lean Manufacturing

Lean manufacturing not only reduces operational costs but also targets to boost, restore and significantly raise the competitiveness of a company (Gupta & Mehta, 2013). El-Namrouty and AbuShabaan (2013) argued that a lean organization can make twice as much product with twice the quality and half the time and space, at half the cost, with a fraction of the normal work-in process inventory. Lean production is an intellectual approach consisting of a system of strategies which, when taken together, produce high quality products at the pace of customer demand with little or no waste (Ondiek & Kisombe, 2012). When customer satisfaction is achieved, sales will surely rise.

The best way to establish a good relationship with customers is to improve the products and services offered to them (Mehta et al. 2012). Implementation of lean helps many organizations to improve their productivity and efficiency; (Tourki, 2010). Khalil et al. (2012) pointed out that; implementation of lean manufacturing can generate superior operational and financial improvements within all systems. The following are benefits of lean manufacturing implementation as highlighted by Kumar and Kumar (2012).

Reduced cost reduced lead time, waste reduction, improved productivity, reduced work in progress (WIP) inventory, lower cycle times, improved flexibility, multiskilled workers, better utilization of equipment and space and reduced defects. Lean manufacturing leads to increased process understanding. Melton (2005) explained that it increases the understanding of the whole supply chain including the manufacturing processes and all other processes within the value stream. Through 5S,

lean manufacturing aids in maintaining high standard of housekeeping in the organization. Its successful implementation requires active involvement by everyone, flow of information along value chain and support by the management. Thus lean manufacturing promotes teamwork and effective communication in the organization.

2.6 Challenges faced when adopting Lean Manufacturing

The case of not achieving the expected results of implementing lean is not because of limitation of lean to specific organizations type; however the misconception of the lean philosophy is amongst the main failure's factors (Tourki, 2010). The main barriers to implement lean manufacturing system are the lack of understanding of lean concepts and shop floor employees' attitude (Nordin et al., 2010). One of the major barriers to lean implementation is providing evidence of its potential benefit to end users (Khalil et al., 2012).

Another challenge when adopting lean manufacturing is people. This is by employees reverting to the old ways of working probably because lean manufacturing initiatives might have burdened them with additional work. Resistance from employees due to the "fear factor" that they would lose their jobs if they find out that their jobs do not add values, since lean manufacturing is about eliminating non value added activities (Wong et al. 2009). Obstacles of lean manufacturing implementation highlighted by Kumar and Kumar (2012) include lack of management support, lack of training, lack of communication, resistance to change and no direct financial advantage.

Lean does not produces any direct financial benefits but it helps in identification and elimination of waste hence reduction of cost. Therefore it is very important that lean manufacturing potential benefits are made known to all employees to ensure that they are supportive and have a common goal to achieve it.

Bhasin and Burcher (2006) in their analysis noted that the major difficulties companies encounter in attempting to apply lean are a lack of direction, a lack of planning and a lack of adequate project sequencing. The challenge to organizations utilizing lean manufacturing is to create a culture that will create and sustain long-term commitment from top management through the entire workforce (Prakash &Kumar, 2011). Nordin et al. (2010) pointed out that to implement lean manufacturing system is not an easy task for any change in organization to take hold and success, the resistance forces or barriers need to be identified and understood.

