# LEAN MANAGEMENT PRACTICES EMPLOYED IN MANUFACTURING OPERATIONS: A CASE OF FOOD MANUFACTURINGCOMPANIES IN NAIROBI

**BY:**

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**A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION (MBA), SCHOOL OF BUSINESS UNIVERSITY OF NAIROBI**

**OCTOBER, 2013**

## DECLARATION

I declare this project is my original work and has not been presented for a degree in any other university.

Signature …… Date …….

Kevin Mwangi – D61/60392/2010

This project has been submitted for examination with my approval as the University Supervisor.

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## DEDICATION

I dedicate this research project to my family who supported me in achieving this educational goal which they have kept me in their prayers and cheering me along the way.

## ACKNOWLEDGEMENT

I wish to acknowledge support my supervisor Zipporah Kiruthu for her great knowledge and guidance in assisting me achieve this project. I also wish to the thank Dr. Okwiri Owino my moderator for providing his wisdom to enable my project to reach the next level. I also wish to thank the firms which contributed in providing necessary information to enable me complete the project.

I also my father for walking with me during and providing his wisdom and experience in the lean management field which propelled the understanding in this field of practice.

## ABSTRACT

The purpose of this study was to explore the extent to which firms employ lean management practices in manufacturing operations especially food manufacturing firms in Nairobi and establish the impact of lean management practices on operational performance of food manufacturing firms.

This objective was carried out upon sample survey of forty seven firms which twenty six of the firms responded. The production supervisors and managers were the officers who were expected to respond to the questionnaires issued to their organizations as at that the given they had the level of knowledge and expertise in the given area.

The data was collected through a structured questionnaire which was a closed ended questionnaire. The data was collected through a descriptive statistics and presented in frequency tables. Regression analysis was performed to generate the relationship between lean management practices and operational performance.

The study revealed that organizations employed lean management practices to a great extent and in doing so they were able to benefit from improved operational performance upon application of these lean management practices.

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# CHAPTER ONE: INTRODUCTION

## 1.1Background of the Study

Organization success in today's turbulent environment will be achieved through focus on use of lesser inventory, require less investment, consuming less space and use of less people to become lean. Lean is a comprehensive set of techniques that when combined and matured, will allow a company to reduce and eliminate the seven wastes. This will not only make the company leaner, but subsequently more flexible and more responsive to the market by reducing waste (Wilson, 2010). It is the complementary and synergistic effects of the application of inter - related lean practices and elements that give lean production its unique character and its superior ability to achieve multiple performance goals. While each element by itself is associated with better performance, firms that are able to implement the complete set to achieve distinctive performance outcomes that can result in sustainable competitive advantage (Shah and Ward, 2007).

Organizations resist in applying lean practices due to the natural resistance to change of scepticism and time, concerns about the impact of change on regulatory compliance, production culture of minimal change overs and large batches to stock and functional culture of staying in silos (Melton, 2005). Lean manufacturing was designed on a certain set of business conditions. Application of lean concepts and tools on a business has wide implications. An enterprise needs to be driven by four main concepts for lean manufacturing to apply. The business must be in a free market environment and should not be struggling for profits. There must be a clear customer focus based on who are the customers, what they need and what they want. The business should have a long term focus, even at the expense of short term gains and finally the enterprise has to eliminate waste. An enterprise has to be willing to undergo the huge cultural changes it takes to implement a lean initiative (Wilson, 2010).

### 1.1.1 Lean management Practices

Lean practices or lean building blocks are used to eliminate waste. Although most of the lean practices may be implemented as stand - alone programs, few have significant impact when used alone. Additionally, the sequence of implementation affects the overall

impact and implementing some out of order may produce negative results (Kilpatrick, 2003). Organizations apply lean practices to improve organization performance. The competitive environment has led to companies constantly improving their products, widening their markets and innovating new products to keep pace with the changing market environment. The change in customers taste and preferences has compelled firms to become flexible in shifting their manufacturing environment from make – to – stock to build – to – schedule to cater for the unique needs and wants of individual customers therefore requiring organizations to have efficient operational systems through adoption of lean practices to have faster turnaround times to enable organizations to offer great services to their customers in the shortest time possible.

The implementation of just – in – time, total productive maintenance, total quality management and human resource management bundles of lean enablers substantially contribute to the operating performance of plants which lead to better manufacturing effect (Shah and Ward; 2003). The distinct dimensions which characterize a lean system are; supplier feedback, just – in – time delivery by suppliers, supplier development, customer involvement, pull system, continuous flow, set up time reduction, total productive maintenance, statistical process control and employee involvement (Shah and Ward; 2007). Manufacturing companies have started to decrease lead times to customers, reduced inventories for manufacturers, improved knowledge management and use robust process to improve performance and efficiency to enable companies compete effectively. The goal of an efficient firm is to eliminate the waste and concentrate on value adding activities. The benefits of a lean firm is the release of working capital, better understand the needs of the customer, quality improvement, empowering multi - skilled teams, increase in supply chain speed, reduced manufacturing costs and increased knowledge of manufacturing production practices (Melton, 2005).

### 1.1.1 Organizational Performance

Baldrige criteria describes performance as the output results from processes, products and services that permit evaluation and comparison relative to goals, standards, past results and other organizations. Performance is expressed in two forms either in financial and non - financial terms. Baldrige criteria describes measurement as numerical information

that quantifies input, output and performance dimensions of processes, product, services and the overall organization outcomes. The challenges for organizations today is to match and align performance measures with business strategy structures and corporate culture, the type and number of measures to use, the balance between merits and costs of introducing these measures and how to deploy the measures so that the results are used and acted upon (Ferdows and De Meyer, 1990).

The traditional way of measuring a firm's performance is through financial measures of return on sales, net profit, return on investment and cash flow. Non – financial measures have also been used to determine the performance of an organization through operational performance. Operational performance is the measurable aspect of an organization's process. It most encompasses production reliability and defect rates, production cycle time, on time delivery, cost of quality and scrap minimization, productivity, and inventory (Voss, Ahlstrom and Blackmon, 1997). The operational level of measure takes into consideration throughput which is the rate at which money is generated by the system through sales, inventory the money invested with the intention of purchase, operating expense which is the money to be spent to turn inventory into throughput and the productivity which is the output per labour hour (Chase, Acquilano, Jacobs and Agarwal; 2007).

### 1.1.2 Food Manufacturing Industry in Kenya

Manufacturing firms are firms whose operations involve transforming or converting inputs such as raw materials, labour skills, managerial skills, capital and sales revenue into products that are finally sold to the consumer (Chune, 1998). The key managerial issues affecting a business include: leadership, effective communication, organization planning and structure, building an admirable corporate culture, teamwork and employee involvement and performance management.

