KNOWLEDGE MANAGEMENT AND OPERATIONAL EXCELLENCE IN KENYA'S BREWING SECTOR

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Research Project Presented in Partial Fulfillment of the Requirements for the Award of Master of Business Administration of the University of Nairobi.

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Declaration

Student's Declaration

This research project is my original work and has never been submitted for a degree in any other University or college for examination, degree award or any other academic purposes.

Signature:
……..Date:……

GEORGE NGUGI KARIUKI

D61/72512/2014

Supervisor's Declaration

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

Signature…….……..Date……..

DR. X. N. IRAKI

Acknowledgements

I acknowledge my supervisor Dr. X. N. Iraki and the entire academic staff of the Department of Management Science, University of Nairobi for their invaluable guidance in the course of this research project.

Dedication

To my future wife

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Abstract

This study sought to determine the level of knowledge management existing in the brewing firms and explore the relationship between knowledge management and operational excellence in Kenya's brewing sector. Based on literature review, a hypothesis was suggested that knowledge management has a positive relation to operational excellence. Five firms that form the entire population of legally recognized firms were chosen for the study. Two are large brewing firms with 99 per cent market share and three are craft breweries. Questionnaires were used to collect data on knowledge management level and operational excellence status in the firms. The mean was calculated and regression analysis done to establish the relationship. Chi square test on knowledge management levels were done to determine association of how and with who knowledge is shared across the firms. Further to the regression analysis, correlation analysis was performed as well since the sample was too small. The research revealed that there is average application of knowledge management among brewing firms in Kenya. The study found that there is a strong positive relationship between knowledge management and operational excellence. It was noted that most knowledge is shared informally through personal and social interactions. Hence there is a need for the firms to cultivate and nurture a culture of openness and trust. It was concluded that knowledge management can be used to predict operational excellence in Kenya's brewing firms. Consequently, firms that extensively practice knowledge management should expect equally high levels of performance in their operations.

Chapter One: Introduction

1.1 Background of the Study

In the growing information age, firms are experiencing fierce competition, higher employee turnover, increased technological engagement in their processes and diminishing returns more than ever before (Wheelen & Hunger, 2012). Business managers and leaders are therefore constantly searching for new ways to deal with these emerging challenges that threaten firm's existence. In Kenya, the manufacturing sectors' overall goal is to increase its contribution to the GDP by at least 10% per annum as envisaged in the Vision 2030 policy document. To achieve this, the manufacturing firms in Kenya have to embrace world class operational excellence by eliminating resource wastage, innovating new products, building quality into the end products and fulfilling customer expectation and preferences. Operational excellence (OPEX) requires creation of new knowledge and the management of this knowledge to create sustainable competitive advantage.

Firms are employing their capability in transforming inputs to outputs of higher value that meet and exceed customer expectations. These inputs are inform of information, people, energy, materials and technology (Gro¨nroos & Ojasalo, 2004). Inputs such as material, energy and technology are available to most of the firms almost in equal measure, however information and people are rare and unique and give the firm the greatest potential for competitive advantage.

Furthermore, firms have put great effort in adopting best practices in their manufacturing processes. For example, world class manufacturing practices are being implemented by several firms in Kenya (KPMG, 2014). Firms are spending more money engaging consulting firms and deploying programs that can enable them produce products of high quality at lowest cost possible. The focus of firms is on

efficiency and effectiveness with the aim of creating distinctive and sustainable competitiveness. Additionally, there is continued entrance of global firms or multinationals in Kenya's manufacturing sector. This has contributed to manufacturing excellence standards going a notch higher as firms endeavor to outdo each other and win more market share for their products.

1.1.1 Knowledge Management

There has been a growing realization of the importance of knowledge management since its emergence. The world has gone through a great transformation where the traditional resources such as land, capital and equipment are no longer regarded as the only inputs to the production process, but knowledge is considered the key primary input for the firm and the economy (Drucker, 1994). Knowledge management has become an important theme at many large business firms as managers realize that much of their firm's value depends on the firm's ability to create and manage knowledge (Laudon & Laudon, 2012). Sustainable competitive advantage is created by leveraging on core competencies through distinctive and difficult to transfer resources such as knowledge (Jasemi & Piri, 2012).

The importance of knowledge management is further supported by ISO standards. For example, the recently revised ISO 9001:2015 published in September 2015 embeds knowledge management at the core of its guidelines. ISO 9001:2008 did not contain this concept. ISO 9001:2015 introduces 'organizational knowledge' concept, where knowledge or information on how to handle tasks, operations or solve problems remains in the company. This reduces situations where only certain individuals can carry out certain tasks, for example solving a breakdown. Everyone is empowered, including the less experienced staff. Knowledge has been recognized as an important tool for

competitiveness and many firms are accepting and integrating it to their operations and strategy (Ajmal, Helo and Kekale, 2010).

Firms have to facilitate and drive the flow of knowledge across functions and departments as well as management levels by sharing answers, insights, expertise, ideas and information. To encourage this outcome, the following areas have been identified as key drivers: Link employees and information, support collaborative and team working, promote techniques to capture and share knowledge, and build evaluation and learning into practice (Dieng, Corby, Giboin, Ribiere, 2006).

The benefits that may accrue from knowledge management are wide and varied. To cite a few; Knowledge management results in less time taken while making decisions or attaining results from a project. Consequently, this lessens the amount of money spent and the effort to get things done. This breakthrough is achieved by learning from others' experience to find better solutions more quickly. Other benefits include timely development of skills and capability among the employees which provides a solution to the problem of multi-functional skill gaps among manufacturing firms. Further it helps in developing a deeper understanding of challenges facing the organization and provides ways of improving organizational results. Breakthroughs through innovation can be realized through knowledge management and stronger relationships and ties between employees can be formed as employees share knowledge and work collaboratively (Kane, 2014).

1.1.2 Operational Excellence

Firms in their pursuit of creating sustainable competitive advantage have adopted operational excellence in their operations strategy. The aim is to balance cost, quality, flexibility and speed to offer superior customer value. To achieve this goal, managers

are focusing more on the value addition process and maximizing on each of the steps along the value chain. Key performance indicators such as overall equipment effectiveness (OEE), quality indices, equipment reliability have attracted laser focus from firms' leadership. It is interesting to note that these key indicators have a human factor that drives them. Hence, to a great extent, the behavior, awareness and level of knowledge of the employees of the firm determines the cost of the output, quality of the product and the speed at which it can be delivered to the customer (Fok-Yew & Ahmad, 2014).