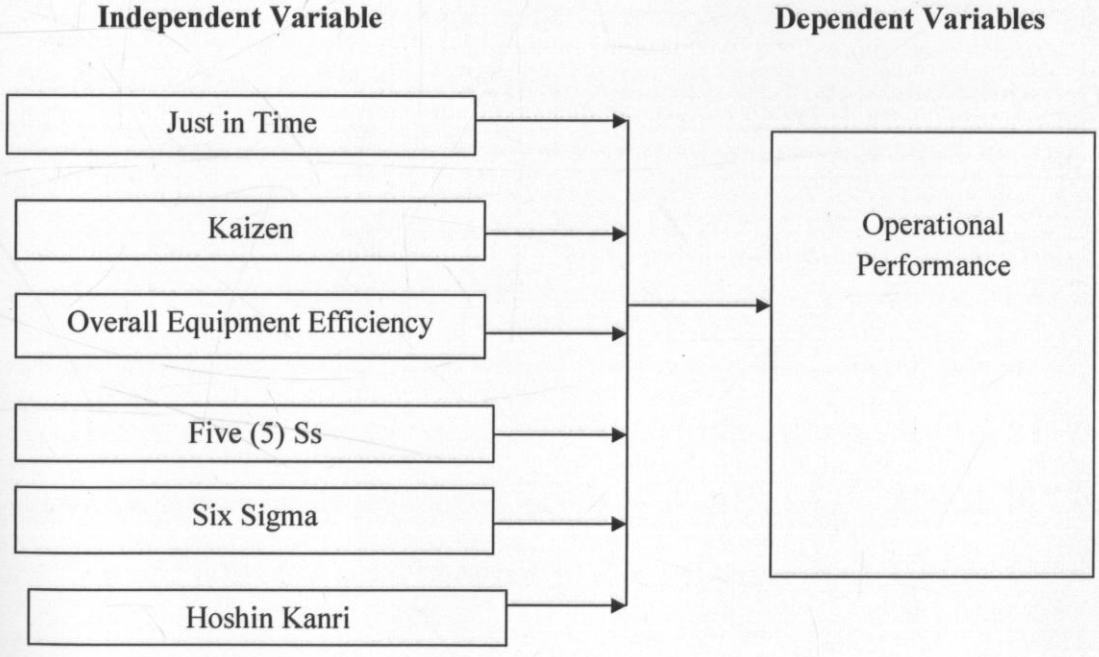
2.7 Empirical Literature Review

ALshbiel and Al-Awaqleh (2012) did a study on lean manufacturing implementation and its effect on achieving competitive advantage for public shareholding industrial companies in Jordan. Muslimen et al. (2011) investigated on how to implement and what suitable approach to be used in order to successfully implement LM in Malaysian manufacturing industries. The researchers have investigated the implementation of lean manufacturing reduces production costs, and improves manufacturing companies' product quality and financial performance.

They recommend the need for decision makers in manufacturing companies to adopt and implement the JIT system due to its effectiveness in reducing production costs, improving product quality and enhancing financial performance, which can lead to achieving the competitive advantage for these companies over others in the same industry in light in the ongoing fierce competition among industrial firms nowadays. The study also recommended working towards supporting the infrastructure for implementing JIT system, in addition to conducting other relevant studies to identify the significance of implementing other management accounting systems such as target costing (TC) and activity-based costing (ABC) and demonstrating their impact on achieving competitive advantage for industrial firms, and comparing the results of future studies.

Figure 2.1: Conceptual framework

Model of the relationship among constructs: Lean Manufacturing and Operation Performance.



Source: Author (2014)

An efficient and effective lean sensitive organization will depend on just in time, Kaizen, overall equipment efficiency, 5Ss, six sigma and Hoshin Kanri. A well implemented JIT system for instance whose core objective is to eliminate waste at every stage of production will translate into an improved operational performance, and so is Kaizen, overall equipment efficiency, 5Ss, six sigma and Hoshin Kanri.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter details the research methodology that was adopted so as to meet the objectives set out in chapter one which was to establish the lean manufacturing practices at Unga Group Limited and determines the benefits and challenges to effective implementation of lean manufacturing. The research design and justification, data collection method and data analysis technique are discussed.

3.2 Research Design

The design adopted for this research is a case study method of Unga Group Limited being the unit of study. A case study is a holistic inquiry whose goal is to gain insight, explore the depth and complexity inherent in a contemporary phenomenon. It is used to have a hand on all details and gain in-depth understanding of the chosen sample case instead of the whole population (Tourki, 2010).The main reason for choosing a case study method for this research is that the reality is captured in great detail.

Zainal (2007) argued that case studies not only help to explore or describe the data in real-life environment, but also help to explain the complexities of real life situations which may not be captured through experimental or survey research. The study was intended to provide an in-depth description of lean manufacturing at the target unit and document the benefits and challenges of its implementation.

3.3 Data Collection

Primary data was collected using a standardized questionnaire containing both open ended as well as close ended questions and in-depth personal interviews which was administered to the with the Operation Manager, Plant Manager, Production Manager, Process Manager, Quality Assurance Manager, some of the shop floor employees and suppliers. Closed ended questions were used to enable the collection of quantitative data for analysis using a Likert-scale, while the open ended questions were used to enable the researcher to collect qualitative data on the respondent's view of LM practices at UGL. The variables covered in the literature review together with the research objectives formed the basis of the interview schedule design. Mcgrath (2007) argued that use of in-depth interviews is effective in case studies as superior depth of information and detail can be obtained as compared to other techniques.

