

**RAW MATERIALS DELIVERY SYSTEMS AND OPERATIONS
PERFORMANCE OF AGROCHEMICAL FIRMS IN KENYA**

BY

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**A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE
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DECLARATION

I declare that, this is my original work and has not been presented for a study in any University or college.

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Sign_____

Date_____

SUPERVISOR

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

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Date_____

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Above all, I thank God for His grace, provision and seeing me through the project. Individually, I take the formatting errors that would be spotted in this script. My special gratitude goes to my supervisor Dr. X.N. Iraki who tirelessly guided me through the whole process. I would like to acknowledge all the MBA students, colleagues, friends and my family especially for their moral and material support for the completion of this project.

DEDICATION

This project is dedicated to my parents Dr. and Mrs. Josh Odhiambo, who have been my key asset to success and supported me emotionally during the time of the project. I sincerely appreciate their support and prayers that led to the completion of this project within the stipulated timeframe.

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ABSTRACT

The motive behind this study was to investigate the raw materials delivery systems in the agrochemical sector in Kenya and their effects on the operations of the organizations. The objectives of the study were to establish raw materials delivery systems used by agrochemical firms and the relationship between raw materials delivery systems and operational performance of agrochemical firms in Kenya. Descriptive research design was used in this study. The target population for this research was the agrochemical industries in Kenya. The employee in charge of operations in the companies that deal with agrochemicals were targeted. The study relied mostly on primary and secondary data sources. Primary data was collected using structured questionnaires. Employees of Agrochemical firms were respondents of the study. Both postal and electronic questionnaire were used to collect data from respondents. Secondary data was gathered from internal reports, media publications and various internet search engines covering the business process management of Agrochemical firms in Kenya. The Statistical Package of Social Sciences (SPSS) was used to process and analyse the data in order to determine the relationship between the variables. Regression and correlation analysis was used to determine the joint relationship between independent and dependent variables. The study established that raw material delivery systems gave firms a competitive edge despite the poor computerization of systems among agrochemical firms in Kenya. The study established that firms that adopted information management, transport management and handling of raw materials in transit realized operational efficiency and effectiveness. The study concluded that; raw material management is critical to the overall performance of any manufacturing concern. Beside demand and other forces like competitor's actions and general price index; raw material situation in terms of efficient management and effective planning determines the activity level, the turn-over and the ultimate profit in a given company. The study recommended that despite the poor level of computerization among agrochemical firms, managers of manufacturing firms should be responsible in implementing supply chain changes for efficiency and effectiveness of their firms.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Business entities in the world are always geared towards providing goods and services to the customers. Efficient provision of these products requires a seamless operation between the suppliers of the raw materials, the processing and the delivery of the products to the customers. As such, it is essential for business owners, the professionals and the scholars to understand the best delivery systems that can optimize the performance of their operations (Stadtler, 2008). It is also essential for the business owners and the management to determine the relationship between the delivery systems and the efficiency of operations in their companies. In merchandise business operations, the raw materials are transported to the processing site. At the processing site, the raw materials are stored then processed or packaged into finished products. The products are stored and then transported to the outlets that sell them to the consumers (Wisner & Stanley, 2007).

Business operations at a merchandise company are comprised of the supplier of the raw materials, the company processing the raw materials and the consumers. Lummus et al (2001) opines that the logistics of raw materials' delivery systems can best describe the relationship between the three players in the merchandise businesses. Different business entities use different delivery systems. Entities like food companies, service industries, agrochemical businesses, hardware and electronics each have distinct raw materials' delivery architecture. However, generally, the raw materials delivery system can be described as the part of logistics that deals with the planning, the implementation, and the control of the effective and efficient flow of raw materials and the related

information between the point of origin to the merchandize business for processing. An investigation of such systems is important for the improvement of the overall efficiency of business operations.

Ayieko et al (2005) observe that the raw material delivery in the traditional supply chain system in Kenya is hampered by transportation and storage problems. The authors state that the vegetables and fruits products in Kenya are consumed by many customers. However, their delivery from the rural farms to the urban areas is affected by the transport and the storage problems. Poor roads and poor storage systems are cited as some of the problems that affect the supply chain in Kenyan merchandise business.

1.1.1 Raw Materials' Delivery Systems

Raw materials, according to the definition advanced by Wisner & Stanley (2007), consist of purchased assemblies, materials and parts that are delivered by suppliers and used in the manufacture of finished products or services. They include things like wood for cooking, bathroom soaps for hotels, nuts, bolts, chemicals for packaging, fossil fuels and agricultural produce for a retail chain. All these goods are delivered to the company through defined delivery systems. They can be delivered to and stored in an offsite warehouse, in stockrooms located within the facility or directly at the point where they are used.

The raw materials delivery systems include many players. The company ordering the raw materials is a central player in the chain. The suppliers and the other middle people, like agents, also play important roles in the delivery systems of the raw materials. The ordering process, the processing of the raw materials and the transportation to the company, the transit handling of the goods and the storage at the company are vital

elements of the delivery process. The delivery systems affect the quality of the products from the company. If the delivery systems are poorly designed, the company may face a situation of production hold-ups, idle manpower and idle machinery (Stadtler, 2008).

1.1.2 Operations Performance

Operational Performance Management involves the alignment of the various business units within a company in order to ensure the units are helping to achieve a global strategy and a set of centralized goals (Childerhouse & Towill, 2003). Performing organizations achieve their goals by satisfying their customers with superior products and services with minimal costs of production. Manufacturing firms achieve operational effectiveness and efficiency by continuously improving their products and services through improved processes. Firms minimize waste and unnecessary costs within the system by empowering people with appropriate technology and skills to perform (Kannan & Tan, 2005).

Continuous Improvement Process (CIP or CI) is one of the operations performance aspect that focus on ongoing effort of engaged employees and improvement teams to improve information, materials, products, services or processes. These efforts generally seek small step "incremental" improvement over time or larger quick "breakthrough" improvement and change to improve customer value and reduce non value adding activity thus reducing costs, increasing delivery velocity and remaining competitive or relative in a changing global environment (Li & Lee, 1994).

In business operations, the time taken for delivering the raw materials, the quality in which the materials are delivered and the cost are important. Raw materials from the suppliers should thus be delivered in a good form as described by the quality

considerations. As well, they should be delivered in a timely manner within the targeted cost implications. All the stakeholders in the business chain help in ensuring that the raw materials are delivered in an effective way to the business premises (Ghodsypour & O'brien, 2001).

1.1.3 Relationship between Raw Materials Delivery System and Operations Performance

Li & Lee (1994) observe that if raw materials are delivered early enough, as required by the organization, products will be processed on time and sold to fetch profits. In this regard, systems that facilitate early delivery are considered to be part of the elements of effective and efficient business operations. This ensures that there are no delays and disruptions in the production and the delivery of goods to the consumers. Ghodsypour & O'brien (2001) suggest that an organization should consider the cost of delivering the products, the time used to deliver the products and the quality when selecting the raw materials delivery system.

Kannan & Tan (2005) carried out a study in the United States of America in order to understand the factors that influenced the effectiveness of the delivery of raw materials and the products in business operations. The results of the study supported the argument that the supply chain management, the inventory and the quality management were important functions in the effectiveness of the delivery of raw materials and products in business operations. According to the findings, it was concluded that there existed links between the just in time (JIT) philosophy, the supply chain management and the total quality management during the raw material delivery in the business operations.

1.1.4 The Agrochemical Industries in Kenya

The rise of the agrochemical industries in Kenya is traced back to the 1960s. This period saw the emergence of small scale farmers and the farming cooperative societies. This called for the need of repacking the agrochemical products into smaller packs with the subsequent need to train farmers on products and their applications. New foreign companies including BASF, Montedision, DuPont, American Cyanamid, Ciba Geicy, May & Baker, Hoechst and other local companies entered the market. All these entrants joined a group that was known as Pesticide Chemicals Association of East Africa. This association later on changed to the Pesticides Chemicals Association of Kenya. Currently, the agrochemical industry players operate under the Agrochemicals Association of Kenya.