Manufacturing sector in Kenya only accounts for 16% of gross domestic product. It currently employs 254,000 people representing 13% of total employment and an additional 1.4 million people are employed in the informal side of the industry. The manufacturing sector in Kenya is pre – dominantly agro based with low value addition,

employment, capacity utilization and export volumes due to weak linkages to other sectors of the economy. The food manufacturing sub – sector in Kenya is divided into bakers and millers, cocoa, chocolate and sugar confectionary, slaughtering, preparation and preservation of meat and vegetable oils (Kenya Association of Manufacturers, 2013; Kenya National Bureau of Statistics, 2013). Nearly 50% of manufacturing firms in Kenya employ 50 workers or less. They are family owned and their operations fall in the small and medium enterprises (GOK, 2006). Kenyan Association of Manufacturers has 735 members of whom 23.43% are represented by food and beverages sector within the manufacturing industry (Kenya Association of Manufacturers, 2013).

Kenyan manufacturers believe that manufacturing strategy of their company enhances their long – term business performance and success. The operations strategies in which companies compete in order of their rank are: high quality, low cost, time/speed, innovativeness, flexibility quality of human resources, skills and team work, dependability, supplier relationships and government (Nyamwange, 2001). Globalization and intense competition has forced manufacturing companies to improve their manufacturing methods to have a competitive edge. The industry production has been slowed down owing to the rise in inflation, high cost of energy and dumping of cheap products. Implementation of lean practices would help to achieve a competitive edge rather than compete on price reduction (Kabuga, 2012). The manufacturing sector faces a myriad of challenges emanating from both domestic and global environments which are a great setback to endeavours to compete globally. The challenges can be tackled through adoption of lean practices (Nderi, 2012).

## 1.2 Statement of the Problem

The central research problem of this study is: Do food manufacturing companies employ lean practices to improve their organizational performance? Lean operating system is a system which follows certain practices to minimize losses such as: waste, variability and flexibility through a value stream which is optimized individually from end – to – end with a motivation for growth and survival (Paneru, 2011).

Food industry specifically deals with perishable goods therefore shelf life of products determines mode of preservation and handling of the product. Poor handling and preservation of the product leads to waste in terms of excess product produced exceeding demand. Firms within the food industry shall benefit greatly from adoption of lean practices as it will reduce their customers returning goods previously sold to them. These will reduce returns, replacements or refunds of goods once sold to them. Elimination of waste through reduction in lead time, reduction in inventory, reduced cost and demand management ensures companies are able to procure in a lean manner therefore gain a competitive advantage (Kabuga, 2012). In Kenya, the infiltration of counterfeit items in the formal distribution channels has destroyed the reputation of companies by customers being sold for defective items leading to reduction of customer loyalty. The uncertainty of demand has provided a loophole to unscrupulous to channel their counterfeit material within the market without notification therefore legitimising their trade. The uncertainty of demand influences the channel member decision on production lead time (Biyalogorsky and Koenigsberg, 2006). The food manufacturing companies have forged closer linkage with distributors to mitigate by taking on and locking out the perpetrators of production of fake products to ensure customers enjoy the best of a company's products.

Lean manufacturing tools and techniques such as customer involvement, production smoothing, value stream mapping, visual display control, kanban and 5S have been implemented by companies to some extent but not in a systematic manner. These practices implemented in isolation does not assist companies reap the full benefits of lean (Kisombe, 2012). This study will build on the latter's work with a goal of shifting from organizational efficiency to organizational performance and lending an ear of improvement from large sugar manufacturing companies to small manufacturing firms.

The previous studies have not detailed the impact of lean practices on operational performance in food manufacturing companies in Nairobi therefore this study will seek to determine the impact of adopting lean practices to improve operational performance of food manufacturers in Nairobi.

The research will specifically answer the following questions:

i. What is the extent of application of lean practices by food manufacturers in Nairobi?

ii. What is the impact of lean practices on the operational performance of the organization?

## 1.3 Objective of the Study

**i.** To establish the extent of lean practices employed by food manufacturers in Nairobi.

**ii.** To establish the relationship between lean practices and operational performance of food manufacturers in Nairobi.

## 1.4 Value of the Study

The manufacturing companies which are the backbone of our society will be aided by this study as it will make them understand the lean practices necessary to apply to grow and improve their performance.

The academicians may use the results of this study as a reference. The findings of the study should be compared with lean production in other countries and organizations at higher levels of business to enable them compete effectively in the market to gain a competitive edge.

The government will benefit in employment creation, optimal use of resources and greater standards of performance based on lean practices.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1 Introduction

This chapter provides information on topics related to the research problem. It examines the input provided by various authors on the concept of lean practices. It covers on: concept of lean manufacturing, lean management practices, operational performance and effects of lean practices adoption on operational performance.

## 2.2 Lean Manufacturing

Organizations are facing competition in the market, therefore there is need to adopt appropriate business improvement practices to be able to compete effectively in the market and gain a competitive edge. The benchmark of lean manufacturing is embodied by Toyota Production System. The Toyota Production System was developed to improve quality and productivity and is predicated upon two philosophies that are central to Japanese culture: elimination of waste and respect for people (Chase, Acquilano, Jacobs and Agarwal; 2007). Toyota Production System goal is reduction of cost by eliminating waste through two methods: just – in - time and autonomation (automation with a human touch) which are the pillars of Toyota Production System (Ohno, 1978).

Lean production is an integrated set of activities designed to achieve high – volume production with minimal inventories of raw materials, work – in – process and finished goods. This definition of lean leaves no room for surplus or safety stock. No safety stocks are allowed as they would be waste. Any hidden inventory in storage areas, transit system, carousels and conveyors is a key target for inventory reduction (Chase, Acquilano, Jacobs and Agarwal; 2007). The term lean is often used interchangeably with the terms lean manufacturing and lean production. It is called lean, because in the end, the process can run: using less material requires less investment, using fewer inventories, consuming less space and less people (Wilson, 2010). The basis of Toyota Production System is the absolute elimination of waste and its major goal is cost reduction without increasing prices. The formula for calculation of Toyota Production System profit = selling price – cost (Ohno, 1978). Toyota Production System can only be appreciated

once revolutionary concepts such as: supplying value to the customer, reducing lead times and focusing on the absolute elimination of waste are included (Wilson, 2010).

## 2.3 Lean Management Practices

Lean production is integrated systems composed of highly inter – related practices. The high inter – correlation between practices lends to support configuration and suggests that managers should be able to recognize the contribution of each individual principle and discern the close relationship and collective importance of each practice when pursuing lean production (Shah and Ward; 2007). Lean management practices can only be employed upon acknowledgement of the lean principles such as: value, value stream, flow, pull, perfection and respect for people which are practiced to achieve elimination of waste (Oppenheim, Murman and Secor, 2009). Lean management is implemented by organizations through practices of environment enablers, big just – in – time and the small just - in - time.

### 2.3.1 Environment Enablers of Lean Practices

The environment enablers taken into consideration to achieve lean are: leadership style, corporate culture and organizational structure in the macro - environment. Leadership is the management's ability to translate customer requirements into concrete policies, organizational structures and productive strengths in pursuit of a competitive advantage. Leadership allows a company have a long – term strategic focus upon application of a new initiative. The top management requires commitment, deep knowledge about lean techniques and fight against organizational barriers upon implementation to achieve the vision of the improvement program (Kovachev, 2010).