3.4 Data Analysis

The data obtained was quantified to indicate the frequency and proportion of employees who responded in various ways to different questions regarding the issues that were raised in the application of Lean and operational performance.

The following model was used to show the relationship between LM practices and the organizational performance:

$Y=a+(b1x1)+(b2x2)+(b3x3)+(b4x4)+(b5x5)+(b6x6);$

Where Y=Operational Performance, a = the Y intercept when x = zero;

b1, b2, b3, b4, b5 and b6 are the regression weights attached to the variables;

x1=JIT, x2 = Kaizen, x3= OEE, x4 = Six Sigma, x5 = Hoshin Kanri, x6= Five 5Ss.

CHAPTER FOUR

DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1 Introduction

This chapter provides an analysis of data collected from the field. The results have been presented in tables and figures to highlight the major findings. They are also presented sequentially according to the research questions of the study. Mean scores and standard deviations analyses have been used to analyze the data collected. The raw data was coded, evaluated and tabulated to depict clearly the lean manufacturing practices and operational performance at Unga Group Limited.

4.2 General information of Unga Group Limited

The study was designed to establish the lean practices and operational performance at Unga Group Limited. The company is practicing several lean manufacturing tools and therefore the study sought to establish the general information of the company and the respondents employed in the study with regards to the current position, Description of company ownership and Annual company turnover. The data points assisted in answering the study questions.

4.1.1 Annual Turnover

The annual turnover of UGL for the last five years in terms of Kenya shillings is shown in the **(table 4.1)** below:

Table 4.1: Annual Turnover

Year	2009	2010	2011	2012	2013
Turnover (000)	11,643,639	11,524,454	13,214,442	15,976,765	15,759,078

Source: Research data

From table 4.1, it shows that the Annual company turnover is over 10 billion in the last five years. The turnover has been on an increasing trend.

4.1.2 Company Ownership

The company ownership is shown in **(table 4.2)** below.

Table 4.2: Company Ownership

Local	Unga Group Ltd	65%
Foreign	Seaboard Corporation -USA	35%

Source: Research data

Table 4.2 indicated that the company is locally owned at 65% while another 35% is owned foreign owned. This indicated that local ownership of UGL is dominant in compare to foreign ownership.

4.3 Effects of Lean Manufacturing Practices on Organization Performance

The respondents were asked to indicate their views of the attributes of the Lean Manufacturing practices adopted by UGL. They were asked to rate the nature and extent to which they consider Just In Time, Kaizen/Continuous Improvements, Overall Equipment Efficiency, Six Sigma, Hoshin Kanri and Five (5) Ss attributes significant in Lean Manufacturing practices.

Table 4.3: Just in Time

Tool	Mean	Standard deviation
Waste reduction	4.00	0.76
Reduced manufacturing costs	3.88	0.64
Reduced inventory	3.38	0.52
Reduced changeover time	3.00	0.53
Short setup time	2.75	0.71

Source: Research data

Waste reduction had the highest mean score at 4.00 while short setup time had the least mean score at 2.75. Other significant attributes of JIT were reduced manufacturing costs at a mean score of 3.88, reduced inventory at mean score of 3.38 and reduced changeover time at mean score of 3.00.

Table 4.4: Kaizen/Continuous Improvements

Tool	Mean	Standard deviation
Reduce cost in plant maintenance	4.00	0.76
Enhanced quality of output	3.38	0.92
Eliminate waste	3.25	0.71
Reduced errors	2.26	0.76

Source: Research data

Reduced cost in plant maintenance had the highest mean score at 4.00, which means that it is significant in Continuous Improvement while reduced errors had the least mean score at 2.26. Other significant attributes of Kaizen were enhanced quality of output at mean score of 3.38 and eliminate waste at a mean score of 3.25.

Table 4.5: Overall Equipment Efficiency (OEE)

Tool	Mean	Standard deviation
Actual availability (Reduced down time loss)	4.38	0.74
Performance efficiency (Reduced speed loss	4.13	0.99
Quality of product (Reduced quality loss)	3.38	0.74
Enhanced quality of output	3.38	0.52
Reduced production time	3.75	1.04

Source: Research data

Actual availability (Reduced down time loss) had the highest mean score at 4.38, which means that it is significant in OEE while reduced production time had the least mean score at 3.75. Other significant attributes of OEE were performance efficiency (reduced speed loss at mean score of 4.13, quality of product (reduced quality loss) and enhanced quality of output at both mean score of 3.38.