The association has registered companies that deal with agrochemicals and companies that offer support services in the sector. The association has 63 agrochemical firms in Nairobi as part of its membership. Some of the companies import the products and repackage them while others buy the raw materials, process and package them for sale. The agrochemicals are regulated products. The Pest Control Products' Act of 1982, Cap 346, regulates the importation, exportation, manufacture, distribution and use of the products for the control of pests and the organic functions of plants and animals and for connected purposes (AAK, 2011).

1.2 Research Problem

In business operations, the flow of the raw materials is an important process that affects the competitiveness of business. The logistics of the raw materials delivery system are useful in improving the business operations in terms of delivery of quality products in

time and at a considerable cost. An improved delivery process can enhance the competitive edge of the business (Childerhouse & Towill, 2003).

The raw materials delivery systems are different in different business entities. The structure and the form of these systems determine the effectiveness of the business operations in a company. An effective delivery of raw materials from the suppliers to the customers is affected by different factors. An understanding of these delivery systems is essential for the improvement of business operations in companies. Batra et al (2003) explain that the effective integration of the producers of the raw materials, the converters of the raw materials into products and the customers is important in achievement of the just in time deliveries of the raw materials and the components. Such a well-integrated system can make business satisfy their customers. This can lead to improved profitability.

Papageorgiou (2009) carried out a study that was aimed at investigating the supply chain management and optimization in a pharmaceutical industry. The delivery systems of the raw materials for pharmaceutical industry were part of the variables that were studied. In the study findings, the author observed that the pharmaceutical industries have enhanced methodologies for the delivery of the raw materials and products to the pharmacies and the customers respectively. Effective delivery systems were reported to be essential because they helped avoid uncertainty in the operations of the pharmaceutical industry.

Gao & Tang (2003) carried out a study aimed at investigating the raw materials delivery system in the steel industry. In the study, the authors found out that cost of purchasing the raw materials was central to the raw material delivery system. A multi-objective linear programming model was identified as the major guide to the delivery system in

the steel industry. This model defines the selection of vendors and the ordering quantity. The steel industry uses this model and the numerical computational result to come up with the major decisions in delivery of raw materials. As a result, a system coming from this model helps in minimization of costs and improvement of profits.

Kimunguyi (2013) carried out a study with an aim of understanding the strategies that the agrochemical companies in Kenya adopt to deal with the challenges of distribution systems of their products. In this study, the author found out that the agrochemical industries faced challenges from the pressure exerted by the environmental groups. The companies adopt operational strategies that limit costs. They also adopt green supply chain in their operations which help reduce the operations' costs. This study is important because it focuses on the operations performance of the agrochemical industries and the supply chain of the products. However, it does not focus on raw materials delivery.

Muyanga and Jayne (2008) came up with studies aimed at the effect of the policies on the operations of the agro produce industries in Kenya. Part of the results showed that the government's decisions affected some of the elements of the supply chain functions in the agrochemical industries. Road construction and other transport levies were said to directly impact on the delivery systems of the industries. This study partly explains some of the factors that affect the delivery systems in the agrochemical industries in Kenya. However, they fall short of giving a full explanation of the link between the delivery systems and the operations' performance.

The studies mentioned in this section are important because they have discussed the issues of the delivery of raw materials and their effects on some aspects of the operations in organizations. However, the studies do not focus specifically on the

delivery systems of raw materials in the agrochemical industries in Kenya. This study intends to bridge this gap by investigating the raw materials delivery systems in the agrochemical sector in Kenya and their effects on the operations of the organizations.

1.3 Study Objective

This study intended to investigate the delivery systems of raw materials in the agrochemical industries and their effects on the efficiency of operations. The specific objectives included:

- i. To establish raw materials delivery systems used by agrochemical firms in Kenya
- ii. To determine the relationship between raw materials delivery systems and operational performance of agrochemical firms in Kenya.

1.4 Significance of the Study

The results of this study would be important to different parties. The organizations that deal with the merchandize business would use the results to improve the business operations. The results would help the businesses understand the delivery systems that can lead to the effectiveness of business operations. Such understanding would help them improve their business operations.

The researchers can use the results of the study to further their research work. Researchers who wish to do more studies about the delivery systems of raw materials and their effects on the performance of the agrochemical industries would use the information to do a literature review for future studies. The agrochemical industry is an important component of the Kenyan economy and most researchers across the world

would be interested in the delivery systems that would make the industry more prosperous.

The agrochemical firms in Kenya can also benefit from the results of the study. With an established relationship between the delivery systems and the operations performance of the firms, improvements can be put in place to ensure that profitability has been realized in the business. The firms can also benchmark their performance against the delivery systems that produce good results in terms of operations.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In this chapter, a literature review of the topic under discussion was carried out. The review includes a discussion of the components that make up the raw materials delivery systems. The discussion will focus on information management in delivery systems, transportation and materials handling and the storage. In the chapter, journal publications, books, reviews and other works relevant to the study were discussed. The chapter is organized in six sections.

2.2 Raw Materials Delivery Systems

Raw materials management is an ever evolving, increasingly complex and crucial part of any manufacturing process in the agrochemical industry. One of the crucial goals of Supply Chain Management is to ensure smooth flow of raw materials from the suppliers to the companies. To realize this goal, SCM strives to create good relations with both their suppliers and their customers. With effective coordination between the three parties, consumer satisfaction and productivity is enhanced. Again, unnecessary time wastage is avoided and the ultimate goal of profit maximization is achieved. To encourage good buyer and supplier relationships, significant strategies are acted upon. The strategies include quality management and timely deliveries among others (Boyer & Verma, 2009)

Vonderembse & Tracey (1999) carried out a study to investigate the degree in which manufacturers use supplier involvement and supplier selection criteria in enhancing productivity. The findings supported the claim that firms which employ the two

practices pride themselves in higher manufacturing and supplier performance. Supplier criteria involve analyzing a supplier's ability to meet their end of the bargain without a breach of contract or cases of low standard performance. Supplier involvement on the other hand refers to seeking supplier ideas when the firm wants to come up with new product designs or in the continuous improvement effort.

Once a firm has settled on particular suppliers, it expects timely deliveries. Here, the supplier must avoid delays in delivering the raw materials to the manufacturer. As well, the manufacturer must deliver the finished goods to the consumers without delay. The need to make items of the right quality, right quantity, at the right time and in the right place has led to the adoption of JIT philosophy. In a realm of supply chain management, JIT refers to an inventory strategy used in improving business's returns on investment through reduction of in process inventory and all related costs (Vokurka &Lummus, 2000).

JIT is becoming important due to the increased competitiveness in the business sector. Markets have become dynamic and customer-driven. Consumers are demanding better quality and variety of goods and services. Included in their demands, are high degrees of reliability and fast delivery. In an effort to deal with competition, manufacturers embrace the JIT techniques. Here, new stocks are ordered only when stocks have dropped to the re-order level and not beyond it. This enables the companies to minimize their operational costs, waste products and excess stock. According to Vokurka & Lummus (2000), JIT systems are very essential tools for firms to ensure quality in all stages of raw materials delivery. With JIT, manufacturing workmanship, vendor quality, design quality and product quality are enhanced. Apart from quality, a JIT

environment is conducive for development of good buyer-supplier relations and customer relationships.

Otila (2011) carried out a study with a purpose of determining the supply chain practices adopted by the cosmetic industry in Kenya. The findings showed that there is a major use of consistent performance measures across all areas of the supply chain. As well, the Kenyan cosmetic firms have widely adopted supplier involvement in their operation. However, the research findings suggest that more supply chain practices need to be adopted by these firms. Among these practices is the need for management to exchange transaction data by use of ICT. Accurate forecasting of the market demand needs to be given priority. Lastly, outsourcing of services should be given a deeper thought. All these can improve the delivery systems of the raw materials and improve the operations. The information management, the transportation management and the handling of raw materials in transit are important factors that can be used to define the delivery systems of raw materials.

