EFFECT OF LEAN MANUFACTURING ON ORGANIZATIONAL PERFORMANCE: A CASE OF SOUTH NYANZA SUGAR COMPANY, AWENDO, KENYA

BY

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DECLARATION

This researches my original work and has not been presented in any other university or institution of higher learning for examination.

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DEDICATION

I dedicate this thesis to my parents, my wife Pacifica, daughter Kylieflorence, brother, sisters, nieces and nephews for showing me the essence of education.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

LM: Lean manufacturing

SONY: South Nyanza Sugar Company

TPS: Toyota Production System.

JIT: Just in Time

VSM: Value Stream Mapping

RFID: Radio Frequency Identification

SCA: Sustainable Competitive Advance

IO: Industrial Organization

ABSTRACT

Due to the present business landscape that is characterized by global competition and high cost pressures, both of which have motivated companies to take a global approach to their supply markets, lean manufacturing has become a common practice among organizations worldwide. The purpose of this study was to explore the effect of lean manufacturing on organizational performance in Sony Sugar Company, Awendo, Kenya. The study objectives were to establish the effect of elimination of waste on organizational performance, to examine the effect of intellectual knowledge on organizational performance, to determine the effect of an Andon on organizational performance, to establish the effect of technology adoption on organizational performance in Sony Sugar Company, Awendo, Kenya and to establish the moderating influence of organizational culture on the relationship between lean manufacturing and organizational performance. The study population was 371 who were HoDs, Divisional HoDs and Supervisors of Sony Sugar Company in nine departments with a sample size 79 out of 371 targeted population. The study used correlation research design and questionnaires were used as tools for data collection. Quantitative data was analyzed descriptively using percentage, frequencies, mean and standard deviation. Inferentially, Pearson Correlation coefficient and use multiple regression analysis were used as analysis tools to test for significance among various hypotheses. Quantitative techniques were used to analyze the data with the assistance of SPSS software program version 22. Five hypotheses were formulated and subsequently tested to establish the influence organizational culture. It was therefore concluded that there is a regression relationship between lean manufacturing combined with organizational culture and organizational performance implementation. The study found that elimination of waste; intellectual knowledge; andon and technology adoption were individually predictors of organizational performance with andon being the most significant predictor. The study established that organizational culture was a moderating factor in the study. The results support the current theories related to the study. Consequently, this study provides manufacturing organizations with insights of how they can develop a competitive edge through the implementation of lean manufacturing. This study therefore, recommends that factors associated with lean manufacturing need to be considered by firms in their performance strategic plans as they have significant impact on performance. Both the government, private sector should design a way of empowering the employees on the need to be equipped with lean manufacturing practices so as not to affect its implementation since the finding indicated that the strength of relationship of lean manufacturing and organizational performance depended on organizational culture. Quarterly production and customer satisfaction reports should be filed in order to track the quality of products and services delivered and the extent of customer satisfaction with a view of increasing profit and market share through the application of lean manufacturing practices. Suggestions for further research. A study can be replicated in a larger number of sugar companies and in more counties. This may account for any environmental factors that may exist in any one county and improve the generalization of the results. A study can be carried out to investigate the influence of other factors like “pull” production and lean manufacturing, just-in-time, total quality management and production smoothing on organizational performance

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The present business landscape is characterized by global competition and high cost pressures, both of which have motivated companies to take a global approach to their supply markets. With the advent of lean thinking in the late1980s in Japan which resulted to a revolution in the field of production which began with research in Massachusetts Institute of Technology with an intent of analyzing the production system behind Toyota's success. The research took a time frame of five years resulting to a book "The Machine that Changed the World", one of the most cited references in operation management over the last eighteen years (Holweg and Pil, 2001). Through this research a new name for a system was brought to board known as Toyota Production System (TPS). Despite the fact that Just in Time (JIT) production or Automation were known for more than a decade before the publishing of the book, this had a tremendous role in spreading the concept outside Japan (Holweg and Pil, 2001). The western world needed a friendlier explanation, another name for such a specific system and some concrete examples to show that it is applicable in other types of cultures. During the last twenty years the lean concept was proved to be fitting not only to different cultures, but also to most of the industries.

Gamage et al., (2012) looking on impact of lean manufacturing on performance and organizational culture in Sri Lanka showed that organizations in the bulk apparel production industry could achieve positive cultural shift and gain financial benefits as well through implementation of lean manufacturing practices. Similarly, Yasir and Mohammad (2015) study on using lean techniques to reduce waste and improve performance in municipal construction project delivery in USA, concluded that many alternatives of lean techniques were identified and prioritized to support in reaching the optimum goal of waste reduction and performance improvement. Likewise, Raja et al., (2015) while looking at relationship between lean production and operational performance in the manufacturing industry in Malaysia observed that problems might occur here and there in the manufacturing company. This is where LP comes in handy as it avoids problems and increase

Operational Performance since it promotes conformity with specifications to deliver result and avoid waste both in the work force and the products. Kijpokin (2014) while looking at the role of lean production on organizational performance in Thailand, concluded that significant business performance enhancements can be realized through Lean Production implementation over considerable period of time. Besides that, Jeremiah et al., (2012) writing on Lean Manufacturing Implementation: in South African environment showed that for lean implementation to be successful employees must be given training that is relevant to their work and senior management of the organization must display commitment towards the lean program being implemented by making necessary resources (time, funds) available for lean activities. Finally, Onyeizugbe and Ike (2016) while looking at Lean Production: in Oil and Gas Companies in Nigeria observed that lean production can be used to resolve severe organizational performance problems in the oil and gas industry in Rivers State of Nigeria. However, all these studies looked at lean manufacturing with a view of its techniques unlike this study that is addressing the aspect of its adoption in relation to; elimination of waste, intellectual knowledge, organizational culture and adoption of technology in Sony Sugar Company, Awendo, Kenya.

Manufacturing companies' performance is significantly affected by the manufacturing practices implemented. In the current business scope, many manufacturing companies have implemented from time-to-time lean manufacturing practices that are dynamic in nature. Womack and Jones (2003) posit that LM implementation is grounded in five principles namely; specifying value from the customer's perspectives, identifying the value stream, creating the flow, introducing pull system and working towards perfection. Alagumurthi and Ramachandran, (2013), lean manufacturing techniques have facilitated manufacturing plants to dramatically increase their competitive edge.

The Kenya Sugar Industry Strategic plan (2010-2014) states the following challenges faced by the Kenya sugar industry manufacturers but not limited to; irregular routine factory maintenance, high post-harvest losses, low crushing capacity, low sugar extraction rates, slow adoption of new and appropriate technology, lack of industrial research, high cost of sugar production, narrow product

base, dilapidated processing equipment, inefficient factory operations, wastage in cane yard and limited value addition.

Organizations must be capable of adapting to current and future changes in the external business environment by continually renewing their structures and practices and by preparing planned changes based on systematic data gathering and analysis (Daft & Huber, 1986; Ellis & Shpielberg, 2003; Emery, 2004).Besides that the current global market has forced the manufacturing organizations to adopt proactive and innovative approach for improving their manufacturing capabilities (Mishra et al., 2013). Organizations may attain competitive advantage from lean production practices. Such practices enable the organization to get superior performance through reduction of wastes and other related costs (Ohno, 2008). Lean manufacturing helps in enhancing production processes and boosting up the employees job satisfaction (Singh et al., 2010). Eliminating variability aids to reduce the overall cycle time which is a core objective of Lean. Consequently, this aids to reap the benefits that Lean proponents (Lewis, 2008; Ransom, 2008; Hines et al., 2008) advocate; namely shorter cycle time, shorter lead times, lower WIP, faster response time, lower cost, greater production flexibility, higher quality, better customer service, higher revenue, higher throughput and increased profit.

1.1.1 Kenya sugar industry

Kenya sugar industry experiences technology capabilities challenges and this has remained a major limitation to the increased production of sugar and to the growing of more sugarcane (Obonyo, 2004). Imported sugar is cheaper than sugar produced in Kenya due to high production cost and inappropriate technology (Wanyande, 2001). The Kenya Sugar Industry Strategic plan (2010-2014) states the following challenges faced by the Kenya sugar industry manufacturers but not limited to; irregular routine factory maintenance, high post-harvest losses, low crushing capacity, low sugar extraction rates, slow adoption of new and appropriate technology, lack of industrial research, high cost of sugar production, narrow product base, dilapidated processing equipment, inefficient factory operations, wastage in cane yard and limited value addition

Kenya factories operate at a capacity utilization of 55 to 60 percent because of technical and management limitations (KSB, 2010; KSI, 2009). Factory capacity utilization is low in comparison to world leaders like India where the sugar industry is operating at an average of 113% capacity utilization (Kumar and Arora, 2009). Factory time efficiency for the Kenya sugar industry dropped from 79.58% in 2006 to 74.91% in 2008 (Mwanaongoro & Imbambi, 2014). Factory Time Efficiency (FTE) in the 2013 calendar year was 82.29% and Overall Time Efficiency (OTE) was 73.57% over the same period. These results are however low compared to the industry standards of 92% and 82% for FTE and OTE respectively (KSB, 2013). In the year 2013, the mill white sugar from all the mills failed to meet the Kenya Bureau of Standards colour requirement of 400 ICUMSA units (KSB, 2013).

1.2 Statement of the Problem

The main goal of a lean manufacturing system is to produce products of higher quality at the lowest possible cost and in the least time by eliminating wastes (Dennis, 2007). In the financial year ended 30thJune 2015 Sony Sugar Company registered pretax loss of KShs. 1,154 million up from KShs. 529 million of the previous year Gross sales of the year was KShs. 4.5 billion compared to 5.3 billion achieved in the previous year. All these were as a result of operating below capacity (Auditor General Report, 2014/2015). Sugar production cost in Kenya is higher than those in other producing countries in East Africa and COMESA member states. The Kenya Sugar Industry Strategic plan (2010-2014) puts the cost of producing sugar in Kenya at 415-500 USD/ tonne while that of Uganda 180-190 USD/ tonne and Tanzania at 140-180 USD/ tonne. This is due to but not limited to: use of outdated technology, organizational culture, improper waste elimination process and use of employees physically and not intellectually.

A research carried out by Keitany & Riwo-Abudho (2014) indicated that improving management style and involving all employees at all levels, as well as better inventory management leads to a more efficient practice of lean production. But their study did not investigate that for organizations to duly realize the importance of lean manufacturing they need to utilize their employees

intellectually but not physically. Ondiek and Kisombe (2012) recommended further research in the area of lean manufacturing, not only in the sugar sector but also in other areas of the Kenyan economy. All these studies were designed to determine the elements of lean production, effect of lean production systems on product quality, strategies for waste reduction and the challenges of adopting lean production measures of organizational performance. Onyeizugbe and Ike (2016) recommended that managements of companies are encouraged to increase their resource commitment to staff training so as to develop skills and to update knowledge on lean production; internal customer and supplier relationship should be created in the process of this integrative process which might not capture full insights into organizational performance with the advent of lean production in the production line. Hence there is need to further research on the effects of lean manufacturing on organizational performance in the sugar production sector in Kenya.

1.3 Purpose of the Study

The purpose of this study was to establish the effect of lean manufacturing on organizational performance, a Case of Sony Sugar company, Awendo, Kenya.

1.4 Objectives of the Study

This study was guided by the following objectives:

i. To establish the effect of elimination of waste on organizational performance in Sony Sugar company, Awendo, Kenya.
ii. To examine the effect of intellectual knowledge on organizational performance in Sony sugar company, Awendo, Kenya.
iii. To determine the effect of andon on organizational performance in Sony Sugar Company, Awendo, Kenya.
iv. To establish the effect of technology adoption on organizational performance in Sony sugar company, Awendo, Kenya.
v. To establish the moderating influence of organizational culture on the relationship between lean manufacturing and organizational performance.

1.5 Research Hypotheses

H_{o1}There is no significant relationship between elimination of waste and organizational performance in Sony Sugar Company, Awendo, Kenya.

H_{o2}There is no significant relationship between intellectual knowledge and organizational performance in Sony Sugar Company, Awendo, Kenya.

H_{o3}There is no significant relationship between Andon and organizational performance in Sony Sugar Company, Awendo, Kenya.

H_{o4}There is no significant relationship between technology adoption and organizational performance in Sony Sugar Company, Awendo, Kenya.

H_{05} The strength of relationship between lean manufacturing and organizational performance does not depend on organizational culture.

1.6 Scope of the Study

The study focused on the effect of lean manufacturing on organizational performance in Sony Sugar Company, Awendo, Kenya. Thus the study sought to establish the interplay between the drive for lean manufacturing and its effect on organizational performance. The motivation for choosing to study this subject in Sony Sugar Company, Awendo, Kenya is the fact that it is a locally owned manufacturing organization that has been utilizing lean manufacturing practices for quite a long time, enough time to be able to arrive at meaningful conclusions and recommendations. This study was carried out in Sony Sugar Company, whose offices are based at Awendo, Kenya. The target respondents were the employees of the company. The time frame covered was February 2017 to April 2018.

1.7 Significance of the Study

To the government, the study provided greater insight into the relationship between lean manufacturing and organizational performance. This may aid in formulation of policies and regulations that can help improve efficiencies and effectiveness in the sector and improved manufacturing sector could increase national GDP and by extension increase job creation. Improved

lean manufacturing possibly will boast flow of trade and reduction of cost in exports creating export incentives, improved prices of goods and services, and reliable manufacturing sector.

To the manufacturing firms, they may benefit from the study as they could better understand the underlying lean manufacturing practices influencing performance of their firms and they may be better placed to deal with hurdles that impede successful lean manufacturing. Efficient and effective lean manufacturing will provide base for organizational growth, increased productivity, reduced cost of production, improved distribution, quality products, and increase customer satisfaction.

To the world of academia, the study may also benefit the academic community as it may contribute to the increasing body of literature on lean manufacturing. It may possibly provide a framework of lean production dimensions which may be used as a test base for further research. In general, this research would contribute towards a theoretical and practical improvement of lean manufacturing adoption, implementation and upgrade in diverse cultural and business setting, based on a Kenyan case study.

1.8 Limitations of the Study

The main limitation of the study was creating time for collecting data. During the data collection period I was fully engaged in my official duties caused difficulty in going to the field in time. This was overcome by going on my annual leave.

1.9 Operational Definition of Terms

Lean manufacturing: It is the name given to a team-based systematic approach for discovering and eliminating various types of waste (Upadhye et al., 2010).

Elimination of waste: Is the standardization of worker actions. A standardized work basically ensures that each job is organized and is carried out in the most effective manner. Alavala, (2008)

Intellectual knowledge: Intellectual knowledge is presented by organization knowledge used for creation of organization wealth. According Armstrong (2002) it can be stocks and flow of knowledge disposal in organization. Such knowledge can be

considered as not tangible sources that contribute to the quality of internal processes and create value added

Andon: Is a Japanese word for paper lantern, is a term for a visual control system using an electric light board (or other signal device) hung in a factory, so that a worker can call for help and stop the line (Monden, 1997; Liker, 2004).