In lean management practice, the organizational structure is flat and horizontal in focus opposite to the traditional method of vertical structure. Lean management creates a horizontal focus of assigning responsibility to a middle level manager who controls the value from design to delivery in the value stream but with close support of a functional head who is responsible for the line and work schedules. This ensures communication, co – ordination and collaboration are required to enable individual and organizational changes within the organization need (Found, Dun and Fei, 2009). Organizational culture

is the shared attitudes, beliefs, experiences, ideas and values of an organization which control the way members interact with each other and outside stakeholders. The organization's ability to learn, share information and make decisions facilitates the integration of an individual in a new culture. The lean cultures desired by organizations are: waste elimination, flow, production scheduling, problem solving, standardized processes, visual control and management, continuous improvement, respect for people, teamwork, leadership, long – term focus and reflection (Nadler, 2010).

The great benefit of application of environment enablers is the achievement of the perfection principle. Perfection is striving for excellence through continuous improvement in a never ending cycle. Perfection is achieved by integration of organization philosophy, techniques and structures to achieve sustained performance improvements in all activities on an uninterrupted basis through product and service design in a customer focus and process oriented approach to satisfy and delight customer (Costin, 1998). Perfection is achieved through organization learning where an organization when faced with a challenge it identifies the root cause of the problem by asking the 5 whys and solving the problem permanently through a team approach in line and specialist responsibility therefore constantly self - reflecting to compare whether the company is working towards the mission and vision desired (Liker, 2004). Continuous improvement and quality management programs go hand in hand as they seek to achieve excellence through improvement. Lean tools and techniques adopted to achieve the continuous improvement are: 5S, andon, kaizen, quality management programs and six sigma (Bhuiyan and Bhagel, 2005).

### 2.3.2 Awareness level of Lean Practices

The big just – in – time is the awareness level of lean management practices which is applied in the micro – environment through application of network relationships, employee empowerment and financial accounting system. The awareness level of lean practice enables companies to apply flow, value and respect for people practices in improvement of organization performance. Network is the relationship the company has upstream with its suppliers and downstream with its customers. The company involves downstream its customers through its quality programs, product design and just - in –

time link. The customers are attracted by given values such as reliability, maintainability and availability with the purpose of eliminating waste in the value stream caused by non – value adding activities (Nordin, Deros and Wahab, 2010).

The company partners with the suppliers upstream through early supplier involvement, product design and development involvement, quality improvement and feedback program involvement and just – in - time delivery. The customer demand pull initiates a production process designed to maximize the product flow through the value stream necessitating partnership with the suppliers and the customers (Nordin, Deros and Wahab, 2010). Flow is the concept that parts and assembles items into value adding activities in essence reduces production cycle and lead time with ideal state of creating one piece flow which is frequently not possible due to obstacles (Wilson, 2010). The flow principle ensures smooth and continuous flow limiting the number of tasks and optimizing the loop iterations to achieve overall value through concurrent engineering (Oppenheim, Murman and Secor, 2009). The benefit of flow: efficiency in plant design, synchronization, increases production flexibility and responsiveness, improving effectiveness and reliability, autonomous and planned maintenance (Slack, Chambers and Johnston; 2010). The obstacles to flow included: inventory, batch processes, distance, variations, defect creating process, non – value adding activities and changeovers. The obstacles are handled through rate balancing, distance reduction, elimination of defects and bottlenecks and inventory removal through lean tools and techniques such as cell manufacturing, quick changeovers, standardization, synchronized production and total productive maintenance (Arnas, Jabbour and Saltorato, 2012).

Employee empowerment is the system of measuring and control that provides each employee with necessary information and authority to add value and eliminate waste. Employee empowerment is encouraged through group problem solving, training, employee involvement, workforce commitment and cross functional teams (Nordin, Deros and Wahab, 2010). It promotes the best human relations at work by respecting people to create a learning environment which harnesses ideas and actions. This is achieved when management views workers as assets through maintaining payroll levels and staff even when business conditions deteriorate, provide job security and maintaining

a flexible working environment. This allows for decisions to be made slow by consensus, through consideration of all options and implementing decisions rapidly (Liker, 2004). The greatest lean cultural change is performed through problem solving, motivation for change and leadership. For a lean initiative to be accomplished there has to be a solution with a long term vision and plan established through engaging all others for action to be achieved. The lean tools and techniques which will adopt the respect for people shall be teamwork, job rotation and employee training (Arnas, Jabbour and Saltorato, 2012).

The financial and accounting aspect of lean management practices offer support to the operations. The lean practice makes use of direct costs to elimination transaction costs by target costing on value stream areas. This enables an organization seek same product costs regardless of the volume and therefore eliminating overhead costs (Fiume, 2006). The lean enterprise capability to pass information through its information systems makes it possible to solve problems and makes decisions. A computerized information system reduces the vertical level structure and increases the autonomy of the team (Vienazindiene and Ciarniene, 2013).

### 2.3.2 Actual Operation of Lean Practices

The small just – in – time is the actual operation of lean management practice which is synchronized through use of the kanban production control system in the remote environment. Kanban is a visual control, used to keep the supply system going. Kanban system is a means to control just – in time supply and autonomation (automation with a human touch). The Kanban works hand – in – hand with the order point method. The order – point method is a control technique used to carry out optimum ordering in repetitive processes. In traditional kanban system, there are three main functions of identification tag for product type, job instruction tag for weight, production period and finished product and transfer tag for transportation after production. Toyota Production System has two tags: work – in – process tag for identification and job instruction and withdrawal tag for identification and transfer (Shingo, 1989).

Toyota is the production method and kanban is the only method by which it is managed. Kanban is the tool for realizing just – in – time. The goal of Toyota Production System is

continuous flow. For kanban to work the processes must flow as much as possible and all other conditions must work in accordance with standard work methods (Ohno, 1978). In effect, the kanban card is the authorization to move or work on parts and without the card no part or lot can be moved or worked on (Stevenson, 2002). The function of a kanban system is to provide transport information, product information, prevent over production and excessive transport, serves as a work order to attach goods, reveal existing problems and maintain inventory control (Ramnath, Elanchezhian and Kesavan, 2010). Process improvement in a kanban system is achieved through reduction of inventory (Wilson, 2010). The greatest benefit of actually operating the lean management practice is the application of the pull principle.

Pull is the synchronization of production objectives and actual customer demand through approaches of build – to - schedule. Just – in – time is a later process which gets only what it needs from an earlier process. The earlier process produces what was just taken (Ohno, 1978). Just – in – time is the controlled relationship between orders – to – delivery cycle (Shingo, 1989). All we are doing at the time line from the moment the customer gives an order to the point when we collect the cash, we are reducing time line by removing the non – value added wastes (Liker, 2004). When inventory levels are low, quality problems become visible (Chase, Jacobs, Acquilano, Agarwal; 2006). The goals of just – in – time is to reduction in variation , zero fluctuation of last process, eliminate disruptions, make the system flexible by reducing set up and lead times and eliminate waste due to excess inventory. Excess inventory will be reduced if there are close vendor relationships, which provide frequent small deliveries of high quality goods (Stevenson, 2002). The lean tools and techniques which are used to guard against waste of over processed or unneeded tasks such as: kanban, materials requirement planning and uniform plant loading. The application of just – in – time can be done by developing programs with suppliers to establish long – term relationships and develop few supplier arrangements that provide frequent deliveries in small quantities. The advantage is that it translates into increase in profits and competitiveness (Kimilu, 2005).