2.2.1 Information Management in Raw Material Delivery Systems

The supplier of raw materials can only respond to the information supplied to him by the buyers. As such, the way in which the information about raw materials' demand from the buyer is managed affects the delivery systems. When handling information about the delivery of raw materials, issues like the quantity needed, the quality and the time of delivery are essential to the delivery system. Vastag & Clay (2005) observe that information management in the delivery of raw materials can have a knock on effect on other aspects of business in an organization. The authors state that studies have indicated that the performance of an organization is related to an array of management techniques.

Effective information management techniques have positive knock on effect on the other operations in the organization.

Forecast of demand is an important process in the information management of the raw materials delivery systems. The supplier can only deliver the raw materials that he has been requested to supply. It is essential for the buyer to come up with an accurate forecast of the quantity of the raw materials that are required for processing or packaging.

The company has to keep enough raw materials to cater for any event that the suppliers fail to meet their delivery obligations. The ordering costs should be considered during demand forecast management. The ordering costs should be economized. In the logistics of raw materials delivery, an organization incurs costs while ordering for the delivery. One of the ways of reducing the costs is to reduce the amount of times that the deliveries are ordered. An optimized information management in the raw materials delivery system helps reduce such costs (Tony, 1997).

In technology driven information management systems, focus is put on the integration of the procurement, logistics and operations in an organization. This process requires a frictionless coordination of information and raw materials' flow from the supplier to the buyer. It is essential for an organization to have a corporate portal that can be accessed by the suppliers of raw materials. Through this portal, it is easy for the suppliers to have access to the databases, relevant workflows and the application systems (Vastag & Clay, 2005).

These portals should be tailored to suit specific raw materials delivery processes, depending on the industry. Information technology thus comes out as one of the basic elements of effective information management in the raw materials delivery systems. Information technology has expanded the traditional communication systems through the integration of new electronic channels like web, wireless and the voice technologies. This has enabled a seamless integration and automation of the manual tasks and processes through the use of the internet (Turban et al, 1997).

Lussier (2011) introduces the concept of materials requirement planning as part of the essential component of information management in the delivery systems of raw materials. According to the author, the materials requirement planning is a system that integrates the operations and the inventory control with complex ordering schedule. It includes developing a process for the ordering of the raw materials and the related components at the right time and in their right quantity. This planning generates information that enables the business operations to come up with smaller orders with less lead time. Firms that have different delivery systems and lead times are encouraged to use the materials requirement planning in order to generate information that can be used to effectively manage the raw materials delivery systems.

2.2.2 Transportation Management in Raw Materials Delivery Systems

Transport and logistics is an integral part of the delivery of raw materials in any organization. Good transportation management is bound to come up with a proper delivery system. The issue of transport management is focused both on the supplier and the buyer of the raw materials. The transport management system can be adopted by organization in order to streamline the delivery processes of their raw materials.

Here, four important processes should be emphasized upon. The first process is the planning and the decision making. This process defines the most efficient transport scheme according to given parameters. These parameters are dictated by the user policy. The user policy may include considerations of the transport cost, shorter lead times, flows regrouping coefficient and fewer stops possible to ensure quality of the materials delivered (Waldmann & Stocker, 2007).

The transportation execution is also an integral process in the transport management system. The system allows for the execution of the transportation plan like the carrier rate acceptance and the carrier dispatching. The third process of the system is the transport follow-up. This system allows the following of any physical or administrative operation regarding the transportation. It allows for the traceability of the transport event by event. It also allows for traceability of customs clearance, editing of reception, invoicing and booking documents and sending transport alerts. Alert may include accidents, delays and non-forecast stops. The last process in the transport management system is the measurement. This sets key performance indicators reporting function for the transport (Cordeau et al, 2006).

The transport management system can be used to meet various functions. The functions include but not limited to planning and optimization of terrestrial transport rounds, inbound and outbound transportation mode and transportation provider selection, management of motor carrier, rail, air and maritime transport, real time transportation tracking, service quality control in the form of key performance indicators, vehicle load and route optimization, transport costs and scheme simulation, shipment batching of orders and cost control.

All these can be utilized to improve the delivery systems of raw materials. In the raw materials delivery systems, the typical key performance indicators include the percentage of On Time Pick Up or Delivery Performance relative to requested, the Cost Per Metric - mile; km; Weight; Cube; Pallet, Productivity in monetary terms, for instance, cost per unit weight or shipping unit and productivity in operational terms, for example, shipping units/order or weight/load (Gubbins, 2003).

From the discussion, it is clear that the management of the transportation of raw materials contributes immensely to the success of the raw materials delivery in an organization. If the transportation is not well managed and coordinated, there may be delays in delivery. Such delays may compromise the quality of the materials being delivered. For instance, some raw materials may be having short expiry periods. Such materials have to be delivered within the optimum time to ensure that they do not spoil.

2.2.3 Handling of the Raw Materials in Transit and on Site Storage

While in transit, it is important that the raw materials be handled with care. This ensures that they reach their destination in their best quality. Sometimes, the delivery of the raw materials may be carried out through different transport modes. For example, materials may be shipped from overseas using ocean transportation. At the port, the materials may be offloaded onto tracks, containers or railway wagons. The handling processes between these changing points should be carried out in a manner that will not tamper with the quality of the raw materials in transit (Bowersox et al, 2002).

The equipment used to handle the raw materials determines the quality of the handling process. The materials' handling equipment ranges from simple carts and wheelbarrows to highly sophisticated equipment like cranes and forklifts.

Power trucks and forklifts are used for the lifting of bulky or heavy loads. The handling is in connection with trailers that transport the raw materials along particular routes for distribution. Conveyers and monorails are also used to transfer materials over a short distance. These systems are either powered artificially or through gravity. The use of containers during delivery of raw materials minimizes the amount of handling needed for materials during the transit period. It also maximizes efficiency because transportation is carried out in large units (Stock & Lambert, 2001).

Mital (1997) contributes to the materials handling debate by defining the materials handling as the art and the science of conveying, elevating, positioning, transporting, packaging and storing of materials. Raw materials are handled from the stage they are loaded onto the transportation mode from the supplier to the time they are stored at the site storage of the buyer. The handling of materials while in transit should be carried in a careful manner that it can improve the productivity in an organization.

The handling systems should be developed in such a manner that they should reduce wastage and promote cleaner and easier handling. As well, they should be handled with an aim of improving safety and minimizing accidents. The issue of safety and accidents should be strongly emphasized upon especially when it comes to dealing with products like chemicals and petroleum. Poor handling of these materials while in transit may lead to accidents that may be fatal (Vastag & Clay, 2005).

The storage for raw materials is part of the raw materials delivery system. Once the raw materials have been transported and handed to the buyer, they should be stored in a proper manner. This ensures that they are kept in good conditions and handed over for processing when required.

Here, the materials should be stored in the required condition. The temperature, light intensity and humidity should be to the prescribed standards. Aeration is also of chief importance when storing the materials (Stock & Lambert, 2001).

2.3 Effects of Raw Materials Delivery Systems on the Operational Performance of an Organization

An elaborate and efficient delivery system for the raw materials in an organization can help improve the operational performance. Factors that determine the operational performance of an organization include but are not limited to cost of getting the raw materials, the timeliness of delivery of the raw materials for the processing, the quality of the raw materials delivered, customer satisfaction and the quantity of the materials. All these can be affected by the delivery system adopted by an organization (Mahadevan, 2010).

The means used for transporting the raw materials to the organization is a determining factor in the operations efficiency. Some transportation systems like the use of airplanes help deliver the raw materials on time. This ensures that the organization has had the required inputs for the products. If the inputs are delivered on time because of the use of a faster and efficient system like the aviation, the goods are produced and sold to customers on time. This improves customer satisfaction. However, such a system is also risky because a mishap can lead to the destruction of all the goods. The raw materials cannot survive an air accident. Transport systems like the train and the ships may be slow in delivering the goods. Such delays may be due to breakdowns and poor states of roads (Kumar & Suresh, 2006).

The model used to select the delivery systems can help minimize the costs of operations in an organization. Models like linear programming and economic order quantity are essential in the minimization of the costs of operations. Systems that use such models optimize on all the variables of the raw materials delivery systems. The mode of communication used in the delivery systems also determines the quality and the quantity of raw materials that an organization receives from the suppliers. As such, efficient communication models should be adopted to ensure that the suppliers of raw materials give the best quality. High quality raw materials lead to high quality products which in turn improve customer satisfaction, sales and profitability (Mahadevan, 2010).