1.1.3 Kenyan Brewing Sector

One sector where knowledge management would make a difference in Kenya is in the brewing sector. The brewing sector is very competitive with dominant multinational corporations fighting for market share in most places of the world including Kenya. Companies like Heineken, SAB Miller and Diageo have had their presence in Kenya. Diageo owns and controls one of the leading brewer in East and Central Africa; the East African Breweries Limited. However, the emergence of craft breweries in Kenya such as The Big Five Breweries, Ozzbeco (K) Ltd and Sirville Brewery, continue to raise the competition bar even further. This interest in brewing is a sign of how competitive the industry has become. The East African Breweries Limited has dominated competition in Kenya's brewing industry followed by Keroche Breweries Limited that had an annual capacity of one hundred million liters by 2014 according to the company's website. The increasing number of macro brewers and microbrewers are attempting to take advantage of the naturally expanding markets as a result of growing middle income earners.

1.2 Research Problem

The Kenya's brewing sector is faced with stiff competition from multinationals and barriers such as high taxes, growing health and social concerns that are a threat to the industry's continued growth. To confront these problems, the industry could focus more on knowledge management which has been neglected as a key strategic factor (Dugguh & Terzungwe, 2014).

The focus of this research was to investigate the application of knowledge management in Kenya's brewing industry and to relate it to operational excellence. Knowledge management is tied with employees and their cultures. Firms are faced with a growing employee turnover and therefore a higher probability of losing the knowledge possessed by human resource. "When employees walk out the door, they take valuable organizational knowledge with them" (Lesser and Prusak 2001, p. 1). The study identified the critical knowledge areas, knowledge acquisition, sharing and application of knowledge to drive efficiency, quality, innovation and minimization of costs which constitute operational excellence.

Employee's working for firms that have well organized knowledge repositories have high job satisfaction and the firm spends less time and money on trainings. Mosoti and Masheka (2010) in their case study "Knowledge Management: A case of Kenya" found out that only 5 out of 69 organizations interviewed had a knowledge management policy or strategy written down. This represents less than 10 per cent which shows the existing gap of application of knowledge management in Kenya. "The major reasons given by organizations for embracing knowledge management in their firm operations are: profit growth and firm market share expansion, quality improvement in operations, creation of a sustainable strategic competitive advantage, encourage creativity and innovation

which is important to firm's strategy, retention and storage of employee knowledge, knowledge creation and knowledge transfer in a dynamic business environment, helps avoid costly mistakes based on poor management decisions" (Cheruiyot, Jagongo & Owino, 2012, p. 3). The brewing sector was chosen because no previous research has been undertaken in this context. Mwololo (2015) had focused on operational excellence and competitiveness of Kenyan manufacturing firms and therefore the concept of knowledge management has not been explored.

Further, observations made by the author in one of the brewing firms in Kenya, showed that there were cases of stock outs due to plant breakdowns and market returns due to poor quality. All of these were attributable to lack of knowledge at the time it was needed whereas that knowledge was present with someone else in the organization. This suggests that if knowledge was effectively managed, cases of plant breakdown and market returns will significantly reduce as well.

1.3 Research Objectives

The specific research objectives were:

1. Identify the knowledge management level in the Kenyan brewing sector.
2. Analyze the relationship between knowledge management and operational excellence.

1.4 Value of the Study

By exploring the actual involvement of knowledge management practices in Kenyan brewing sector and how it contributes to improved operational excellence, this research contributes to inform the business leaders and operations managers in the brewing sector of the importance to integrate knowledge management in their strategic plan in order to create sustainable competitive advantage. The study is useful to other

researchers who may be interested in knowledge management and operational excellence in other firms besides brewing firms. It also supports the focus of operations management on soft factors as a means of continuous improvement and firm overall performance.

Chapter Two: Literature Review

2.1 Knowledge Management

As early as the eighteenth century, scholars were interested on knowledge management. On the forefront were economists led by Adam Smith. He advanced the concept of division of labor which is centered on knowledge. Articles written by another economist, Alfred Marshall, showed that knowledge was often the basis for firms choosing their location. During the Second World War, economists observed to ascertain how long it took to build a war plane, and subsequently the second, third and fourth. After the first plane, the second took shorter time than the first and so did the third take less than the second. There was some learning taking place as the job was done that played a critical role on studies on knowledge management later on. Hence, there has been a great emphasis on the role of knowledge on firms. (Encyclopedia of Knowledge Management, 2006).

Some scholars (for example, Wilson, 2002; Blake, 2000) have thought that knowledge management is a passing fad like Total Quality Management. Knowledge Management is a management concept suggesting that it is prudent to manage the intellectual assets of an organization for advantage in the marketplace. Knowledge management may lead to quick and rational decision making in the operations, foster innovations, motivate workers and increase productivity. Further it is the basis of a learning organization. Knowledge Management in manufacturing companies impact production volumes, costs, time delays and efficiencies (Schwartz, 2006). An employee who is knowledgeable in the organization's processes be they technical or non-technical, is most likely to make better decisions as it is possible to consider qualitative and quantitative information and as well combine them.

Knowledge management is a subject area that seeks to develop the performance of persons and firms by maintaining and maximizing on the benefits of knowledge assets both present and future. Knowledge management systems encompass both human and automated activities and their associated artifacts. Knowledge management consists of "leveraging intellectual assets to enhance organizational performance" (Stankosky, 2008, p. 4). To achieve sustainable improvement it is crucial that we have access to knowledge of best practice in the shop floor. Knowledge can be contained in either subjects such as a person, a group of individuals, an organization, or in objects such as a product, a process or a system.

Knowledge management develops systems and processes to acquire new knowledge and share it as an intellectual asset. It enhances the creation of useful, actionable, and meaningful information, and seeks to improve both personal and corporate learning (Prat, 2006). In addition, it can maximize the value of an organization's intellectual base across departments and geographical locations. Firms are successful not only on the products they sell but as well on the knowledge they possess. This intellectual capital is critical to giving the firm a sustainable competitive advantage in the market it chooses to base its operations. Organizational knowledge can also be referred to as 'intellectual capital', 'organizational memory', 'institutional memory' (for example, Tan, 2000), 'knowledge assets', and 'intangible assets'. Knowledge management seeks to leverage on intellectual capital that will create unique core competencies and lead to competitive advantage (Rigby, 2009).

Davenport and Prusak (1998) also notes that the greatest driver for sustained competitive advantage in a firm is the knowledge that the firms owns and subsequently how prudently it is used and how promptly it creates new knowledge for innovation. Tacit knowledge, social knowledge, and complex knowledge are difficult to imitate (Leonard & Sensiper, 1998; Helfat & Raubitschek, 2000; McEvily & Chakravarthy, 2002). Hence, competences based on these types of knowledge cannot be easily copied by competitors, and strategies based on these competences are likely to lead to sustainable competitive advantage. Since technology and processes are similar in brewing firms, knowledge management can be a key source of competitiveness. Knowledge is generally classified as either tacit or explicit. Nonaka (1994) was first to differentiate between two broad categories of knowledge, tacit and explicit knowledge. Scholars such as (Prat, 2006) have further classified knowledge along dimensions such as explicitness, reach, abstraction level and propositionally as shown in the figure below.