Technology adoption: Is a process that begins with awareness of the technology and progresses through a series of steps that end in appropriate and effective usage Bridges to Technology Corp (2005)

Organizational culture: It refers to a system of shared assumptions, values, and beliefs that show employees what is appropriate and inappropriate behavior. Chatman & Eunyoung (2003).

Organizational performance: It encompasses three specific areas of firm outcomes: (a) financial performance (profits, return on assets, return on investment, etc.); (b) product market performance (sales, market share, etc.); and (c) shareholder return (total shareholder return, economic value added, etc.). Richard et al. (2009)

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In this chapter Literature was reviewed under the following theoretical review, thematic concerns of elimination of waste and organizational performance, intellectual knowledge and organizational performance, organizational culture and organizational performance, technology adoption and organizational performance, organizational culture lean manufacturing and organizational performance theoretical framework, research gaps and conceptual framework and identified research gaps.

2.2 Theoretical Review

The study was anchored on two theories, resource based view theory and theory of constraints.

2.2.1 Resource Based View Theory

This study was modeled on resource-based view theory advanced by Penrose (1959).In the resource-based view theory, firm's performance is affected by firm-specific resources and capabilities. In view of RBV theory, lean manufacturing is taken as a strategic decision which can be used to fill gaps in the firm's resource and capabilities. This implies that, the adoption of lean manufacturing will result to firms' ability to utilize resources and capability to ring shortened time between customer order and the product build/shipment by eliminating sources of waste hence resulting to increasing firms' competitive edge.

2.2.2 Theory of Constraints

This study was also be guided by theory of constraints developed by Eliyahu (1984).In the theory of constrains any element or factor that limits the system from doing more of what it was designed to accomplish (i.e., achieving its goal) is a constraint. In view of theory of Constraints, organizational performance is directly uplifted with the blending of lean manufacturing as catalyst of elimination of constraints with a view of ensuring systems do more of what they are designed to accomplish. This implies that to initiate and implement breakthrough improvement through focusing on a

constraint that prevented a system from achieving a higher level of performance directly requires lean manufacturing practices hence increasing firms' competitive edge.

2.3 Lean Manufacturing and Organizational Performance

The market is becoming more volatile day by day, so understanding market dynamics is a crucial factor if one wants to design manufacturing systems better Gadalla, (2010). Lean manufacturing believes the simple fact that customers will pay for the value of services they receive, but will not pay for mistakes Rawabdeh, (2005). Lean manufacturing plays an important role of adding competitive advantage to a firm in customer support and business excellence. According to Boyer & Sovilla, (2003), managers should also work to create interest in the implementation of lean.

In today's highly competitive environment, many companies are striving to gain a share of the global market and to take advantage of higher production and sourcing efficiency. From the point of view of Bhasin and Burcher (2006), lean is viewed more as a philosophy than a strategy. Supplier involvement is a must if an organization is to reap the rewards of lean practices. Moreover, lean manufacturing should be considered as a continuous improvement process for better results. Bhuiyan and Baghel (2005) overviewed the continuous improvement process from the past to the present scenario. Continuous Improvement (CI) uses different methodologies to get better results in an organization. These methodologies include lean manufacturing, six-sigma, lean six-sigma and the balance score card. Hopp and Spearman (2004) found that continuous improvement efforts are means to achieve high levels of pull production (production is based on actual daily demand) through eliminating variability in the system and thereby reducing defects in the organization. In order to implement the concept of lean manufacturing successfully, many researchers emphasizes on commitment by top management Alavi, (2003).

In clarifying the multidimensional relationship between lean manufacturing and organizational performance, a clear definition of organizational performance will be required. According to Richard, et al., (2009), firm performance encompasses three specific areas of firm outcomes: financial performance (profits, return on assets, return on investment); market performance (sales,

market share); and, customer satisfaction/value added Richard, et al., (2009). Firm performance comprised the actual output or results of an organization as measured against its intended outputs (or goals and objectives), it involved the recurring activities to establish organizational goals, monitor progress toward the goals, and make adjustments to achieve those goals more effectively and efficiently Richard, et al., (2009). Lean helps firms reduce costs, cycle times and unnecessary, non-value added activities, resulting in a more competitive, agile and market responsive company Alukal, (2003). In addition Lean manufacturing is based on the elimination of waste, both value added and non-value added, from the processes that are used to produce goods and services Feld, (2001). These lean tools also contribute to creating an improvement in organizational performance. Measuring operating costs could identify whether, when and where to make operational changes to control expenses, point out areas for improved asset management and could attract and retain valuable customers by improving the price value relationship of products offered through cost reductions and service improvements Keebler, & Plank, (2009). Finally, According to Bruce and Larco (1999) Lean is both a concept that can be viewed and implemented at a number of level and also a commitment process of relentless improvement that can significantly impact upon an organizations health, wealth and competitiveness. Starting in the 1980s, firms viewed time as a source of competitive advantage, based upon the observation that firms were competing effectively in time tended to excel at improving quality, understanding evolving customer needs, exploiting emerging markets, entering new businesses, and generating new ideas and incorporating them into innovations Njambi & Katuse, (2013). Thus, firms started to focus on eliminating waste in the form of time, effort, defective units, and inventory in manufacturing distribution systems Njambi & Katuse, (2013).

In order to understand firm performance it is prudent to first understand what performance measurement is all about since it is through performance measurement that firm performance could be realized. In reference to Prathap and Mittal, (2010), Performance measurement is a crucial criterion for evaluating the competence and achievement of an organization. Tuttle & Heap, (2008)

defined performance measurement as the process of quantifying action, where measurement is the process of quantification and action leads to performance. Their major focus was on the importance of satisfying customer requirements with greater efficiency and effectiveness than the competitors. Here the effectiveness referred to the extent to which customer requirements were met, largely with the essence that customer was always right and the efficiency referred to the measurement as to how economically the firm‘s resources were utilized (i.e. total output against total input) to provide a specific level of customer satisfaction (Islam & Sunders, 2013).

2.4 Elimination of Waste and Organizational Performance

The main goal of a lean manufacturing system is to produce products of higher quality at the lowest possible cost and in the least time by eliminating wastes Dennis, (2007). Anything (process or product tangible and intangible) that does not add value to the end product is called waste Henderson & Larco, (2003). There are different indicators that can be used to measure waste elimination in an organization they include value stream mapping, total productive maintenance, autonomation and continuous improvement.

Various methods and tools that aim to improve the operational performance of organizations are comprised under the lean strategy’s umbrella Bhasin (2012). In particular, Rocha-Lona, et al., (2013) consider just-in-time (JIT), total productive maintenance (TPM), autonomation, value stream mapping (VSM) and kaizen/continuous improvement (CI) as the most essential methods of the lean approach. In the case of TPM, it is a lean manufacturing method that contributes to the optimization of predictive, preventive and corrective maintenance activities in order to achieve the maximum level of efficiency and profit from production equipment Brah and Chong (2004). To achieve this, TPM relies on tools such as overall equipment effectiveness (OEE), single minute exchange of die (SMED), 5S, autonomous maintenance, quality maintenance, initial control before starting production, and a safety and hygiene environment (Brah and Chong 2004; Rocha-Lona, et al., (2013). Autonomation, also known as jidoka, is a lean method that targets the reduction of quality defects with the use of tools that include mistake proofing devices (i.e. poka-yokes), visual control

systems (i.e. andons) and a full working system (Shingo 1986). In the case of VSM, it is a lean manufacturing method that visually identifies and measures waste resulting from the inefficiencies, unreliability and/or incapability of information, time, money, space, people, machines, material and tools during the transformation process of a product Pavnaskar, et al., (2003). Rocha-Lona, et al., (2013) consider the current and future value stream maps and flow diagrams as the most commonly used tools employed during a VSM analysis. Finally, kaizen, or CI, is one of the most important processes in a lean organization. The focus of kaizen is on the elimination of waste through the continuous and incremental improvement of processes. Once embedded as part of an organization's culture, kaizen acts as a platform for the sustainment of lean initiatives Imai (2012). Rocha-Lona, et al., (2013), Bhuiyan and Baghel (2005) and Lyu (1996) suggest 5S, brainstorming, continuous flow, kanbans, data check sheet, five whys, run charts, Pareto chart, VSM, Gantt chart, mistake proofing and process maps as tools that most commonly contribute to the kaizen strategy.

The waste concept includes all possible defective work and activities, Taj & Berro, (2006). Waste can be classified into eight categories (Womack & Jones, 2003): motion waste, waiting waste, correction waste, over processing waste, overproduction waste, unnecessary transportation waste, inventory waste and knowledge waste. Through the systematic elimination of waste, alignment of production with demand and necessary involvement of the workforce, Lean is capable of increasing the business competitiveness of any organization (Garcia & Bonavia, 2015)

2.5 Intellectual Knowledge and Organizational Performance

While the literature offers a large number of papers that show how learning orientation (LO), knowledge application (KA), the organizational learning process (OLP), or knowledge management individually improve organizational performance, my approach focuses on proposing an integrated model of these concepts and their relationship with organizational performance in reference to elimination of some employer practices in relation to human resources, in order to be at a competitive edge with use of the OPAP (orientation, process, application, and performance) Model. The study of learning and knowledge in organizations has moved from the earlier contributions of the resource-

based view (Penrose, 1959) to the knowledge-based theory of the firm Grant, (1996) and is now considered from different perspectives including LO, the OLP, knowledge management, and knowledge application (KA).Furthermore, these concepts are usually applied to the manufacturing sector Mangiarotti, (2012), with only a small number of studies focusing on the financial sector, concentrating on banking (Xue & Wang, 2011) and insurance (Huang et al., 2011).

Multiple studies have established a positive association between LO and organizational performance (Alegre &Chiva,2013; Ellinger, et al., 2002; Fugate, et al., 2009; Gandía & Montagud, 2011; Watkins & Marsick, 1993). These studies measured the level of (LO) through defined capabilities and compares it to organizational performance metrics, such as financial results, operational effectiveness, and organizational improvements Watkins & Marsick, (1993); productivity, innovation, growth, and entrepreneurship Alegre & Chiva, (2013); efficiency, effectiveness, and differentiation Fugate et al., (2009); and financial performance and progress in work performance Ellinger, et al., (2002). Furthermore, using innovative teaching methods boosts academic performance Gandía & Montagud, (2011) and therefore learning.

The (OLP) consists of a series of phases that makes new knowledge available for the organization Huber, (1991). A large number of authors have delved into the stages, phases, or dimensions that make up the (OLP), from the initial contributions of Argote, et al., (1990) and Huber (1991) to the current studies of Lloria and Moreno-Luzon (2014) and Liu (2015). From this range of models, this paper advocates the perspective that considers the OLP as decomposed into acquisition, distribution, interpretation, and retention of knowledge (Huber, 1991; Pérez, et al., 2004, 2005; Tippins & Sohi, 2003). Furthermore, over the past three decades, the literature has shown the advantages that organizations obtain by seeking to optimize their OLP. Thus, authors long ago linked learning, knowledge, and competitive advantages Nonaka & Takeuchi, (1995). Since these pioneering contributions, many studies have associated the OLP with four sorts of organizational improvements: sustainable competitive advantages Zahay & Handfield, (2004), business returns

(Pérez López et al., 2005; Tippins & Sohi, 2003), operational effectiveness Pérez López et al., (2005), and development of new products Liu, (2015).

(KA), also known as knowledge utilization (Backer, 1992; Oluikpe, 2015), was not taken into account in old models posed in relation to the knowledge-based theory of the firm. Nevertheless, it has a prominent position in current models because the most important source of competitive advantage for organizations is not knowledge itself, but the application of this knowledge Alavi & Leidner, (2001). Moreover, Kulkarni et al., (2007), in their knowledge management success model, assume that it is not enough that the knowledge available is used, but it should rather be of high quality and useful, these being the essential attributes that KA should have. The accessibility and quality (A&Q) are likewise recognized as the most important factors when it comes to the use of available information Zimmer et al. (2007). Therefore, based on these two studies, accessibility, quality, and use are the dimensions used for evaluating the level of KA. Furthermore, the model of Zimmer et al. (2007) distinguishes between two kinds of knowledge: on the one hand, the knowledge arising from relational sources, such as bosses, colleagues, and subordinates; on the other hand, knowledge obtained from non-relational sources, such as the press, the Internet, intranet, and databases. This classification is connected with the distinction between explicit and tacit knowledge Nonaka & Takeuchi, (1995) also considered to analyze knowledge utilization by Oluikpe (2015).

At this point, it should be noted that KA is the last stage of the knowledge management model for many authors (Alavi & Leidner, 2001; Nonaka & Takeuchi, 1995). However, this paper does not go into the analysis of knowledge management but focuses on the two constructs that make it up: the OLP and KA. This approach follows recent studies that have distinguished between the knowledge management process and KA Mills & Smith, (2011), or between knowledge sharing and KA Choi et al., (2010), rather than including knowledge management as a whole. Thus, not only does this distinction intend to know if knowledge management affects performance, but how it is done Cohen & Olsen, (2015). Finally, while there is long-standing evidence of the positive influence of LO, the OLP or knowledge management on organizational performance (Huber, 1991; Senge, 1990), far

fewer articles have measured the improvement in organizational performance obtained by enhancing the level of KA as a separated and individual construct.

This indicator analyses the extent to which companies can learn and apply knowledge of their employees to improve their results (both their operational effectiveness and financial performance) rather than using them physically. The need to address this issue is based on the belief, increasingly consolidated, that in the future, the only sustainable competitive advantage will be the creation of organizational knowledge and its proper management (Grant, 1996; Hine, Parker, & Ireland, 2010). Further, learning and knowledge management will generate new intellectual capital, which is considered the principal intangible resource of organizations (Ochoa, et al., 2010).

2.6 Andon and Organizational Performance

Inman et al. (2003) have recognized the study of Andon systems as an important research opportunity to address the tradeoffs between quality and throughput. There are three types of transfer lines: no Andon, full Andon; and partial Andon systems. A line with no Andon is also known as a paced line, where a job is passed to the next machine at the end of the cycle no matter whether it is complete (with good quality) or incomplete (with defects). In a full Andon system, for every defect that cannot be fixed within the cycle, the line is stopped to allow additional time to fix the problem and partial Andon is only applied in signaling the problem without stopping the line every time, or the workers are encouraged to reduce the number of line stoppages, Jingshan & Dennis (2006).

It has been reported in Mayne et al. (2001), Strozniak (2001), Liker (2004) and Tierney (2004) that every assembly line worker at Toyota is empowered to stop the line by pulling the Andon cord when they see defects or problems, in order to correct them. A production line at Toyota may stop hundreds of times during each shift. As addressed by Liker (2004), implementing Andon is one of the approaches used to "build a culture of stopping to fix problems, to get quality right the first time", and to "use visual control so no problems are hidden".