Performance measurement systems design a short-term aspect, which arises from the necessity to cope with machine shutdowns due to equipment or quality problems. Perhaps the best known performance measurement framework is Kaplan and Norton's (2009) balanced scorecard which is based on the principle that a performance measurement system should provide managers with sufficient information to address the questions: how do we look to our shareholders (financial perspective)?, what must we excel at (internal business perspective)?, how do our customers see us (customer perspective)? and how can we continue to improve and create value (innovation and learning perspective)?

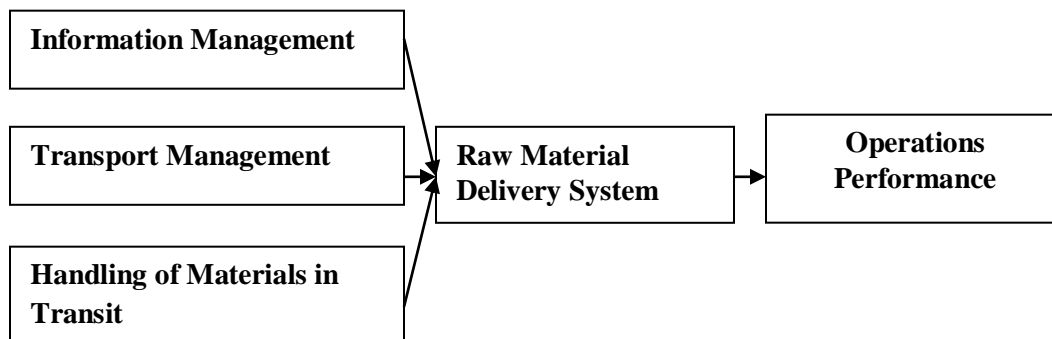
2.4 Summary

This chapter reviewed literature about the raw materials delivery systems. In the analysis, it was determined that an efficient delivery system of the raw materials should have an elaborate transport management system, information management and proper handling of the materials while in transit. The review of the literature shows that robust

raw materials delivery systems should be all inclusive in decision making. They should involve all the stakeholders. Lean manufacturing, agile manufacturing, the JIT techniques are some of the processes that should be adopted by organizations during the design of delivery systems in order to satisfy customers.

The raw materials delivery systems in the regulated sectors like the agrochemical industry require more planning and processes than the conventional sectors. The health, safety and environmental factors should be considered when planning the supply chain systems of regulated sectors. In the regulated sectors, the delivery of raw materials determines whether the products conform to the prescribed standards or not.

2.5 Conceptual Model



(Source: Author, 2015)

From the conceptual model, it is clear that information management, transportation management and handling of goods in transit are the independent variables that contribute to the operations performance of the agrochemical industries in Kenya. The three elements form part of the raw materials delivery systems which is the intervening variable that affects the operations performance of an organization.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the methods that were used in data collection for the research are discussed. These methods aimed at obtaining information about the raw materials delivery systems in the agrochemical industries in Kenya. The chapter explains the research design, the target population, data collection instruments and the method of data analysis.

3.2 Research Design

Descriptive research design was used in this study. This design involved collection of data from selected respondents in order to determine the current status of that population with respect to one or more variables (Cooper & Schindler, 2008). The study was used to support inferences of cause and effect. In the research, the design helped to create a cause and effect relationship between the delivery systems and the operations performance (Babbie, 2013).

The use of descriptive design in this study enabled the researcher to find out information without manipulating the variables that relate to the process of supply chain management. As well, this design was given an incisive analysis of the raw materials delivery systems in agrochemical industries and their relationship with the efficiency of business operations. Given that the human mind cannot extract large volumes of data, descriptive statistics are important for reducing the available data to manageable forms. When using this design, an in-depth and narrative description of numbers organizes the data into patterns that are easy to understand.

The descriptive research has a weakness in confidentiality. Subjects may not be frank and truthful because they may dwell on saying only what the researcher wants to hear (Krishnaswami, 2003).

3.3 Population of the Study

The target population for this research was the agrochemical industries in Kenya. The employee in charge of operations in the companies that deal with agrochemicals were targeted. According to the Agrochemicals Association of Kenya, there were 63 registered companies in Nairobi which dealt with the agrochemical products (AAK, 2014). Given that the number of the respondents was small, the study was a census. All the members of the Agrochemicals Association of Kenya in Nairobi that deal directly with the products were targeted.

3.4 Data Collection

The study relied mostly on primary and secondary data sources. Primary data was collected using structured questionnaires. Employees of Agrochemical firms were respondents of the study. The questionnaire sought to understand the elements of raw materials delivery systems in each organization. As well, the questionnaire tested various elements of operations at the firm. These included the cost of operations, the time used to deliver the products and the storage charges.

Both postal and electronic questionnaire were used to collect data from respondents. The questionnaire were administered during working hours of the week at firm premises. Drop and pick later method was applied where respondents did not have enough time to respond immediately.

Secondary data was gathered from internal reports, media publications and various internet search engines covering the business process management of Agrochemical firms in Kenya. Permission to access office circulars, logistical/ distribution files and manuals and other relevant documents was initiated through the Head of Operations.

3.5 Data Analysis

To permit quantitative analysis, data was converted into numerical codes representing attributes or measurement of variables. Descriptive statistics technique was chosen because it made it possible to show the distribution or the count of individual scores in the population for a specific variable. The Statistical Package of Social Sciences (SPSS) was used to process and analyze the data in order to determine the relationship between the variables. Descriptive statistics such as frequency distributions, percentages and frequency tables were used to summarize and relate variables which were attained from the administered questionnaires. The data collected and analysed was presented in the form of tables. Specifically, regression and correlation analysis was used to determine the joint relationship between independent and dependent variables.

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the analysis of the data collected from the respondent and discusses the research findings on raw materials delivery systems and operations performance of Agrochemical firms in Kenya. All completed questionnaires were edited for accuracy, uniformity, consistency and completeness. The response rate of 95% respondents was achieved from the total target of 63 Agrochemical firms. This good response was attributed to the fact that quite a good number of the respondents were knowledgeable to fill the postal and electronic questionnaires. According to Mugenda and Mugenda (2003) the sample size should be as large as possible so as to produce the salient characteristics of the accessible population to an acceptable degree. The sample size should be in such a way that it is within plus or minus 0.05 of the population proportion with a 95 percent level of confidence as given by Krishnaswami, (2003).

Summaries of data findings together with their possible interpretations were presented by use of mean, percentages, frequencies, variances, standard deviation and tables. The objectives of the study were to: establish raw materials delivery systems used by agrochemical firms in Kenya and to determine the relationship between raw materials delivery systems and operational performance of agrochemical firms in Kenya.

4.2 Organization Demographics

4.2.1 Period of Operation

The respondents of the study were asked to indicate the period which their firms had operated in Kenya and the following were the findings as shown in Table 4.1

Table 4.1 Period of Operation

Period of Operating	Frequency	Percentage (%)	Cumulative
0-1 year	0	0	0
2-5 years	13	22	22
6-10 years	23	38	60
11-15 years	13	22	82
16-19 years	6	10	92
20 and above years	5	8	100
Total	60	100	

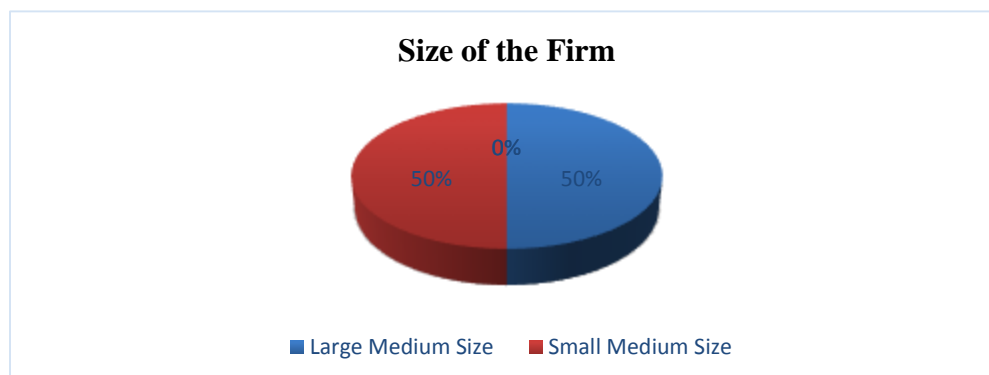
Source: Research data

As shown in Table 4.1, 22% of the respondents indicated that they had been operating in Kenya for a period of between 2-5 years. 38% of the respondents indicated that they had been operating in Kenya for a period between 6-10 years. 22% of them indicated that had been operating in Kenya for a period of between 11-15 years due to quality products. 10% of them had been operating in Kenya for a period of between 16-19 years due to continuous improvement practices. And finally, 8% of them had been operating in Kenya for a period above 20 years.