Figure 2.1.1: Knowledge Types (Prat, 2006)

Depending on the various types of knowledge, different methods of sharing knowledge arises. There are four modes of knowledge conversion namely, socialization, internalization, externalization and combination that transform tacit knowledge to

explicit knowledge and vice versa. “Knowledge that cannot be transferred meaningfully and shared across is not useful. Knowledge has advantage and can be used to make decisions and actions only when distributed throughout the organization” (Laudon & Laudon, 2012, p. 417).

Knowledge management is surpassing the value of tangible assets in today’s business environment. It is argued that knowledge is the most significant resource in the modern economy, even more superior to labor, capital and land (Drucker, 1993). The most ignored part in KM is relevant knowledge distribution. The value of Knowledge lies in the ability of members of the organization to utilize the managed knowledge to deal with dynamic, recurrent and unusual situations that they face day to day. Tom Butler, (2006) argues that Information Technology (IT) systems can store and retrieve data but cannot store information or knowledge. Considerable interpretation of the data is required to turn it to information and then into knowledge. IT systems are limited in this aspect which however human beings are suitably adapted to. However, he quickly points out that the interpretations of humans on a set of data and information rarely concurs to the same knowledge. The Aristotelian view of knowledge management considers the abilities to acquire, represent, store, retrieve and apply knowledge to enhance the operations of the organization as the only way to assume knowledge management has been engaged in an organization (Encyclopedia of KM, 2006).

In this study, our focus is on management of knowledge that is critical to a brewing firm. This is knowledge that adds value to the products or services. For example, knowledge of a specific task, such as how to resolve a malfunction in a critical production machine. The awareness of who knows what in an organization, or the memory of who solved a similar problem and how last time or in another department.

The knowledge of who is most suited and able to do a certain task, and who has the latest information or training or best qualified to be consulted on a matter. The information on process history such as, has a certain process been tried before and what was the results? “The competitive advantage of an organization will depend more on their capacity to embed new knowledge on their production processes, organization strategy and in the product that they are offering their customers” (Mothe, Gertler, Landry, Niosi & Wolfe, 2000, p. 10).

The culture of a firm is critical to the success of Knowledge Management (Grover & Davenport, 2001). Leadership and the support of top management emerges as a key influence in the success of knowledge management. The human resource function of an organization plays a critical role in influencing persons and their behaviors. Other elements such as IT, tools, and methodology are a key knowledge management drivers, although it is generally argued that IT should only form a small proportion of knowledge management (Davenport & Prusak, 2000; Smith & Farquhar, 2000).

From literature review there is a very useful framework outlined by Botha, Kourie, & Snyman (2008) titled the "knowledge management broad categories". In this framework, Botha et al illustrate that the knowledge management process involves three broad categories that overlap and closely relate to each other. However, this model does not include the creation of new knowledge in the KM process. In the model, knowledge can either be people focused or technologically focused. Most organizations view KM as a technological rather than a social challenge. “Knowledge management is not entirely about IT, rather it is about human resource management and enabling people to use knowledge towards solving problems for the business” (Mothe, Gertler, et al 2000, p. 12).

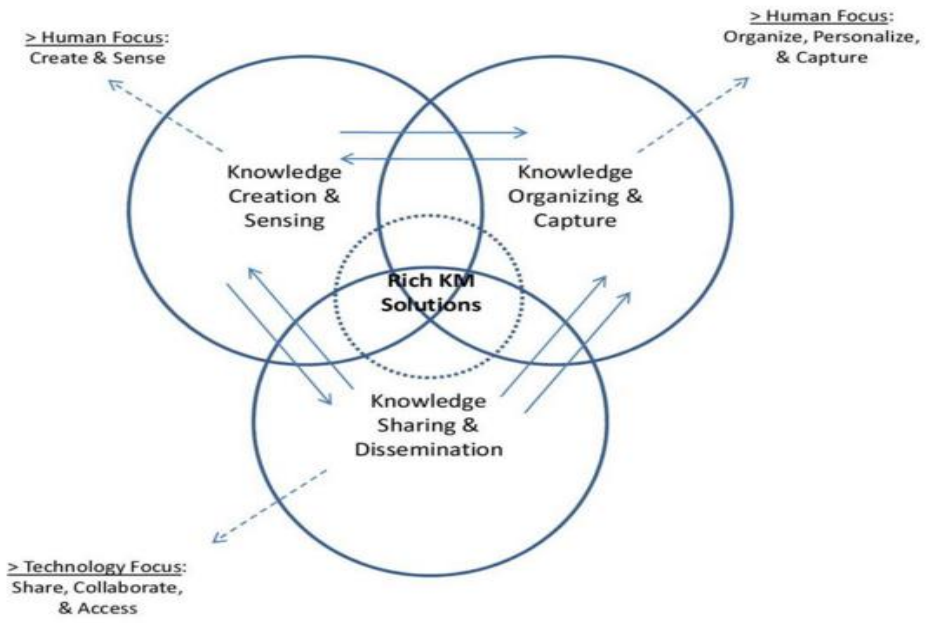


Figure 2.1.2: The Knowledge Management Process Model by Botha et al (2008)

The institute of brewing and distilling has identified the following as key knowledge areas in brewing: beer types, raw materials and processes for brewing, Package types, Barley and malt, Adjuncts and colored malts, Water, Mash conversion, Brewing plant – milling, Brewing plant -mashing and conversion, Brewing plant - wort separation, Wort boiling, Hop bitterness, Wort boiling systems, Wort clarification, Wort cooling and oxygenation, Brewing yeast, Yeast Handling, Fermentation theory, Fermentation and beer flavor, Fermentation vessels, Fermentation control, Health and safety, Maturation, High-gravity dilution, Storage, beer movement, dissolved oxygen and beer quality, Haze stabilization, Filtration, Line capacity, design, efficiency reporting and loss control, Labelling and coding, Container inspection, Packaging line safety, Pasteurization ,Sterile Filtration and Sterile Filling, Bottling, Canning, Kegging, Quality parameters, Evaluation and tasting, Shelf life, Detergents and sterilants and cleaning-in-place (CIP) systems, Chemical and hazardous material handling, Energy and Water conservation and finally Packaging waste. (IBD Syllabus, 2009).