## 2.4 Organizational Performance

The goal of a firm is to make money (Goldratt and Cox, 1990). Performance measurement is a quantifying process for the efficiency and effectiveness of action. On a more essential level efficiency and effectiveness focus on the central business related issues – cost, quality, delivery, people, suppliers, markets and new product innovation. An effectiveness assessment quantifies the extent to which a process generates intended results (Neely, Adams and Crowe; 2002).The main performance metrics in relation to a manufacturing company performance is based on: quality, speed, dependability and cost (Ferdows and De Meyer, 1990). Two performance metrics could not be improved simultaneously unless there is a slack in the system, meaning an improvement in one would mean a degradation of the other (Skinner, 1966). The elements for measuring lean performance are: quality, capacity, inventory, costs and productivity.

In traditional manufacturing companies, such constraints were likely to be batch size and lead time or part quality and part cost. The traditional way to meet new performance levels was to invest in the system to increase the amount of slack available, what this resulted in was simply the movement from one performance frontier to another. These assumptions were questioned when in the 1970s and 1980s; Japanese manufacturers were able to compete on numerous aspects of performance without the same problems experienced by Western companies (Tan and Matthews, 2009).

Lean metrics such as: visible performance measures, targeted improvement, team reward and recognition guide the organization in their transformation into lean enterprises. The decision makers should use appropriate integral and specific indicators to assess the current status of the enterprise at each stage of the transformation process. Integral indicators are: production efficiency, inventory turnover, work – in – process, labour productivity and production while specific indicators are: total idle time, manufacturing cycle time, scrap rate related losses (Andreeva, 2009). Companies have employed operational performance measures in an integrated form but there are still many problems in today's manufacturing environment that need to be considered with the goal to modify the standard measures to make it appropriate for internal manufacturing and local external environments (Ghalayini, Noble and Crowe, 1996).

## 2.5 Operational Performance

Operational performance is the effectiveness and efficiency of an organization transforming inputs into outputs. The operational performance metrics is designed to deliver throughput by matching production to order demands. The product mix and multi stages of production line make it difficult for the throughput to meet the demand of the shop floor. Many variables affect the throughput such as machine breakdown, lead time in manufacturing; defective production and uncertainty of demand. Throughput measures to be considered in lean management practices shall be carried out through long – term relationship between work – in - process inventory and flow time according to Little's law principle. Throughput = Inventory/Flow time (Little and Graves, 2008).

### 2.5.1 Work – in – Process Inventory

Work – in – process inventory which is partially produced goods shall be reduced in the production flow through first time through capability and build – to – schedule when the customer requires. First time through capability is a major indicator of quality and defects; which are either caused by lack of knowledge or attention which can only be addressed by quality targets set by management upon consideration of certain specifications. First time through capability is calculated for each process and yield at the end of the production run. First time through capability is realised by measuring the percentage of units that go through the production process without being scrapped, rerun, rested and returned by the downward operation or diverted off line for repair (Andreeva, 2009). First time through capability measures the internal quality to determine if the product is right the first time resulting in quality containment effectiveness, process efficiency and waste elimination. Instruments introduced by companies; due to scientific and technical progress have replaced workers hands to achieve first time throughput with an ultimate focus of achieving zero defects through conformance to requirements in the production process (Mulchandani, 2001).

Build – to – schedule demonstrates on the way in which a firm should produce exactly what the customers want, in the proper sequence and mix. The challenges of build – to – schedule is the changing takt time, no clear material flow, different work load on process

and dynamic scheduling (Mulchandani, 2001). The elements of build – to – schedule that need to be reviewed are: capacity, demand generation, in – house production and outsourcing. A firm with a higher capacity creates more value when the quoted dock – to – dock time is shorter. A firm with a higher demand uncertainty requires quoting a longer dock – to – dock time. A firm with a higher outsourcing cost will have a lower expected profit due to quoting shorter expected dock – to – dock time. A firm which updates its production schedule more often; can accrue more profit by guaranteeing a shorter dock – to – dock time (Rao, Swaminathan and Zhang, 2005). The best type of build – to – schedule process will be chosen by meeting the overall demand, involving the customer, automating the process, varying the product design and creating product flexibility (Waters, 2002). The production cycle determines the period of monitoring to achieve 100% target value. Build – to –schedule aligns capacity to demand therefore keeping changes in volume or stream from starving the upstream or downstream department assist in operating with smaller floats and able to respond to customer demand in line with vehicle sequencing (Raghunathan, Rubenstein and Miller, 2004).

### 2.5.2 Flow Time

Flow time is the time taken from customers order till receiving the goods ordered which is identified through dock – to – dock time and overall equipment effectiveness. Dock – to – dock time is the time taken to convert raw materials into finished goods to be able to deliver upon the customers requested order. The result of long lead time causes channel to make production and ordering decisions long before they know the actual demand of the product. Dock – to – dock time can be reduced on two aspects of sales and production. At the sales department, dock – to – dock time can be reduced due to faster delivery quotes, reduction of cancelled orders and reduction of future demand forecasts (Hopp, Spearman and Woodruff, 1990). At the production department, dock – to –dock time can be reduced by synchronizing flow; shrinking lot sizes, kanban production control, and single minute exchange die which stabilizes the process (Wilson, 2010). The ability of a firm to make on time deliveries, lower material handling, obsolesces, and inventory carrying cost improves the dock – to – dock time allowing for flexibility and

efficiency of the production system and eventually lowering the total cost of production (Andreeva, 2009).

Overall equipment effectiveness is the measure of production effectiveness based on equipment availability, quality yield and cycle time performance. The metrics help gauge plant effectiveness and efficiency by categorizing key productivity losses which occur within the manufacturing process such as break downs, set ups and adjustments, minor stops, speed loss, production rejects and start – up rejects (Samad, Hossain and Asraffuzzaman, 2012). The result of overall equipment effectiveness is process cycle efficiency which is the amount of time value is actually applied to a product while still in process to reduce the cost of production (Cox and Monroe, 2004). At the production department, flow time can be increased through quality management, reduction of in – process inventories, decreasing disruption of production process, reducing the dependence of distant forecasts and easier overall management of facility. This shall be carried out through search for excess work – in – process inventory, continuous flow manufacturing, synchronized production, smoothing the work flow and elimination of variability (Hopp, Spearman and Woodruff, 1990).

## 2.6 Effect of Lean Management Practices on Operational Performance

Lean implementation has a great effect on operational performance such as lead time reduction, productivity increase, reduction of work – in - process inventory, quality improvement and space utilization reduction (Kilpatrick, 2003). The impact of lean manufacturing activities will have an effect: financially, on customers, processes, people and the future (Susilawati, Tan, Bell and Sarwar; 2013).