2.7 Technology Adaption and Organizational Performance

It has been observed that in order to handle production barriers, there is use of modern technologies like radio frequency identification (RFID) technology with Value Stream Mapping (VSM) in leading industries but the problem is the misapplication of technology-based lean concept and a lack of availability of proper implementation systems Vlachos, (2014). Rogers, (2003) suggests assessing users' perceived characteristics of innovation such as relative advantage, compatibility, complexity, trialability, and observability. In this case I consider trialability, observability, compatibility and complexity as the most essential methods of the lean approach. Furthermore, such misapplication also results in a reduction of employee confidence and the wrong usage of resources (Mostafa et al., 2013). Hence, in order to solve this issue a comprehensive, unidirectional and suitable implementation approach is required that combines a lean implementation with technology (RFID) Muhammad et al (2017). Keeping in view the previous literature, there is a research work by Olesen et al (2015) related to this topic, and they offered an implementation approach for intermodal container facilities which utilizes technology like RFID and Barcode for lean implementation. But they did not discuss what steps or methodology can be utilized to attain a technology combined lean implementation. However, Jasti and Kodali (2015) considered an IT system (comprising an auto scanning and information recording) as one of the leading pillars out of nine pillars in their lean supply chain management framework.

On the managerial and technical sides, the leading barriers are the lack of basic knowledge about lean tools, managers' attitudes towards modern concepts and company cultures towards the absorption of modern technologies for lean (Rafique et al,2016). Furthermore, in latest research by Jasti and Kodali (2016) on lean production systems, utilization of technology systems was again considered as a leading tier for lean implementation in their research work but details or steps regarding how to implement technology are not provided at all.

2.8 Organizational Culture and Organizational Performance

Organizational culture is one group of people's behavior and attitude. Building lean culture guides and changes the way people think and act. Lean culture means the changing of employee's behavior, emotion and political process. Organizations have little chance in successfully implementing lean unless paying attention to culture. Overall, it is imperative that organization considers important aspects of cultural factor, including openness, collaboration, receptivity, and data sharing Bhasin and Burcher (2004), Dahlgaard and Dahlgaard-Park (2006) concludes that cultural issue is considered important for adopting and implementing lean in organizations.

The evaluation of the Lean Culture is helpful for managers in many ways, particularly in the identification of further Lean transformation paths. Lean Culture assessment should consider the following cultural values: continuous improvement, clear leadership, waste elimination, organization of the value stream, and respect for employees. Lean Culture assessment should be accompanied by Lean performance indicators Wieslaw, (2015).

Anchanga et al. (2006) stated that the creation of supportive organizational culture is an essential platform for the implementation of lean concept. Antony and Banuelas (2001) agreed that successful implementation required adjustments of organizational culture and changes in employee attitude. Bhasin (2011) mentioned that collaboration is required in order to achieve and sustain the success of lean implementation. Bhasin and Burcher (2006) and Dahlgaard and Dahlgaard-Park (2006) considered critical success factors for lean adoption, towards the cultural implications.

2.9 Theoretical gap

The RBV developed as a complement to the industrial organization (IO) view with Bain (1968) and Porter (1979, 1980, 1985) as some of its main proponents. With its focus on the structure conduct-performance paradigm, the IO view put the determinants of firm performance outside the firm, in its industry's structure. Being positioned against this view, the RBV explicitly looks for the internal sources of SCA and aims to explain why firms in the same industry might differ in performance. As

such, the RBV does not replace the IO view, rather it complements it (Barney, 2002; Mahoney & Pandian, 1992; Peteraf & Barney, 2003).

The RBV's core metaphor is Ricardian, for it stands on the heterogeneity and immobility of competitive capability-producing and rent-earning resources (Barney, 1991b). Firms are seen as atom-like entities aiming to gain above-normal profits in unmediated competition with other firms in a shared market. The RBV assumes firms are profit maximizing entities directed by boundedly rational managers operating in distinctive markets that are to a reasonable extent predictable and moving towards equilibrium (Bromiley & Papenhausen, 2003; Leiblein, 2003). It accepts that information about the future value of a resource is asymmetrically distributed. If the firm's managers can estimate the future value of a resource better than their competitors – or when they are simply lucky – this provides their firm with ex ante sources of SCA.

Subsequently, the development of isolating mechanisms that prevent other firms from competing their above-normal-profits away provides the firm with ex post sources of SCA (Mahoney, 1995; Rumelt, 1984). Given its focus on the resource as the firm's significant component and its uncomplicated view of firms as a bundle of these resources, the RBV is explicitly reductionist. It stands against holistic or emergent theories that liken firms to organisms with complex feedback-controlled mechanisms focused on boundary maintenance.

2.9.1 Lack of empirical evidence on lean manufacturing concept and organizational performance link in Kenyan context.

The empirical review had evident that research in the area of lean manufacturing had been done but not in a comprehensive approach in developing world. Literature review available indicated that studies had focused more on developed world like European Union, United states and advanced Asian and not taking in to account developing counties such as Africa Shahram Taj, (2008); Hallam and Contreras (2017) and Womack et al. (1990).In their study, Shahram Taj, (2008) examined lean manufacturing performance in China: assessment of 65 manufacturing plants and the results were found to be positive. Hallam and Contreras (2017) did their study on the interrelation of Lean and

green manufacturing Practices: A case of push or pull in implementation in the USA. They found a positive relationship when the firms practiced lean manufacturing practices.

Our empirical review also confirmed the primary argument by academics is that implementation of lean production will positively affect performance and lead to competitive advantage (Krafcik, 1988; MacDuffie, 1995; Chang & Lee, 1995; Lewis, 2000; Shah & Ward, 2003) in their developed countries. Another viewpoint that has been investigated is the impact of lean production on industries in countries other than the United States (Lawrence and Hottenstein, 1995; Katayama and Bennett, 1996; Lieberman and Demeester, 1999; Salaheldin 2005).(Taj and Morosan,2011; Belekoukias, et al., 2014;) had all studied on effect of lean manufacturing on organizational performance in developed countries. However, first world such as Europe and America had more developed organizational structure that could easily support the implementation of lean manufacturing as opposed to developing countries (Jorge, et al., 2014). While all the previous studies had tended to focus more on the developed world Onyeizugbe & Ike, (2016); Noah, et al., (2014) there was limited literature on developing countries. In Kenya Keitany & Riwo-Abudho (2014); Ondiek and Kisombe (2012); Openda (2013)) had all done studies on effect of lean manufacturing on organizational performance however, little had been written about the lean manufacturing in Africa and more specifically there was very little research done on lean manufacturing in Kenya.

In their studies, Shibani & Ahmed (2015) revealed large evidence that Lean practices have been and continue to be largely adopted in the manufacturing sector within different industries in the western developed countries. In fact, there is considerable evidence that western companies have gained competitive advantages, achieved greater efficiencies, and have boosted productivity and improved results by being successful lean implementers Timans, et al., (2012). Shibani & Ahmed (2015) agreed that the results of the literature review revealed several factors that influence the process of adopting lean manufacturing in developing countries, including the organizational infrastructure, trade agreements, political and economic environments, ability and willingness to change organizational structure and culture and, top management support and commitment. Hence the

findings of developed countries could not represent the universe of the developed countries nor could findings be generalized to other countries hence needed to re-examine the studies on effect of lean manufacturing on organizational performance.

2.10 Conceptual Framework of Lean manufacturing and organizational performance

Independent Variable

Lean Manufacturing

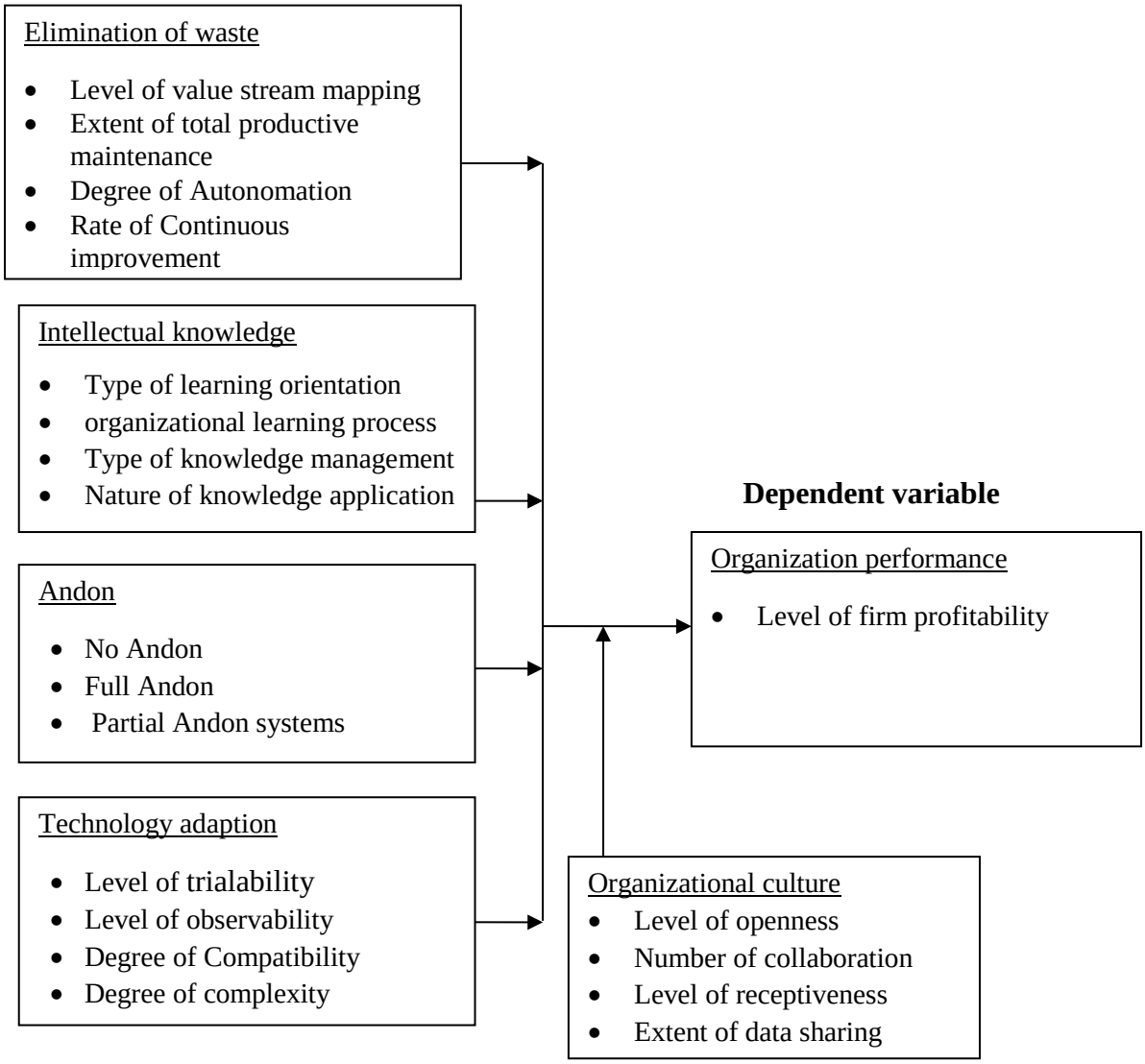

Figure 2. 1: Conceptual framework on effect of lean manufacturing on organizational performance
(Source: Researchers own concept)

The Independent variables are elimination of waste whose indicators are level of value stream mapping, level of total productive maintenance, Level of autonomation, level of continuous improvement and if enhanced it will contribute to organizational performance. Intellectual

knowledge whose indicators are level of learning orientation, organizational learning process, type of knowledge management, level of knowledge application and if enhanced it will contribute to organizational performance. Andon whose indicators are no andon, full andon and partial andon and if enhanced it will contribute to organizational performance. Technology adoption whose indicators are level of trialability, level of observability, level of Compatibility and level of complexity and if enhanced it will contribute to organizational performance. The dependent variable for this study is organizational performance whose indictor is level of firm profitability. And moderating variable is organizational culture whose indicators are level of openness, number of collaborations, level of receptiveness and extent of data sharing.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes: model specification, data types and measurement, research design and data collection procedure, data presentation and analysis.

3.2 Model Specifications

Multiple linear regression model was used to establish the simultaneous effect of lean manufacturing on organizational performance of South Nyanza Sugar Company, Awendo, Kenya, since the model showed how much of the Variance in the dependent variable was explained when independent and moderating variable shall be theorized to simultaneously influence it and the fact that the study data type was dichotomous and continuous. Based on Aiken and West (1991) the relationship between of lean manufacturing on organizational performance was be developed into linear regression model as follows:

$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5\ \varepsilon$

Where,

Y–Organizational performance,

ε -is the Model error variable

β0 – is a constant term of independent variables, β1X1, β2X2, β3X3, β4X4 and (moderating variable) β5X5

X1 -elimination of waste,

X2 - intellectual knowledge,

X3- Andon,

X4- denotes technology adoption,

X5 -moderating variable which is organizational culture,

β0, β1, β2, β3 and β4, 0,1,2,3, 4 is model co-efficient

In the model β0, - is a constant term of the variables and Measure of sensitivity βof dependent variables Y which was the predictor variable and ε - is an error term to establish an unexplained variation in the model and its variability was tested by 0.05 sensitivity.

This study then used the indices generated from factor analysis to run a multiple regression analysis. This approach enabled the researcher to investigate the relationship between various measures of lean manufacturing and organizational performance as shown in equation 1.

3.2.1 Tests of Normality, Linearity, and, Homogeneity and Autocorrelation

Linearity was tested using analysis of variance (ANOVA) test of linearity. This test computes both the linear and non-linear components of a pair of variables and linearity is significant if the F significance value for the non-linear component is below 0.05 (Zang et al., 2011). The use of inferential parametric statistical procedures requires the testing of the assumptions of normality. This allows graphical tests to be done on the normality of the data by considering skewness and kurtosis coefficients. These tests assist in confirming whether the data is normally distributed or not. In cases where the normality is violated, the outcomes may not be a true representation of the relationship existing among the variables. The Shapiro-Wilk test was used to test normality in the study.

Homogeneity of variance refers to the assumption that the dependent variable manifests similar amounts of variance across the ranges of values for an independent variable. A good regression model should have homogeneity of variances. This was measured using Leven's test for equality of variance through the one-way ANOVA procedure. This test measures whether or not the variance between the dependent and independent variable is the same.

The Multicollinearity test measures whether predictor variables are highly correlated. This was established by computing the Tolerance and Variance Inflation Factor (VIF). Tolerance is a measure of collinearity and it measures the percentage of variance in the dependent variable that is not accounted for by the independent variables. Tolerance values of less than 0.1 are acceptable.

3.3 Research Design

This study adopted correlational research design. The design was chosen for this study since it attempts to observe two or more variables at the point in time and was useful for describing a relationship between two or more variables (Breakwell, Hammond & Fife-Schaw, 1995). Bless and Khathura (1993) described correlation as the degree of relation between two variables that are not manipulated by the researcher. Correlation research design was used to establish the relationship between the subscales of the lean manufacturing and organizational performance scales

In the context of social science, the design investigation seeks to reveal possible relationship by gathering, present and interpret information for purposes of clarification. By identifying possible cause retrospectively, the study adopted correlation research to test hypothesis. It was thus be examining, retrospectively, the dependent variable which was organizational performance as measured by level of firm profitability while the independent variable is lean manufacturing measured by elimination of waste, intellectual knowledge, andon, technology adoption and moderated by organizational culture.

3.4 Target Population

The study population was employees of Sony Sugar Company in nine departments (HoDs, Divisional HoDs and Supervisors). The target population was 371people, which consists of Manufacturing Department 62, Agricultural Department 124, Human Resource Department 67, Finance and accounting Department 38, General Administration Department 30, Procurement Department 21, Company secretary Department 7, Sales and marketing Department 9 and ICT Department 13 as illustrated in table 3.1.