2.2 Operational Excellence

The institute for operational excellence defines operational excellence as “the point at which each and every employee can see the flow of value to the customer, and fix that flow before it breaks down.” A basic requirement for business success is the continuous improvement of efficiency and effectiveness. To achieve this, companies have over time adapted ways to build excellence into their operations such as team work, quality circles, ISO and six sigma. OPEX is an approach focused on optimization of organizational processes, the organizational structure and culture as well as the overall business strategy (Crabtree, 2010).

Jorge & Rabechini (2011) have discussed theories towards operational excellence and innovation processes with a focus on continuous processes. These theories include the theory of process excellence, the theory of performance measures and the theory of learning organization. The theory of process excellence aims to describe how inputs (what they are, what they cost, where they come from, how they got to us) are processed (by which technologies, by whom, with what quality, in what timeframe, with what economy) into those outputs (of what variety and quality, at what cost, how they get to the customer). The choices involved are myriad and they are important, as these very decisions determine the quality, cost and delivery of the product or service provided (Holweg, 2015). The learning organization theory is centered on people and their capability, skill and knowledge to deliver value for the organization.

The Shingo model focuses on the principles and supporting concepts that influence the right kind of behavior that are seen as the ingredients of delivering business results through operational management. The principles remain the same but the way we share and implement them may be different from firm to firm. The emphasis is on the

principles which drive behavior and ultimately determine the organizational culture. The modern firm cannot win only through efficiency and leanness. The Shingo model emphasizes that the way firms gets results matters. The end result must be what the customer needs and wants (Richardson, 2015). Dr. Shingo understood that OPEX is not attained by cosmetic imitation or the selective and random use of designs, methods and approaches. Instead, achieving OPEX requires firms to understand and "know why" (i.e., an understanding of underlying principles) (Shingo Institute, 2016).

Operational Excellence leans towards the element of people which is ignored in other techniques such as lean sigma. Operational Excellence focuses on teamwork and the people who form those teams (Crabtree, 2010). The operational excellence management system delivers industry leading performance across seven value drivers namely; safety, environment, compliance, quality, productivity, yield and cost. According to this model, operational excellence is a function of the management system and culture and supports knowledge sharing as one of the pillars to drive continuous improvement (Asif, Fisscher, Bruijn & Pagell, 2010).

2.3 The Brewing Industry

Beer is made using malt, hops, yeast and water. Although these are basic ingredients and known to all beer producers, beer manufacturers uses different brewing techniques and processes to achieve several varieties and tastes of these alcoholic beverages. These techniques and processes are as a result of knowledge residing within the organization that helps to competitively differentiate the firm's products in the market. This knowledge is a strategic competitive factor and the bedrock upon which innovation can be formed (IBISWorld, 2015). The global beer industry has grown significantly. The growth has been attributed to the growing social acceptance of beer and a greater

population with disposable income. China, the United States and Brazil are the leading countries globally in beer manufacturing with the biggest breweries in the world. Breweries are factories with multiple operations and the continuous batch production is done in production lines (Statista, 2014).

2.3.1 Brewing industry in Kenya

The brewing industry in Kenya is dominated by East African Breweries Limited with about 90 per cent of the market share (KPMG Africa, 2014). Keroche breweries limited has been at the forefront to win more market share for its products. There has been an emergency of microbrewers all targeting the emerging middle class and growing consumer preferences. Only East African Breweries Limited is listed in the Nairobi Stock Exchange. Studies have found that a significant part of a firm's share price is associated to its intangible assets, of which knowledge and information is one key component, along with product brands, firm reputation, and distinctive organization processes. Projects initiated through knowledge available or discovered within the firm have been found to give impressive returns on investments (Gu and Lev, 2001; Blair and Wallman, 2001).

Imports from multinationals have also served to increase competition and rivalry. Despite the tough legislation on alcohol consumption in Kenya, the high taxes and high cost of doing business in the country, the beer industry continues to survive mainly because of the emergence of a large middle income population. However, large beer manufacturers might be facing a difficult future. This is attributed to emergence of alternative alcoholic beverage such as spirits, wines and craft beers. Large manufactures have no choice but to adopt appropriate strategies to compete on the basis of price, innovative and quality products to win consumers shifting to craft beers.

2.4 Knowledge Management and Operational Excellence in Brewing Industry

Managing knowledge in a big brewing industry is a daunting task; information is in many departments and with many different individuals and stored in diverse methods and formats. A lot of this knowledge is to some extent not available to those who need it, since it is most frequently localized or even personal and difficult to distribute, while the brewing and packaging operations data are rarely integrated into strategic decision making. Our culture in Kenya has been individualistic (Keriga & Bujra, 2009). Knowledge acquisition in our school system has been inclined to individualism. This therefore creates a challenge in Kenyan organization's today since knowledge management requires knowledge sharing, a facet we never practiced from early child hood. Our culture orientation has been generally selfish in knowledge sharing (Wamitu, 2015). Furthermore, the idea of employees working for one company from the time they leave college to the time they retire is viewed as Victorian. The current generation Y is more fluid and often on the move from one company to another. Moreover firms are also facing many dynamic challenges leading them to lay off, re-engineer or outsource. In the process, key skills and experience is lost. Faced by this threat that could jeopardize their competitiveness, brewing firms have to realize that their knowledge of what and how they do things is a key asset that should be explicitly managed with the same effort and consideration as they manage other valuable corporate assets.

2.5 Relationship between Knowledge Management, OPEX and Brewing

The practice of knowledge management fosters a culture of learning. This may mean for a firm that there is less time consumed while doing a task and mistakes are not repeated because knowledge management creates organizational memory. The principles of knowledge management will ultimately influence quality of products,

efficiency of processes and innovation. All these characteristics support operational excellence (Vrellas & Tsiotras, 2014). Brewing has been practiced for many years. Various models and tools to improve operational excellence have been employed. With the stiff competition among firms within the sector, firms would achieve operational excellence by strategically managing better what they know. These includes people know how, process knowhow and product know how in order to create sustainable competitive advantage (Mothe, Gertler, et al, 2000). The brewing ingredients are the same, the equipment and machines are similar too, hence the key differentiator is the soft elements of management which includes knowledge management.