Table 4.6: Six Sigma

Tool	Mean	Standard deviation
Quicker customer feedback	4.25	0.71
Eliminate non value added activities	4.00	0.76
Process improvement	3.13	0.83
Zero defects	2.38	0.74

Source: Research data

Quicker customer feedback had the highest mean score at 4.25, which means that it is significant in Six Sigma while zero defects had the least mean score at 2.38. Other significant attributes of Six Sigma were Eliminate non value added activities at mean score of 4.00 and process improvement at a mean score of 3.13.

Table 4.7: Hoshin Kanri

Tool	Mean	Standard deviation
Reduced training	3.83	0.74
Waste elimination	3.38	0.74
Best use of resources	3.63	0.73
Reduced errors	2.88	0.83

Source: Research data

Reduced training had the highest mean score at 3.83, which means that it is significant in Hoshin Kanri while reduced errors had the least mean score at 2.88. Other significant attributes of Hoshin Kanri were waste elimination at mean score of 3.38 and best use of resources at a mean score of 3.63.

Table 4.8: Five (5) Ss

Tool	Mean	Standard deviation
Standardize/Seiketsu	4.44	0.73
Sustain/Shitsuke	4.00	0.87
Sort/Seiton	3.56	0.73
Separate/Seiri	3.38	0.74
Sweep and Shine/Seiso	2.63	0.92

Source: Research data

Standardize had the highest mean score at 4.44, which means that it is significant in Five 5Ss while sweep and shine had the least mean score at 2.63. Other significant attributes of Five 5Ss were sustain at mean score of 4.00, sort at mean score of 3.56 and separate at a mean score of 3.38.

4.4 Impact of Lean Manufacturing Implementation

The respondents were asked to rate the nature and extent of Impact of Lean manufacturing implementation to the statements provided. **Table 4.9** shows the study finding.

Table 4.9: Impact of Lean Manufacturing Implementation

Statement	Mean	Standard deviation
Profitability improvement	4.45	0.53
Product and service quality improvement	4.44	0.73
Improved material flow and through put	4.34	0.50
Productivity improvement	4.00	0.87
Customer lead time reduction	3.56	0.73
Labor productivity	3.45	0.73
Work in process reduction	3.38	0.74
Reduced scrap and rework costs	3.00	0.50
Wastage reduction	2.87	0.53
Inventory reduction	2.63	0.92
Set up time reduction	2.00	0.71
Manufacturing cycle	1.56	1.56

Source: Research data

Profitability improvement had the highest mean score at 4.45, which means that it is significant as an impact of lean manufacturing implementation while manufacturing cycle had the least mean score at 1.56. Other significant impacts of lean manufacturing implementations are product and service quality improvement with at mean score of 4.44, improved material flow and through put with at mean score of 4.34, productivity improvement at a mean score of 4.00, customer lead time reduction at a mean score of 3.56, labor productivity at a mean score of 3.45, work in process reduction at a mean score of 3.38, reduced scrap and rework costs at a mean score of 3.00, wastage reduction at a mean score of 2.87, inventory reduction at a mean score of 2.63 and set up time reduction at a mean score of 2.00.

4.5 The Extent of Adoption of Lean Manufacturing Practices

The respondents were asked rate the extent of adoption for each of the following Lean Manufacturing Practices presented to them. **Table 4.10** shows the study finding.

Table 4.10: The Extent of Adoption of Lean Manufacturing Practices

Practice	Mean	Standard deviation
JIT (Just In Time)	4.41	0.78
Kaizen - Continuous Improvement	4.22	0.45
Overall Equipment Efficiency	3.99	0.71
Six Sigma	3.98	0.60
Hoshin Kanri	3.67	0.50
Five (5) Ss	3.45	0.73

Source: Research data

Just in time had the highest mean score at 4.41, which means that it is significant practice adopted in lean manufacturing while Five Ss had the least mean score at 3.45. Other significant practices adopted in lean manufacturing are Kaizen at mean score of 4.22, Overall Equipment Efficiency at mean score of 3.99, Six Sigma at mean score of 3.98 and Hoshin Kanri at mean score of 3.67.

