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**DETERMINANTS OF EFFECTIVE SUPPLY CHAIN MANAGEMENT PERFORMANCE
IN ROAD CONSTRUCTION PROJECTS IN KENYA**

BACKSTONE OTIENO ANG'ANA
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**A Research Project report Submitted in Partial Fulfillment of the requirements for the
award of Degree in Masters of Business Administration (Project Management Option) in
the School of Business, Department of Management Science, Kenyatta University.**

Ang'ana, Backstone
*Determinants of
effective supply*



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DECLARATION

This research report is my original work and it has not been presented in any university for examination or any other credit.

SIGN: 

DATE: 30/11/2012

Backstone O. Ang'ana

This research report has been submitted for examination with our approval as the University Supervisors.

SIGN: 

DATE: 30/11/2012

Gladys Kimutai

Lecturer

Management Science Department

School of Business

Kenyatta University

SIGN:

DATE:

This research project has been submitted for examination with my approval as the Chairperson, Management Science Department.

SIGN: 

DATE: 30/11/2012

Ms. Gladys Kimutai

Chairperson

Management Science Department

School of Business

Kenyatta University

DEDICATION

This project is dedicated to my family for their support, understanding and encouragement, patience and inspiration during my study period.

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LIST OF ABBREVIATIONS

SCM	Supply chain management
JIT	Just in time management
SCEM	Supply chain event management
SRM	Suppliers relations management
CRM	Customer relations management
CSM	Customer service management
CDM	Customer demand management
CSCMP	Council of supply chain management professionals
PM	Project Management
WBS	Work Breakdown Structure
PRISM	Projects Integrating Sustainable Methods

OPERATIONAL DEFINITION OF TERMS

A **Project** is a temporary endeavor undertaken to create a unique product, service or result according to Project Management Institution, (2004) or a value creation undertaking based on a specific mission, which is completed in a given or agreed timeframe and under constraints, including resources and external circumstances according to Project Management Association of Japan, (2005)

Project Management is a dynamic process that utilizes the appropriate resources of the organization in a controlled and structured manner to achieve some clearly defined objectives identified as strategic needs. It is always conducted within a defined set of constraints (Trevor, 2008)

Project Life Cycle is the fundamental processes undertaken to complete a project which include initiation/conception, definition, planning, launch/execution, closure and post-project evaluation (Trevor, 2008).

Project implementation is an application, execution of an idea, plan, design, and policy. It is a process where all the proper planned activities are put into action (Rosario, J.G., 2000).

ABSTRACT

This study aimed at assessing the determinants of supply chain management performance in road construction projects in Kenya. For the purpose of this study the researcher aimed at establishing a conceptual model linking the relationships with customers and suppliers, information and communication technology, materials flows management, strategic alliances and SCM Performance. There were many elements that determine project success, but the focus of this study was on three critical project parameters or performance i.e. time, cost and quality. The main objective of the study was to determine factors that affect Supply Management performance in the road construction projects in Kenya. The scope of the research was road construction contractors and other agencies in the road construction industry in Kenya. The populations were staff of the road contractors. This research study adapted a descriptive survey design and employed simple and stratified random sampling. The research was conducted using data that is both qualitative and quantitative data. Structured and unstructured questionnaires were used to collect data from the road construction companies. 81 questionnaires were distributed and 75 were returned. A bigger percentage of the companies identified materials flow and information technology as the key driver in supply chain management of road construction companies. Other indicators that influenced implementation included strategic alliances, training and adoption of appropriate technologies for the road projects. The road construction was also found to be male dominated and characterized by excess costs and exceeded time limits. Based on these findings, road project implementers need to find ways to adjust road construction with modern supply chain requirements in order to reduce on duration, quality and costs arising from SCM logistics. The researcher recommends that companies should utilize web based technologies and enter into a price commitment contract with their suppliers to guarantee a certain long-term prices. Further integration of IT and communication into road projects is also recommended.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The management of Road construction projects requires knowledge of modern management as well as an understanding of the design and construction process. Brent Williams, Wesley S. Randall, Rodney Thomas, (2010) in their research paper "An inventory of theory in logistics and SCM research", observed that Construction projects have a specific set of objectives and constraints such as a required time frame for completion. While the relevant technology, institutional arrangements or processes will differ, the management of such projects has much in common with the management of similar types of projects in other specialty or technology domains such as aerospace, pharmaceutical and energy developments.

Generally, project management is distinguished from the general management of corporations by the mission-oriented nature of a project. A project organization will generally be terminated when the mission is accomplished (Womack et al. 1990). Project management is the art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, time, and quality and participation satisfaction.

By contrast, the general management of business and industrial corporations assumes a broader outlook with greater continuity of operations (Scannel & Monczka, 2000). Nevertheless, there are sufficient similarities as well as differences between the two so that modern management techniques developed for general management may be adapted for project management. Specifically, project management in construction encompasses a set of objectives which may be accomplished by implementing a series of operations subject to resource constraints. There are potential conflicts between the stated objectives with regard to scope, cost, time and quality, and the constraints imposed on human material and financial resources. These conflicts should be resolved at the onset of a project by making the necessary tradeoffs or creating new alternatives.

Subsequently, the functions of project management for construction generally include , Specification of project objectives and plans including delineation of scope, budgeting, scheduling, setting performance requirements, and selecting project participants, Maximization of efficient resource utilization through procurement of labor, materials and equipment according to the prescribed schedule and plan, implementation of various operations through proper coordination and control of planning, design, estimating, contracting and construction in the entire process and development of effective communications and mechanisms for resolving conflicts among the various participants.

Supply chain management (SCM) is the management of a network of interconnected business involved in the ultimate provision of product and service packages by end customers; Harland, (1996).Supply chain management spans all movement and storage of raw materials, work in progress inventory, and finished goods from point of origin to point of consumption. Supply chain management (SCM) is a concept originating from the supply system by which Toyota was seen to coordinate its supplies, and manage its suppliers (Womack et al. 1990).In terms of lean production, SCM is closely related to lean supply (Lamming 1996).

Supply chain has been defined as ‘the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer’(Christopher 1992).SCM looks across the entire supply chain, rather than just at the next entity or level, and aims to increase transparency and alignment of the supply chain’s coordination and configuration, regardless of functional or corporate boundaries (Cooper and Ellram 1993).

There are few challenges faced by the construction companies. For instance, the demand from customers is always variable or changing. According to lumnus and Vokurka (1919), demand changes are hard to anticipate. Customers are used to requiring products in a short time frame whenever they increase demands without prior alignment with the company. This means that companies have no power to shape the relationship with the supplier and must accept quality, price decisions, terms and conditions that are dictated by the suppliers. The

relationship with suppliers is inflexible as suppliers impose restricted conditions to the company such as conditions of non-cancelable, non- rescheduling and non-returnable.

There is also lack of integrated software and system, both inside and outside the company. Some of the suppliers are unable to access the companies supplier portal because they have incompetent technology. Key supply chain management operations like customer satisfaction, product quality, delivery precision, capacity constraint and manpower issue are not being measured on timely basis, likewise the flow of material in the company may be jeopardized by the high inventory and unreliable delivery of materials and goods.

The generic methodology offered by SCM contributes to better understanding and Resolution of basic problems in construction supply chains, and gives directions for Construction supply chain development. The practical solutions offered by SCM, however, have to be developed in construction practice itself, taking into account the specific characteristics and local conditions of construction supply chains

Supply Chain Management in Road Construction Industry in Kenya

Supply chain management (SCM) approach is progressively recognized by many organizations as a strategy to attain their business goals today (Chin, et al., 2004). It has become one of the new era manufacturing paradigms for organizational sustainability and competitiveness. Many companies in the road construction industry in Kenya have truly been striving hard to achieve superior supply chain performance in order to outperform its competitors. Enhancing supply chain performance is critical approach for achieving competitive advantages for companies (Womack et al. 1990).