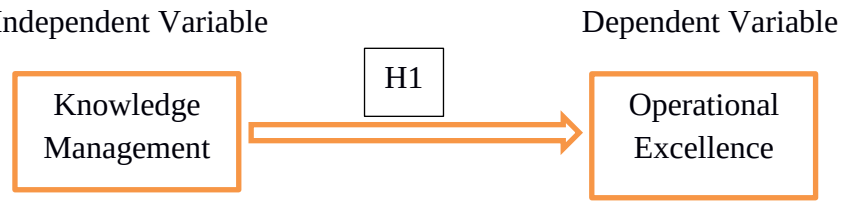
2.6 Summary of Literature Review

Knowledge management involves the identification of critical knowledge areas, acquisition and sharing of knowledge. These requires an organization culture that can support team work and has the right leadership. The pillars of knowledge management also form the foundation for operational excellence of a firm. Smart and brilliant actions that motivate being right the first time are as a result of individuals possessing perfect knowledge. "We all know the importance of regular physical exercises, sleeping well and enough and taking care of what we eat. Nevertheless, this awareness does not translate to the action being easier. Because in life knowledge is only part of the battle. Knowledge becomes useful only when followed with an action" (Achor, 2013, p. 34).

Despite the benefits of knowledge management, firms in the brewing sector in Kenya seem not to have proactively embedded it in their practice. KM is not in the firm's strategies or policies and hence achieving and sustaining operational excellence has been more of a mirage. Firms have incurred huge costs due to lack of knowledge of some individuals whereas that knowledge was available elsewhere in the organization. The fact that knowledge is intangible makes it difficult to measure. It is very difficult

to measure knowledge management owing to the inherent characteristic that it is intangible (Bose, 2004). Beer manufacturing firms in Kenya have an opportunity to realize operational excellence through knowledge management which in turn will improve the organizational performance.

2.7 Conceptual Framework



The relationship between knowledge management and operational excellence was explained by testing the hypothesis below. The conceptual framework shows that knowledge management practices (independent variable) leads to operational excellence (dependent variable).

H1: Knowledge Management has a positive impact on operational excellence in Kenya's brewing sector.

Chapter Three: Research Methodology

3.1 Research Design

To address the research questions, descriptive research design was adopted. Since the objective of the study was to collect information on the status of knowledge management and operational excellence in Kenya's brewing sector, and demonstrate the relationship between them, descriptive research design was best suited for this study. Our objective was to describe the sector as it is in the practice of knowledge management and operational excellence. The objective questions to answer were based on 'what is' rather than "why" or "how". It was the intention of this study to make a conclusion based on the findings of the research objectives which also necessitated the choice of descriptive research design.

3.2 Population and Sampling

All legal breweries that manufacture in Kenya as well as legal craft breweries constituted the whole population. There are two major breweries in Kenya both having about 95% of the market share. The two are EABL and Keroche breweries Ltd. Hence the study covered the two breweries to understand knowledge management in large beer manufacturing firms. In addition, to understand knowledge management and operations management in the growing craft brewer's category, a study was done in all Nairobi based craft brewers namely; The Big Five Breweries, Ozzbeco (K) Ltd and Sirville Brewery. The study took a census and therefore no sampling.

3.3 Data Collection

Questionnaires were designed to gather information from staff of brewing firms. The staff rated the key indicators of knowledge management to help us to assess the extent

of knowledge management and the level of operational excellence. This information was to be used for quantitative analysis of the research. The researcher validated the questionnaire by pilot testing. The feedback gathered was used to refine the instrument.

3.4 Data Analysis

1. Identify the knowledge management level in the Kenyan brewing sector

The mean of the data obtained was used to show the level of knowledge management on each of these categories;

a) Who the knowledge is shared with

b) How the knowledge is shared

The standard deviation was also calculated to measure confidence in the statistical data. The research aimed to investigate how and with who knowledge is shared with. Knowledge sharing could be horizontal i.e. among peers or vertical which means knowledge could be shared from bottom top or top bottom in the organizational hierarchy. This knowledge could be shared through emails, intranet, knowledge database, personal interactions or trainings.

2. Analyze the relationship between knowledge management and operational excellence

OEE (Overall Equipment Effectiveness) is a “best practices” metric that identifies the percentage of planned production time that is truly productive (Ojha, 2015). An OEE score of 100% represents perfect production: manufacturing only good parts, as fast as possible, with no down time. Overall Equipment Effectiveness (OEEs) of less than 50% was considered lack of operational excellence. OEEs of between 50% and 85% were considered as average operational excellence while OEEs above 85% were considered

as presence of strong operational excellence based on manufacturing benchmark study for fast moving goods conducted by Sage and Epicor covering more than 100 global manufacturing operations in 2016 (SageClarity, 2016). The knowledge sharing level and the operational excellence status identified were analyzed quantitatively through regression analysis. Correlational analysis was further performed to establish extent of relationship and support the regression analysis since the population observed was small. Additionally, chi square test on knowledge sharing level was done to test association among methods of sharing knowledge and the firms.

Chapter Four: Data Analysis, Results and Discussions

This chapter covers data analysis, presentation and discussion of the results. Out of the total of 5 firms, 4 firms responded with filled questionnaires indicating a response rate of 80%. The number of firms is dictated by the fact that there are only two big breweries and three craft breweries.

4.1 Results

The study sought to determine the knowledge management status and operational excellence in Kenya's brewing firms. The respondents were asked to rate knowledge sharing in their firms for each of the knowledge areas on the questionnaire (appendix 2) using either 3 for very frequently, 2 for frequently, 1 for less frequently and 0 when they could not tell. The mean and standard deviation for each firm was obtained as shown in table 4.1.1 and 4.1.2 depending on who the knowledge is shared with and how it is shared respectively. A mean of the firm's means was also obtained to obtain a mean for the sector.

Firms	**Shared Top Bottom**	**Shared Bottom Up**	**Shared horizontally**	**Shared Externally**
EABL	1.85	2.13	2.15	0.54
Keroche	1.75	1.00	2.00	0.50
Serville	1.00	1.00	1.48	1.00
BigFiveBreweies	1.00	1.00	1.36	1.00
Mean	***1.40***	***1.28***	***1.75***	***0.76***
Standard Deviation	***0.47***	***0.56***	***0.38***	***0.28***

Table 4.1.1 Level of knowledge management based on who the knowledge is shared with

Firms	Emails	Socialization & Personal Interaction	Training	Intranet or IT Database	One Point Lessons	Others (Please Specify)
EABL	1.13	1.92	1.54	1.38	2.00	0.00
Keroche	1.00	2.00	1.00	1.00	1.00	0.00
Serville	1.00	1.00	1.90	0.00	1.00	0.00
Big Five Breweries	1.00	1.00	1.33	0.00	0.00	0.00
Mean	***1.03***	***1.48***	***1.44***	***0.59***	***1.00***	***0.00***
Standard Deviation	***0.06***	***0.55***	***0.38***	***0.70***	***0.82***	***0.00***

Table 4.1.2 Level of knowledge management based on how knowledge is shared

Firm	*OEE in Percentage for your last financial year*	*Profits last financial year*	*Number of employees*
EABL	59%	13 Billion	1,500
Keroche	55%	Not available	250
Sirville	52%	Not available	10
Big Five Breweries	50%	Not available	14
Mean OEE	**59%**		

Table 4.1.3 Operational Excellence Status

The results show that knowledge is shared mostly horizontally, followed by top bottom and less frequently externally. It is easier to pass knowledge horizontally among peers than it is bottom to top or vice versa. Most of the knowledge passed top to bottom is in form of policy, formal training and operational instructions. All the firms share less information externally to safeguard their knowledge of what they know or do as a form of competition (Prat, 2006). EABL has the highest level of knowledge shared across all levels attributed to the huge amount of knowledge they have and elaborate systems to encourage knowledge sharing. The craft brewers has the least level of knowledge sharing since they have few employees and knowledge is "concentrated with the owner or the master brewer" according to Mr. Njogu who owns Sirville Breweries.