Table 3. 1: Number of employees in Sony Sugar Company, Awendo, Kenya

Department	Total
Manufacturing	62
Agricultural	124
Human Resource	67
Finance and accounting	38
General Administration Department	30
Procurement Department	21
Company secretariat	7
Sales and marketing	9
ICT	13
Grand Total	**371**

Source: Sony Sugar Company, Awendo, Kenya (2017).

3.5 Sample Size

This study adopted the formula proposed Nassiuma (2000) for determining sample size, to arrive at 79 out of 371 employees of Sony Sugar Company.

$$n = \frac{NC^2}{C^2 + (N-1)e^2}$$

Where,
n = Sample

N = Population

C = Coefficient of variation

e = Standard error

Nassiuma (2000) recommends a margin error ranging between 2% - 5% and coefficient of variation ranging between 20% - 30%. For this study N = 371 respondents, C = 20% and e = 0.02 as illustrated below:

$$79 = \frac{371 \times 0.2^2}{0.2^2 + (371-1)0.02^2}$$

The choice of C=0.2 was informed by the fact that coefficient of variation indicates how scattered about the mean of a given set of data is. The sample for the various departments was identified through stratified random sampling. In all the categories, the sample selected was proportionate for each department as shown in Table 3.2.

3.5.2 Sampling procedure

The sample size table was arrived using statistical formulae and it consisted of 79 employees selected from Sony Sugar Company, Awendo, Kenya, 79 was therefore be a representative for a population of 371 as show in table 3.2.

Table 3. 2: Sample size

Department	Population	Sample Size	Percentage
Manufacturing	62	13	16%
Agricultural	124	27	34%
Human Resource	67	14	18%
Finance and accounting	38	8	10%
General Administration Department	30	6	7%
Procurement Department	21	4	5%
Company secretariat	7	2	3%
Sales and marketing	9	2	3%
ICT	13	3	4%
Total	**371**	**79**	**100%**

3.6 Research Instrument

The data collection instruments were questionnaires for HoDs, Divisional HoDs and Supervisors.

3.6.1 Questionnaire

The data collection instruments were questionnaire to collect data from 79 employees of Sony Sugar Company, Awendo, Kenya. This study used closed questions which is one where responses are restricted to small set of responses that generate precise answers to develop the empirical study. In designing the questionnaire, a five point liker-type scale was used in order to provide the extent of the respondents feelings or opinions on the effect of lean manufacturing variables under consideration on organizational performance where by a scale of one implies strong disagreement with an issue or statement while a scale of five implies a strong agreement in that order (Patton, 2002).

3.7 Data Types and Measurements

The researcher used primary data form Sony Sugar Company, Awendo Kenya because this study was an empirical study.

3.7.1 Measurement of Variables

According to Stevens (1946) a variable is measured using a scale ordinal if any transformation of the scale values that preserves their numerical order produces another scale that shares the same one-to-one relation between comparisons among objects and comparisons among corresponding scale values. The independent variables, moderating variables and independent variables were measured using the ordinal scale as shown in table 3.3.

Table 3. 3: Measurement of variables

Variable	Measurement	Scale	Question number
elimination of waste	Level of value stream mapping Extent of total productive maintenance Degree Level of autonomation Rate of continuous improvement	Ordinal	1.1
Intellectual knowledge	Type of learning orientation Organizational learning process, Type of knowledge management, Nature of knowledge application	Ordinal	1.2
Andon	No andon Full andon Partial andon	Ordinal	1.3
Technology adoption	Level of trialability Level of observability Degree of Compatibility Degree of complexity	Ordinal	1.4
Organizational culture	Level of openness Level of collaboration Level of receptiveness Level of data sharing	Ordinal	1.5
Organizational performance	Level of firm profitability	Ordinal	1.6

Source: Researcher (2018)

3.8 Pilot Test of the Instrument

A pilot study was administered in order to test for validity, reliability and practicability of the research instruments. The most important issue in the research is to ensure reliability and validity.

Lastly, the practicability characteristics of instrument can be judged in terms of economy, convenience and interpretability: economy considers tradeoff between an ideal research project and what the budget can afford; convenience test suggests that the measuring instrument should be easy to administer and interpretability consideration is especially important when persons other than the designers of the test are to interpret the results Kothari, (2004). Pilot study is therefore used to pretest the constructs to be used in the analysis with the aim of reducing measurement errors, improving validity of the construct measurement and identifying problems in the design and layout of the questions Dillman, (2000). The researcher administered the questionnaires to the head of Human Resource Department in Sony Sugar Company, Awendo, Kenya in order to solicit responses for various questions. The researcher recruited research assistants based on their data collection experience and then train them on how the questions were phrased. This enabled the research assistants to understand the purpose and the intention of the survey. Moreover, they were familiarized with the questionnaire. Once they collected data, they returned the questionnaire to the main researcher for coding and entering into a computer.

3.8.1 Reliability and Validity Tests

Reliability gauges the level to which a measure provides consistent results. It is concerned with the internal property of a measure (Cooper & Schindler, 2006). The Cronbach's alpha test of reliability recommended by Burns and Bush (2010) was used to find out how reliable the research instrument was. It shows the degree to which research instrument items are homogeneous and measure the same underlying construct (Cooper & Schindler, 2006). Values that are close to 1 suggest a high level of consistency. Gliem and Gliem (2003) note that the alpha value that is greater or equal to 0.7 is sufficient. The 23 items in the research instrument were tested using the Cronbach's alpha test and an alpha value of 0.998 was found. This meant that the instrument on elimination of waste, intellectual knowledge, technology adoption, organizational culture and organizational performance was very reliable.

Validity of a survey instrument is measured by assessing whether it measures what it was intended to measure. Dillman (2000) suggested that a pilot study should be conducted to ensure clarity and proper interpretation of the questionnaire by the respondents. A pilot survey was done by exposing selected members of the population to the questionnaire. Their feedback was used to improve the questionnaire to be used in the survey.

3.9 Data collection procedure

Questionnaires was be administered to the head of Human Resource Department in Sony Sugar Company, Awendo, Kenya. The questionnaires was reformulated through pilot test which was undertaken to confirm their reliability and validity. To aid in data collection, entry, coding and data cleaning the main researcher employed 5 research assistants. The main researcher ensured that the research assistants employed had experience in data collection and data entry. The research assistants were facilitated in terms of financial and relevant information such as location of Sony Sugar Company among others. Before the research assistants embarked on data collection they were taken through the whole questionnaire and trained on best data collection procedures. The data was collected during week days from 8am to 5pm and the main researcher kept in touch with the research assistants via mobile phone and mid-week meetings. After the completion of data collection, the research assistants entered data in Statistical Package for Social Sciences (SPSS) version 22 using uniform codes. Thereafter, the main researcher conducted data cleaning and analysis.

Data collection procedure started in February 2018 immediately the instruments were be received. The researcher obtained research permission from the Sony Sugar Company, Awendo, Kenya and National Commission for Science Technology and Innovation. The questionnaires were then administered to the employees of Sony Sugar Company. The researcher and research assistant then carried out the exercise by distributing the questionnaires to departments. The questionnaires were taken to the selected departments in Sony Sugar Company, Awendo, Kenya. The questionnaires were left with the employees who completed them and then later collected by the research assistants.

This was done in three phases. After two weeks, the researcher and research assistants collected the questionnaires for analysis.

3.10 Data Analysis

Quantitative analysis began by editing, coding, cleaning and transforming data. Data were analyzed using descriptive statistics of percentages, frequencies means and standard deviations. Inferential statistics were used to analyze data from the likert scale and data was shown in tables. Inferential statistics was used to give final conclusion of the study. The analysis was done by use of SPSS version 22.

Each hypothesis was analyzed as follows: Pearson correlation coefficient was used to test the relationship of hypothesis Ho1 There is no significant relationship between elimination of waste and organizational performance in Sony Sugar Company, Awendo, Kenya.Ho2 There is no significant relationship between intellectual knowledge and organizational performance in Sony Sugar Company, Awendo, Kenya.Ho3 There is no significant relationship between Andon and organizational performance in Sony Sugar Company, Awendo, Kenya.Ho4 There is no significant relationship between technology adoption and organizational performance in Sony Sugar Company, Awendo, Kenya.H05 The strength of relationship between lean manufacturing and organizational performance does not depend on organizational culture.

3.11 Ethical Consideration

The Belmont Report (1979) outlines three basic principles relevant to the ethics of research involving human subjects, namely respect of persons, beneficence, and justice. In conducting this research great care was taken to understand and be familiar with any and all of the regulations associated with field of the study. It was extremely important to protect the right of the participants. Cooper and Schindler (2003) argued that research must be designed so that a respondent does not suffer physical harm, discomfort, pain, embarrassment, or loss of privacy. Informed consent, confidentiality, anonymity and, the participant right to privacy were some of the measures used to

ensure that the participant, respondent or subject would be treated with principal of respect of the person, beneficence and justice.

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter presents the study results which have been discussed based on thematic and sub-thematic areas as per objectives. The thematic areas are elimination of waste and organizational performance, intellectual knowledge and organizational performance, Andon and organizational performance, technology adoption and organizational performance Descriptive, inferential and qualitative statistical analysis were carried out in this chapter and discussed simultaneously in a cross-sectional manner. For each research objective, descriptive analysis was first done by use of the percentage frequencies, arithmetic mean and the standard deviation followed by inferential analysis by use of correlation analysis and multiple regression analysis to test the significance relationship under study.

4.2 Questionnaire Return Rate

Out of the 79 questionnaires administered to 9 departments, 65 were dully filled giving a response rate of 82%. This is line with the views of Cooper and Schiendler (2006) who observes that 75% and above response rate is reasonable enough for statistical generalization.

4.3 Demographic characteristics of the Respondents

In order to understand the characteristics of respondents the researcher was dealing with in the study, their background information was necessary, especially the position held in the company. The study sought to elicit first information from the respondents on distribution by department. These are further discussed in the following sub sequent sub-themes.

4.3.1 Demographics Profile of the Respondents

The demographic characteristics of the participants that were considered by the study were position held in the company, department and level of education and length of service in the station. Distribution by department important to check whether respondents were evenly distributed across the Sony Sugar Company Awendo, Kenya. Distribution of respondents by position held was done

to ascertain that respondents were evenly distributed across all cadres none of the cadres was given preferential consideration in the selection of the respondents. Distribution of respondents by level of Education was considered important because level of Education would most likely have impact on lean manufacturing and organizational performance. It had for options of bachelors, masters, PhD and any other qualification. Distribution of respondents by level of service was done to indicate how long the respondents had worked in their organizations. The duration an individual had been in service was considered important in management of lean manufacturing and organizational performance. The responses of the participants are shown in Table 4.1.

Table 4. 1: Demographics characters of respondents

CHARACTERISTIS	n=65	(%) percent
Department		
MANUFACTURING	11	16.9
Agriculture	21	32.3
Human Resource	12	18.5
Finance and Accounting	6	9.2
General Administration	5	7.7
Procurement	3	4.6
Company Secretariat	2	3.1
Sales and Marketing	2	3.1
ICT	3	4.6
Total	**65**	**100.0**
post held		
HOD	7	10.8
DIVISION HOD	13	20.0
SUPERVISOR	22	33.8
ORDINARY EMPLOYEE	23	35.4
Total	**65**	**100.0**
Level of education		
Bachelors	42	64.6
Masters	15	23.1
PhD	2	3.1
Other Qualifications	6	9.2
Total	**65**	**100.0**
Length of service		
Under five years	17	26.2
5-10 years	21	32.3
10-15 years	17	26.2
15 years and above	10	15.4
Total	**65**	**100.0**

The study findings of the department indicate 11(16.9%) of the respondents were from Manufacturing Department, 21(32.3%) from Agricultural Department, 12(18.5%) Human Resource Department, 6(9.2%) from Finance and accounting Department, 5(7.7%) from General Administration Department, 3(4.6%) from Procurement Department, 2(3.1%) from Company secretary Department, 2(3.1%) from Sales and marketing Department and 3(4.6%) from ICT

Department 13. This implies that all the departments had a proportion of employees that would be a support of lean manufacturing in the organization.

The study findings on post held indicate that 7(10.8 %) of the employees were respondents were HoDs, 13(20.0 %) were divisional HoDs, and 22(33.8 %) were supervisors and 23(35.4 %) were ordinary employees. This implies that a number of respondents were respondents were on a designation of a supervisor and above and their position could influence on a subject view of lean manufacturing as needing to be either implemented or managed. The research findings on level of Education indicate that 42(64.6%) had Bachelors level of education, 6(9.2%) had other levels of education. This was of essence to the study because level of education would have impact on lean manufacturing and organizational performance. Respondents with high level of Education also had better skills in overseeing the application of lean manufacturing in their respective departments.

4.4 Testing Assumptions of Multiple Regressions

The key inferential statistic adopted for the present study was multiple regressions. Consequently data were examined for the following assumptions as required for multiple regressions analysis (Tabachnick&Fidell2013); normality, linearity, homogeneity of variance, autocorrelation and multicollinearity.

4.4.1 Test for normality

An assessment of the normality of data is a prerequisite for many statistical tests because normal data is an underlying assumption in parametric testing. There are two main methods of assessing normality, graphically and numerically. Statistical tests have the advantage of making an objective judgment of normality; graphical interpretation has the advantage of allowing good judgment to assess normality in situations when numerical tests might be over or under sensitive.

In this study, Kolmogorov-Smirnov test statistics (KS-test) and Shapiro-Wilk test (SW-test) were carried out to determine if the data sets which were tapped on Likert scale differed significantly without making any assumption about the distribution of the data. The null hypothesis was that the sample populations were not normal. In all the variables under investigation i.e elimination of waste,

intellectual knowledge, andon, technology adoption and organizational culture, p< 0.05 in which case the null hypothesis was rejected and was concluded that the samples were picked from a normal population. While testing whether a population is normal by use SW-test, statistic, the null hypothesis is rejected if the value is too small (Shapiro and Wilk 1965). In this study, all the SW-test statistics were approaching 1>0.05 and hence the null hypothesis that the population was not normal is rejected. The results of Kolmogorov-Smirnov test statistics and Shapiro wilk test are shown in tables 4.2.

Table 4. 2: Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Elimination of waste	.208	65	.000	.855	65	.000
Intellectual knowledge	.216	65	.000	.885	65	.000
Andon	.214	65	.000	.886	65	.000
Technology adoption	.182	65	.000	.885	65	.000
Organizational culture	.222	65	.000	.883	65	.000
Organizational performance	.240	65	.000	.872	65	.000

a. Lilliefors Significance Correction

4.4.2 Testing for linearity

Prior to conducting linear regression a linear relationship ought to exist between the two or more variables (Tabachnick & Fidell, 2013). Pearson's product moment correlations were therefore run to examine existence of linearity. Results revealed that all the independent variables related linearly with financial performance (Table: 4.3). The relationships were all positive implying that enforcement of lean manufacturing could impact directly on organizational performance of the sugar milling companies. The linearity assumption was upheld.