4.2.2 Size of the Firm

The respondents of the study were asked to indicate the size of their firms in Kenya and the following were the findings as shown in Figure 4.1:

Figure 4.1 Size of the Firm



Source: Research data.

As shown in Figure 4.1, 50% of the agrochemical firms were large sized while 50% of them were small sized. This mixture provided good data for analysis.

4.4 Transport Management Systems and Operations Performance

4.2.3 Mode of Delivering Raw Materials to Premises

The respondents of the study were asked to indicate the mode of delivering raw materials to their firms and the following were the findings as shown in Figure 4.2:

Table 4.2 Mode of Delivering Raw Materials to Premises

Mode of delivery	Frequency	Percentage (%)
Airplane	0	0
Trucks	32	53
Pick Ups	10	16
Railway Wagons	11	18
Ships	7	13
Total	60	100

Source: Research data

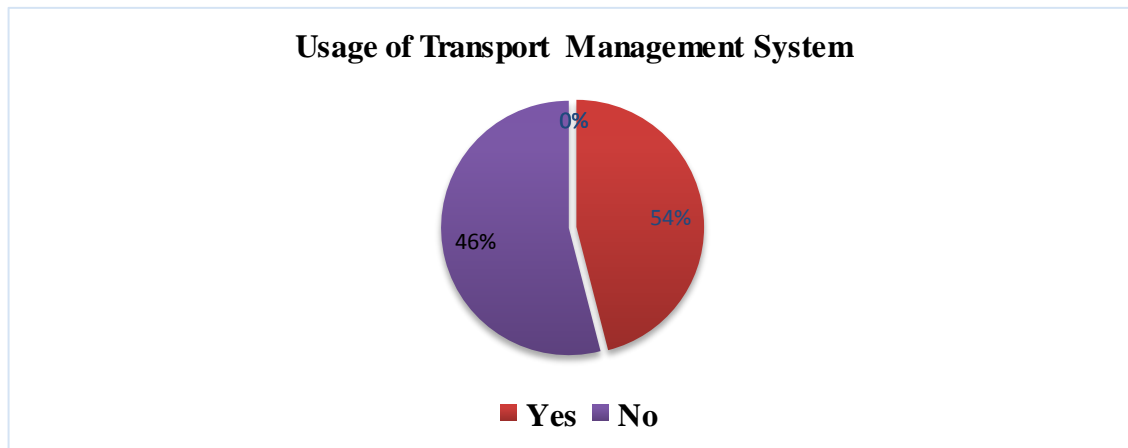
As shown in Table 4.2, majority (53%) of the respondents indicated that they transported raw materials using trucks. This was due to convenience and affordability of the associated mode of transport to agrochemical firms in Kenya. 18% of them indicated that they used railway transport due to the nature of their products and cost. 16% of them indicated that they used pick ups to transport materials despite their small capacity to handle large quantities of raw materials at a given point of time. 13% of them indicated that they used ships to transport raw materials incase of long distances. They preferred mode of transport based on customer demands and speed of production and processing.

According to the objective of the study, it was observed that agrochemical firms in Kenya preferred transporting their raw materials using road transport due to lack of alternative channels of transportation that is more efficient and effective. Delays experienced from railway wagons and high costs of air transport contributed to agrochemical firms to opt to use road transport. On the other hand, agrochemical firms in developed countries like Japan and China use raw material delivery systems which are integrated with modern technologies to increase efficiency and effectiveness. Electric trains and refrigerated vans are used to transport raw materials.

4.2.4 Usage of Transport Management System

The respondents of the study were asked to indicate whether they used transport management system in their logistical activities and the following were the findings as shown in Figure 4.2:

Figure 4.2 Usage of Transport Management System



Source: Research data.

As shown in Figure 4.2, majority (54%) of the respondents indicated that they used transport management system in order to minimize logistical costs of operation while 46% of them indicated that they were still using manual systems of transport due to costs associated with transport systems and equipment.

4.2.5 Extent to which Transport Management System Improve Operations Performance

The respondents of the study were asked to indicate the extent to which transport management system improved operations performance of their firms and the following were the findings as shown in Table 4.3:

Table 4.3 Transport Management System and Operations Performance

Statements	N	Very True + True	Somehow true	Not true	Total	S.E
		[3]	[2]	[1]		
The adoption of transport management systems helps improve the time of product delivery to clients.	60	84.3	8.1	7.6	100	.134
Transport management system helps reduce the cost of storage of the raw materials at the firm	60	90.4	9.6	0.00	100	.121
The use of transport management systems improves the quality of the products delivered to the clients	60	91.0	6.4	2.6	100	.118
The use of transport management systems helps reduce the idle time of equipment and employees	60	91.4	5.3	3.3	100	.111
Valid N (list wise)	60					

Source: Primary data

As shown in Table 4.3, 84.3 % of the respondents interviewed indicated that adoption of transport management systems helped the firm to improve the time of product delivery to clients. Clients received the right product at the right time and in the right form without delay due to integration of technology in the supply chain. Timely exchange of information concerning products required by the firm was facilitated using modern information communication technologies. 90.4% of them indicated that their firms

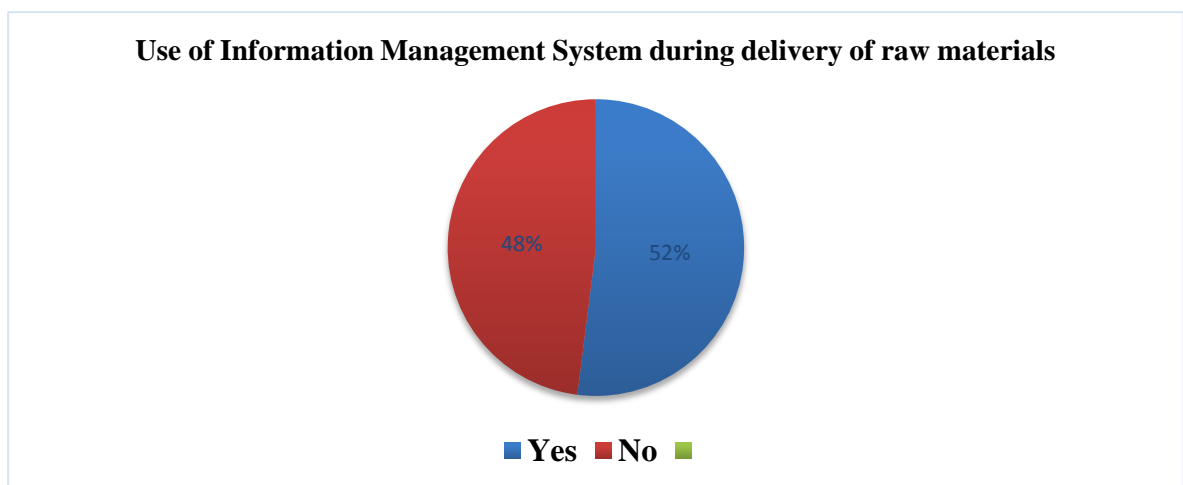
realized reduced costs of raw material storage due to accurate forecasting of products required in the market using system forecasting techniques.