Further, it was noted that personal interaction and socialization was the most employed method of disseminating knowledge. This is in line with literature review that showed most organizational knowledge is shared socially and that information systems are not the core of knowledge management but rather support people and culture (Mothe, Gertler, et al, 2000). The research also shows that training is another popular method used by firms to transfer critical knowledge across the organization. The brewing firms have invested in formal brewing diplomas offered by Institute of Brewing and Distilling, a highly ranked certification center in the world. All the firms had little or no knowledge distributed through an intranet or IT database. The craft brewers had none owing to the fact that they have few employees and the firms are small in size. This finding was unusual since it indicates that knowledge sharing is mostly done informally rather than formally which will be expected of formal corporates.

The brewing firms observed, track their overall equipment effectiveness as shown in table 4.1.3. However, the privately owned firms were unwilling to disclose their profits

or they were unknown to respondents. EABL is leading owing to the many years (since 1922) of continuous improvement and association with multinationals hence benefitting from world class manufacturing knowledge and practices.

4.2 Data Analysis

4.2.1 Level of Knowledge Management in Kenya's Brewing Firms

A chi square test to determine association between firms and who the knowledge is shared with was done. Similarly, another chi square test was done to determine association between firms and how the knowledge is shared across the firms. The chi square tests were performed using Excel and the results are as follows.

Firms	Shared Top Bottom	Shared Bottom Up	Shared horizontally	Shared Externally	Total	
EABL	1.85	2.13	2.15	0.54	6.67	0.321
Keroche	1.75	1.00	2.00	0.50	5.25	0.253
Serville	1.00	1.00	1.48	1.00	4.48	0.216
Big Five Breweries	1.00	1.00	1.36	1.00	4.36	0.210
Total	5.60	5.13	6.99	3.04	20.76	
	Expected Counts					
	1.800	1.646	2.244	0.977		
	1.417	1.296	1.767	0.769		
	1.210	1.106	1.508	0.656		
	1.177	1.077	1.467	0.639		
	Test Statistic		**0.9992**			
	α		0.05			
	df		9			
	p-value		0.000561	0.0023		
	Critical Value		3.325			

Table 4.2.1.1 Chi Square Test to determine association between firms and who the knowledge is shared with

The following hypothesis was proposed.

H_0: who the knowledge is shared with is independent of the firm

The test statistic X^2 obtained above was 0.9992 which is less than the critical value of 3.325 and p-value is less than $\alpha = 0.05$. Hence the null hypothesis is rejected and we conclude that knowledge sharing on the basis of who it is shared with is dependent on the firm. This implies that each of the brewing firm is likely to share their knowledge in a similar manner. This can be explained by the fact that the brewing firms have similar cultures. The employees attended same schools and most of the employees begun working for EABL before moving to Keroche Breweries or starting their own craft breweries. Therefore, there is a high likelihood that the firms share the same culture.

Firms	**Emails**	**Socialization & Personal Interaction**	**Training**	**Intranet or IT Database**	**One Point Lessons**	**Total**	
EABL	1.13	1.92	1.54	1.38	2.00	7.96	0.359
Keroche	1.00	2.00	1.00	1.00	1.00	6.00	0.270
Serville	1.00	1.00	1.90	0.00	1.00	4.90	0.221
Big Five Breweries	1.00	1.00	1.33	0.00	0.00	3.33	0.150
Total	4.13	5.92	5.78	2.38	4.00	22.19	
		Expected Counts					
	1.479	2.122	2.071	0.852	1.434		
	1.115	1.600	1.561	0.642	1.081		
	0.911	1.306	1.275	0.524	0.883		
	0.620	0.889	0.867	0.357	0.601		
				Test Statistic	**0.988**		
				α	0.05		
				df	12		
				p-value	1.3E-05	7.4954E-05	
				Critical Value	5.226		

Table 4.2.1.2 Chi Square Test to determine association between firms and how the knowledge is shared

The following hypothesis was proposed.

H_0: how the knowledge is shared is independent of the firm

The test statistic X^2 obtained above was 0.988 which is less than the critical value of 5.226 and p-value is less than $\alpha = 0.05$. Hence the null hypothesis is rejected and we conclude that knowledge sharing on the basis of how it is shared is dependent on the firm. Therefore each of the brewing firm is likely to share their knowledge in a similar fashion using similar fashion. As explained earlier for the case of who the knowledge is shared with, the same applies to how the knowledge is shared. The culture of an organization plays a very critical role in how knowledge is shared (Grover & Davenport, 2001).

4.2.2 Relationship between Knowledge Management and Operational Excellence in Kenya's Brewing Firms

A regression analysis of the four firms to determine the relationship between knowledge management and operational excellence was done. The level of knowledge management and overall equipment effectiveness was regressed and the results were as follows.

Firms	Knowledge Sharing Levels	OEE in Percentage
EABL	1.63	59%
Keroche	1.25	55%
Serville	1.04	52%
Big Five Breweries	0.85	50%
Mean	***1.19***	***54%***
Standard Deviation	***0.33***	***4%***

Table 4.2.2.1 Regression Analysis Inputs

Regression Statistics								
Multiple R	0.937							
R Square	0.877							
Adjusted R Square	0.816							
Standard Error	0.016							
Observations	4							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	1	0.0036	0.0036	14.30	0.0634			
Residual	2	0.0005	0.0003					
Total	3	0.00408						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.423	0.034	12.462	0.006	0.277	0.569	0.277	0.569
Knowledge Sharing Levels	0.105	0.028	3.781	0.063	-0.014	0.224	-0.014	0.224
RESIDUAL OUTPUT								
Observation	*Predicted OEE in Percentage*	*Residuals*	*Standard Residuals*					
1	0.593	-0.003	-0.207					
2	0.553	-0.003	-0.268					
3	0.532	0.018	1.415					
4	0.512	-0.012	-0.940					

Table 4.2.2.2 Regression Analysis Output from Excel

The regression model summary indicates that the coefficient of determination for the model (R square) was 0.877 indicating that knowledge management explain 87.7% of variation in operational excellence. The coefficients of the regression analysis indicate a positive relationship exists between knowledge management and operational

excellence. However the firm has to overcome other unexplained factors in order to attain operational excellence. The model is not suitable to predict firms operational excellence given firm's knowledge management level as the significance F value of 0.0634 is greater than 0.05. The following regression equation can be deduced from the model in table 4.2.2.2.