Table 4. 3: Testing for linearity

	Elimination of waste	Intellectual knowledge	Andon	Technology adoption	Organizational culture	Organizational performance
Elimination of waste	1					
Intellectual knowledge	.951	1				
Andon	.973	.961	1			
Technology adoption	.965	.976	.991	1		
Organizational culture	.951	.967	.959	.955	1	
Organizational performance	.955	.943	.967	.960	.961	1

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

4.4.3 Testing Homogeneity of Variances

Multiple regressions analysis assumes that on manipulation of the independent variables, variances of the dependent variable remain homogeneous (Tabachnick & Fidell, 2013). The uniformity of variability in the scores of dependent variables as independent variables were manipulated was therefore examined using Levene's test. The test examined whether variance of organizational performance was the same across the indicators of lean manufacturing and organizational culture as the moderating variable. For variances to be homogeneous, the expectation was that none of the Levene statistic would be significant at the 5% level of significance. Results revealed that none of the Levene statistics was significant, and hence homogeneity of variances was not violated (Table: 4.4).

Table 4. 4: Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Elimination of waste	1.135	2	30	.874
Intellectual knowledge	1.032	2	30	.969
Andon	.032	2	30	.969
technology adoption	.135	2	30	.874
Organizational culture	1.024	2	30	0.839
Organizational performance	1.777	2	30	0.846

4.4.4 Testing Autocorrelation

Autocorrelation relates to existence of correlations among linear regression residuals (Tabachnick & Fidell 2007). The Durbin-Watson (DW) statistic was used to assess autocorrelation. The expected interval for lack of autocorrelation was (.991, .980) inclusive; The DW statistic was found to be .991(Table 4.5) clearly showing that autocorrelation was not an issue in the data set. Table 4.5.

Table 4. 5: Testing Autocorrelation

Model	R	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.991[a]	.980	.209	1.921

4.5 Descriptive statistics

Descriptive statistics were used to examine conformity of the effect of lean manufacturing on organizational performance, a Case of Sony Sugar company, Awendo, Kenya. Frequencies and percentages were used to explore lean manufacturing indicators, whereas means and standard deviations were used to examine organizational performance

4.5.1 Elimination of waste and organizational performance.

Elimination of waste is an aspect of lean manufacturing that a company should adopt to realize organizational performance. It was important to get information on elimination of waste and organizational performance to ascertain if the employees of Sony Sugar Company used lean manufacturing to build organizational performance. The respondents were requested to respond to the statements in the Likert scale of 1-5 where 5=strongly agree, 4=Agree, 3=Neutral, 2=Disagree, 1=strongly disagree. Table: 4.6 provides the measures of central tendencies and dispersion of respondents on elimination of waste and organizational performance.

Table 4. 6: Elimination of waste and organizational performance

STATEMENT FOR RESPONDENTS	SD	D	N	A	SA	Mean	Std.Dev
Value stream mapping identifies and measures waste.	13(20.0%)	11(16.9%)	7(10.8%)	19(29.2%)	15(23.1%)	3.18	1.478
Total productive maintenance gives the workers basic maintenance tasks.	4(6.2%)	12(18.5%)	10(15.4%)	22(33.8%)	17(26.2%)	3.55	1.238
Autonomation reduces defects in the production line.	8(12.3%)	9(13.8%)	14(21.5%)	19(29.2%)	15(23.1%)	3.37	1.318
Continuous improvement leads to achieving high levels of pull production.	7(10.8%)	8(12.3%)	14(21.5%)	21(32.3%)	15(23.1%)	3.45	1.275

Four statements were developed to measure the extent of effect of lean manufacturing on organizational performance. The statements were, value stream mapping identifies and measures waste, total productive maintenance gives the workers basic maintenance tasks, autonomation reduces defects in the production line and continuous improvement leads to achieving high levels of pull production.

Statement (1) value stream mapping identifies and measures waste had a mean of 3.18 and a standard deviation of 1.478. This results indicate that majority 19(29.2%) of respondents agreed that value stream mapping identifies and measures waste, this was followed by 15(23.1%) who strongly agreed and the mean was lowest at 7(10.8%) who were neutral. Statement (2) total productive maintenance gives the workers basic maintenance tasks had a mean of 3.55 and a standard deviation of 1.238. This results indicate that majority 22(33.8%) of respondents agreed total productive maintenance gives the workers basic maintenance tasks, this was followed by a score of 17(26.2%) who strongly agreed and the score was lowest at 4(6.2%) who were strongly disagreed. (3) autonomation reduces defects in the production line had a mean of 3.37 and a standard deviation of 1.318. This results indicate that majority 19(29.2%) of respondents agreed autonomation reduces defects in the production line, this was followed by a score of 15(23.1%) who strongly agreed and the score was lowest at 8(12.3%) who strongly disagreed. Statement (4) continuous improvement leads to achieving high levels of pull production had a mean of 3.45 and a standard deviation of 1.275. This

results indicate that majority 21(32.3%) of respondents agreed that continuous improvement leads to achieving high levels of pull production, this was followed by a score of 15(23.1%) who strongly agreed and the score was lowest at 7(10.8%) who disagreed.

This result indicate that majority 22(33.8%) of the respondents agreed that Total productive maintenance gives the workers basic maintenance tasks, the second was statement 4(Continuous improvement leads to achieving high levels of pull production) with a mean of 3.45 and SD of 1.275, this implies that majority 21(32.3%) of the respondents agreed that continuous improvement leads to achieving high levels of pull production, statement (3) Autonomation reduces defects in the production line, the mean was lowest at 3.18 with a standard deviation 1.478, this implies that majority 19(29.2%) of the respondents agreed that value stream mapping identifies and measures waste. Variability among respondents was higher (σ= 1.478) on statement 1, and lower (σ=1.238) for statement 2.This finding is in consistence with Garcia & Bonavia, (2015), who highlights that through the systematic elimination of waste, alignment of production with demand and necessary involvement of the workforce, elimination of waste is capable of increasing the business competitiveness of any organization, however they did not clearly depict the aspects of value stream mapping, total product maintenance, autonomation and continues improvement indicators for improvement in organizational productivity which this study found out.

Data was also collected using pen ended questionnaire administered for departmental. One main domain of elimination of waste and its variables were developed and emergence of different themes was noted. The results revealed that, in the domain of elimination of waste all managers of the study showed positive themes for the variable of elimination of waste. Six of the managers showed positive themes for the variable of elimination of waste, whereas three managers showed negative responses. It was concluded that managers with management qualification had better concept about the concept of elimination of waste, as compared to those who were working at these managerial posts on the basis of their long term experience only.

4.5.2 Intellectual knowledge and organizational performance.

Intellectual knowledge is an aspect of lean manufacturing that a company should adopt to realize organizational performance. It was important to get information on intellectual knowledge and organizational performance to ascertain if the employees of Sony Sugar Company used lean manufacturing to build organizational performance. The respondents were requested to respond to the statements in the Likert scale of 1-5 where 5=strongly agree, 4=Agree, 3=Neutral, 2=Disagree, 1=strongly disagree. Table 4.7 provides the measures of central tendencies and dispersion of respondents on intellectual knowledge and organizational performance.

Table 4. 7: intellectual knowledge and organizational performance

STATEMENT FOR RESPONDENTS	SD	D	N	A	SA	Mean	Std.Dev
learning orientation results to operational effectiveness, and organizational improvements	10(15.4%)	12(18.5%)	8(12.3%)	21(32.3%)	14(21.5%)	3.26	1.395
organizational learning makes new knowledge available for the organization	11(16.9%	9(13.8%)	13(20.0%)	17(26.2%)	15(23.1%)	3.25	1.403
Knowledge management generates new intellectual capital	4(6.2%)	12(18.5%	11(16.9%)	17(26.2%)	21(32.3%)	3.60	1.285
Knowledge application results to accessibility, quality, and use of knowledge earned.	10(15.4%)	12(18.5%)	7(10.8%)	20(30.8%)	16(24.6%)	3.31	1.424

Four statements were developed to measure the extent of effect of lean manufacturing on organizational performance. The statements were, learning orientation results to operational effectiveness, and organizational improvements, organizational learning makes new knowledge available for the organization, knowledge management generates new intellectual capital and knowledge application results to accessibility, quality, and use of knowledge earned.

Statement (1) learning orientation results to operational effectiveness, and organizational improvements had a mean of 3.26 and a standard deviation of 1.395. This results indicate that majority 21(32.3%) of respondents agreed that learning orientation results to operational effectiveness, and organizational improvements, this was followed by 14(21.5%) who strongly agreed and the mean was lowest at 8(12.3%) who were neutral. Statement (2) organizational learning

makes new knowledge available for the organization had a mean of 3.25 and a standard deviation of 1.403.

This results indicate that majority 17(26.2%) of respondents agreed organizational learning makes new knowledge available for the organization, this was followed by a score of 15(23.1%) who strongly agreed and the score was lowest at 9(13.8%) who disagreed. (3) Knowledge management generates new intellectual capital had a mean of 3.60 and a standard deviation of 1.285. This results indicate that majority 21(32.3%) of respondents strongly agreed knowledge management generates new intellectual capital, this was followed by a score of 17(26.2%) who agreed and the score was lowest at 4(6.2%) who strongly disagreed. Statement (4) knowledge application results to accessibility, quality, and use of knowledge earned had a mean of 3.31 and a standard deviation of 1.424. This results indicate that majority 20(30.8%) of respondents agreed that knowledge application results to accessibility, quality, and use of knowledge earned, this was followed by a score of 16(24.6%) who strongly agreed and the score was lowest at 7(10.8%) who were neutral.

This result indicate that the majority 21(32.3%) of the respondents agreed Knowledge management generates new intellectual capital, statement 2 sought the opinion of responder whether organizational learning makes new knowledge available for the organization, the mean was the lowest at 3.25 with a standard deviation of 1.403, this implies that majority 17(26.2%) of the respondents agreed that organizational learning makes new knowledge available for the organization. Variability among the respondents was higher (σ= 1.424) on statement 4, and lower (σ=1.285) for statement 3. This study support Ochoa, et al., (2010) who further observed that learning and knowledge management will generate new intellectual capital, which is considered the principal intangible resource of organizations. The same trend was observed by, management (Grant, 1996; Hine, Parker, & Ireland, 2010) who looked at the need to address intellectual knowledge based on the belief, increasingly consolidated, that in the future, the only sustainable competitive advantage will be the creation of organizational knowledge and its proper management, however they did not address the component of knowledge management and the aspect learning

orientation that this study found out to be eminent. Further similarity to this finding is with Mangiarotti, (2012), who further looking at intellectual knowledge and organizational performance concluded that the intellectual knowledge is responsible for improving organizational performance, although it contradicts Gandía & Montagud, (2011) who specifically posit that through using innovative teaching methods boosts organizational performance.

Qualitative data was further supported with the following views from the managers that lack of intellectual knowledge affects organizational performance. This finding is in line with the views of Huber, (1991) The (OLP) consists of a series of phases that makes new knowledge available for the organization Huber, (1991) who suggested that the (OLP) consists of a series of phases that makes new knowledge available for the organization performance.

4.5.3 Andon on organizational performance.

Andon is an aspect of lean manufacturing that a company should adopt to realize organizational performance. It was important to get information on andon and organizational performance to ascertain if the employees of Sony Sugar Company used lean manufacturing to build organizational performance. The respondents were requested to respond to the statements in the Likert scale of 1-5 where 5=strongly agree, 4=Agree, 3=Neutral, 2=Disagree, 1=strongly disagree. Table 4.8 provides the measures of central tendencies and dispersion of respondents on andon and organizational performance.

Table 4. 8: Andon and organizational performance

Statement for respondent	SD	D	N	A	SA	Mean	Std.Dev
No andon system makes the condition of manufacturing process readily and easily visible to employees	7(10.8%)	9(13.8%)	16(24.6%)	19(29.2%)	14(21.5%)	3.37	1.269
Full andon system brings immediate attention to problems as they occur in the process	9(13.8%)	15(23.1%)	5(7.7%)	16(24.6%)	20(30.8%)	3.35	1.473
Partial andon system ensures that processes are being carried out efficiently and productively	11(16.9%)	8(12.3%)	13(20.0%)	18(27.7%)	15(23.1%)	3.28	1.398

Three statements were developed to measure the extent of effect of lean manufacturing on organizational performance. The statements were, no andon system makes the condition of manufacturing process readily and easily visible to employees, full andon system brings immediate attention to problems as they occur in the process, partial andon system ensures that processes are being carried out efficiently and productively.

Statement (1) no andon system makes the condition of manufacturing process readily and easily visible to employees had a mean of 3.37 and a standard deviation of 1.269. This results indicate that majority 19(29.2%) of respondents agreed that) no andon system makes the condition of manufacturing process readily and easily visible to employees, this was followed by 14(21.5%) who strongly agreed and the mean was lowest at 7(10.8%) who strongly disagreed. Statement (2) Full andon system brings immediate attention to problems as they occur in the process had a mean of 3.35 and a standard deviation of 1.473.

This results indicate that majority 20(30.8%) of respondents strongly agreed full andon system brings immediate attention to problems as they occur in the process, this was followed by a score of 16(24.6%) who agreed and the score was lowest at 5(7.7%) who were neutral. (3) Partial andon system ensures that processes are being carried out efficiently and productively had a mean of 3.28 and a standard deviation of 1.398. This results indicate that majority 18(27.7%) of respondents agreed Partial andon system ensures that processes are being carried out efficiently and productively, this was followed by a score of 15(23.1%) who strongly agreed and the score was lowest at 4(6.2%) who strongly disagreed.

This result indicate that 19(29.2%) of the respondents agreed that No andon system makes the condition of manufacturing process readily and easily visible to employees, this was followed by statement 2(Full andon system brings immediate attention to problems as they occur in the process) with a score of 3.35 and the standard deviation was 1.473. This result indicate that the majority 20(30.8%) of the respondents strongly agreed that Full andon system brings immediate attention to problems as they occur in the process. Statement 3 sought the opinion of the respondents whether

(Partial andon system ensures that processes are being carried out efficiently and productively), the score was lowest at 3.25 with a standard deviation 1.398, this implies that majority 18(27.7%) of the respondents agreed that (Partial andon system ensures that processes are being carried out efficiently and productively).Variability among the Board of management was higher (σ= 1.473) on statement 2, and lower (σ= 1.269) for statement 1.

Liker (2004), implementing Andon is one of the approaches used to "build a culture of stopping to fix problems, to get quality right the first time", and to "use visual control so no problems are hidden". As such, the andon production system may be an appropriate precursor to effective detection of problems in the production line. Further andon production system may serve to make manufacturing process readily and easily visible to employee, however, Inman et al. (2003) have recognized the study of Andon systems as an important research opportunity to address the tradeoffs between quality and throughput.

4.5.4 Technology adoption and organizational performance.

Technology adoption is an aspect of lean manufacturing that a company should adopt to realize organizational performance. It was important to get information on technology adoption and organizational performance to ascertain if the employees of Sony Sugar Company used lean manufacturing to build organizational performance. The respondents were requested to respond to the statements in the Likert scale of 1-5 where 5=strongly agree, 4=Agree, 3=Neutral, 2=Disagree, 1=strongly disagree. Table 4.9 provides the measures of central tendencies and dispersion of respondents on technology adoption and organizational.