Statistical figures show that main contractors are purchasing more labor and material than previously, According to 2004 statistics by the Ministry of Planning, in the Kenyan construction industry, the main contractors share in the total national turnover had increased by 24%. Thus suppliers and sub contractors represented 75% of turnover. Currently this is expected to be more. Consequently, the main contractors become more and more reliant on other actors in the construction supply chain (suppliers and subcontractors). Therefore, they

need to revise their supply chain strategies and trading relations with suppliers and subcontractors.

According to the Central Bureau of Statistics, the construction industry in Kenya contributes 7 % of the gross domestic product (GDP). Kenya's current Road Network inventory is estimated at 177,500km comprising 63,000km classified roads and 114,500km of unclassified roads administered by various government departments. Roads have long been considered as the prime communication link between all economic sectors and the citizenry in Kenya. Indeed, roads account for over 80% of Kenya's total passenger and freight transportation, as well as value of output. K'Akumu, Owiti A. (2007) Construction statistics review for Kenya.

The Road construction industry in Kenya is very important for the Kenyan economy; contributing 5 per cent of the country's gross domestic product (GDP) and employing more than one million people. According to report by Kenya National Bureau of Statistics (KNBS), the economy of Kenya grew by 4.9 per cent in the first quarter of 2011 due to the improved productivity in the construction industry. KNBS reported that the Road construction industry added Sh12.6 billion to the country's GDP in Q1 2011 supported by the massive road infrastructure projects currently under way across the county.

The construction boom was also reflected in cement consumption which rose to 779.3 million tones up from 667.1 million tones consumed in Q1 2010. Thanks to the rapidly expanding population, the construction industry in Kenya is expected to expand further as investors rush to meet increasing demand for decent housing. Opportunities for investment are immense particularly in the manufacture and supply of construction materials and components, construction of middle and lower income housing as well as in the area of upgrading informal settlements.

Construction supply chains are still full of waste and problems caused by myopic control. Comparison of case studies with prior research justifies that waste and problems in construction supply chains are extensively present and persistent, and due to interdependency largely interrelated with causes in other stages of the supply chain. The characteristics of the construction supply chain reinforce the problems in the construction supply chain, and may

well hinder the application of SCM to construction. Previous initiatives to advance the construction supply chain have been somewhat partial.

1.2 Statement of the Problem

Studies carried out by the World Bank report on infrastructural projects in Kenya indicate that serious concern has been expressed about public projects that have been abandoned in various parts of the country, after huge financial mobilizations. Most of the projects are in the Road construction industry and sometimes funded by the foreign agencies. Various factors have been adduced for this unhealthy scenario, the most notable being poor project analysis and management. Another problem facing the sector include phenomenal increase in prices of the inputs occasioned by dearth of building material locally, and difficulties in importation of foreign alternatives .

An efficient supply chain management in an organization contributes immensely on the performance of the organization. Road construction projects are one of the industries that require supply chain management (SCM) to optimize its operations. Road construction projects entails carrying out feasibility studies, preparing designs for the roads, procurering the contractors to execute the works, and monitoring and supervision of the projects. The researcher aims at establishing a conceptual model linking the relationships with customers and suppliers, information and communication technology, materials flows management, strategic alliances and SCM Performance.

This will provide important implications for the management of the road construction companies to understand determinants that contribute to the supply chain success. The organizations can then enhance the SCM performance by improving current practices/strategies through focusing on the determinants that significantly influence supply chain performance. Statistical figures show that main contractors are purchasing more labor and material than previously. For instance, in 1994, in Kenya's construction industry (i.e. residential, commercial, roads and industrial building), the main contractors' share in the total national turnover had decreased to 24% (the contractor, 2010). Thus, suppliers and subcontractors represented about 75% of turnover. Currently, this is expected to be more.

Construction Kenya, a premier source for Kenya building and construction information, is predicting the growth rates based on projects to increase during the next decade, fueled by the rise in population and government spending on major infrastructure projects around the country. Despite the slowdown in the world economy in 2009, the Kenyan construction sector remained buoyant as reflected in the increased investment in both infrastructures, residential and commercial buildings during the year. Consequently, main contractors become more and more reliant on other actors in the Construction supply chain (e.g., suppliers and subcontractors). Therefore, they need to revise their supply strategies and trading relations with subcontractors and suppliers.

The road construction industry has a very low absorption capacity added to shortage of well trained indigenous manpower required to plan, manage, and to execute contracts awarded to them. As the firms resort to improvise, they experience frequent incidences of wastage and pilfering. Reports indicate on the average, wastefulness, pilfering and other factors accounted for about 2.5 % of 15% in Kenya. The sector has not been accorded meaningful research and development (R&D) attention, despite the crucial place it occupies in the economy. It is this light that the study is considered timely and appropriate. The researcher aims at presenting how Information and communication Technology, Materials Flows Management, Relationships with Customers and Suppliers, and Strategic Alliances determines the effectiveness of supply chain management in road construction projects in Kenya. Thus, the goal of this study was to establish key SCM enablers all of which must be leveraged for supply chain management to be effective in the road construction projects industry in Kenya.

1.3 Research Objective

General objective

The research objective was to establish the determinants of effective supply chain management performance in the road construction projects in Kenya.

Specific objective

The specific objectives of the study were;

1. Determine how Information and communication Technology affects Supply chain performance in the road construction projects in Kenya.

2. Establish to what extent does Materials Flows Management affects Supply Management performance in the road construction projects in Kenya.
3. Determine how supplier and customer relationships affect Supply chain performance in the road construction projects in Kenya.
4. Determine the effects of Strategic Alliances on Supply chain performance in road construction projects.

1.4 Research Questions

The research was guided by the following research questions;

1. What is the influence of Information and communication Technology on SCM performance in road construction projects in Kenya?
2. How does Materials Flows Management affect SCM performance in road construction projects?
3. How do suppliers and customer relationships affect SCM performance in road projects?
4. What is the effect of Strategic Alliances on SCM performance in road construction projects?

1.5 Significance of the Study.

The results of the study will act as a source of information for consultants, contractors & construction companies and the Government agencies that are involved in the road construction sector in making better use of its content either to improve on the internal their performance of or institute measures and build capacity that would be able to influence their actions in different ways. The study is of paramount importance to academicians and practitioners as the proposed framework is expected to uncover many neglected relationships that are of interest to managers. In addition, specific patterns of SCM practices would also be revealed which would further encourage managers to implement this technique and possibly improve both SCM and organization performance. The study can also be seen as an answer to the call for research seeking more investigation into the relationship of strategic purchasing with supply management concept.

The research would be handy in helping to determine measures that may be taken to improve on the performance of the staff of construction companies especially with regard to the

management of the supply chain. The study has provided researchers with literature to be reviewed and form a basis upon which further studies on Supply Chain Management practices could be done.

1.6 Scope of the Study

The researcher restricted himself to road construction companies (organizations), consulting firms involved in the road construction sector and the government agencies concerned with the road construction industry in Kenya. The study focused on departments of purchasing, planning, logistics and operations of the selected organizations. These departments are directly involved in supply chain activities of any given organizations.

1.7 Limitation and Assumptions of the Study

Perhaps the most serious limitation of the study will be its focus on the road construction sector, thus precluding the generalization of findings to other construction sectors of the industry and other sectors that may benefit from the benefit of a sound supply chain management strategy. It is also assumed that the questionnaire will be responded to appropriately. An assumption is also made that difficulties will not be encountered in reaching some staff as majority of them move from one station to another more frequently and that there will be cordial cooperation and that suspicion by some of employees during data collection will not be encountered..