Operational Excellence = 0.423 + 0.105 Knowledge Management + error

A test of goodness of fit (F-test) was also performed to determine whether the model above was suitable in predicting the operational excellence in a brewing firm.

Test Hypothesis:

H_0: $\beta i = 0$

H_A: $\beta i \neq 0$ Where βi is the coefficient of knowledge management

The critical F value (obtained from the F statistical tables) was found to be $F_{1, 2} = 18.51$ at a p-value of 0.05. Since the calculated F value of 14.30 was lower than the critical F value of 18.51, the null hypothesis was therefore accepted. The model obtained could therefore not be used to predict the operational excellence of a brewing firm with a confidence level of 95%.

Since the firms observed were few, the regression analysis was considered insufficient. Hence, a correlation to test the extent to which knowledge management and operational excellence fluctuate together was done. The results are as shown in table 4.2.3. The correlation coefficient of 0.937 show that knowledge sharing and OEE are positively correlated. This further indicates that knowledge management and operational excellence are strongly related to each other as shown in figure 4.2.1.

	Knowledge Sharing Levels	OEE in Percentage
Knowledge Sharing Levels	1	
OEE in Percentage	0.936632058	1

Table 4.2.2.3 Correlation Output from Excel

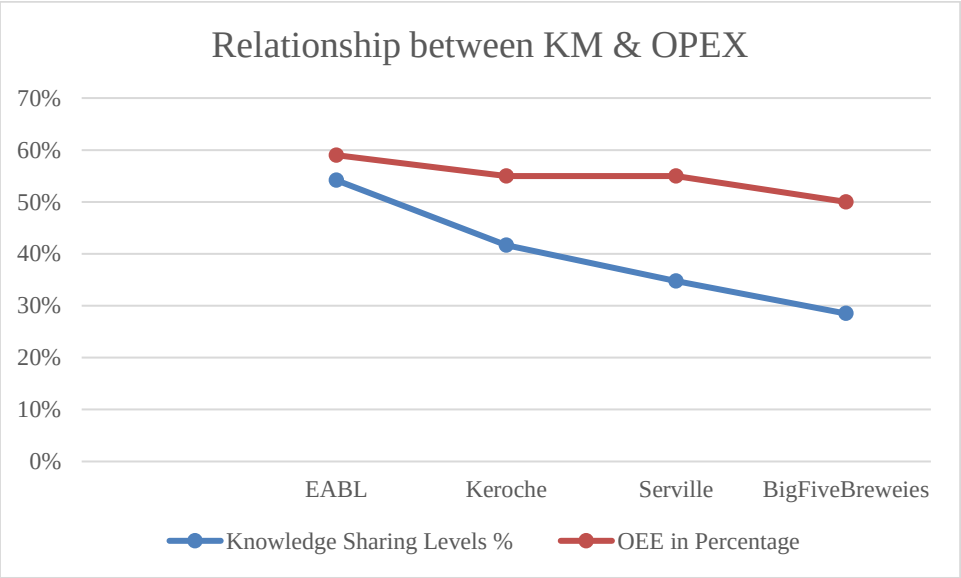


Figure 4.2.2.1 Graphical Representation of relationship between KM and OPEX

The above relationship shows that the higher the knowledge sharing levels the higher the OEEs. Hence knowledge management practice by firms can lead to better operational excellence (Prat, 2006). EABL and Keroche have invested on trainings as a formal method of knowledge sharing. They have the highest level of knowledge sharing in the sector as well as well as OEEs.

None of the brewing firms under consideration has a specific employee responsible for knowledge management in their organization hierarchy. The mean OEE for the sector is 59% which is considered as average operational excellence (SageClarity, 2016). The

average operational excellence is attributed to lack of knowledge and capability among employees leading to loss of production time and other wastages, lack of market share which means equipment and human resource are idle most of the times and poor organization culture that is not focused on continuous improvement. Most of the factors affecting OEE are never learnt by the organization hence the tendency to repeat same mistakes (Jorge & Rabechini, 2011). OEE is a well-known index of measuring operational excellence and effectiveness (Iannone & Nenni, 2015). The cumulative mean for knowledge sharing levels was found to be 1.19 which shows that knowledge is less frequently shared in the brewing firms in Kenya. From the results obtained, we can relate the average OEE to the less frequency of sharing knowledge. There is an opportunity to realize world class operational excellence by paying attention and emphasis on knowledge management. Financial performance for the brewing firms were unknown to respondents apart from East African Breweries Limited which is a publicly listed entity. The knowledge management and operational excellence in the brewing sector is not different from other sectors. The operational excellence in Kenya's manufacturing sector is influenced by knowledge management (Cheruiyot, Jagongo & Owino, 2012).

Chapter Five: Summary, Conclusion and Recommendations

5.1 Summary

Five brewing firms were selected for these research. Two of them, Keroche Breweries Limited and East African Breweries Limited own a market share of over 99 per cent of total beer market in Kenya. The remaining three are craft beer firms with smaller market share. Four out the five firms responded with a completed questionnaire representing 80 per cent response rate. The data obtained was used to calculate knowledge management levels of each firm. A chi square test was done on the knowledge sharing methods that established knowledge sharing was closely associated among the brewing firms. This together with overall equipment effectiveness of the firm was used to create a regression model. The findings indicated that knowledge management has a positive impact on operational excellence of a brewing firm.

Operational Excellence = 0.423 + 0.105 Knowledge Management + error

However, the regression model was not statistically significant since the sample is too small. This therefore, necessitated a correlational analysis that was done to validate the relationship. The results showed a positive and strong correlation between knowledge management and operational excellence.