Table 4. 9: Technology adoption and organizational performance

Statement for respondents	SD	D	N	A	SA	Mean	Std.Dev
Trialability provides observable predictions of change results and minimized perceived risk.	11(16.9%)	10(15.4%)	12(18.5%)	15(23.1%)	17(26.2%)	3.26	1.439
Observability makes an innovation visible to others	8(12.3%)	10(15.4%)	13(20.0%)	19(29.2%)	15(23.1%)	3.35	1.328
Compatibility of an innovation largely depends on users' lifestyles, situations, beliefs, and values.	11(16.9%)	8(12.3%)	13(20.0%)	17(26.2%)	16(24.6%)	3.29	1.411
Complexity of an innovation has to be assimilated into an employee's working style.	10(15.4%)	9(13.8%)	13(20.0%)	15(23.1%)	18(27.7%	3.34	1.417

Four statements were developed to measure the extent of effect of lean manufacturing on organizational performance. The statements were, trialability provides observable predictions of change results and minimized perceived risk, observability makes an innovation visible to others, compatibility of an innovation largely depends on users' lifestyles, situations, beliefs, and values and Complexity of an innovation has to be assimilated into an employee's working style.

Statement (1) trialability provides observable predictions of change results and minimized perceived risk had a mean of 3.26 and a standard deviation of 1.439. This results indicate that majority 17(26.2%) of respondents strongly agreed that trialability provides observable predictions of change results and minimized perceived risk, this was followed by 15(23.1%) who agreed and the mean was lowest at 10(15.4%) who disagreed. Statement (2) Observability makes an innovation visible to others had a mean of 3.35 and a standard deviation of 1.328.This results indicate that majority 19(29.2%)of respondents agreed Observability makes an innovation visible to others, this was followed by a score of 15(23.1%)who strongly agreed and the score was lowest at 8(12.3%)who strongly disagreed. (3) Compatibility of an innovation largely depends on users' lifestyles, situations, beliefs, and values had a mean of 3.29 and a standard deviation of 1.411. This results indicate that majority 17(26.2%) of respondents strongly agreed Compatibility of an innovation largely depends on users' lifestyles, situations, beliefs, and values, this was followed by a score of 16(24.6%) who strongly agreed and the score was lowest at 8(12.3%) who disagreed. Statement (4) Complexity of an innovation has to be assimilated into an employee's working style had a mean of

3.34 and a standard deviation of 1.417. This results indicate that majority 18(27.7%of respondents strongly agreed that knowledge application results to accessibility, quality, and use of knowledge earned, this was followed by a score of 15(23.1%) who agreed and the score was lowest at 9(13.8%) who disagreed.

This results indicate that a majority 19(29.2%) of the respondents agreed that their observability makes an innovation visible to others this was followed by a score of 15(23.1%) who strongly agreed and the score was lowest at 10(15.4%) who disagreed. Conclusively, statement 4 (Complexity of an innovation has to be assimilated into an employee's working style.) with a mean of 3.34 and standard deviation of 1.417. This result indicate that the majority 18(27.7%) of the respondents strongly agreed that complexity of an innovation has to be assimilated into an employee's working style. Statement 3 sought the opinion of the respondents whether compatibility of an innovation largely depends on users' lifestyles, situations, beliefs, and values the score was lowest at 3.29 with a standard deviation 1.411, this implies that majority 17(26.2%) of the respondents agreed that their Compatibility of an innovation largely depends on users' lifestyles, situations, beliefs, and values.

Variability among the respondents themselves was higher (σ= 1.439) on statement 1 and lower (σ= 1.328) for statement 2. This result is in consistence with Rogers, (2003) who confirmed that assessing users' perceived characteristics of innovation such as relative advantage, compatibility, complexity, trialability, and observability had a positive impact on organizational performance. Technology adoption could result to maximum utilization of resource with reduction in the production cost and time with n intent of producing a high quality product or service affect organizational performance. For example, Mostafa et al., (2013) suggested that misapplication also results in a reduction of employee confidence and the wrong usage of resources

Jasti and Kodali (2016) further looking on lean production systems, utilization of technology systems was again considered as a leading tier for lean implementation in their research work but details or steps regarding how to implement technology are not provided at all. Hence, keeping this

in view, the availability of an implementation approach seems to be lacking in the previous literature (to the best of our knowledge) which must be capable of implementing technology combined lean implementation with detailed availability of each and every step required for that. This is in line with the findings of this study whose correlation output showed that all the technology adoption characteristics were statistically significant ($P<0.05$). As such, the technology adoption dimension of lean manufacturing may be an appropriate precursor to effective organizational performance if the component of recognition is enhanced. Technology adoption practices may serve to empower organizations to realize competitive edge and resulting to dynamics in innovation and empowering employee working style, however, Jasti and Kodali (2015) considered an IT system (comprising an auto scanning and information recording) as one of the leading pillars out of nine pillars in their lean supply chain management framework. Further similarity to this finding is with Hagen, (2010) who concluded that IT is being used by organizations to improve performance, communication, motivate employees, increase competitiveness, improve market dynamics, and repositioning the company against its competitors facilitating entry into new markets.

Qualitative data were further supported with the following views from the managers that technology adoption affects organizational performance. These findings are in parallel with the research conducted by (Kamil 2001; as cited by Sobhani 2008), who states that efficient usage of IT in companies increases productivity through increasing the capital, while investing in IT, improving the growth of Total Factor Productivity in industries producing information technologies, and speeding up the growth of TFP in industries using information technologies

4.6 Descriptive Analysis for the Moderator

The moderator variable for this study is organizational culture. Regarding organizational culture, the study found that Sony Sugar Company do practice organizational culture in terms of openness , collaboration, receptiveness and data sharing to full utilization of lean manufacturing practices and in return reduces waste and minimizes operating costs to a great extent (table 4.10). This finding suggests that there has been great improvement in use of lean manufacturing practices in Sony Sugar

Company Awendo, Kenya. This could be attributed to the models and patterns of behavior typical in an organization; it also includes employees' mental programmes amongst others.

Table 4. 10: Organizational culture and organizational performance

Statement for respondents	SD	D	N	A	SA	Mean	Std.Dev
Openness builds lean culture, guides and changes the way people think and act.	6(9.2%)	8(12.3%)	13(20.0%)	20(30.8%)	18(27.7%)	3.55	1.275
Collaboration achieves and sustains the success of lean implementation.	5(7.7%)	10(15.4%)	15(23.1%)	19(29.2%)	16(24.6%)	3.48	1.239
Receptiveness leads to open and responsive production techniques.	7(10.8%)	8(12.3%)	12(18.5%)	17(26.2%)	21(32.3%)	3.57	1.346
Data sharing leads to identification of further lean transformation paths.	5(7.7%)	11(16.9%)	12(18.5%)	22(33.8%)	15(23.1%)	3.48	1.239

Four statements were developed to measure the extent of effect of lean manufacturing on organizational performance. The statements were, openness builds lean culture, guides and changes the way people think and act, collaboration achieves and sustains the success of lean implementation, receptiveness leads to open and responsive production techniques, data sharing leads to identification of further lean transformation paths

Statement (1) Openness builds lean culture, guides and changes the way people think and act had a mean of 3.55 and a standard deviation of 1.275. This results indicate that majority 20(30.8%) of respondents agreed that Openness builds lean culture, guides and changes the way people think and act, this was followed by 18(27.7%) who strongly agreed and the mean was lowest at 6(9.2%) who strongly disagreed. Statement (2) Collaboration achieves and sustains the success of lean implementation had a mean of 3.48 and a standard deviation of 1.239.This results indicate that majority 19(29.2%) of respondents agreed collaboration achieves and sustains the success of lean implementation, this was followed by a score of 16(24.6%) who strongly agreed and the score was lowest at 5(7.7%) who strongly disagreed. (3) Receptiveness leads to open and responsive production techniques had a mean of 3.57 and a standard deviation of 1.346. This results indicate that majority 21(32.3%) of respondents strongly agreed receptiveness leads to open and responsive production techniques, this was followed by a score of 17(26.2%) who agreed and the score was lowest at 7(10.8%) who disagreed. Statement (4) Data sharing leads to identification of further lean

transformation paths had a mean of 3.48 and a standard deviation of 1.239. This results indicate that majority 22(33.8%) of respondents agreed that data sharing leads to identification of further lean transformation paths, this was followed by a score of 15(23.1%) who strongly agreed and the score was lowest at 5(7.7%) who strongly disagreed.

Variability among respondents was higher (σ= 1.346) on statement 3, and lower (σ=1.239) for statement 2 and 4.This finding is in consistence with This is in agreement with Kamugisha, (2013) who highlights that organizations that have good performance are perceived to have effective and essential organizational culture, however they did not clearly depict the aspects of elimination of waste, intellectual knowledge, andon and technology adoption indicators of lean manufacturing for improvement in organizational which this study found out.

4.7 Descriptive Analysis for Dependent Variable

The dependent variable for this study is organizational performance. Organizational performance was measured in terms of level of firm's profitability. The descriptive analysis for level of firm's profitability is of firm performance is discussed as follows:

Table 4. 11: Organizational performance

Statement for respondent	SD	D	N	A	SA	Mean	Std.Dev
Gradual profitability growth	10(15.4%)	12(18.5%)	8(12.3%)	15(23.1%)	20(30.8%)	3.35	1.473
Significant growth in your firms sales	4(6.2%)	11(16.9%)	13(20.0%)	20(30.8%)	17(26.2%)	3.54	1.226
The company's customers are increasingly satisfied with its products	9(13.8%)	12(18.5%)	11(16.9%)	19(29.2%)	14(21.5%)	3.26	1.361
Generally, the growth of the firm has been steady and very satisfactory in terms of return on investment and sales	8(12.3%)	12(18.5%)	13(20.0%)	15(23.1%)	17(26.2%)	3.32	1.371

Four statements were developed to measure the extent of effect of lean manufacturing on organizational performance. The statements were gradual profitability growth, significant growth in your firms sales, the company's customers are increasingly satisfied with its products, generally, the growth of the firm has been steady and very satisfactory in terms of return on investment and sales

Statement (1) Gradual profitability growth had a mean of 3.35 and a standard deviation of 1.473. This results indicate that majority 20(30.8%) of respondents strongly agreed that gradual profitability growth, this was followed by 15(23.1%) who agreed and the mean was lowest at 8(12.3%) who strongly disagreed. Statement (2) Significant growth in your firms sales had a mean of 3.54 and a standard deviation of 1.226.

This results indicate that majority 20(30.8%) of respondents agreed significant growth in your firms sales, this was followed by a score of 17(26.2%) who strongly agreed and the score was lowest at 4(6.2%) who strongly disagreed. (3) The company's customers are increasingly satisfied with its products had a mean of 3.26 and a standard deviation of 1.361. This results indicate that majority 19(29.2%) of respondents agreed that the company's customers are increasingly satisfied with its products, this was followed by a score of 14(21.5%) who strongly agreed and the score was lowest at 9(13.8%) who strongly disagreed. Statement (4) Generally, the growth of the firm has been steady and very satisfactory in terms of return on investment and sales had a mean of 3.32 and a standard deviation of 1.371. This results indicate that majority 17(26.2%)of respondents strongly agreed that generally, the growth of the firm has been steady and very satisfactory in terms of return on investment and sales, this was followed by a score of 15(23.1%) who agreed and the score was lowest at 8(12.3%) who strongly disagreed.

This result indicate that the majority with a mean of 3.54 and a standard deviation of 1.226 of the respondents agreed amount of sales measures organizational performance, statement 1 sought the opinion of responder whether profitability growth results to gradual firm performance, the mean was the lowest at statement 3 of 3.26 and standard deviation of 1.361. As a result the study found that the firm performance can be measured by profitability growth, firm sales customer satisfaction and return on investment. This finding is in line with Richard et al. (2009), who highlights that organizational performance encompasses three specific areas of firm outcomes: financial performance (profits, return on assets, return on investment, etc.); product market performance

(sales, market share, etc.); and shareholder return (total shareholder return, economic value added), however he did not conduct it in the context of lean manufacturing as the independent variable.

4.8 Hypothesis Testing Results

Five hypotheses were formulated to test the effect of lean manufacturing on organizational performance a case of Sony Sugar Company Awendo Kenya. The multiple regressions model was used to test the hypotheses by assuming that regression coefficients attributed to the identified lean manufacturing not zero and therefore a function of the form $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \varepsilon$) could be used to model the relationship between lean manufacturing and organizational performance profitability and cost of extension services.

An examination of correlations revealed that there were significant correlations among the various lean manufacturing indicators as well as between the lean manufacturing and organizational performance (Table 4.17). This clearly paved way for use of regression to establish causation.

Correlation Analysis – Lean manufacturing indicators and organizational performance

Table 4. 12: Correlation Analysis – Lean manufacturing indicators and organizational performance

	Elimination of waste	**Intellectual knowledge**	**Andon**	**Technology adoption**	**Organizational culture**	**Organizational performance**
Elimination of waste	1					
Intellectual knowledge	.951	1				
Andon	.973	.961	1			
Technology adoption	.965	.976	.991	1		
Organizational culture	.951	.967	.959	.955	1	
Organizational performance	.955	.943	.967	.960	.961	1

Source (Researcher 2018)

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

Table 4. 13: Model summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.991[a]	.980	.209	1.921

a. Predictors: (Constant), Elimination of waste, Intellectual knowledge, Andon, Technological adoption, Organizational culture

b. Dependent Variable: Organizational performance

From table 4.13, R value was 0.991 showing a positive direction of R is the correlation between the observed and predicted values of the dependent variable. The values of R range from -1 to 1 (Saunders et al, 2012). The sign of R indicates the direction of the relationship (positive or negative). The absolute value of R indicates the strength, with larger absolute values indicating stronger relationships. Thus the R value at 0.991 shows a stronger relationship between observed and predicted values in a positive direction.

The coefficient of determination R^2 value was 0.98. This shows that 98 % of the variance in dependent variable (organizational performance) was explained and predicted by independent variables (elimination of waste, intellectual knowledge, andon, technology adoption and organizational culture as the moderation variable).

Table 4. 14: ANOVA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	113.741	5	22.748	20.733	0.000[a]
	Residual	0.647	59	0.011		
	Total	114.388	64			

a. Predictors: (Constant), Organizational culture, Technological adoption, Intellectual knowledge, Elimination of waste, Andon

b. Dependent Variable: Organizational performance

The ANOVA in table 4.14 illustrates whether the model can predict organizational performance using the independent variables. The F statistic (F=20.733) was significant at a 95% confidence level (Sig. F < 0.05). This means that the model has predictive power. There exists a statistically

significant relationship between elimination of waste, intellectual knowledge, andon, technology adoption and organizational culture as the moderation variable and organizational performance.