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, the researcher reviews literature that has been found useful in investigating on the determinants of effective supply chain management performance in the road construction projects and how to integrate the supply chain management practices adopted by an organization. This chapter will also review literature on how supply chain management affects performance both directly and also indirectly.

2.2 Concept of Supply Chain Management

SCM is a concept that has originated and flourished in the manufacturing industry. The first signs of SCM were perceptible in the JIT delivery system as part of the Toyota Production System (Shingo 1988). This system aimed to regulate supplies to the Toyota motor factory just in the right - small - amount, just on the right time. The main goal was to decrease inventory drastically, and to regulate the suppliers' interaction with the production line more effectively.

After its emergence in the Japanese automotive industry as part of a production system, the conceptual evolution of SCM has resulted in an autonomous status of the concept in industrial management theory, and a distinct subject of scientific research, as discussed in literature on SCM. Along with original SCM approaches, other management concepts (e.g., value chain, extended enterprise) have been influencing the conceptual evolution towards the present understanding of SCM. In a way, the concept of SCM represents a logical continuation of previous management developments (Van der Veen and Robben 1997). Although largely dominated by logistics, the contemporary concept of SCM encompasses more than just logistics (Cooper et al. 1997). Actually, SCM is combining particular features from concepts including Total Quality Management (TQM), Business Process Redesign (BPR) and JIT (Van der Veen and Robben 1997). SCM offers a methodology to relieve the myopic control in the supply chain that has been reinforcing waste and problems.

Supply chain management performance is defined as the multiple measures of performance developed by the organization to gauge the ability of a supply chain to meet an organization's long-term and short-term objectives (Wade et al., 1996). The basic concept of SCM includes tools like Just-In-Time delivery (JIT) and logistics management.

The current concept of SCM is somewhat broader but still largely dominated by logistics. Until now, in construction, initiatives belonging to the domain of SCM have been rather partial covering a subset of issues that include transportation costs in a limited part of the construction supply chain and the construction site. In most cases, the issues are regarded from a main contractor's point of view. According to some authors, Cooper and Ellram, 1993, the shift from traditional ways of managing the supply chain towards SCM includes various elements. The traditional way of managing is essentially based on a conversion (or Transformation) view on production, whereas SCM is based on a flow view of production. The conversion view suggests that each stage of production is controlled independently, whereas the flow view focuses on the control of the total flow of production (Koskela 1992).

The definition put forward by the American professional of supply chain is that supply chain encompasses the planning and management of all activities involved in sourcing, procurement, conversion and logistics management activities. It also includes the crucial elements of coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers and customers. In essence, supply chain integrates supply and demand management within and across companies. An integrated supply chain has a clear advantage on the competitiveness of an organization.

The importance of better tracking of products, logistics, improved efficiency, fast tracked quotation and ordering, improved customer relations; better control of suppliers, adequate resource scheduling and aggregate planning of activities has been repeatedly reported as major milestones in supply chain management. In all of those efforts, strategic planning for organizations has an integrate role. Most organizations purchase materials and parts through purchase orders. Regularly required items are frequently purchased in advance and stocked in the organizations warehouses, while other less frequently used items are not stocked and purchased as needed.

Many organizations also use blanket orders and annual pre negotiated contracts for recurring material and services requirements, large organizations generally have a centralized purchasing function. Supply chain event management (SCHEM) is a consideration of all possible occurring events and folders that can cause a disruption in supply chain .with SCHEM possible sceneries can be created and solutions can be planned .some experts distinguish SCM and logistics whole others consider the terms changeable. According to hurricane scholar Douglas.T, (2000) SCM encompasses the planning and management activities involved in sourcing, procurement, conversion and logistics management activities. Importantly it also includes coordination and collaboration with channel partners, intermediaries, third party service providers and customers. In essence SCM Integrates supply and demand management within and across organizations. Supply chain management has crossed over from being a narrow management function to being a key differentiating function. The success of an organization hinges on a different set of criteria, where every organization is racing to get the right product to the right place at the right time and at the right cost. The methods of pipeline mapping (Scott and Westbrook 1991), supply chain modeling (Davis 1993) and logistics performance measurement (Lehtonen 1995) analyze stock levels across the supply chain.

The LOGI method (Luhtala et al. 1994, Jahnukainen et al.1995) studies time buffers and controllability problems of the delivery process. Supply chain costing (La Londe and Pohlen 1996) focuses on cost buildup along the supply chain. Integral Methods like value stream mapping (Hines and Rich 1997, Jones et al. 1997) and process performance measurement (De Toni and Tonchia 1996) offer a “toolbox” to analyze various issues including lead-time and quality defects. In order to achieve a competitive advantage, supply chains need to be managed appropriately (Bode, Wagner,Petersen & Ellram, 2011; Francois & Gilles, 2005; Salvador, Forza, Rungtusanatham & Choi, 2001; Scannel,Vickery & Droge, 2000).

The set of practices developed by an organization to effectively manage the functioning of a supply chain are known as supply chain management practices (Li, Nathan,B., Nathan,T., & Rao, 2006). An extensive literature review was carried out to identify different dimensions of the supply chain management practices. The rationale used in the study followed the selection of supply chain management practices whichcover both the upstream and

downstream sides of the supply chain (Celtek & Kaynak, 1999; Li et al., 2005). Despite the increasing amount of attention paid to Supply chain management (SCM) practices by practitioners and academicians (Donlon, 1996; Malik, Niemeier & Ruwadi, 2011;

Tracey, Lim & Vonderembse, 2005) failures in effectively implementing SCM practices still exist (Handfield, Krause, Scannel & Monczka, 2000; Handfield & Nichols, 1998; Moberg, Speh, & Freese, 2003). One of the main reasons for the failure to successfully implement SCM can be attributed to the fact that there is lack of agreement between researchers as to what constitutes the critical dimensions of SCM (Chen & Paulraj, 2004a, 2004b; Donlon, 1996; Lambert, Dastugue, & Croxton, 2005; Li, B.Nathan, R.Nathan & Rao, 2005; Min & Mentzer, 2004; Tan, Lyman & Wisner 2002). Secondly, studies at some point in their analysis clearly mention the need to interlink the SCM dimensions and the firm performance (Donlon 1996; Lambert, Chen & Paulraj, 2004a, 2004b; Li, B.Nathan, R.Nathan & Rao, 2005; Tan et al., 2002).

Researchers have typically not addressed this issue. Third, supply chain is complex entity which consists of various echelons, for instance, suppliers, manufacturers, distributors and consumers (Beamon, 1999). Challenges exist in terms of identifying appropriate performance measures for the analysis of supply chain (Arzu Akyuz, & Erman Erkan, 2010; Beamon, 1999). Researchers have thus far been content in limiting their choice of performance measures. For instance, Cohen and Lee (1988) consider cost as an important measure of supply chain management performance. Customer responsiveness has also been recognized as an important dimension of SCM performance (Christy & Grout, 1994). In addition, Lee and Burlington (1993) identify supply chain flexibility as an important measure of SCM performance.