5.2 Conclusion

The study sought to identify the knowledge management level in the Kenyan brewing sector and analyze the relationship between knowledge management and operational excellence. The findings in this research indicate that knowledge management has a positive impact on operational excellence in Kenya's brewing sector. Although, firms in this sector have similar knowledge areas and ingredients used in their value addition processes, how they manage these knowledge and create new knowledge for innovation

determines their operational excellence levels (Holweg, 2015). Hence, employing knowledge management in the operations management of the firms can lead to sustainable competitive advantage (Rigby, 2009). This research revealed that knowledge management is practiced to a limited extent and firms therefore have to make improvements in this regard. Craft breweries had the least level of knowledge management as the number of employees is very small, hence critical knowledge is concentrated at the owners and the master brewers. Most of the knowledge is shared informally through socialization and personal interaction. Organizations could do more by fostering an open culture based on trust to motivate employees to share knowledge more. The largest brewery in Kenya recorded the highest level of knowledge management as well as the highest operational excellence status. The strong correlation between knowledge management and operational excellence offers brewing firms great opportunity to increase their operational excellence if knowledge management is implemented effectively. The two objectives sought in this study were fully met.

5.3 Recommendations

The results and findings provide valuable information on the firm level knowledge management that operations managers in the brewing firms can leverage to improve the competitiveness of their firms through operational excellence. The management should consider employing a person dedicated in their organization structure to drive knowledge management. They should as well develop policies that integrate knowledge management to their business strategy. The findings are hoped to provide the firm leadership with awareness of knowledge management positive relation to operational excellence and assist them to identify this as an opportunity to improve on their bottom line. The practitioners should ensure knowledge is shared freely in the organization and

is available to the decision maker when and where needed. Intranet and IT databases can facilitate this. Since most knowledge was shared informally, the practitioners should ensure the organizational culture is one that promotes openness and trust among employees. This study can be used by scholars and researchers who would wish to focus on knowledge management and operational excellence. The academics can study other sectors and contribute to existing literature.

5.4 Limitations

This study relied on staff members' perception to determine the level of knowledge management in Kenya's brewing firms which was susceptible to errors associated with biasness. Some information such as profits earned were not obtained as the respondents were not willing to disclose the information or it was not available to them. These were privately owned firms. The research relied on knowledge sharing as an indicator of presence of knowledge management and OEE as the indicator for operational excellence. There is more to knowledge management than knowledge sharing and similarly, there is more to operational excellence and OEE cannot be the only indicator for operational excellence. Future studies with broad indicators of both knowledge management and operational excellence will be useful to enrich this study. The time available for collecting data was also a limiting factor as respondents took longer to respond with some having not responded at the time of writing this research project. The study was focused on brewing sector and not the alcohol manufacturing firms which is broader as it includes spirit products. Furthermore, the study was cross sectional and can only be used to explain the brewing firm at the time of the study.

5.5 Suggestions for Further Research

Based on the results of this study, interested researchers could carry out a similar study focusing on knowledge creation and knowledge storage as elements of knowledge management that influence operational excellence. Also, there are broad indicators of operational excellence that can be included in the study besides overall equipment effectiveness. Further to this study, the researcher could extended to cover all manufacturing firms in Kenya. Future research could carry out independent studies on large brewing firms and craft brewing firms as well, to find out the similarities or differences in knowledge management and operational excellence. Other sectors could be explored in this regard to determine whether knowledge management has an impact on operational excellence. Additionally, it would be important to consider a longitudinal study rather than the cross sectional study that was done and as well consider extending the research geographically to other areas outside Kenya. Researchers could as well extend the study to cover illicit brewers who were not considered in this study.

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Appendix 1

Key Words

Brewing

Knowledge management

Operational excellence

Acronyms

EABL – East African Breweries Limited

KM – Knowledge Management

OPEX – Operational Excellence

Appendix 2

Dear Respondent,

This questionnaire is aimed at collecting data on knowledge management and operational excellence of brewing firms in Kenya. You are kindly requested to fill in the questions following the instructions given. The information you provide will be treated with utmost confidentiality and will be used for the purpose of accomplishing academic goals. Do not include your name anywhere in the questionnaire. Note that there are no wrong or right answers. The questionnaire is designed to address the two objectives of this study outlined in part A and part B as follows:

PART A: LEVEL OF KNOWLEDGE MANAGEMENT IN KENYA'S BREWING FIRMS

i) Who is the knowledge shared with in each of the knowledge areas?

Knowledge Areas	(Please indicate using either **3** – very frequently, **2** – frequently, **1** – Less frequently, **0** – cannot tell)			
	Shared Top Bottom	**Shared Bottom Up**	**Shared horizontally**	**Shared Externally**
beer types				
Barley and malt				
Brewing Water				
Mash conversion				
Milling				

Wort separation and boiling, cooling & oxygenation				
Hop bitterness				
Brewing yeast				
Yeast Handling				
Fermentation theory, vessels, control and beer flavor				
Food Health and safety				
Maturation				
Beer Storage and movement				
Haze stabilization				
Line capacity, design, efficiency reporting and loss control				
Labelling and coding				
Container inspection				
Pasteurization				
Sterile Filtration and Sterile Filling				
Bottling, Canning, Kegging				
Beer Quality parameters				
Evaluation and tasting				
Detergents and sterilants and cleaning-in-place (CIP) systems				
Chemical and hazardous material handling				
Energy and Water conservation				
Packaging waste				
Equipment Maintenance and repair				
Equipment Operation				

ii) How the knowledge is shared in each of the knowledge areas

Knowledge Areas	(Please indicate using either **3** – very frequently, **2** – frequently, **1** – Less frequently, **0** – cannot tell)					
	Emails	**Socialization & Personal Interaction**	**Training**	**Intranet or IT Database**	**One Point Lessons**	**Others (Please Specify)**
beer types						
Barley and malt						
Brewing Water						
Mash conversion						
Milling						
Wort separation and boiling, cooling & oxygenation						
Hop bitterness						
Brewing yeast						
Yeast Handling						
Fermentation theory, vessels, control and beer flavor						
Food Health and safety						
Maturation						
Beer Storage and movement						
Haze stabilization						

Line capacity, design, efficiency reporting and loss control						
Labelling and coding						
Container inspection						
Pasteurization						
Sterile Filtration and Sterile Filling						
Bottling, Canning, Kegging						
Beer Quality parameters						
Evaluation and tasting						
Detergents and sterilants and cleaning-in-place (CIP) systems						
Chemical and hazardous material handling						
Energy and Water conservation						
Packaging waste						
Equipment maintenance and repair						
Equipment Operation						

iii) Does your organization have someone responsible for knowledge manag ☐ ☐

Yes No

PART B: RELATIONSHIP BETWEEN KNOWLEDGE MANAGEMENT AND OPERATIONAL EXCELLENCE

a) What was the overall equipment effectiveness (OEE) for your plant last year? ……
…….

b) How many employees do you have in your firm? …….

c) How much profits did your firm make in the last financial year? ……

End

Thank you for your cooperation.

Appendix 3

Population

1. East African Breweries Limited
2. Keroche Breweries Limited
3. The Big Five Breweries
4. Ozzbeco (K) Ltd
5. Sirville Brewery