4.6 Correlation Analysis

If two predictor variables have their coefficient of correlations is greater than 0.5, they are said to be correlated. In table 10, none of the predictor variables had coefficient of correlation between themselves of more than 0.5 hence all of them were included in the model. The matrix also indicated high correlation between the response and predictor variables, that is, JIT (Just In Time), Kaizen - Continuous Improvement , Overall Equipment Efficiency, Six Sigma, Hoshin Kanri and Five (5) Ss.**(Table 4.11)**

Table 4.11: Correlation Analysis

	Operational performance	JIT	Kaizen	OEE	Six Sigma	Hoshin Kanri	Five Ss
Operational performance	1						
JIT	0.24	1					
Kaizen	0.35	0.12	1				
OEE	0.47	0.13	0.25	1			
Six Sigma	0.31	0.25	0.25	0.38	1		
Hoshin Kanri	0.46	0.45	0.43	0.15	0.25	1	
Five Ss	0.33	0.27	0.35	0.43	0.18	0.12	1

Source: Research data

4.7 Regression Analysis

A multivariate regression model was applied to determine the significant of each of the six independent variables with respect to the operational performance in adopting lean manufacturing practices.

4.8 Significance of the Regression Coefficients

The data for this is summarized in **(table 4.12)**

Table 4.12: Significance of the Regression Coefficients

		Unstandardized Coefficients	Standardized Coefficients	t
		B	Std. Error	Beta
(Constant)		0.26	0.46	
JIT (Just In Time)	X1	0.13	0.05	0.25
Kaizen	X2	0.17	0.05	0.02
OEE	X3	0.05	0.02	0.11
Six Sigma	X4	0.05	0.02	0.09
Hoshin Kanri	X5	0.05	0.08	0.09
Five (5) Ss	X6	0.14	0.05	0.14

Source: Research data

The regression model found is;

$Y = 0.26 + 0.13X1 + 0.17X2 + 0.05X3 + 0.05X4 + 0.05X5 + 0.1X6$

On the observation all the coefficients are positive meaning that a change in any one of them affects operational performance in the same direction. This means that that all the independent variables in this model are suitable predictors of operational performance.

4.9 Discussion

In this study all the independent variables, Just in Time, Overall Equipment Efficiency, Kaizen-Continuous Improvement, Six Sigma, Hoshin Kanri and Five Ss) are found to be significant in the prediction of operational performance. The full model is also significant. The objective of this multi-dimensional approach is the reduction of costs by eliminating the non-value activities, using tools such as Just-in-Time, Five (5) Ss and Kaizen. Measuring efficiency of machinery and quality improvement, increase in level of motivation and commitment and reduction of customer lead time using OEE, Hoshin Kanri and Six Sigma.

4.10 Challenges to Lean Manufacturing Implementation

The respondents were asked to rate the challenges which they faced and prevents implementing Lean Manufacturing practices. Table 4.13 shows the study finding.

Table 4.13: Challenges to Lean Manufacturing Implementation

Challenges to LM implementation	Mean	Standard deviation
People (Employees fear factors)	3.78	0.44
Poor infrastructure	3.67	0.50
Lack of direct financial advantage	3.66	0.50
Lack of understanding of lean concepts	3.56	0.53
Shop floor employees attitude	3.22	0.83
Lack of communication	2.89	0.93
Lack of top management support	2.44	0.53
Power outages/blackouts	2.00	1.12
Lack of vendor support	1.78	0.83
Lack of training	1.56	0.53
High cost of electricity	1.56	0.53

Source: Research data

Employees fear factor is the most challenge to lean manufacturing implementation with a mean of 3.78, while lack of training and high cost of electricity are the least challenge with both having a mean score of 1.56. other challenges of implementing lean manufacturing are; poor infrastructure at a mean score of 3.67, lack of direct financial advantage at a mean score of 3.66, lack of understanding of lean concept at a mean score of 3.56, shop floor employees at a mean score of 3.22, lack of communication at a mean score of 2.44, lack of top management support at a mean score of 2.00 and lack of vendor support at a mean score of 1.78.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of findings as discussed in chapter four and interpretations of the results, conclusions, recommendations based on the findings and suggestions for further research.