Studies have generally ignored the complexity in levels of supply chain and fail to completely characterize the supply chain system (Beamon, 1999). In order to capture the construct of performance measure, all the different dimensions of SCM performance need to be considered simultaneously. In addition, it is recognized that since SCM has firm level implications and it becomes imperative to measure effects of SCM performance on organizational performance measures (Green, McGaughey & Casey, 2006). Furthermore the

question about which dimensions of SCM are distinctly related to supply chain performance and finally to firm performance has largely gone unnoticed (Ansoff & Sullivan, 1993; Bechtel & Jayaram, 1997; Chopra & Meindl, 2001;

Harrison & Hoeck, www.ccsenet.org/ijbm International Journal of Business and Management Vol. 7, No. 8; April 2012 Published by Canadian Center of Science and Education 3 2002; Mentzer, Dewitt, Keebler, Min, Nix & Smith, 2001; Mentzer, Min & Zacharia, 2004). The major challenge faced by researchers in Supply Chain (SC) literature is to analyze the SC system's performance (Arzu Akyuz, & Erman Erkan, 2010; Beamon, 1999). Often vague terms, such as "adequate" or "inadequate" are commonly used to quantify performance measures (Beamon, 1999). The analysis of supply chain performance becomes complex because of different entities involved such as suppliers, manufacturers, wholesalers, and customers. Organizations implementing SCM have obtained improved performance. Cost savings, increased revenues, and the reduction of defects in products are some of the chief advantages of introducing supply chain management (Shin, Collier & Wilson, 2000).

It has been demonstrated that business profitability is closely associated with market and business shares (Buzzed, Gale & Sultan, 1975). Based on the long-term and short-term goals of the SCM, the organizational performance measures identified were and financial and market performance and customer satisfaction. In context of SCM, the financial and market performance is operationalized in terms of market share, return of total assets, annual sales growth (Tan et al., 1999; Venkatraman & Ramanujan, 1987). The customer satisfaction dimension is measured by total product value to the customer; meeting quality standards set by the customer, understanding customer needs, retention of loyal customers and alignment of organizations goal in terms of customer needs (Feciková, 2004; Jamal & Naser, 2002).

The benefits of strategic purchasing involve the formation of effective communication channels and developing a long-term strategic orientation with the supply network for achieving mutual goals (Carr & Pearson, 2002; Harland, Lamming & Cousins, 1999). The role of purchasing evolved over the years as firms started recognizing the importance of aligning long-term organizational goals with that of suppliers and effectively communicating strategic goals to all components of the supply chain. Strategic purchasing involves the

formation of a flexible supply base (Giunipero & Eltantawy, 2004); this helps enhance long term relationships. Communicating a fixed strategy and exclusively involving the suppliers who meet the strategic requirements of the firm improves communication and understanding between members of the supply chain, thereby assisting in cultivation of mutually beneficial long term relationships (Olkkonen, Tikkanen & Alajoutsijärvi, 2000).

2.3 Project Management

Until 1900 civil engineering projects were generally managed by creative architects, engineers, and master builders themselves, for example Vitruvius (first century BC), Christopher Wren (1632–1723), Thomas Telford (1757–1834) and Isambard Kingdom Brunel (1806–1859). It was in the 1950s that organizations started to systematically apply project management tools and techniques to complex engineering projects. As a discipline, project management developed from several fields of application including civil construction, engineering, and heavy defense activity.

Two forefathers of project management are Henry Gantt, called the father of planning and control techniques, who is famous for his use of the Gantt chart as a project management tool (alternatively Harmonogram first proposed by Karol Adamiecki; and Henri Fayol for his creation of the five management functions that form the foundation of the body of knowledge associated with project and program management. Both Gantt and Fayol were students of Frederick Winslow Taylor's theories of scientific management. His work is the forerunner to modern project management tools including work breakdown structure (WBS) and resource allocation.

The 1950s marked the beginning of the modern project management era where core engineering fields come together to work as one. Project management became recognized as a distinct discipline arising from the management discipline with engineering model. In the United States, prior to the 1950s, projects were managed on an ad-hoc basis, using mostly Gantt charts and informal techniques and tools. At that time, two mathematical project-scheduling models were developed. The "Critical Path Method" (CPM) was developed as a joint venture between DuPont Corporation and Remington Rand Corporation for managing plant maintenance projects. And the "Program Evaluation and Review Technique" or PERT,

was developed by Booz Allen Hamilton as part of the United States Navy's (in conjunction with the Lockheed Corporation) Polaris missile submarine program; These mathematical techniques quickly spread into many private enterprises.

At the same time, as project-scheduling models were being developed, technology for project cost estimating, cost management, and engineering economics was evolving, with pioneering work by Hans Lang and others. In 1956, the American Association of Cost Engineers (now AACE International; the Association for the Advancement of Cost Engineering) was formed by early practitioners of project management and the associated specialties of planning and scheduling, cost estimating, and cost/schedule control (project control). AACE continued its pioneering work and in 2006 released the first integrated process for portfolio, program and project management (Total Cost Management Framework). The International Project Management Association (IPMA) was founded in Europe in 1967, as a federation of several national project management associations. IPMA maintains its federal structure today and now includes member associations on every continent except Antarctica. IPMA offers a Four Level Certification program based on the IPMA Competence Baseline (ICB). The ICB covers technical, contextual, and behavioral competencies.

There are a number of approaches to managing project activities including lean, iterative, incremental, and phased approaches. Regardless of the methodology employed, careful consideration must be given to the overall project objectives, timeline, and cost, as well as the roles and responsibilities of all participants and stakeholders (Krause, Hadfield & Tyler, 2007).. The traditional phased approach identifies a sequence of steps to be completed. In the "traditional approach", five developmental components of a project can be distinguished ,four stages plus control, (Krause, Hadfield & Tyler, 2007):. Typical development phases of an engineering project include initiation, planning and design execution and construction monitoring and controlling systems completion Not all projects will have every stage, as projects can be terminated before they reach completion. Some projects do not follow a structured planning and/or monitoring process. And some projects will go through steps 2, 3 and 4 multiple times.

Many industries use variations of these project stages. For example, when working on a brick-and-mortar design and construction, projects will typically progress through stages like pre-planning, conceptual design, schematic design, design development, construction drawings (or contract documents), and construction administration. In software development, this approach is often known as the waterfall model i.e., one series of tasks after another in linear sequence.

In software development many organizations have adapted the Rational Unified Process (RUP) to fit this methodology, although RUP does not require or explicitly recommend this practice. Waterfall development works well for small, well defined projects, but often fails in larger projects of undefined and ambiguous nature. The Cone of Uncertainty explains some of this as the planning made on the initial phase of the project suffers from a high degree of uncertainty. This becomes especially true as software development is often the realization of a new or novel product. In projects where requirements have not been finalized and can change, requirements management is used to develop an accurate and complete definition of the behavior of software that can serve as the basis for software development.^[18] While the terms may differ from industry to industry, the actual stages typically follow common steps to problem solving—"defining the problem, weighing options, choosing a path, implementation and evaluation."

PRINCE2 is a structured approach to project management, released in 1996 as a generic project management method. It combined the original PROMPT methodology (which evolved into the PRINCE methodology) with IBM's MITP (managing the implementation of the total project) methodology. PRINCE2 provides a method for managing projects within a clearly defined framework. PRINCE2 describes procedures to coordinate people and activities in a project, how to design and supervise the project, and what to do if the project has to be adjusted if it does not develop as planned. In the method, each process is specified with its key inputs and outputs and with specific goals and activities to be carried out. This allows for automatic control of any deviations from the plan. Divided into manageable stages, the method enables an efficient control of resources. On the basis of close monitoring, the project can be carried out in a controlled and organized way. PRINCE2 provides a common language for all participants in the project. The various management roles and responsibilities involved

in a project are fully described and are adaptable to suit the complexity of the project and skills of the organization.

PRiSM (Projects integrating Sustainable Methods) is a structured project management method developed to align organizational sustainability initiatives with project delivery. By design, PRiSM is a repeatable, practical and proactive methodology that ensures project success while decreasing an organization's negative environmental impact. The methodology encompasses the management, control and organization of a project with consideration and emphasis beyond the project life-cycle and on the five aspects of sustainability. PRiSM is also used to refer to the training and accreditation of authorized practitioners of the methodology who must undertake accredited qualifications based on competency to obtain the GPM certification.