91% of them indicated that transport management systems that were used by their firms improved the quality of the products delivered to the clients. This was as a result of maintaining product integrity while on transit from the point of production to the point of consumption. 91.4% of them also indicated that their firms used transport management system to reduce idle time of equipment and employees. Increased productivity and maximization of capacity improved overall operations performance.

According to the objective of the study, transport management system adopted by agrochemical firms in Kenya contributed significantly to their performance in terms of time management, reduced costs of storage, improved quality of delivered products and effective utilization of resources.

4.5 Information Management Systems and Operations Performance

Figure 4.3 Usage of Information Management System during delivery of Raw Materials



Source: Primary data

As shown in Figure 4.3, majority (52%) of the respondents indicated that their firms used information management systems during delivery of raw materials while 48% of them indicated that they did not use information management systems during delivery of raw materials due to high costs associated with equipment.

The respondents of the study were asked to indicate the extent to which information management system improved operations performance of their firms and the following were the findings as shown in Table 4.4:

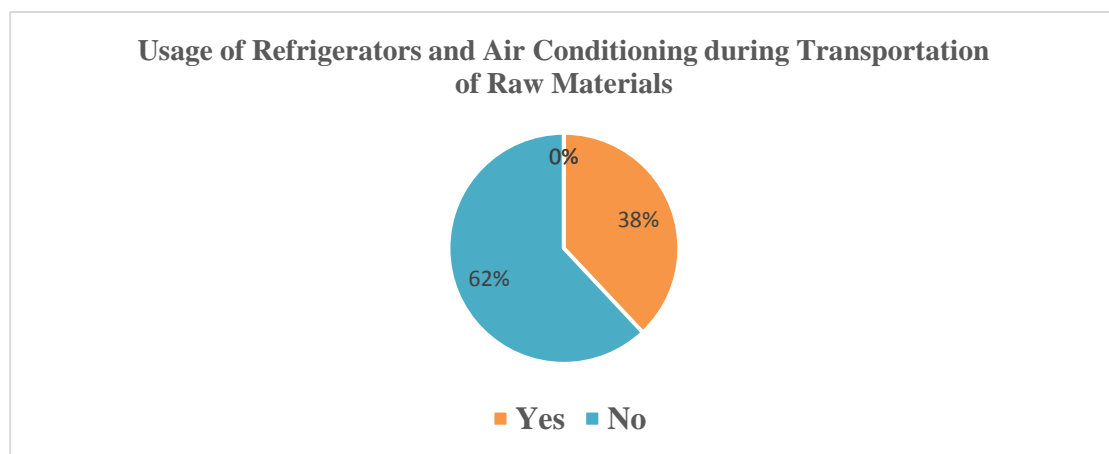
Table 4.4 Information Management Systems and Operations Performance

Statements	N	Very True + True [3]	Somehow true [2]	Not true [1]	Total	S.E
The use of proper communication systems improves the quality and quantity of the materials delivered in your organization	60	90.0	6.6	3.4	100	.154
The use information management systems during delivery of raw materials improve the delivery time of the materials.	60	89.3	10.7	0.00	100	.121
The use of demand forecasts reduces the cost of handling and storing goods in the firm.	60	93.7	3.2	3.1	100	.148
The use of a corporate portal shared between suppliers and the firm helps reduce idle time of equipment and employees due to the improved delivery times of raw materials.	60	84.0	10.4	5.6	100	.134
Valid N (list wise)	60					

Source: Primary data

As shown in Table 4.4, 90% of the respondents suggested that application of appropriate communication systems improved the quality and quantity of the materials delivered in their organization. 89% of them also argued that their firms used information management systems during delivery of raw materials in order to improve the delivery time of the materials. This was as a result of customer demand and expectation after making an order. 93.7% of them suggested that their firms used demand forecasts in order to reduce the cost of handling and storing goods in the firm. Information systems provided an opportunity to anticipate demand and supply forces in the market. In addition, 84% of them indicated that the use of corporate portal shared between suppliers and the firm helped them to reduce idle time of equipment and employees thus increased productivity and maximum utilization of capacity. According to the objectives of the study, it is observed that adoption of management information systems by agrochemical firms in Kenya was highly recognized as it contributed to improved performance in terms of quality and quantity of the materials delivered, delivery time, demand forecasting and storage, supplier integration with agrochemical firms and equipment utilization.

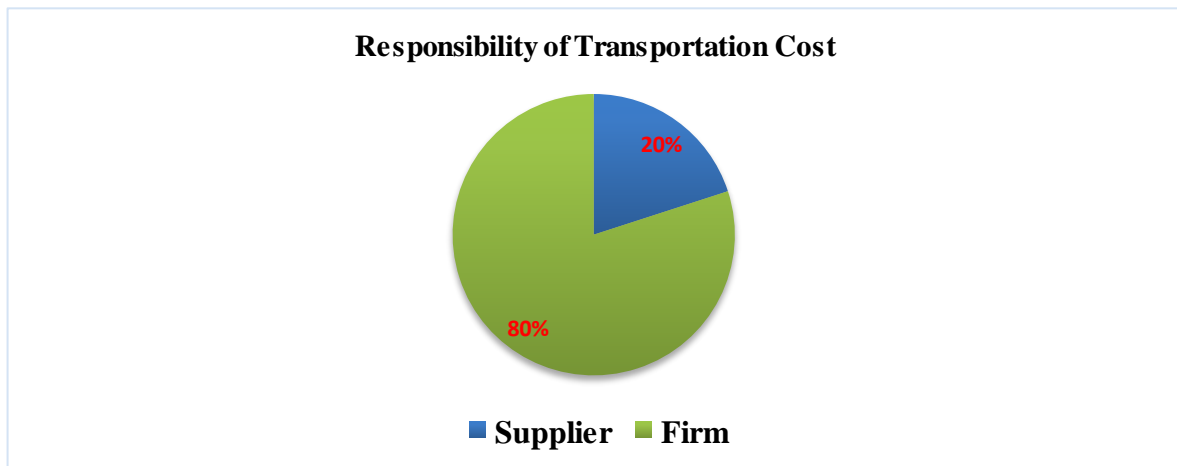
Figure 4.4 Usage of Refrigerators and Air Conditioning Systems When Transporting Raw Materials



Source: Primary data

As shown in Figure 4.4, 62% of the respondents clearly indicated that their firms used refrigerators and air conditioning during transportation of the raw materials. This was due to retaining product integrity from the point of production to the point of consumption. While 38% of them indicated their firms did not use refrigerators and air conditioning during transportation of the raw materials due to high costs associated with equipment. The data shows that a lot of sensitive or perishable raw materials are used in agro chemical firms in Kenya.

Figure 4.5 Responsibility of Transportation Cost



Source: Primary data

From Figure 4.5, 80% of the respondents indicated that the responsibility of transportation cost was catered by the firm while 20% indicated that the cost was catered by the supplier. The firm was willing to cater for the transportation costs where the supplier had no capacity to supply raw materials using appropriate equipment while suppliers with adequate equipment and well established were willing to cater for the transportation costs. According to the objective of the study, it was observed that agrochemical firms operating in Kenya did not have co-partnerships with their suppliers

in the industry to improve their performance. Contrary to expectations, there was little integration among suppliers.

4.6 Material Handling in Transit and Operations Performance

The respondents of the study were asked to indicate the extent to which material handling during transit improved operations performance of their firms and the following were the findings as shown in Table 4.5:

Table 4.5 Material Handling in Transit and Operations Performance

Statements	N	Very True + True [3]	Somehow true [2]	Not true [1]	Total	S.E
The use of proper materials handling equipment like air conditioners and refrigerators helps improve the quality and quantity of the materials delivered in your organization	60	91.0	5.00	4.00	100	.154
The use of better handling facilities during the delivery of raw materials reduces the cost of operations in the firm.	60	91.0	9.0	0.00	100	.121
Valid N (list wise)	60					

Source: Primary data

As shown in Table 4.5, 91% of the respondents indicated that they used proper materials handling equipment like air conditioners and refrigerators in order to improve the quality and quantity of the materials delivered in their organization thus quality customer service delivery. 91% of them indicated that the use of better handling facilities during the delivery of raw materials reduced the cost of operations among their firms.