## 2.7 Summary

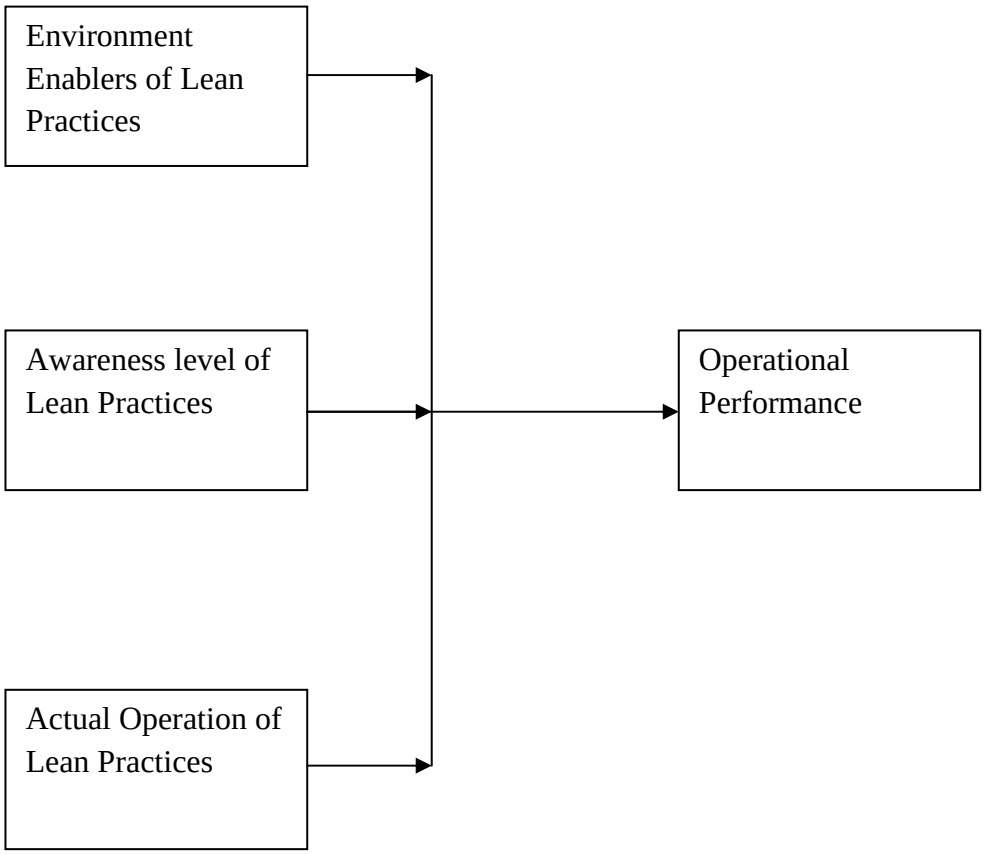
Lean practices introduction in an organization's operation is not a smooth journey and many at times, firms fail to see through the process due to lack of commitment by the members of the organisation. Lean management implementation is dependent upon measurement of performance to assess whether the firm is changing and leaving up to its desired goal. A company needs determination and commitment from every member of the organization to incorporate the new culture which will emerge due to new principles

and practices to be able to continuously achieve the mission and vision desired by the organization.

## 2.8 Conceptual Framework

A conceptual framework links abstract concepts as a first stage in designing a piece of research (Burns and Burns, 2008).

**Schematic Diagrams showing Variable Relationships**



# CHAPTER THREE: RESEARCH METHODOLOGY

## 3. 1 Introduction

This chapter presents the research methodology employed to answer the research questions of the survey study. It provides a full description research design, the target population, sampling design and data collection instrument.

## 3.2 Research Design

The research shall be carried out through a cross – sectional research design shall be used to examine the relationship between properties and dispositions (Nachmias and Nachmias, 1996).The descriptive research study which is a study concerned with describing the characteristics of a particular individual or group (Kothari, 2004). The research design will gain information about; the size, form, distribution and existence of lean practices and establish the effect of the lean practices in the operational performance of food manufacturers in Nairobi. This will permit the researcher to make statistical inference on the broader population and generalize findings to real life situations and thereby increase the external validity of the study.

## 3.3 Population of the study

The total population of the study is drawn from 47 manufacturing businesses in Nairobi in the food sub sector registered as members of Kenya Association of Manufacturers, 2013 which represents 27.33% of business within the food and beverage sector. It will be carried out through a census survey which will collect information from a single unit in all companies represented by the list of firms shown as food processors in the Kenya Association of Manufacturers directory in the food sector within Nairobi.

## 3.4 Data Collection

Primary data will be collected through a closed – ended structured questionnaire to obtain quantitative data for statistical analysis and will allow great uniformity in questions asked and response compatibility. Structured questionnaires provide to the respondent; questions which are definite, concrete and pre –determined (Nachmias and Nachmias,

1996). The questionnaires will be administered to operation managers, shop floor managers and chief operations officer.

The questionnaire will have three parts; PART A will cover the demographic and respondent's profile, PART B will cover the extent to which lean practices have been employed and adopted and lastly, PART C will examine the impact of lean practices on operational performance. The questionnaires were sent to the respondents by either emails or 'drop' and 'pick' method – a copy of the letter to the respondents is shown as Annex 2.

### 3.5 Data Analysis

The data will be analysed through descriptive statistics, regression analysis and statistical package for social science (SPSS 17.0). Regression analysis is a technique employed on one variable to determine the effect of another variable (Vohra, 2011). The descriptive statistics will be used to describe the basic features of data collected in the study and provide simple summaries about the sample and measures.

# CHAPTER 4: DATA ANALYSIS FINDINGS AND DISCUSSIONS

## 4.1 Introduction

This chapter is organized in the following manner; the part A provides a complete analysis of the demographic and respondents profile to identify the necessary details of the respondent being chosen in the sample survey, part B provides an analysis of the extent to which lean management practices have been employed and part C which is the final section to determine the impact of lean management practices in operational performance.

## 4.2 Response Rate

The response rate sought to gather information from production supervisors and managers or any individual responsible for the production function in the food manufacturing companies in Nairobi. The research was expected to gather information from a sample of forty seven food manufacturing companies. However, twenty six firms responded, which constituted 55% of the targeted sample of the forty seven firms selected.

## 4.3 Respondents Characteristics

**Table 4.1 Years of Experience**

| Number of Years | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| 6-10 years | 6 | 23.1 | 23.1 | 23.1 |
| 11-15 years | 4 | 15.4 | 15.4 | 38.5 |
| Over 16 years | 16 | 61.5 | 61.5 | 100.0 |
| Total | 26 | 100.0 | 100.0 | |

**Source: Primary Data**

Table 4.1 shows that among the respondents 61.5% have more than 16 years of food manufacturing experience. This information was necessary to provide the relevance of the data.