Critical chain project management is a method of planning and managing project execution designed to deal with uncertainties inherent in managing projects, while taking into consideration limited availability of resources (physical, human skills, as well as management & support capacity) needed to execute projects. CCPM is an application of the Theory of Constraints (TOC) to projects. The goal is to increase the flow of projects in an organization (throughput). Applying the first three of the five focusing steps of TOC, the system constraint for all projects is identified as are the resources. To exploit the constraint, tasks on the critical chain are given priority over all other activities. Finally, projects are planned and managed to ensure that the resources are ready when the critical chain tasks must start, subordinating all other resources to the critical chain.

The project plan should typically undergo resource leveling, and the longest sequence of resource-constrained tasks should be identified as the critical chain. In some cases, such as managing contracted sub-projects, it is advisable to use a simplified approach without resource leveling. In multi-project environments, resource leveling should be performed across projects. However, it is often enough to identify (or simply select) a single "drum". The drum can be a resource that acts as a constraint across projects, which are staggered based on the availability of that single resource. One can also use a "virtual drum" by

selecting a task or group of tasks (typically integration points) and limiting the number of projects in execution at that stage.

Event chain methodology is another method that complements critical path method and critical chain project management methodologies. Event chain methodology is an uncertainty modeling and schedule network analysis technique that is focused on identifying and managing events and event chains that affect project schedules. Event chain methodology helps to mitigate the negative impact of psychological heuristics and biases, as well as to allow for easy modeling of uncertainties in the project schedules. Traditionally, project management includes a number of elements: four to five process groups, and a control system. Regardless of the methodology or terminology used, the same basic project management processes will be used. Major process groups generally include; initiation, planning or development, production or execution, monitoring and controlling and closing

The initiating processes determine the nature and scope of the project. If this stage is not performed well, it is unlikely that the project will be successful in meeting the business' needs. The key project controls needed here are an understanding of the business environment and making sure that all necessary controls are incorporated into the project. Any deficiencies should be reported and a recommendation should be made to fix them. The initiating stage should include a plan that encompasses analyzing the business needs/requirements in measurable goals, reviewing of the current operations, financial of the costs and benefits including a budget, stakeholder, including users, and support personnel for the project, project including costs, tasks, deliverables, and schedule After the initiation stage, the project is planned to an appropriate level of detail (see example of a flow-chart). The main purpose is to plan time, cost and resources adequately to estimate the work needed and to effectively manage risk during project execution. As with the Initiation process group, a failure to adequately plan greatly reduces the project's chances of successfully accomplishing its goals.

Project planning generally consists of determining how to plan (e.g. by level of detail or rolling wave), developing the scope statement, selecting the planning team, identifying deliverables and creating the work breakdown structure, identifying the activities needed to

complete those deliverables and networking the activities in their logical sequence, estimating the resource requirements for the activities, estimating time and cost for activities, developing the schedule, developing the budget, risk planning and gaining formal approval to begin work. Additional processes, such as planning for communications and for scope management, identifying roles and responsibilities, determining what to purchase for the project and holding a kick-off meeting are also generally advisable. For new product development projects, conceptual design of the operation of the final product may be performed concurrent with the project planning activities, and may help to inform the planning team when identifying deliverables and planning activities.

Executing consists of the processes used to complete the work defined in the project plan to accomplish the project's requirements. Execution process involves coordinating people and resources, as well as integrating and performing the activities of the project in accordance with the project management plan. The deliverables are produced as outputs from the processes performed as defined in the project management plan and other frameworks that might be applicable to the type of project at hand.

Monitoring and controlling consists of those processes performed to observe project execution so that potential problems can be identified in a timely manner and corrective action can be taken, when necessary, to control the execution of the project. The key benefit is that project performance is observed and measured regularly to identify variances from the project management plan. Monitoring and controlling includes; Measuring the ongoing project activities ('where we are'), Monitoring the project variables (cost, effort, scope, etc.) against the project management plan and the project performance baseline (where we should be); Identify corrective actions to address issues and risks properly (How can we get on track again); Influencing the factors that could circumvent integrated change control so only approved changes are implemented. In multi-phase projects, the monitoring and control process also provides feedback between project phases, in order to implement corrective or preventive actions to bring the project into compliance with the project management plan.

Project maintenance is an ongoing process, and it includes; Continuing support of end-users, Correction of errors, Updates of the software over time (Krause, Handfield & Tyler,

2007)..Over the course of any construction project, the work scope may change. Change is a normal and expected part of the construction process. Changes can be the result of necessary design modifications, differing site conditions, material availability, contractor-requested changes, value engineering and impacts from third parties, to name a few. Beyond executing the change in the field, the change normally needs to be documented to show what was actually constructed. This is referred to as change management. Hence, the owner usually requires a final record to show all changes or, more specifically, any change that modifies the tangible portions of the finished work. The record is made on the contract documents – usually, but not necessarily limited to, the design drawings. The end product of this effort is what the industry terms as-built drawings, or more simply, “as built.” The requirement for providing them is a norm in construction contracts.

Krishna Kumar, 1987, observed that when changes are introduced to the project, the viability of the project has to be re-assessed. It is important not to lose sight of the initial goals and targets of the projects. When the changes accumulate, the forecasted result may not justify the original proposed investment in the project. Closing includes the formal acceptance of the project and the ending thereof. Administrative activities include the archiving of the files and documenting lessons learned. This phase consists of, Project close- Finalize all activities across all of the process groups to formally close the project or a project phase and Contract closure- Complete and settle each contract (including the resolution of any open items) and close each contract applicable to the project or project phase.

Project controlling should be established as an independent function in project management. It implements verification and controlling function during the processing of a project in order to reinforce the defined performance and formal goals. Project control is that element of a project that keeps it on-track, on-time and within budget (Appleton, S, 1997). Project control begins early in the project with planning and ends late in the project with post-implementation review, having a thorough involvement of each step in the process. Each project should be assessed for the appropriate level of control needed: too much control is too time consuming, too little control is very risky. If project control is not implemented correctly, the cost to the business should be clarified in terms of errors, fixes, and additional audit fees (David,F.R 2006).

Control systems are needed for cost, risk, quality, communication, time, change, procurement, and human resources. In addition, auditors should consider how important the projects are to the financial statements, how reliant the stakeholders are on controls, and how many controls exist. Auditors should review the development process and procedures for how they are implemented (David,F.R 2006).. The process of development and the quality of the final product may also be assessed if needed or requested. A business may want the auditing firm to be involved throughout the process to catch problems earlier on so that they can be fixed more easily. An auditor can serve as a controls consultant as part of the development team or as an independent auditor as part of an audit.

Businesses sometimes use formal systems development processes. These help assure that systems are developed successfully. A formal process is more effective in creating strong controls, and auditors should review this process to confirm that it is well designed and is followed in practice. A good formal systems development plan outlines a strategy to align development with the organization's broader objectives, Standards for new systems, Project management policies for timing and budgeting, Procedures describing the process, Evaluation of quality of change

Like any human undertaking, projects need to be performed and delivered under certain constraints. Traditionally, these constraints have been listed as "scope," "time," and "cost". These are also referred to as the "project management triangle", where each side represents a constraint. One side of the triangle cannot be changed without affecting the others. A further refinement of the constraints separates product "quality" or "performance" from scope, and turns quality into a fourth constraint.The time constraint refers to the amount of time available to complete a project.