5.2 Summary and Conclusion

The objectives of this study included identifying lean practices employed in manufacturing process, establishing the extent of adoption of Lean manufacturing practices and operational performance for which Unga Group Limited was taken as the case for study. It was found out from the study that all the independent variables (Just in Time, Overall Equipment Efficiency, Kaizen-Continuous Improvement, Six Sigma, Hoshin Kanri and Five Ss) are significant in the prediction of operational performance. The study confirmed that Unga Group Limited had adopted the concept of lean manufacturing in their operations.

The research also looked into the challenges facing the implementation of lean manufacturing practices and confirmed that people (employees fear factors), poor infrastructure, lack of top management support, lack of understanding of lean concepts, shop floor employees attitude, lack of communication, lack of direct financial advantage, power outages/blackouts, lack of vendor support lack of training, high cost of electricity affect operational performance in that order.

Arising from the finding of the study, some related issues in Lean Manufacturing are aimed at improving the state of Lean Manufacturing Practices and Operational Performance of Unga Group Limited. Majority of the respondents agreed that lean practices were being applied at UGL. The more the respondents were senior in their job places the more they understood and agreed that Lean was applied at UGL. This indicates gap of information on Lean initiatives with more communication about Lean to the senior employees than to the junior employees. The respondents tended to define it by what they associated it with. Some of the major practices, tools at UGL that the respondents considered part of application is the overall activities in the manufacturing section and goes downwards to the customers.

Majority of the respondents agree that Lean management implementation has been successful. The main factors recognized are profitability improvement, product and service quality improvement, improved material flow and through put, productivity improvement, customer lead time reduction, labor productivity, work in process reduction and reduced scrap and rework costs.

Despite the success of Lean implementation at UGL, it was not free of any challenge. Respondents cited five factors as main challenges to adopting lean practices which include; people (employees fear factors), poor infrastructure, Lack of direct financial advantage, lack of understanding of lean concepts and shop floor employees attitude. To enhance Lean initiatives, a culture of improvement and change, communication of the benefits of continuous improvement and lean practices among the staff will be fundamental.

Lean management and application of related tools, equipments and techniques is a continuous process at UGL highly driven by the need to improve product quality, eliminating waste and increase level of motivation and commitment for the employees. The extent of application of lean practices involves all departments and all employees being targeted through communication, training and reviews among other means which have turned out to be successful.

Lean organizations are able to be more responsive to market trends, deliver products and services faster, and provide products and services less expensively than their non-lean counterparts. Lean crosses all industry boundaries, addresses all organizational functions, and impacts the entire system – supply chain to customer base.

The findings from the research showed the need for establishing lean performance parameters and the use of a strategic tool like just-in-time delivery of materials, minimization of inventories and Lean's dependence upon high quality products and services and policy deployment for top-down planning. Lean value systems can be created at UGL in their search to implement lean manufacturing practices.

5.3 Recommendations

In order for UGL to realize the full benefits of operational performance through lean manufacturing, an increased attempt to involve employees at all levels should be encouraged. Lean manufacturing practices should be utilized to improve quality; to stay competitive in today's marketplace, a company must understand its customers' wants needs and designs processes that meet their expectations and requirements. In the manufacturing process, what is required will be purchased as inventory through

JIT and machines efficiency should be enhances through OEE. Before starting with the introduction of lean implementation actions it is strongly recommended to first of all make sure that the whole workforce understands that lean is more than just a toolbox, the use of teamwork and the elimination of non value adding tasks.

5.4 Limitations of the Research

Every study certainly encounters certain limitations due to a variety of factors. Due to tight schedules of the top management at Unga Group Limited, the study encountered difficulties in gaining access to the respondents and the researcher had to keep rescheduling their time to align with the availability of the respondents.

Information relating to Lean manufacturing practices is always treated with sensitivity. This caused difficulties in convincing the respondents of the importance of giving sincere answers to the asked questions evidenced through reluctance of accepting invitation to participate in the study to counter the challenge, the research had to inform the respondents in advance the purpose for the research study being carried out, that it was meant for academic purpose only and not for other investigations.

The study was limited to Unga Group Limited and it could therefore give a general picture of lean manufacturing practices, and operational performance, its challenges and how these challenges are addressed by other milling firms in Kenya. Thus the study cannot be taken as the actual representative of the situation within the milling industry in Kenya as the findings of this study are organizational specific and apply to Unga Group Limited.

5.5 Recommendations for Further Research

This study concentrated on the study of lean manufacturing practices and the operational performance of Unga Group Limited. The researcher recommends further research on the same topic but in other organizations in the milling industry. This will help to establish whether the same effects will be held true in the other milling organizations. This will also assist in providing concrete facts upon which reliable conclusions can be made.