**Table 4.2 Number of employees who work in the organization**

| Number of Employees | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| 0-49 people | 8 | 30.8 | 30.8 | 30.8 |
| 50-99 people | 2 | 7.7 | 7.7 | 38.5 |
| 100-149 people | 4 | 15.4 | 15.4 | 53.8 |
| Over 150 people | 12 | 46.2 | 46.2 | 100.0 |
| Total | 26 | 100.0 | 100.0 | |

Table 4.2 shows that 46.2% of the respondents run large companies with staff greater than 150 employees with 30.8% of the respondents having 50 members of staff or less.

### 4.4 Lean management practices employed by food manufacturing companies

The second part of the questionnaire, the respondents were asked if there organization employed the three management practices based on environment enablers, awareness level and actual operation of lean practices. The items were summed up using the likert scale into a unit variable, with provision of a percentage for the level of lean implementation employed by the organization through mean, standard deviation, variance and percentages to determine the extent to which the lean management practices are employed by the different firms.

#### 4.4.1 Environment Enablers of lean practices

Table 4.3 provides response on value stream mapping activities performed by organizations within all the companies. The response shows that a large extent 77% of the respondents maintained a value stream which helped them eliminate waste within the system and non – value adding activities which had a negative influence in the performance of the organization. All the respondents said that the organizations had waste in the production system but they were regularly reviewing their systems to ensure that they eliminate them.

**Table 4.3 Value stream mapping activities**

| Implementation Extent | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| | Low extent | 2 | 7.7 | 7.7 | 7.7 |
| | Moderate extent | 4 | 15.4 | 15.4 | 23.1 |
| | Great extent | 6 | 23.1 | 23.1 | 46.2 |
| | Very great extent | 14 | 53.8 | 53.8 | 100.0 |
| | Total | 26 | 100.0 | 100.0 | |

### 4.4.2 Awareness level of Lean Practices

**Table 4.4 Employee Involvement Practices**

| Implementation Extent | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low extent | 2 | 7.7 | 8.3 | 8.3 |
| | Moderate extent | 4 | 15.4 | 16.7 | 25.0 |
| | Great extent | 8 | 30.8 | 33.3 | 58.3 |
| | Very great extent | 10 | 38.5 | 41.7 | 100.0 |
| | Total | 24 | 92.3 | 100.0 | |
| Missing | System | 2 | 7.7 | | |
| Total | | 26 | 100.0 | | |

Table 4.4 shows the level to which employees in given organizations are involved. Two firms representing 7.7% did not fill the specific area on inclusion of the employees within decision making. There justification for this was that the production equipment is automated therefore most of their employees are not involved in decision making therefore they depend on their machines and their top management incase of any production decisions and problems. 70% of the respondents depend on the shop floor employees and involve them in key decisions especially the decisions related to production who have a greater understanding of their area of expertise.

**Table 4.5 Customer Involvement Practices**

| Implementation Extent | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Low extent | 2 | 7.7 | 7.7 | 7.7 |
| Moderate extent | 4 | 15.4 | 15.4 | 23.1 |
| Great extent | 8 | 30.8 | 30.8 | 53.8 |
| Very great extent | 12 | 46.2 | 46.2 | 100.0 |
| Total | 26 | 100.0 | 100.0 | |

Table 4.5 shows that to a great extent of 77% customers are involved and engaged in the value identification of the product offering and features they would like to be included in the final goods provided to them. The companies are dependent on the feedback on quality and delivered performance to know how to meet and exceed their expectations based on the information they provide through customer satisfaction surveys.

**Table 4.6 Supplier Involvement Practices**

| Implementation Extent | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Low extent | 2 | 7.7 | 7.7 | 7.7 |
| Moderate extent | 2 | 7.7 | 7.7 | 15.4 |
| Great extent | 6 | 23.1 | 23.1 | 38.5 |
| Very great extent | 16 | 61.5 | 61.5 | 100.0 |
| Total | 26 | 100.0 | 100.0 | |

Table 4.6 shows that the 85% of the respondents involve their suppliers to a great extent in their production with most being long contracted suppliers who undergo a supplier certification program but accordingly most firms evaluate their suppliers based on price than on cost, with very few requesting the goods at just – in – time as and when required by the organization.

### 4.4.3 Actual Operation of Lean Practices

**Table 4.7 Continuous flow and Pull Production Practices**

| Implementation Extent | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Low extent | 2 | 7.7 | 7.7 | 7.7 |
| Moderate extent | 4 | 15.4 | 15.4 | 23.1 |
| Great extent | 6 | 23.1 | 23.1 | 46.2 |
| Very great extent | 14 | 53.8 | 53.8 | 100.0 |
| Total | 26 | 100.0 | 100.0 | |

Table 4.7 shows that 77% of the production practices depended on continuous flow and pull production practices in the organizations manufacturing. The organizations confirmed goods were pulled according to the current demand of the work stations and therefore shipment of finished goods necessitated the production pull. The equipment are also grouped and classified according to similar processing and routing requirements of the families of products.

### 4.5 Summary of results of implementation of lean management practices

| **Variable** | **Mean** | **Standard Deviation** | **Variance** |
|---|---|---|---|
| Value stream mapping | 4.09 | 0.811 | 0.658 |
| Employee Involvement | 4.17 | 0.917 | 0.841 |
| Customer Involvement | 4.38 | 0.941 | 0.886 |
| Supplier Involvement | 4.33 | 0.482 | 0.232 |
| Continuous flow and pull production | 4.23 | 0.992 | 0.985 |

The summary gives the mean, standard deviation and variances of the responses received. The summary provides an overall representation of the results of implementation of lean management practices. The results show that the value stream mapping (mean 4.09, standard deviation 0.811 and variance 0.658), employee involvement (mean 4.17, standard deviation 0.917 and variance 0.841), customer involvement (mean 4.38, standard deviation 0.941 and variance 0.886), supplier involvement (mean 4.33, standard deviation 0.482 and variance 0.232) and continuous flow and production(mean 4.23, standard deviation 0.992 and variance 0.985).

### 4.6 Operational Performance

The final section of the questionnaire asked respondents whether operational performance improves with the implementation of lean management practices.

**Table 4.8 Operational Performance**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Moderately agree | 4 | 15.4 | 15.4 | 15.4 |
| Agree | 12 | 46.2 | 46.1 | 61.5 |
| Strongly agree | 10 | 38.5 | 38.5 | 100.0 |
| Total | 26 | 100.0 | | |

Table 4.9 shows that 61.5% agree that operational performance improves with employment of lean management practices which result in increased inventory throughput which are identified through improvement of quality, reduction in work – in – process by build – to – order schedule and flow time.

### 4.6.2 Regression models showing the impact of lean management practices on operational performance

**Table 4.9 Relationship between lean management practices and operational performance**

| **R** | **$R^2$** | **Adjusted $R^2$** | **Standard Error of Estimate** |
|---|---|---|---|
| 0.504 | 0.254 | 0.103 | 0.460 |

Regression analysis was used to analysis the information collected from the 26 food manufacturing firms. There is positive relationship which is generated between the lean management practices and the operational performance of the firms due to the adjusted $R^2$ value (0.254).