According to the objectives of the study, agrochemical firms are striving to fully adopt new raw material handling systems in order to improve the quality and quantity of materials delivered. Usage of technology and advanced equipment will enhance performance of agrochemical firms.

4.7 Regression Analysis

In addition, the researcher conducted a multiple regression analysis so as to test relationship between raw materials delivery systems and operational performance of agrochemical firms in Kenya. The researcher applied the statistical package for social sciences (SPSS V 20.0) to code, enter and compute the measurements of the multiple regressions for the study.

Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (Operations Performance of Agrochemical firms in Kenya) that is explained by three independent variables (Information Management, Transportation Management and Handling of the Raw Materials in Transit).

4.8 Model Summary

Table 4.6: Model Summary

Model	R	R²Square	Adjusted R Square	Std. Error of the Estimate
1	0.923	0.852	0.789	0.6273

Source: Research data

The three independent factors that were studied, explain only 85.2% of operations performance of agrochemical firms in Kenya as represented by the R^2 . This therefore means that other factors not studied in this research contribute 14.8% of operations performance of agrochemical firms in Kenya. Therefore, further research should be conducted to investigate the other factors (14.8%) that influence operational performance of agrochemical firms among the 63 agrochemical firms in Kenya.

4.9 Relationship between Independent and Dependent Variables

Table 4.7: Coefficient of Value

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig. P-Values
		B	Std. Error	Beta		
1	(Constant)	1.139	1.2235		1.515	0.0133
	Information Management	0.887	0.1032	0.152	4.223	0.0122
	Transportation Management	0.645	0.2178	0.116	3.236	0.0111
	Handling of the Raw Materials in Transit	0.429	0.1837	0.113	3.126	0.0141

Source: Research data

As shown in Table 4.7, 0.852 explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (Operations Performance of Agrochemical firms in Kenya) that is explained by all the three independent variables (Information

Management, Transportation Management and Handling of the Raw Materials in Transit). Multiple regression analysis was conducted to determine the relationship between Operations Performance of Agrochemical Firms in Kenya and the three variables.

At 5% level of significance and 95% level of confidence, Information Management had a 0.0122 level of significance, Transportation Management showed a 0.0112 level of significance and Handling of the Raw Materials in Transit showed a 0.0111 level of significance. After regression analysis, it can be concluded that there is a positive relationship between independent variables (Information Management, Transportation Management and Handling of the Raw Materials in Transit) and dependent variable (Operations Performance of Agrochemical firms in Kenya).

4.10 Discussion of the Findings

The study established that information management systems contributed to improved operations performance of agrochemical firms in Kenya. This is supported by Vastag & Clay (2005) who argue that effective information management techniques have positive knock on effect on the other operations in the organization. The information about how raw materials demand from the buyer is managed affects the delivery systems. When handling information about the delivery of raw materials, issues like the quantity needed, the quality and the time of delivery are essential to the delivery system.

Further, Tony (1997) postulates that in technology driven information management systems, focus is put on the integration of the procurement, logistics and operations in an organization. This process requires a frictionless coordination of information and raw materials flow from the supplier to the buyer.

It is essential for an organization to have a corporate portal that can be accessed by the suppliers of raw materials. According to Lussier (2011), planning generates information that enables the business operations to come up with smaller orders with less lead time. Firms that have different delivery systems and lead times are encouraged to use the materials requirement planning in order to generate information that can be used to effectively manage the raw materials delivery systems.

The study found out that majority of agrochemical firms in Kenya used transport management in raw materials delivery systems to enhance service delivery to their clients at the right time, in the right place and form. This is supported by Waldmann & Stocker (2007) from literature review who argue that transport and logistics is an integral part of the delivery of raw materials in any organization. Good transportation management is bound to come up with a proper delivery system. The issue of transport management is focused both on the supplier and the buyer of the raw materials. Further, Cordeau et al (2006) concurs that in the raw materials delivery systems, the typical key performance indicators include the percentage of On Time Pick Up or Delivery Performance relative to requested, the Cost Per Metric - mile; km; Weight; Cube; Pallet, Productivity in monetary terms, for instance, cost per unit weight or shipping unit and productivity in operational terms, for example, shipping units/order or weight/load.

The study identified that proper handling of the raw materials in transit improved the operations performance of agrochemical firms in Kenya. This is supported by Bowersox et al (2002) who argue that, while in transit, it is important that the raw materials be handled with care. This ensures that they reach their destination in their best quality.

Sometimes, the delivery of the raw materials may be carried out through different transport modes. Further, the handling processes between these changing points should be carried out in a manner that will not tamper with the quality of the raw materials in transit (Bowersox et al, 2002). The handling systems should be developed in such a manner that they should reduce wastage and promote cleaner and easier handling.

As well, they should be handled with an aim of improving safety and minimizing accidents (Stock & Lambert, 2001).

From the discussion of the findings of the study, it can be concluded that objectives of the study were achieved. Agrochemical firms in Kenya were striving to adopt refrigerators, air conditioning systems and transport management systems where applicable to enhance their performance despite the internal and external challenges. Further, it was established that there was a positive relationship between raw materials delivery systems and operational performance of agrochemical firms in Kenya.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summaries of the study findings as per the study objectives, conclusions based on those findings, recommendations and limitations which are based on both the study findings and other relevant literature considered necessary and vital to be used in future to improve the study situation.

5.2 Summary of the findings of the Study

The study sought to investigate the raw materials delivery systems and operations performance of agrochemical firms in Kenya. The study objectives were to find out the raw materials delivery systems used by agrochemical firms in Kenya and determine the relationship between raw materials delivery systems and operational performance of agrochemical firms in Kenya.

The study established that information management systems were used by agrochemical firms in Kenya to improve operational performance. Computerization of systems among some agrochemical firms, information technology, relationships among suppliers and customers and real time information with regard to raw material management has contributed to improved quality of products delivered.

The study established that transport and logistics was an integral part of the delivery of raw materials in competitive firms. Good transportation management gives firms a competitive edge during in-bound and out-bound logistical activities.

Transportation, storage and handling of raw materials from the point of production to the point of consumption promote efficiency and effectiveness of the logistics system. Product integrity is determined by the nature of raw materials used to manufacture the product.

It was established that proper handling of the raw materials in transit improved the operations performance of agrochemical firms in Kenya in terms of; cost, real time, place and form. Product processes between these changing points should be carried out in a manner that will not tamper with the quality of the raw materials in transit. The handling systems should be developed in such a manner that they should reduce wastage and promote cleaner and safer handling of materials. It was established that there is a positive correlation between independent variables and dependent variable of the study. Therefore, a unit increase of the independent variables leads to a unit increase in the dependent variables.

5.3 Conclusions

Based on the objectives of the study, it can be concluded that agrochemical firms in Kenya have recognized the value of raw material delivery system as a driver of gaining competitiveness. The major drive of using raw material delivery systems is to minimize operational costs and maximize profits. Further, it can be concluded that firms that adopt information management, transport management and handling of raw materials in transit are likely to have operational efficiency and effectiveness.

Raw materials management is critical to the overall operational performance of any manufacturing concern.

Besides demand and other forces like competitors' actions and general price index; raw materials situation in terms of efficient management and effective planning determines the activity level, the turn-over and the ultimate profit in a given company.

Material function is assumed to be organized and operated on an integrated basis and is also presumed to be responsible for material forecasting, planning, inventory control, scrap control and disposal; providing management information regarding purchases and inventories within the framework of the financial policies and norms. A glance at these functions will reveal the intricacies involved in maintaining balanced policies on raw material management.

Finally, material management being the coordination of efforts (planning, controlling, organizing, directing) towards achieving efficiency in the procurement, transportation, stocking and utilization of inputs of a manufacturing organization is therefore central to production activities and management. Effective and efficient functioning of the material management has direct bearing on the total performance of the organization.

5.4 Recommendations

The study established that the level of computerization among manufacturing firms, the degree of use of models for inventory decision making, the involvement of industry experts in the management of raw materials and inventory; the prospects for improvement were evident. Therefore, the study recommends that Government initiatives to promote ICT will enhance logistical systems of agrochemical firms in Kenya thus resulting to operational efficiency.