The cost constraint refers to the budgeted amount available for the project. The scope constraint refers to what must be done to produce the project's end result. These three constraints are often competing constraints: increased scope typically means increased time and increased cost, a tight time constraint could mean increased costs and reduced scope, and a tight budget could mean increased time and reduced scope.The discipline of project

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management is about providing the tools and techniques that enable the project team (not just the project manager) to organize their work to meet these constraints.

The work breakdown structure (WBS) is a tree structure that shows a subdivision of effort required to achieve an objective—for example a program, project, and contract (Passia, M 2001). The WBS may be hardware-, product-, service-, or process-oriented. A WBS can be developed by starting with the end objective and successively subdividing it into manageable components in terms of size, duration, and responsibility (e.g., systems, subsystems, components, tasks, subtasks, and work packages), which include all steps necessary to achieve the objective. The work breakdown structure provides a common framework for the natural development of the overall planning and control of a contract and is the basis for dividing work into definable increments from which the statement of work can be developed and technical, schedule, cost, and labor hour reporting can

2.4 The Role of Supply Chain Management

In order to achieve a competitive advantage, supply chains need to be managed appropriately (Bode, Wagner, Petersen & Ellram, 2011; Francois & Gilles, 2005; Salvador, Forza, Rungtusanatham & Choi, 2001; Scannel, Vickery & Droge, 2000). The set of practices developed by an organization to effectively manage the functioning of a supply chain are known as supply chain management practices (Li, Nathan, B., Nathan, T., & Rao, 2006). An extensive literature review will be carried out to identify different dimensions of the supply chain management practices. This will identify supply chain management practices which cover both the upstream and downstream sides of the supply chain (Celtek & Kaynak, 1999; Li et al., 2005).

In order to capture the holistic perspective of supply chain management, an extensive analysis of different SCM practices is required, three important supply chain management dimensions can be identified. These dimensions include long term relationships, concurrent engineering and strategic purchasing. All the above-mentioned dimensions attempt to explore the supply chain management construct in a holistic manner rather than being limited only to certain practices covering one particular aspect of the SCM domain. A brief introduction of each of the three SCM dimensions is presented below.

2.4.1 Long term relationships

The central tenet of long-term relationships is the ability to maintain a cooperative relationship between two or more entities in lieu of mutual economic gains (Krause, Handfield & Tyler, 2007). Organizations engaged in SCM should constantly monitor the long term relationships dimension of the supply chain. Some of the key advantages of maintaining long-term relationships include ease of important information sharing between involved partners, sharing a certain level of trust and improvements in knowledge management and overall firm level benefits (Griffith, Harvey & Lusch, 2006).

2.4.2 Concurrent engineering

Concurrent engineering deals with the early involvement of suppliers, customers, and buyers during the product/service design stage (Celtek & Kaynak, 1999). Concurrent engineering also involves simultaneous working together of different member constituents. This is important in supply chain context. For instance, the importance of the involvement of customers during the early stages is stressed in many studies (Divett, Crittenden & Henderson, 2003; Li et al., 2005; Li et al., 2006; Tan et al., 2002; Uncles, Dowling, & Hammond, 2003; Vickery, Jayaram, Droge, & Calantone, 2003). The critical element in concurrent engineering practice is the simultaneous inclusion of all phases of the related divisions (Jarvis, 1999). This essentially means that during the product design stage, the customers who are part of the concurrent engineering crossfunctional teams can voice their opinions along with other functional area members such as marketing, production, and finance and help in reduction of lead time.

2.4.3 Strategic purchasing

Purchasing has been viewed as an essential component of a firm's strategic planning process (Castaldi, Ten Kate, & Den Braber, 2011; Cousins, 2005; Wade, Hartley, Turner & Pierce, 1996). As recognized by Carr and Peterson (2002), strategic purchasing is an upstream component of supply chain management (SCM). This dimension involves strategically selecting the suppliers. The construct of strategic purchasing is operationalized in terms of dimensions such as whether purchasing is aligned with the firm's strategic orientation,

whether purchasing is carried out while keeping the long-term issues of the firm in mind, and whether the suppliers have adequate knowledge of the firm's strategic goals (Chen & Paulraj, 2004a, 2004b). Purchasing is often linked to an organization's achieving competitive advantage (Wade et al., 1996).

2.4.4 Supply Chain Management Performance

The major challenge faced by researchers in Supply Chain (SC) literature is to analyze the SC system's performance (Arzu Akyuz, & Erman Erkan, 2010; Beamon, 1999). Often vague terms, such as "adequate" or "inadequate" are commonly used to quantify performance measures (Beamon, 1999). The analysis of supply chain performance becomes complex because of different entities involved such as suppliers, manufacturers, wholesalers, and customers. For the purpose of this study, supply chain management performance is defined as

The multiple measures of performance developed by the organization to gauge the ability of a supply chain to meet an organization's long-term and short-term objectives. three major SCM performance measures such as SC delivery flexibility, inventory cost, and customer responsiveness time were identified. The measurement of SC delivery flexibility is essential to estimate the responsiveness of a supply chain. Delivery flexibility deals with delivering products which are desired by the customer to the market as quickly as possible. The higher the flexibility, the better is the responsiveness of a supply chain. For instance, if the supply

2.5 Determinants of Supply Chain Management Performance

Firms have certain guiding philosophies and business requirements that are the foundation of all supply chain activities. These may relate to areas such as capable human resources, proper organization design, real-time and shared information technology capabilities, proper planning and adequate strategic alliances with proper customer and supplier relationships.

Research by Marien (2009) identified four key supply chain enablers, all of which must be fully leveraged if SCM is to be successful. Marien also observed that these four enablers become barriers to effective SCM if they are not in place. Each of the four enablers also has

its own set of attributes. The four key enablers are organizational infrastructure, technology, strategic alliances, planning and human resource management.

Four essential supply chain requirements are connectivity, integration, visibility and responsiveness. connectivity is the ability to exchange information which external supply chain partners in a timely, responsible and usable format that facilitates inter organizational collaboration. intergration is the process of combining or coordinating separate functions, processors or producers and enabling them to interact in a seamless manner. Visibility is the ability to access or view pertinent data or information as it relates to logistics and the supply chain. Responsiveness is the ability to react quickly to customer's needs or specifications by delivering a product of the right quality, at the right time, in the right placemat the lowest possible cost.

2.5.1 Information and Communication Technology

Information is said to be the glue that holds supply chains together. As a key infrastructure, web-based technologies continue to have significant impact on supply chain strategies. On the coordination side, the web provides a virtually free platform for enhancing transparency, eliminating information delays and distortions, and significantly reducing transaction costs. One should note, however, that, while information flow has accelerated considerably, material flow has not gained much speed. This phenomenon makes the coordination of material, and information and cash flows even more crucial for effective supply chain coordination. On the design side, current technology does not yet permit dynamic supply chain design in response to changing business environment.

The adoption of web services represents a significant step in that direction. Technology is an enabler in SCM for helping supply chain members to establish partnerships for better supply chain system performance .Yu, Yen and Cheng explored that information technology is the essential ingredient for business survival and improves competitiveness of any organization. Efficient SCM can offer substantial improvements in productivity and in customer satisfaction. Information and communication technology enhances the service level of SCM , improves operational efficiency and information quality.

2.5.2 Materials Flows Management

The material requirement planning system uses information from the master schedule and the inventory system. It breaks down the master schedule items into sub-assembly and raw materials requirements, matches these against what is already on hand (or in order) and computes specific requirements (item by item) of everything needed. It also dictates when orders should be released (to purchasing or shop) so that the components will be available as specified in the proposed master schedule. If procurement or production time is inadequate, the master schedule may have to be revised.

After a preliminary MRP is established, the time required to produce those materials is compared with the capacity of the work centers to determine whether sufficient labour and machine hours exist. This is the Capacity Requirements planning (CRP) function. If capacity is insufficient, demands cannot be met, the master schedule must again be raised and the process repeated until an acceptable schedule is achieved.