Table 4. 15: Regression Coefficient

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	4.924	0.724	1.572	3.537	0.020
Elimination of waste	0.648	0.145	0.699	4.824	0.042
Intellectual knowledge	0.716	0.185	0.752	4.063	0.030
Andon	0.761	0.761	0.768	4.168	0.006
Technology adoption	0.507	0.282	0.552	4.001	0.001
Organizational culture	0.612	0.138	0.672	4.919	0.037

Table 4.15 gives the results for the regression coefficient for the multiple linear equation. $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \varepsilon$) which by supplying the coefficients becomes:

$Y = 4.924 + 0.0.648X_1 + 0.716X_2 + 0.761X_3 + 0.507X_4 + 0.612X_5$

Where:

Y =Organization performance

The t-value of constant produced (t = 4.537) was significant at 95 per cent level (Sig. F< 0.05), thus confirming the fitness of the model. Therefore, there is statistically significant relationship between elimination of waste, intellectual knowledge, andon, technology adoption and organizational culture as the moderation variable and organizational performance.

H_{o1}There is no significant relationship between elimination of waste and organizational performance in Sony Sugar Company, Awendo, Kenya.

The above equation established that organizational performance was to a great extent affected by elimination of waste. The significant value (P=0.042) indicates the presence of a strong significant association between the predictor variable (elimination of waste) and dependent variable

(organizational performance). The P- value of 0.042 which is less than 0.05 signifies that the model of organizational performance significant at the 5 percent significance level. The hypothesis is thus rejected and therefore it is a concluded that there is a significant relationship between elimination of waste and organizational performance.

The correlation output table 4.15 shows that all the elimination of waste characteristics were statistically significant (P-values under significant 2-tailed were all less than α=0.05) against the four indicators of organizational performance, (profitability, firms sales, Customer satisfaction, return on investment) similarly there was relatively high degree of positive correlation exhibited between the various bivariate variables implying that the more the Sony Sugar employ elimination of waste practices the more the organizational performance was realized and were operational within stipulated time and cost . The small p-values under significant (2-tailed) indicated in Table 4.15 were all less than the threshold α=0.05, implying that there is a significant relationship among the variables leading to rejection of the null hypothesis (Ho_1There is no significant relationship between elimination of waste and organizational performance in Sony Sugar Company, Awendo, Kenya) and acceptance of the alternative hypothesis, and hence the research findings conclude that there is a significant relationship between elimination of waste and organizational. This is in agreement with Bhasin (2012) various methods and tools that aim to improve the operational performance of organizations are comprised under the lean strategy's umbrella.

This finding concur with deduction of Garcia & Bonavia, (2015)who observed that Through the systematic elimination of waste, alignment of production with demand and necessary involvement of the workforce, Lean is capable of increasing the business competitiveness of any organization. The more the team understands the elimination of waste to accomplish the specific technical action steps, the less is the need to remind them that they have a good incentive program in place. Additionally, Garza-Reyes et al. (2012) confirmed the position taken by Sohal and Egglestone, (1994) that Lean manufacturing is a management approach to manufacturing that strives to make

organizations more competitive in the market by increasing efficiency and decreasing costs through the elimination of non-value-added steps and inefficiencies in the process.

H_{o2}There is no significant relationship between intellectual knowledge and organizational performance in Sony Sugar Company, Awendo, Kenya.

Hypothesis 2 posited that organizational performance was independent of intellectual knowledge. The regression coefficient for intellectual knowledge shown in Table 4.15 revealed that intellectual knowledge affect organizational performance in a positive and significant way ($\beta = 0.752$, $p<0.05$). The implication is that the hypothesis that intellectual knowledge does not have a significant effect on organizational performance could not be sustained. The hypothesis is thus rejected and therefore it is a concluded that there is a significant relationship between intellectual knowledge and organizational performance.

The correlation output table 4.15 shows that all the intellectual knowledge characteristics were statistically significant (P-values under significant 2-tailed were all less than $\alpha=0.05$) against the four indicators of organizational performance, (learning orientation, organizational learning process, knowledge management, knowledge) similarly there was relatively high degree of positive correlation exhibited between the various bivariate variables implying that the more the Sony Sugar employ intellectual knowledge practices the more the organizational performance was realized and were operational in production of high quality products at least cost and within the stipulated time. The small p-values under significant (2-tailed) indicated in Table 4.15 were all less than the threshold $\alpha=0.05$, implying that there is a significant relationship among the variables leading to rejection of the null hypothesis (Ho_2 There is no significant relationship between intellectual knowledge and organizational performance in Sony Sugar Company, Awendo, Kenya) and acceptance of the alternative hypothesis, and hence the research findings conclude that there is a significant relationship between elimination of waste and organizational. This is in agreement with Jaw et al. (2006) knowledge flow through human capital boosts organizational performance.

This finding concur with deduction Zanda (2011) who observed that the interaction between knowledge sharing and structural capital can bring competitive advantage in organizations. The more the organization adopts intellectual knowledge to utilize human resources, the less is the need to remind them that they have a human resource capacity building frame work in place. Additionally, Carmeli & Azeroual (2009) asserted that knowledge process leads to constructive benefits for organizational performance. Moreover, Customers and suppliers have wealth of knowledge and their efficient and effective utilization supports the organizations to accomplish the desired objectives (Bontis, 1998).

H_{o3}There is no significant relationship between Andon and organizational performance in Sony Sugar Company, Awendo, Kenya.

Hypothesis 3 postulated a lack of significant effect of andon on organizational performance. Results of the regression analysis reported in Table 4.15 show that andon was positive and significant predictor of organizational performance ($\beta = 0.768$, $p<0.05$). Consequently, an application of and is likely to lead to increase in organizational performance. The hypothesis that null hypothesis was rejected

The correlation output table 4.15 shows that all the andon characteristics were statistically significant (P-values under significant 2-tailed were all less than $\alpha=0.05$) against the three indicators of organizational performance, (no andon, full andon and partial andon) similarly there was relatively high degree of positive correlation exhibited between the various bivariate variables implying that the more the Sony Sugar employ andon practices the more the organizational performance was realized and were operational in production of high quality products through utilization of inputs at least cost and within the stipulated time. The small p-values under significant (2-tailed) indicated in Table 4.15 were all less than the threshold $\alpha=0.05$, implying that there is a significant relationship among the variables leading to rejection of the null hypothesis (Ho_3 There is no significant relationship between Andon and organizational performance in Sony Sugar Company, Awendo, Kenya) and acceptance of the alternative hypothesis, and hence the research findings conclude that

there is a significant relationship between andon and organizational. This is in agreement with Liker (2004), implementing Andon is one of the approaches used to "build a culture of stopping to fix problems, to get quality right the first time", and to "use visual control so no problems are hidden". This finding concur with deduction of Li & Blumenfeld, (2006)who observed that purpose of Andon is to detect defects as they appear, find the root cause of the defect, fix the defect and to make things right the first time by stopping production as defects are detected. The more the organization adopts andon to utilize inputs, they result to production of defect free goods and cost saving practice. Additionally, Raturi and Evans (2005), explains the possibilities of lower production cost which in its turn could create lower selling prices to the customer by decreasing product defects in the manufacturing process. Moreover, Subramaniam et al. (2009) shows how andon display data can be used to improved production performance.

H_{o4}There is no significant relationship between technology adoption and organizational performance in Sony Sugar Company, Awendo, Kenya.

Hypothesis 4 posited that organizational performance is independent of technology adoption. Results of regression analysis revealed that technology adoption positively and significantly affects organizational performance ($\beta = 0.552$, $p<0.05$). Consequently, the null hypothesis was was rejected. The correlation output table 4.15 shows that all the technology adoption characteristics were statistically significant (P-values under significant 2-tailed were all less than $\alpha=0.05$) against the four indicators of organizational performance, (trialability, observability, compatibility and complexity) similarly there was relatively high degree of positive correlation exhibited between the various bivariate variables implying that the more the Sony Sugar employ technology adoption practices the more the organizational performance was realized and were operational in production of high quality products at least cost and within the stipulated time. The small p-values under significant (2-tailed) indicated in Table 4.15 were all less than the threshold $\alpha=0.05$, implying that there is a significant relationship among the variables leading to rejection of the null hypothesis (Ho_4There is no significant relationship between technology adoption and organizational

performance in Sony Sugar Company, Awendo, Kenya) and acceptance of the alternative hypothesis, and hence the research findings conclude that there is a significant relationship between elimination of waste and organizational. This is in agreement with Sobhani, (2008) productivity analysis exposes the positive correlations between IT, Total Factor Productivity and Labor Productivity.

This finding concur with deduction Chong et al (2001), who observed that adoption of the ICT is considered as a way to enable businesses to compete on a global scale with increased efficiency and closer customer and supplier. The more the organization adopts technology practices, the less is the need to incur more cost in the production process with increase in quality of its output with the least cost of production. Additionally, Gakuo, (2011) asserted that ICT has been characterized as an invaluable platform for any organization's economic growth. Moreover, Kadakanchi et al (2006) reaffirms that ICT has revolutionized the global economy through changes in different economic activities for it has become a pivot for economic growth.

H_{05} The strength of relationship between lean manufacturing and organizational performance does not depend on organizational culture.

The fifth study objective was to determine the moderating effect of organizational culture on the relationship between lean manufacturing and organizational performance. It was hypothesized that organizational culture has no significant moderating effect on the relationship between lean manufacturing and organizational performance.

Correlation analysis done to examine the degree of association between organizational culture and organizational performance positively and significantly ($\beta = 0.672$, $p<0.05$). Consequently, the null hypothesis was rejected. This implied that there is a significant relationship between lean manufacturing and organizational performance with organizational culture as the moderating variable leading to rejection of the null hypotheses. The decision criterion used was that any P-value less than the threshold of $\alpha=0.05$ would be considered significant and subsequently lead to the rejection of the null hypothesis or fail to reject the null hypothesis when the P-value obtained is

greater than the threshold of α=0.05. The results obtained are indicated in Table 4.15. This is in agreement with (Schein, 2007) who highlights that Organizations are more likely to embrace change when the organization's culture is aligned with the mission and goals of the company.

Table 4.16: Hypothesis testing

Hypothesis	Test	Results	Remarks
H_{o1} There is no significant relationship between elimination of waste and organizational performance in Sony Sugar Company, Awendo, Kenya.	Regression 0.042	Significant	Reject
H_{o2} There is no significant relationship between intellectual knowledge and organizational performance in Sony Sugar Company, Awendo, Kenya.	Regression 0.030	Significant	Rejected
H_{o3} There is no significant relationship between Andon and organizational performance in Sony Sugar Company, Awendo, Kenya.	Regression 0.006	Significant	Reject
H_{o4} There is no significant relationship between technology adoption and organizational performance in Sony Sugar Company, Awendo, Kenya.	Regression 0.001	Significant	Rejected
H_{05} The strength of relationship between lean manufacturing and organizational performance does not depend on organizational culture.	Regression 0.037	Significant	Rejected

4.9 Chapter Summary

This chapter provides a presentation of the research findings. The chapter has employed the use of tables to present the results of the findings that were derived from the study. The chapter has also shown that the response rate for the study was 82%, which is sufficient to facilitate the acquisition of data that can be generalized among the population. In this chapter, the researcher has provided the findings with regards to the information issued by the respondents. The first section indicators of lean manufacturing and the determination of the performance of the organization. Finally, the researcher summarizes the findings regarding the effect of elimination of waste, intellectual

knowledge, andon, technology adoption and moderation variable -organizational culture on organizational performance as per the research as per the objectives outlined in section 1.4 in chapter one.

The study findings revealed that indeed the major driving forces for lean manufacturing are elimination of waste, intellectual knowledge, andon, and technology adoption and moderation variable -organizational culture. There is a clear indication that the company has a reasonably high overall performance as measured by profitability, customer satisfaction, market share and sales growth over the recent past. In the same manner, it was established that elimination of waste, intellectual knowledge, andon, technology adoption and moderation variable organizational culture all have a positive effect on organizational performance.

The findings further show that these four factors are interrelated such that none can have a significant impact without the presence of the other.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of findings, conclusions and recommendations. The summary of the findings for each hypothesis were presented. The conclusions presented in this section were guided by the research objectives and informed by the findings, analysis, interpretation and discussion in the study. Based on the conclusions made, the contribution of the study to knowledge was examined. Recommendations were based on the results for policy and practice as well as suggestions for further research was made.

5.2 Summary of findings

In the testing of the hypothesis in the study, multiple linear regression analysis was employed. In total, five hypotheses were formulated and subsequently tested in the study in order to establish the effect of lean manufacturing thereof.

5.2.1 Elimination of waste and organizational performance

Summative statement 2 (total productive maintenance gives the workers basic maintenance tasks had the highest mean (3.55) and standard deviation (1.238). The results indicate that (33.8%) of the respondents agreed that total productive maintenance gives the workers basic maintenance tasks. In hypothesis testing, H_{o1} There is no significant relationship between elimination of waste and organizational performance in Sony Sugar Company, Awendo, Kenya was accepted. This meant that based on the findings, there was no significant relationship between elimination of waste and organizational performance in Sony Sugar Company, Awendo, Kenya. It was concluded that the strength of the relationship between elimination of waste and organizational performance depends on lean manufacturing (t-value of 4.824 and p-value of 0.042).

5.2.2 Intellectual knowledge and organizational performance

Summatively statement 4 (Knowledge management generates new intellectual capital) had the highest mean (3.60) and standard deviation (1.285). The results indicate that 32.3% of the 65

respondents' strongly agreed that Knowledge management generates new intellectual capital. In hypothesis testing, H_{o2} There is no significant relationship between intellectual knowledge and organizational performance in Sony Sugar Company, Awendo, Kenya was rejected. This meant that there is significant relationship between intellectual knowledge and organizational performance in Sony Sugar Company, Awendo, Kenya. It was concluded that the strength of the relationship between intellectual knowledge and organizational performance depend on lean manufacturing (t-value of 4.063and p-value of 0.030).

5.2.3 Andon and organizational performance

Summatively statement 1 (No andon system makes the condition of manufacturing process readily and easily visible to employees) had the highest mean (3.37) and standard deviation (1.269).The results indicate that 19.2% of the respondents agreed that No andon system makes the condition of manufacturing process readily and easily visible to employees. In hypothesis testing, H_{o3} There is no significant relationship between Andon and organizational performance in Sony Sugar Company, Awendo, Kenya was accepted. This meant that there is no significant relationship between Andon and organizational performance in Sony Sugar Company, Awendo, Kenya. It was concluded that the strength of the relationship between intellectual knowledge and organizational performance depend on lean manufacturing (t-value of 4.168 and p-value of 0.006).

5.2.4 Technology adoption and organizational performance

Summatively statement 2 (observability makes an innovation visible to others) had the highest mean (3.35) and standard deviation (1.328). The results indicate that 19.2% of the respondents agreed that observability makes an innovation visible to others. In hypothesis testing, H_{o4} There is no significant relationship between technology adoption and organizational performance in Sony Sugar Company, Awendo, Kenya was rejected. This meant that there is significant relationship between technology adoption and organizational performance in Sony Sugar Company, Awendo, Kenya. It was concluded that the strength of the relationship between technology adoption and organizational performance depend on lean manufacturing (t-value of 4.001 and p-value of 0.001).