This study recommends that for efficiency and effectiveness, agrochemical firms should fully automate the entire supply chain system to minimize waste during raw material transportation.

The study also established that raw materials delivery systems were expensive to emerging firms. Therefore, this study recommends that players in the industry should form strategic partnerships to enhance competitive advantage in the manufacturing sector.

Supplier integration with firms in the agrochemical industry would enhance raw materials delivery systems and operational performance of agrochemical firms in Kenya.

Internet connectivity was one of the key assets identified to be the cornerstone of raw material delivery systems. Therefore, this study recommends that manufacturing firms should work in partnership with the Government through fiber optic cable initiatives in order to promote social economic developments in the country.

Agrochemical firms operating in Kenya are expecting to fully adopt information management systems during delivery of raw materials to their premises in order to respond to customer demands on real time and minimize wastages experienced when using railway, road and water transport. Systems will enhance communication, surveillance of raw materials while on transit and provision of timely information for supply chain management decisions.

The study observed that majority of the agrochemical firms were resistant to new technology introduced in the system. Therefore, this study recommends that top level management should steer the change process through institutionalizing the adoption of new technology in the supply chain activities to maximize productivity.

It is further recommended that managers of manufacturing organizations to be responsive to suggestions from within the business and the academic communities and take steps towards achieving efficiency in the practice of raw material management. Having this done, the prevailing problems of incessant stoppage of production, low level of capacity utilization, inability to meet production targets, poor liquidity and other identified problems will be addressed.

5.5 Limitation of the Study

After evaluating the results of this study, the following limitations should be kept in mind. The limitations took on conceptual, contextual, and methodological manifestations. Conceptually, the study only focused on raw materials delivery systems and operations performance of agrochemical firms in Kenya.

Contextually, the study was limited to the agrochemical firms in Kenya, and that these findings may not represent all firms in the agrochemical sector. Gathering accurate information from the respondents was one of the major challenges since they were threatened that the information may be used against them by the management in the terms of performance hence insecurity of their jobs. Assuring the respondents of the confidentiality of the information they gave minimized the challenge.

The respondents though willing to give information appeared to withhold some facts due to the sensitivity of disclosing management matters that require high-level directives and guidelines for interviews or disclosure.

Methodologically, this study relied on employees of agrochemical firms in Kenya and hence in the absence of the interviewer, the questionnaires could have been answered by other subordinate staff who might not be actively involved in the supply chain activities, therefore creating bias to the study.

5.6 Suggestions for Further Research

Future studies should explore the reasons behind the raw materials delivery systems and operations performance of agrochemical firms in Kenya. Researchers should go ahead and establish the reasons behind popularity of some transportation systems among agrochemical firms in Kenya. Future studies should try to investigate the relationship between raw materials delivery systems and operations performance of manufacturing firms in Kenya.

To minimize the challenges experienced by firms operating in the manufacturing sector in Kenya, firms should form a consortium of research in order to investigate supply chain challenges experienced by firms while transporting raw materials. Other aspects of improving operational efficiency of firms need to be considered in future studies apart from logistical aspects.

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Appendix 1: Questionnaire (For employee in charge of operations in each of the Agrochemical firms in Kenya)

SECTION A: ORGANIZATIONAL DEMOGRAPHICS

Please supply the required data by filling in the blanks where space is provided or by ticking [] against the most appropriate answer.

Respondent's Name..... [Optional]

1. For how long has this firm been operating in Kenya?

- a) Less than 5 years []
- b) 5 – 10 years []
- c) 11 – 15 years []
- d) 16 – 20 years []
- e) Over 20 years []

2. What is the size of your firm in terms of market share?

- a) Medium sized Agrochemical Firm []
- b) Small sized Agrochemical Firm []

SECTION B: TRANSPORT MANAGEMENT SYSTEMS AND OPERATIONS PERFORMANCE

3. Which of the following is the most prevalent mode of delivering raw materials to your premises?

- a) Airplane []
- b) Trucks []
- c) Pickups []
- d) Railway Wagons []
- e) Ships []

4. Does your firm use transport management systems to deal with the challenges of transport logistics?

- a) Yes []
- b) No []

5. To what extent do you agree with the statement given?

Key: Not true (1) Somehow true (2) True (3) Very True (4)

Statement	1	2	3	4
The adoption of transport management systems helps improve the time of product delivery to clients.				
Transport management system helps reduce the cost of storage of the raw materials at the firm				
The use of transport management systems improves the quality of the products delivered to the clients				
The use of transport management systems helps reduce the idle time of equipment and employees?				

SECTION B: INFORMATION MANAGEMENT SYSTEMS AND OPERATIONS PERFORMANCE

6. Does your organization make use of management information system when dealing with the delivery of raw materials to the firm?

Yes []

No []

7. To what extent do you agree with the statement given?

Statement	1	2	3	4
The use of proper communication systems improves the quality and quantity of the materials delivered in your organization				
The use information management systems during delivery of raw materials improve the delivery time of the materials.				
The use of demand forecasts reduces the cost of handling and storing goods in the firm.				
The use of a corporate portal shared between suppliers and the firm helps reduce idle time of equipment and employees due to the improved delivery times of raw materials.				

8. Does your organization use utilities like refrigerators and air conditioning systems when transporting the raw materials to the firm?

a) Yes []

b) No []

9. Who meets the cost of such utilities?

a) The Supplier []

b) The Firm []

SECTION C: MATERIAL HANDLING IN TRANSIT AND OPERATIONS PERFORMANCE

10. To what extent do you agree with the statement given?

Statement	1	2	3	4
The use of proper materials handling equipment like air conditioners and refrigerators helps improve the quality and quantity of the materials delivered in your organization				
The use of better handling facilities during the delivery of raw materials reduces the cost of operations in the firm.				

THANK YOU FOR YOUR COOPERATION

Appendix 2: List of Agrochemical firms in Nairobi Registered by Agrochemicals Association of Kenya

1. Agrichem& Tools
2. CleanFarms Kenya
3. CropLife International
4. Dascot Limited
5. Antipest Kenya Limited
6. Sipcam E.A. Limited
7. Amiran Kenya Ltd
8. CropLife Africa Middle East
9. Agriscope (A) Limited
10. Dupont De Nemours
11. Anset International Ltd
12. Bell Industries LTD
13. SGS Kenya Ltd
14. Biomedica Laboratories Ltd
15. Hygrotech E.A. Limited
16. BASF East Africa Limited
17. Bayer E.A Ltd
18. Dipchem Limited
19. DevjiMeghji& Bros. Ltd
20. Chemtura (Pty) Ltd
21. Henchem Ltd
22. Dera Chemical Industries
23. Organix Limited
24. Elgon Kenya Ltd
25. Hygrotech E.A. Limited
26. Farmchem Limited
27. Fedo Agencies
28. Vectorcon Pest Control & Supplies
29. Hardi Kenya
30. Juanco SPS LTD
31. Vermkil Consultants
32. Lachlan (K) LTD
33. East Africa Agri Centre

34. Laibuta Chemicals LTD
35. Rhico (EA) Ltd
36. MbakiAgric-Inputs Distributers
37. MEA LTD
38. Organix Ltd
39. Monsanto Kenya Ltd
40. Pestgon Ltd
41. Murphy Chemicals (E.A.) Ltd
42. Pestmatic Ltd
43. Norbrook Kenya Ltd
44. Qzone Intergrated Pest Managment
45. Osho Chemical Industries Ltd
46. Vestam Pest & H. Suppliers
47. Chemical Industries
48. Prestige Agriculture
49. Profarm Africa LTD
50. Rotam E.A. LTD
51. Safina (EA) Limited
52. Syngenta E. A. Ltd
53. Topserve E.A. Ltd
54. Tropical Farm Management
55. Twiga Chemical Industries Ltd
56. Highchem Essentials Ltd
57. Ultavetis E.A LTD
58. Arysta Life Science Corporation
59. GreenLife Agrosience EA Ltd
60. Bimeda Ltd
61. Koppert Biological Systems
62. Pytech Chemicals GMBH
63. .Sineria East Africa Ltd