Material requirement planning starts in the sales department with drawing up a sales plan. This plan provides an estimate of the volume that the management thinks can be sold or bought. In the master plan, the manufacturing plans at the level of product groups are produced in conjunction with the sales, product development, manufacturing, finance and administration and logistics. In the master plan, the customer orders, sales plan, planned stocks of finished products and the production and purchasing plans are linked together.

Manufacturing resource planning (MRP-II) is where the resources needed to realize the master plan are recorded in the manufacturing resource plan, from which the required composition of manufacturing resources is derived. In the process, it may become clear that particular production series are not feasible because production capacity is insufficient. This necessitates adjustment in the master planning and/or adjustment of the manufacturing capacity. In the latter case, an investment plan needs to be prepared for adding production capacity. Another element is the master resource scheduling; the master resource schedule translates the master plan into specific materials requirements. The MPS is also the basis for computing quantities of materials, semi-manufactured products and components which must

be manufactured .in this way it provides the input for calculating the net material requirement.

The material requirement planning (MRP-I) explodes the requirements of the MPS level, systematically, in accordance with the bill material. It determines the material requirements at the different levels of product structure and finally at the material (item) level, if, at some level, identical requirements emerge fro different MPS items, then these are groped and added up per period. These needs are called the gross requirement and are converted into net requirement per period. The net requirements are then plotted, taking into account the ordering procedures that have been developed. In this way the material requisitions are built up.

2.5.3 Supplier and Customers Relationships

Customer relationship management (CRM) is concerned with learning about customer's needs and behavior and the integration of sales, marketing and service strategies. Customer service management (CSM) is concerned with providing external customers with high quality goods and services, at the lowest cost, with the shortest waiting times and maximum responsiveness and flexibility to their needs. Supplier relationship management (SRM) is concerned with how the enterprise interacts with its suppliers and, therefore, is minor image of CRM. Relationships may be either short or long term and vary in intensity from arms length to high involvement.SRM is becoming increasingly critical as organizations concentrate on core competencies and rely on suppliers to maintain critical advantage or superior positioning over competitors.

In order to do so suppliers need to be grouped into distinctive categories i.e. Commercial suppliers, these suppliers just need to deliver the goods and services according to the agreed terms; preferred suppliers, mutual objectives and improvement programs are developed and agreed by both parties-the preferred status is reciprocal; supplier partners, these suppliers work intensively with the organization to develop new technologies, products and business opportunities. Usually it concerns a limited number of suppliers, who are considered crucial in supporting the organization overall business strategies. Developing partnerships is a very difficult issue and takes a long time to develop between parties. In general a major step

forward is reached when suppliers no longer suspect that their customer is simply trying to find out and cut back their profit margins.

2.5.4 Strategic Alliances

This covers how external companies (customers, suppliers and logistics-service providers) are selected as business allies and how intercompany relationships are built and managed. Importance attributes of strategic alliance involve having expectations clearly stated, understood and agreed to upfront, collaborating on supply chain design and product service strategies, having top management of partnering companies interface on a regular basis and having compatible Information Technology systems. Increased sub-contracting, as a result of make decision based on internal and cost price studies, carried out as benchmarking programs.

Based at Michigan state university, moncka and trent (1991,1992), launched a global procurement and supply chain management benchmarking initiative. The initiative was that companies participating in it would be able to compare their purchasing and supply chain processes, to exchange from and to learn from the best practices. These practices included in sourcing and outsourcings in that organizations need to establish and decide what activities to handle inside or outside the company. The decisive criterion is the question of whether the activity concerned contributes to achieving a competitive advantage. In sourcing means that the company may decide to take over strategic activities that previously were performed by suppliers.

2.6 Conceptual frame work

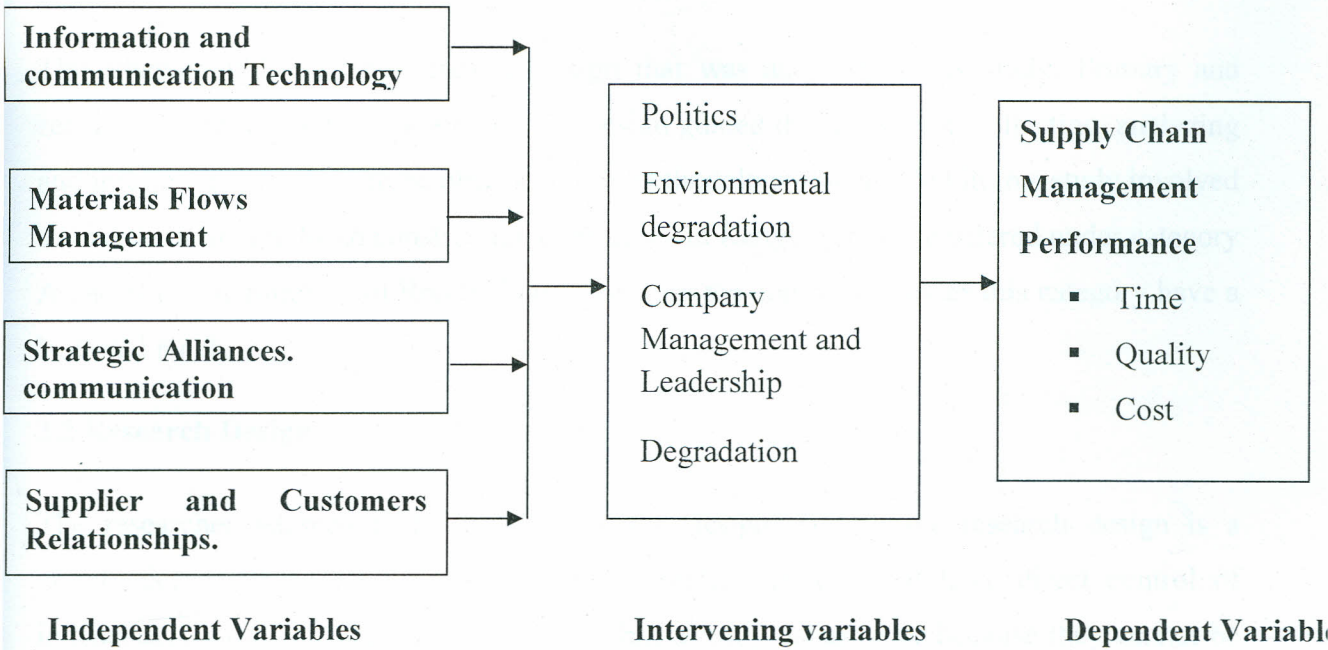


Figure 2. 1: Conceptual Framework (Source: researcher, 2012)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter addresses the research design that was adopted in this study. Primary and secondary sources of data were used. The design guided the research in collecting, analyzing and interpreting the facts to be obtained. The methodology that applied in this study involved a survey among the Road construction companies in Kenya that are registered under category A and B by the ministry of Roads. This is because the companies under this category have a National reach.

3.2 Research Design

The researcher adopted a descriptive research design. Descriptive research design is a systematic, empirical inquiry into which the researcher does not have direct control of independent variables as their manifestation has already occurred or because they cannot be inherently manipulated. The study aimed at collecting information from respondents on the determinants of effective Supply Chain Management performance in Road construction projects in Kenya. Questionnaires with a set of closed and open –ended questions were used.

3.3 Study Population

The population of interest was managers and junior employees of the road construction companies registered in category A and B in Kenya. The total number of target population 55, which will be obtained from the Ministry of Roads. Three employs, a senior manager, officer in charge of supply chain and engineer from the technical department, of the selected companies was interviewed

3.4 Sampling Technique and Sample Size

Cooper and Schindler (2011) assert that a sample is a subset of a population. According to Kothari (2004) and Mugenda (2003) in a descriptive survey a sample enables a researcher to gain information about a population.