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APPENDICES

Appendix I: Research Questionnaire

SECTION ONE: GENERAL INFORMATION OF THE COMPANY

1. Position of Respondent

( ) Production Manager ( ) Operations Manager ( ) Process Manager

( ) Plant Manager ( ) Quality Assurance Manager

Other (specify).....

2. How can you describe ownership of your company?

3. What is the annual company turnover for the last 5 years in (Ksh)

SECTION TWO: IMPACT OF LEAN MANUFACTURING IMPLEMENTATION

1. What lean manufacturing tools have your organization adopted?

Just in time	( )
Overall Equipment Efficiency	( )
Kaizen-Continuous Improvement	( )
Six Sigma	( )
Five 5 Ss	( )
Hoshin Kanri-Policy Deployment	( )
Others (Specify)	( )

2. Listed below are some of the attributes of the Lean Manufacturing practices that could be adopted in your company. Please rank by a tick in the appropriate box the nature and extent to which you consider these attributes significant using the following rating; 5 = to a very large extent, 4 = Large extent, 3 = Moderate extent, 2 = Small extent, 1 = Very small extent.

Just in Time	5	4	3	2	1
Waste reduction					
Reduced manufacturing costs					
Reduced inventory					
Reduced changeover time					
Short setup time					
Others (Specify)					
Kaizen-Continuous Improvement					
Reduce cost in plant maintenance					
Enhanced quality of output					
Eliminate waste					
Reduced errors					
Others (Specify)					
Overall Equipment Efficiency					
Actual availability (Reduced down time loss)					
Performance efficiency (Reduced speed loss					
Quality of product (Reduced quality loss)					
Enhanced quality of output					
Reduced production time					
Others (Specify)					
Six Sigma					
Quicker customer feedback					
Eliminate non value added activities					
Process improvement					
Zero defects					
Others (Specify)					

Hoshin Kanri					
Reduced training					
Waste elimination					
Best use of resources					
Reduced errors					
Others (Specify)					
Five 5 Ss					
Standardize/Seiketsu					
Sustain/Shitsuke					
Sort/Seiton					
Separate/Seiri					
Sweep and Shine/Seiso					
Others (Specify)					

3.Please rank by a tick in the appropriate box the nature and extent to which the implementation of Lean Manufacturing practices has impacted your company using the following ratings; 5 = To a very large extent, 4 = Large extent, 3 = Moderate extent 2 = Small extent 1 = Very small extent

Impact of Lean Manufacturing implementation	5	4	3	2	1
Profitability improvement					
Product and service quality improvement					
Improved material flow and through put					
Productivity improvement					
Customer lead time reduction					
Labor productivity					
Work in process reduction					
Reduced scrap and rework costs					
Wastage reduction					
Inventory reduction					
Set up time reduction					
Manufacturing cycle					
Others (Specify)					

SECTION THREE: THE EXTENT OF ADOPTION OF LEAN MANUFACTURING PRACTICES

1) Indicate the extent of adoption by your organization for each of the following Lean Manufacturing Practices. On a scale of 1 to 5 where 5 = to a very large extent, 4 = large extent, 3 = moderate extent, 2 = small extent, 1 = very small extent),

Principle/Tool	5	4	3	2	1
JIT (Just In Time)					
Kaizen - Continuous Improvement					
Overall Equipment Efficiency					
Six Sigma					
Hoshin Kanri					
Five (5) Ss					
Others (Specify)					

SECTION FOUR: CHALLENGES TO LEAN MANUFACTURING IMPLEMENTATION

1) Listed below are some of the challenges/ barriers which prevent firms from adopting Lean Manufacturing practices. Please rank by a tick in the appropriate box the extent to which you agree with these challenges using the following rating;

5 = Strongly Agree, 4 = Agree, 3 = Undecided 2 = Disagree, 1 = Strongly Disagree.

Challenges to LM implementation	5	4	3	2	1
People (Employees fear factors)					
Poor infrastructure					
Lack of top management support					
Lack of understanding of lean concepts					
Shop floor employees attitude					
Lack of communication					
Lack of direct financial advantage					
Power outages/blackouts					
Lack of vendor support					
Lack of training					
High cost of electricity					
Others (Specify)					