5.2.5 Organizational culture and organizational performance

The level of significance used was 95% ($\alpha = 0.05$) and where $P < 0.05$, Hypothesis five H_{05} that stated that the strength of relationship between lean manufacturing and organizational performance does not depend on organizational culture was rejected. This meant that the strength of relationship between lean manufacturing and organizational performance depended on organizational culture was rejected (t-value of 4.919 and p-value of 0.037) significance level which was statistically significant. It was therefore concluded that there is a regression relationship between lean manufacturing combined with organizational culture and organizational performance.

5.3 Conclusions

In view of the findings summarized in the sections above, lean manufacturing is having a positive effect on organizational performance, this is arrived at as a result of the following conclusions based on the stated objectives.

First, the study concludes that elimination of waste form a major portion of lean manufacturing and positively affects organizational performance. t. Focus value stream mapping, product maintenance, autonomation and continuous facilitates streamlining of the production lines hence minimizing production coast and results to production of high quality products with the scheduled time. These indicators are contributing to realization of organizational performance.

Second, intellectual knowledge as an indicator of lean manufacturing positively and significantly affects organization performance. This is due to the company's efforts to improve on consumption of human resources from time to time. Activities involved in intellectual knowledge utilization such as learning orientation, organizational learning process, knowledge management and knowledge application lead to a realization of organizational performance. Intellectual knowledge utilization therefore is a good lean manufacturing indicator in ensuring organizational performance is attained.

Third, andon as a lean manufacturing indicator has a a positive and significant effect on organizational performance. The andon system makes the condition of manufacturing process readily and easily visible to employees. With a application of the andon system, it brings immediate

attention to problems as they occur in the process and it ensures that processes are being carried out efficiently and productively and this results to a realization of organizational performance.

Fourth, technology adoption positively and significantly. Triability provides observable predictions of change results and minimized perceived risk in adoption of an innovation hence making it observable, compatible and complex. Focus on technology adoption makes innovations to be assimilated into employees' working style hence resulting to direct positive impact on organizational performance.

The fifth objective of the study was to determine the extent to which organizational culture influence the relationship between lean manufacturing and organizational performance Multiple regression analysis was used to determine the interaction effect of organizational culture . The findings reveal that openness, collaboration, receptivity, and data sharing influence organizational performance. The regression results showed that the combination of lean manufacturing and organizational performance was positive and significant and this leads to the conclusion that organizational culture moderates the relationship between lean manufacturing and organizational performance.

5.4 Recommendations

This section presents recommendations made in the study based on the research findings, analysis, interpretation and discussion.

Based on the study findings, the following recommendations are given under the study specific objectives:

In line with the theory of constraints any element or factor that limits the system from doing more of what it was designed to accomplish (i.e., achieving its goal) is a constraint because when the production line is unstable, a firm's own resources and capabilities may be easier to control and according to the study it was established that elimination of waste positively predicts the performance of manufacturing firms; $p < 0.05$ ($P=0.042$) with an explanatory mean of 3.55 and standard deviation of 1.238. Therefore, the study recommends that manufacturing firms should

incorporate elimination of waste in their operations processes such as value stream mapping, total product maintenance, autonomation and continues improvement in order to increase overall cost efficiency, enhanced market share, firms profitably and reduced lead time thereby impacting positively on their performance.

This study established a significant positive relationship between intellectual knowledge and organizational performance; $p < 0.05$ (P=0.030) with an explanatory mean of 3.60 and standard deviation of 1.285. The study therefore recommends the inclusion of intellectual knowledge in the strategic plans of the manufacturing firms in Kenya. Intellectual knowledge as evidenced in this study, of being capable to reducing costs of manufacturing, making sure there is full utilization of human resources, makes new knowledge available for the organization, generates new intellectual capital and results to accessibility, quality, and use of knowledge earned thus impacting positively on both financial and none financial performance of the firms.

Andon involves all aspects of immediate attention to problems as they occur in the production line, including re to alert operators and managers about current problems in manufacturing with capability of impacting positively on organizational performance. This study established that andon statistically and significantly influences the performance of organizations; $p < 0.05$ (P=006) with an explanatory power of mean 3.37 and standard deviation. It is therefore recommended in this study that manufacturing firms should impress andon systems such no adon system, full andon system and partial andon system ensuring production of defect free products resulting managing their cost of production and creation of customer loyalty.

In management of organizations, technology adoption has become an important element that reflects innovation within lean manufacturing and organizational performance with positive effect on the performance of organizations, the study established that Observability makes an innovation visible to others with an explanatory mean of 3.35 and standard deviation of 1.328. As a result, the study recommends that organizations should include technology adoption in their strategic plan and in particular investment in information technology which may make it easy to bring about innovation

in the firm and good information sharing to both suppliers and customers. Additionally, the study recommends investment on technology adoption is useful to managers in manufacturing operations to bring about quality products and reduce the cost of transformation of goods.

The study found that organizational culture moderates the relationship between lean manufacturing dimensions and organizational performance significantly. Consequently, the study recommends that manufacturing firms should direct their limited resources to investment of organizational culture which presently amounts to significant influence on the organizational performance. Improvement on organizational culture does influence the performance of primary functions of lean manufacturing that is; elimination of waste, intellectual knowledge, andon and technology adoption and by extension its effects on organizational performance.

The study further recommends development of organizational culture makes it easy and sufficient for every manufacturing organization to apply openness to build lean culture and to establish collaborations to achieve and sustain success of lean implementation with less expense. This will also improve firm's elimination of waste practices, intellectual knowledge, andon systems and technology adoption, which significantly predicts the performance of manufacturing organizations. By doing so, manufacturing sector would improve in production, produce quality products, be competitive globally and increase national GDP and by extension increase job creation which are some of the prerequisite for the attainment of the country Vision 2030 in Kenya.

Also manufacturing firms for easy track of the implementation and realizing of the impact of the application of lean manufacturing practice, need to conduct quarterly production and customer satisfaction reports and file them in order to track the quality of products and services delivered and the extent of customer satisfaction with a view of increasing profit and market share through the application of lean manufacturing practices.

On the part of government, the study has provided greater insight into the lean manufacturing and organizational performance. This may aid in formulation of policies and regulations that can help improve efficiencies and effectiveness in manufacturing sector so as to boast flow of regional trade

and reduction of cost production hence creating foreign investments incentives, improved prices of goods and services, and reliable production policy which is attractive to global business and increase on market share of our products which improves national growth.

5.5 Suggestions for further research

This study was carried out in Sony Sugar Company based in Migori only.

1. A study can be replicated in a larger number of sugar companies and in more counties. This may account for any environmental factors that may exist in any one county and improve the generalization of the results.
2. A study can be carried out to investigate the influence of other factors like “pull” production and lean manufacturing, just-in-time, total quality management and production smoothing on organizational performance
3. A study can still be done with the moderating variables in this study as the independent variable and lean manufacturing as moderating variable to ascertain the effect that it would cause on organizational performance.
4. Use of other two additional measure of organizational performance; risk minimization and shareholders return may enhance different relationship between lean manufacturing and organizational performance as well as the effect of selected demographic variables on such implementation.

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APPENDICES

APPENDIX I: LETTER OF INTRODUCTION

Dear Sir / Madam

I am a Masters candidate at Rongo University, School of Business and Human Resource. As part of my academic program, I am conducting a study on lean Manufacturing and organizational performance. The purpose of the study is to evaluate the effect of lean manufacturing on organizational performance of Sony Sugar Company. You have been identified as a potential respondent in this research. Please respond to all questions, using your best estimates. Your participation in answering these questions is very much appreciated. Your responses will be COMPLETELY CONFIDENTIAL. If you have any questions or comments about this survey, you may contact Kunyoria Joseph of P.O. Box 4083- 40200, Kisii; Tel: 0701529678; email: kunyoriaj@gmail.com.

Thank you for your support and cooperation. Yours Faithfully,

Kunyoria Ogora Joseph
Student – RU

APPENDIX II: DEMOGRAPHICS

S/NO.	QUESTIONS	RESPONSES	INSTRUCTIONS
1.0	INTRODUCTION		
1.1	Date of participation	__/___/2017	DD/MM/YY
1.2	What post do you occupy in the company	HoD ( ) Divisional HoD ( ) Supervisor ( ) Ordinary employee( )	(Tick your response)
1.0	Name of the department		Key the name of the Department
2.0	SOCIO-DEMOGRAPHIC PROFILE		
2.1	What is the respondent's level of education?	Bachelors ( ) Masters ( ) PhD ( ) Others, Specify ……	(Tick your response)
2.2	How long have you worked with the institution?	Under 5 5-10 years 10-15 years 15 years and above	(Circle your response)

APPENDIX III: QUESTIONNAIRE

SECTION ONE: LEAN MANUFACTURING

1.1 Elimination of waste

Place an × in the appropriate box
Key: 5=SA Strongly Agree 4= A: Agree 3: N:= Neutral 2:D= Disagree:4
1: SD: =Strongly Disagree

STATEMENT	SA	A	N	D	SD
Value stream mapping identifies and measures waste.					
Total productive maintenance gives the workers basic maintenance tasks.					
Autonomation reduces defects in the production line.					
Continuous improvement leads to achieving high levels of pull production.					

1.2 Intellectual knowledge

Place an × in the appropriate box
Key: 5=SA: Strongly Agree 4=A: Agree 3=N: Neutral 2=D: Disagree 1=SD: Strongly Disagree

STATEMENT	SA	A	N	D	SD
learning orientation results to operational effectiveness, and organizational improvements					
organizational learning makes new knowledge available for the organization					
Knowledge management generates new intellectual capital					
Knowledge application results to accessibility, quality, and use of knowledge earned.					

1.3 Andon

Place an × in the appropriate box, by indicate the extent to which your organization used the various types of andons as listed.

Key:5=SA: Strongly Agree 4=A: Agree 3=N: Neither agree nor disagree 2=D: Disagree 1=SD: Strongly Disagree

STATEMENT	SA	A	N	D	SD
No andon system makes the condition of manufacturing process readily and easily visible to employees					
Full andons system brings immediate attention to problems as they occur in the process					
Partial andon system ensures that processes are being carried out efficiently and productively					

1.4 Technology adoption

Place an × in the appropriate box
Key:5=SA: Strongly Agree 4=A: Agree 3=N: Neither agree nor disagree 2=D: Disagree 1=SD: Strongly Disagree

STATEMENT	SA	A	N	D	SD
Trialability provides observable predictions of change results and minimized perceived risk.					
Observability makes an innovation visible to others					
Compatibility of an innovation largely depends on users' lifestyles, situations, beliefs, and values.					
Complexity of an innovation has to be assimilated into an employee's working style.					

SECTION TWO: ORGANIZATIONAL CULTURE

1.5 Organizational culture

Place an × in the appropriate box

Key: 5=SA: Strongly Agree 4=A: Agree 3=N: Neutral 2=D: Disagree 1=SD: Strongly Disagree

STATEMENT	SA	A	N	D	SD
Openness builds lean culture, guides and changes the way people think and act.					
Collaboration achieves and sustains the success of lean implementation.					
Receptiveness leads to open and responsive production techniques.					
Data sharing leads to identification of further lean transformation paths.					

SECTION THREE: ORGANIZATIONAL PERFORMANCE

1.6 Organizational Performance

Place an × in the appropriate box
Key: 5=SA: Strongly Agree 4=A: Agree 3=N: Neutral 2=D: Disagree 1=SD: Strongly Disagree

STATEMENT	SA	A	N	D	SD
Gradual profitability growth					
Significant growth in your firms sales					
The company's customers are increasingly satisfied with its products					
Generally, the growth of the firm has been steady and very satisfactory in terms of return on investment and sales					

APPENDIX V: LETTER FROM THE UNIVERSITY

RONGO UNIVERSITY

OFFICE OF THE DEAN

SCHOOL OF GRADUATE STUDIES

Tel. 0771349741 P.O. Box 103 - 40404
RONGO

Our Ref:**MBM/8013/2014** **Date:** Tuesday, April 24, 2018

The Chief Executive Officer,
National Commission for Science, Technology & Innovation,
Utalii House,
Off Uhuru Highway, Nairobi,
P.O Box 30623-00100,
Nairobi-KENYA.

Dear Sir,

RE: RESEARCH PERMIT FOR MR. KUNYORIA OGORA JOSEPH-MBM/8013/2014

We wish to inform you that the above person is a bona fide graduate student of Rongo University in the School of Business & Human Resource Development pursuing a Masters degree in Business Management. He has been authorized by the University to undertake research titled; "***Effect of Lean Manufacturing on Organizational Performance. A Case of South Nyanza Sugar Company, Awendo, Kenya***"

This is, therefore, to request the commission to issue him with a research permit to enable him proceed for field work.

Your assistance to him shall be highly appreciated.

RONGO UNIVERSITY
THE DEAN
24 APR 2018
SCHOOL OF GRADUATE STUDIES
P. O. BOX 103 - 40404, RONGO

Thank you.

Prof. Ernest S. Mohochi
Ag. DEAN, SCHOOL OF GRADUATE STUDIES

Copy to: Vice Chancellor
Deputy Vice Chancellor (Academic and Student Affairs).
Dean, School of Business and Human Resource Development
HoD, Business Studies

APPENDIX VI: LETTER FORM SONY SUGAR

South Nyanza Sugar Company Limited

SONYSUGAR
Simply The Sweetest

Wednesday, 16 May 2018

Kunyoria Ogora Joseph
P.O Box 103-40405
Rongo- Kenya

Dear Sir,

Re: Permission to collect Data

Reference is made to your letter dated 05th May 2018 regarding the above subject.

We are pleased to inform you that Management has approved your request to carry out research study on **"effect of lean Manufacturing on organizational performance: a case of Sonysugar Company"**

Please note that you will be required to provide a copy of the research work to the undersigned upon completion of the study.

Further note that the research you are to conduct is for academic purpose only.

Arrange therefore to report to the undersigned for guidance on the same.

Thank you.

Yours faithfully,
For South Nyanza Sugar Company Limited

Dan B. Oyamo
Human Resource Development Manager

APPENDIX VIII: LETTER FROM NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471, 2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/18/76215/22576**

Date: **31st May, 2018**

Joseph Ogora Kunyoria
Rongo University
P.O. Box 103-40404
RONGO

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Effect of lean manufacturing on organizational performance: A case of South Nyanza Sugar Company, Awendo, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Migori County** for the period ending **30th May, 2019.**

You are advised to report to **the County Commissioner and the County Director of Education, Migori County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

DR. MOSES RUGUTT, PHD, OGW
DIRECTOR GENERAL/CEO

Copy to:

The County Commissioner
Migori County.

The County Director of Education
Migori County.

THIS IS TO CERTIFY THAT:
MR. JOSEPH OGORA KUNYORIA
of RONGO UNIVERSITY , 0-40200
KISII,has been permitted to conduct research in *Migori County*

on the topic: *EFFECT OF LEAN MANUFACTURING ON ORGANIZATIONAL PERFORMANCE: A CASE OF SOUTH NYANZA SUGAR COMPANY, AWENDO, KENYA*

for the period ending:
30th May,2019

.....
Applicant's Signature

Permit No : NACOSTI/P/18/76215/22576
Date Of Issue : 31st May,2018
Fee Recieved :Ksh 1000

.....
Director General
National Commission for Science, Technology & Innovation