**Table 4.10 Results of ANOVA relating to operational performance**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 1.233 | 2 | 0.617 | 2.815 | 0.083 |
| Residual | 4.600 | 21 | 0.219 | | |
| Total | 5.833 | 23 | | | |

# CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

## 5. 1 Summary of Findings

The purpose of this research project was to determine the extent to which manufacturing operations employ lean management practices and its effect on operational performance of the organization. This study established that organizations employ lean management practices such as environment enablers, awareness level and actual operation of lean practices to improve their operational performance. These lean management practices are practiced in isolation based on the capacity, capability and competence of the different firms. The practice of the actual operation practice and adherence to the rules and practices on a strict basis is a major challenge to most organizations as they sometimes do not relate to the working of the organization causing firms to use them haphazardly or at times abandon and again practices them as and when they feel like.

The awareness level of lean practices in the supplier involvement is slightly higher but the practice is dependent upon the relationship the suppliers has with the organization be it family or the length of the relationship. The research also found that firms are not in full application of the just – in – time due to the erratic supplies in some industries therefore application is based on the need basis. Most of the suppliers are evaluated based on price and not cost reductions and the main view of the organization was that inflation in many factors has forced them not to enjoy greater benefits of cost reductions. Most companies maintain close contact with their suppliers to ensure good services are rendered to their organizations. The employees do two firms were not engaged and involved and the firms declared that their automatic equipment allowed them to sidestep their employees in solving production problems related to the firm. Most firms considered their employees as their great source of answers to their problems and the most important ingredient in problem resolution. Most firms identified that there customers are key in value identification and they contribute immensely in determining what product offerings and features they desire to be considered in the final product.

The environment enablers of organization culture, structure and leadership are critical in determining the value stream achieved by the organization and necessary improvements

which require to be carried out to determine areas which are value and non – value adding.

## 5.2 Conclusion

The study aimed to answer the following questions: What is the extent of application of lean practices by food manufacturers in Nairobi? And what is the impact of lean practices on the operational performance of the organization? These questions were answered through the objectives which were: to establish the extent of lean practices employed by food manufacturers in Nairobi; and to establish the relationship between lean practices and operational performance of food manufacturers in Nairobi.

The study found out that the extent to which the firms employed lean management practices was to a great extent; through many practices such as supplier involvement, customer involvement, employee involvement, continuous flow and pull production and value stream mapping. The firms in applying lean management practices were able to reduce and eliminate waste in some instances therefore improving their production systems. The first objective of determining the extent to which organizations employ lean management practices was greatly used by organizations.

The study found that there was improved operational performance in its inventory throughput upon application of lean management practices. The firms agreed that the improved their throughput due to improved quality, increase in flow time and reduction in work – in – process due to build – to – schedule. The application of lean management practices improved the inventory throughput of the firm.

Most organizations have not strictly adhered to the application of lean management practices and are applying the practices which are compatible to the organizations and therefore they are not enjoying the full benefits of application of lean management practices.

## 5.3 Limitations of the Study

This study focused on the food manufacturing firms situated only in Nairobi County and the limitation is that the specific findings may not be applied to other firms in different

industries and companies out of Kenya. The results of this study are highly dependent upon the single view and attitude of the one respondent and different view might have been generated if the questionnaires may have been issued to different individuals.

The dynamic nature of the production management may change after a period of time and the views provided are limited to a given time period .These findings may not be applicable across time.

### 5.4 Suggestions for Further Research

This study will be of great use over a greater population across all industries in Kenya. The study should be applied across time to ensure the validity of the information it portrays over time instead of it being a one shot study. The companies being involved in the study could of great assistance to provide secondary data which could complement and increase the level of knowledge in the matter of study.

### 5.5 Recommendations

Based on the findings, there is great evidence to recommend the implementation of lean management practices in food manufacturing firms in Kenya because of the benefits gained due to implementing lean management practices. Firms shall benefit out of implementation of lean management practices by increasing their inventory throughput and reduction of waste in their production cycle. The firms which apply lean management practices should do it in a holistic manner rather than in an isolated way to enjoy the great benefits of full implementation. Firms should be willing to assist students to enable them benefit form advanced knowledge which will be generated by the students after production of reports on performance improvement and ways of doing so. The implementation of lean management practices should be driven in a manner that it is strictly adhered to enjoy the true benefits of implementation.

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# APPENDICES

## Appendix I: Introduction Letter

Kevin Mwangi

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30th September, 2012

To Whom It May Concern:

**RE: PERMISSION TO CARRY OUT A RESEARCH IN YOUR FIRM**

I am a post graduate student at the University of Nairobi and in partial fulfilment of a Master in Business Administration Degree; I intend to carry out a research on food manufacturers in Nairobi. The topic of research is 'Lean Management Practices employed in Manufacturing Operations: A Case of Food Manufacturing Companies in Nairobi.

Please note that this is strictly an academic exercise towards the attainment of the above purpose. Any information will be treated with strict confidence. Your manufacturing firm has been chosen for the study and choice is based on the importance of achieving the objective of the study. Your co – operation will be highly appreciated.

Thank you for your anticipated kind response.

Yours sincerely,

**Kevin Mwangi**

**APPENDIX II: Questionnaire**
**RESEARCH QUESTIONNAIRE**

**PART A: DEMOGRAPHIC AND RESPONDENT'S PROFILE**

1. Name of the Respondent (optional) ……..
2. Name of your organization ……
3. For how long has your organization been in existence?
   a) Under 5 years [ ] c) 11 - 15 years [ ]
   b) 6 – 10 years [ ] d) Over 16 years [ ]
4. How many employees work for your organization?
   a) 0 - 49 people [ ] c) 100 - 149 people [ ]
   b) 50 – 99 people [ ] d) Over 150 people [ ]

**PART B: EXTENT TO WHICH LEAN MANAGEMENT PRACTICES HAVE BEEN ADOPTED**

1. Does your organization employ lean management practices in recognition of its effect on operational performance?
   Yes [ ] No [ ]
2. The statements below describe the extent of lean practices on operational performance. Please indicate the extent to which the lean practices adopted by company influenced operational performance:

**Key:**

**V. Very great extent; IV. Great extent; III. Moderate extent; II. Low extent; I. Very low extent**

| | | **V** | **IV** | **III** | **II** | **I** |
|---|---|---|---|---|---|---|
| **1** | Do the customers of the company enjoy value | | | | | |
| **2** | Are the customers willing to pay for the value | | | | | |
| **3** | Does the company have a robust process of determining customer value | | | | | |
| **4** | Are the employees involved in customer engagement | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **5** | Are the customers involved in value identification | | | | | |
| **6** | Is there frequent interaction with internal and external employees | | | | | |
| **7** | Does the company conduct regular customer satisfaction surveys | | | | | |
| **8** | Does the company clearly communicate the value stream | | | | | |
| **9** | Do the cross functional teams agree on the value stream | | | | | |
| **10** | Do the formal value stream maps identify the waste and non – value adding activities | | | | | |
| **11** | Does the company scrutinize every step to identify value | | | | | |
| **12** | Is the factory layout determined by families of products | | | | | |
| **13** | Are the equipment grouped according continuous flow | | | | | |
| **14** | Is the customer demand rate related to production pace | | | | | |
| **15** | Are products classified according to similar processing requirements | | | | | |
| **16** | Are products classified according to similar routing requirements | | | | | |
| **17** | Does the company use a pull production system | | | | | |
| **18** | Is production pulled by a shipment of finished goods | | | | | |
| **19** | Is production at workstations pulled by current demand of the next station | | | | | |
| **20** | Does the company use a kanban, squares or containers of signals for production control | | | | | |
| **21** | Are the shop floor employees key to solving | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | problems | | | | | |
| **22** | Are shop floor employees involved in suggestion programs | | | | | |
| **23** | Do the shop floor employees lead in process/ product improvement | | | | | |
| **24** | Do the shop floor employees undergo cross functional training | | | | | |
| **25** | Does the company have a flexible work environment | | | | | |
| **26** | Does the firm maintain employee payroll even during tough situations | | | | | |
| **27** | Does the company offer job security to all its employees | | | | | |
| **28** | Does the company frequently inform its employees | | | | | |
| **29** | Are the company procedures documented | | | | | |
| **30** | Does the company frequently update the line and cell progress | | | | | |
| **31** | Are you in close contacts with your suppliers | | | | | |
| **32** | Does the company provide feedback to suppliers on quality and delivery performance | | | | | |
| **33** | Does the company strive for long – term relationship with its suppliers | | | | | |
| **34** | Are the suppliers involved in new product development process | | | | | |
| **35** | Are goods supplied in just – in – time basis for key suppliers | | | | | |
| **36** | Are the suppliers contractually committed to annual cost reductions | | | | | |
| **37** | Are the suppliers evaluated based on a total cost basis | | | | | |
| **38** | Does the company have a supplier certification | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | program | | | | | |
| **39** | Does the organization have a corporate communication with its key suppliers on important issues | | | | | |

**PART C: IMPACT OF LEAN MANAGEMENT PRACTICES ON OPERATIONAL PERFORMANCE**

5. Below are some of the operational performance measures employed by a firm to gauge the impact of lean practices on a firm, please tick appropriately the degree to which it has impacted the company.

**Key:**

**V. Strongly agree; IV. Agree; III. Moderately agree; II. Disagree; I. Strongly disagree**

| | | **V** | **IV** | **III** | **II** | **I** |
|---|---|---|---|---|---|---|
| **1** | Does quality improve throughput | | | | | |
| **2** | Does quality reduce the level of customer complaints | | | | | |
| **3** | Does quality reduce the number of defective units produced | | | | | |
| **4** | Does quality reduce the number of product returns | | | | | |
| **5** | Does quality reduce the warranty claims | | | | | |
| **6** | Does quality reduce the scrap level | | | | | |
| **7** | Does quality increase perfection and excellence level desired | | | | | |
| **8** | Does quality increase customer satisfaction | | | | | |
| **9** | Does flow time reduce query time from the customers | | | | | |
| **10** | Does flow time increase the frequency of delivery | | | | | |
| **11** | Does the flow time improve throughput | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **12** | Does flow time reduce the production time | | | | | |
| **13** | Does flow time increase flow in the stations | | | | | |
| **14** | Does flow time decrease the production of the waste | | | | | |
| **15** | Does flow time increase line efficiency | | | | | |
| **16** | Does flow time eliminate production variability | | | | | |
| **17** | Does flow time increase speed of delivery | | | | | |
| **18** | Does flow time reduce the number of late orders | | | | | |
| **19** | Does flow time improve the production scheduling | | | | | |
| **20** | Does flow time improve the arrival of the product at the promised time | | | | | |
| **21** | Does flow time increase the dependability value desired by the customer | | | | | |
| **22** | Does flow time reduce the proportion of product to stock | | | | | |
| **23** | Does build – to – schedule reduce the amount of work – in – process inventory | | | | | |
| **24** | Does build – to – schedule enhance the need for cross functional training | | | | | |
| **25** | Does build – to – schedule increase the capacity of a firm to produce a variety of products | | | | | |
| **26** | Does build – to – schedule increase the use of dynamic scheduling | | | | | |
| **27** | Does build – to – schedule increase the flexibility of production | | | | | |
| **28** | Does build – to – schedule improve throughput | | | | | |

**THANK YOU FOR YOUR TIME**

**LIST OF FOOD COMPANIES WITHIN NAIROBI REGISTERED WITH KENYA ASSOCIATION OF MANUFACTURERS**

| | NAME | ROAD |
|---|---|---|
| 1 | Al Mahra Ind | Lunga Lunga |
| 2 | Alpha Fine Foods | Road A |
| 3 | Arkay Ind Ltd | Kambi ya Somali |
| 4 | Bakers Corner | Road C |
| 5 | Belat Enterprises | Athi River |
| 6 | Belfast Millers | Bamburi Road |
| 7 | Bio Food Products | Road C |
| 8 | Breakfast Cereal Co | Lusingeti Road |
| 9 | C Dormans | Kampala Road |
| 10 | Cadbury Kenya | Ol Kalou |
| 11 | Chirag Kenya Ltd | Road A |
| 12 | Deepa Industries | Sasio |
| 13 | East African Sea Food | Road A |
| 14 | Ennsvalley Bakery | Old Airport |
| 15 | Farmers Choice | Kahawa West |
| 16 | Gonas Best | Lusingeti Road |
| 17 | Green Forest Foods | Old Airport |
| 18 | Highland Canners | Langata |
| 19 | Jambo Biscuits | Kampala Road |
| 20 | Kapa Oil | Mombasa Road |
| 21 | Kenafric Industries | Ruaraka |
| 22 | Kenchic Ltd | Mombasa Road |
| 23 | Kenya Sweets Ltd | Old Airport |
| 24 | Kuguru Food Complex | Enterprise |
| 25 | Kwality Candles & Sweets | Kampala Road |
| 26 | Manji Foods Industries | Lunga Lunga |
| 27 | Melvin Marsh | Dakar |
| 28 | Mini Bakeries | Enterprise |
| 29 | Miritini Kenya | Funzi |
| 30 | Nairobi Flour Mills | Homa Bay |
| 31 | Norda Industries | Mombasa Road |
| 32 | Kenya Co - operative Creameries | Dakar |
| 33 | Nestle Foods | Pate |
| 34 | Patco | Rangwe |
| 35 | Pearl Industries | Gilgil |
| 36 | Pembe Flour Mills | Lunga Lunga |
| 37 | Premier Flour Mills | Mogadishu |
| 38 | Premier Food Industries | Ruaraka |
| 39 | Proctor & Allan | Lusaka |

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| 40 | Promasidor Kenya | Namanga |
| 41 | Razco | Ruaraka |
| 42 | Re - Suns Spices | Gilgil |
| 43 | Spice World | Nanyuki |
| 44 | Trufoods | Jogoo Road |
| 45 | Unga Group | Commercial Street |
| 46 | Wanji Foods Industries | Lunga Lunga |
| 47 | Wrigley Co | Bamburi Road |