The researcher used stratified sampling then simple random sampling to get a sample from the target population, where every element of the population stands a chance to be selected from the list of Road contractors registered under category A and B by the Ministry of Roads. To ensure equitable chances in sampling the researcher used a systematic random sampling technique .According to Naissiuma (2000), a sample size of 50% is representative of the total population.

Table 3.1 Sampling strategy

Companies	No of Companies	50% of the companies	Estimated no of companies	No of employees(3 per company)
Class A	25	12.5	13	36
Class B	30	15	15	45
Total	55	27.5	28	81

Source: Author (2012)

The appropriate sampling interval, **I**, will then be calculated by dividing population size, **N**, by the required sample size, **n**, as follows;

$$I=N/n$$

Thus the appropriate interval will be;

$$55/17=3.25 \text{ app } 3$$

Thus the first company was chosen from the list of contractors registered under category A and B by the ministry of Roads as Road contractors and the subsequently every third company will be selected to form the respondents to be interviewed.

3.5 Data collection and procedure

The main instrument in Data collection was through questionnaires targeting at least Three employs, a senior manager, officer in charge of supply chain and engineer from the technical department, of the selected companies. Questionnaires were either dropped and picked later or emailed to the respondents. For the secondary data, previous documents or materials to support the data received from questionnaire and information from interviews that include books and magazines available in the library as well as information from the company's websites were used.

3.6 Data Analysis and Presentation

This section discusses the techniques used to analyze data. Before processing the responses, data preparation in the completed questionnaires was edited, coded, and cleaned. Data collected was analyzed using descriptive statistics. Descriptive analysis using percentages and mean has been used to help to understand and interpret variables. The sampled questionnaires were analyzed with the aid of SSPS using descriptive statistics and presented using frequency tables, pie charts and bar charts as was found appropriate. The descriptive statistical tools were used in describing the data and determining the respondents' degree of agreement with the various statements under each factor. Data analysis was done using SPSS and Microsoft excels to generate quantitative reports which will be presented in the form of tabulations, percentages, mean and standard deviation.

CHAPTER FOUR

DATA ANALYSIS AND RESEARCH FINDINGS

4.1: Introduction

This chapter shows the results of the study and their analysis. The analysis is carried out by use of the scientific package for social sciences (SPSS). The construction companies are located in geographically diverse area in terms of coverage. The researcher got the information from the respondents in 12 of the 13 class A company's proposed and from 13 of the 15 class B companies proposed. The researcher collected the information himself and the response were recorded on the spot. In cases where no response was obtained, it was due to absence in our anticipated location.

4.2. Background Information

4.2.1 Response Rate

Out of the 81 questionnaires that were given out to the respondents only 6 were not well answered and were therefore discarded. This indicates that the response rate was high and therefore the findings of the study will not be invalidated. This is as summarized in table 4.1 below. There was 92% response from Class A companies while the response from class B companies was 93%, giving an average response of 92%.

Table 4.1 Response Rate

Type of respondent	Number of Companies given 3 Questionnaires each	Proposed 50% of companies	Frequency	Percentage
a) Class A	25	36	33	92
b) Class B	30	45	42	93
Totals	55	81	75	89

Source: (Research data, 2012)

4.2.2 Demographic Characteristics of the Respondents

Out of the 25 respondents interviewed, only 20% involved in the road construction projects were women who acknowledged participation in the projects. This gives an indication of male dominance road projects which could be associated with the nature of projects.

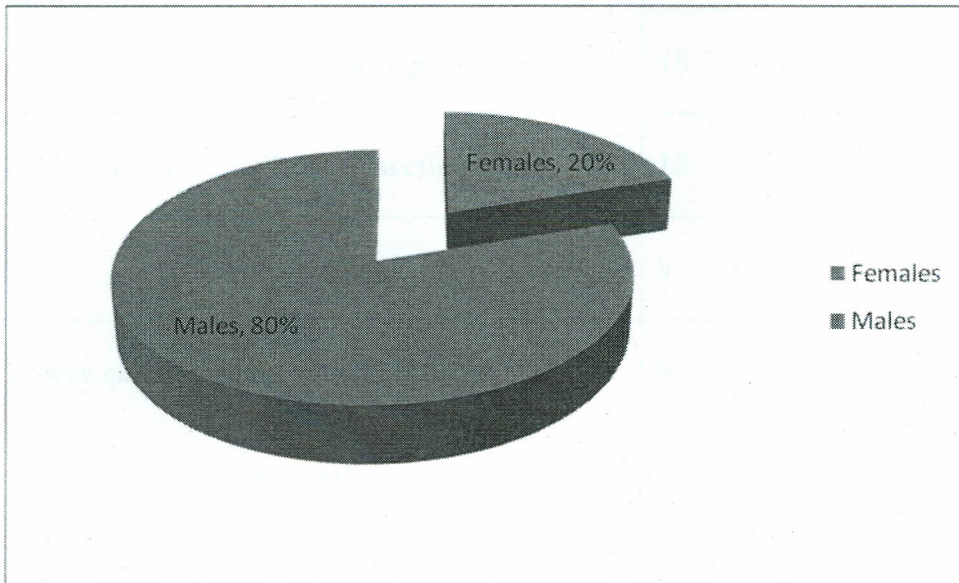


Figure. 4.1 Gender participation

4.2.3 Position of Respondents

The 75 respondents interviewed were in different positions in their companies. A relatively high (52%) number of those who were available for the interview due to their position were at management level of the companies while 28% were in the middle cadre of supervisors with the remaining 20% coming from the lower cadres. A suitable reason for this could be the unwillingness of lower cadres to comment on the projects due to victimization and lack of confidence in the affairs of the construction company.

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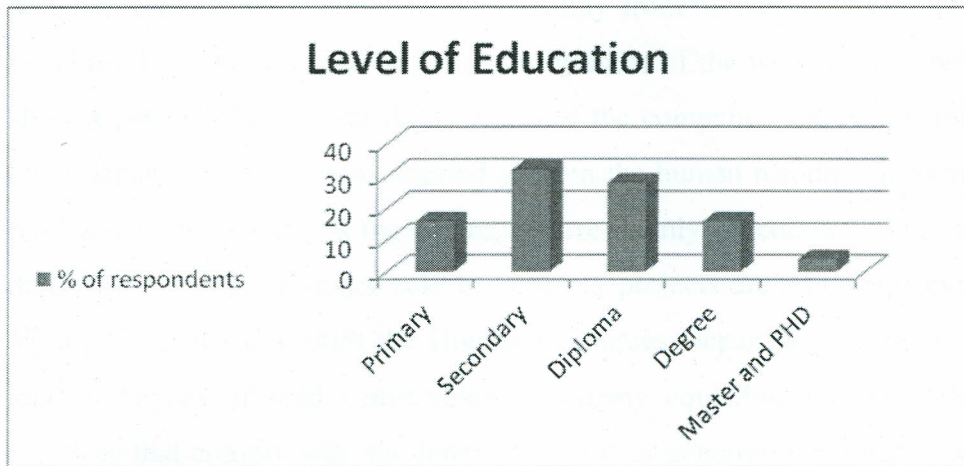
Table 4.2 Position of Respondents

Respondents	Position of respondents	Number	Percentage
Top management	Head of division	21	28
	Head of department	18	24
Middle level	Head of section	12	16
	Supervisor	9	12
Lower carder	Support staff	9	12
	Casual or vendor	6	8

Source: (Research data, 2012)

4.2.4 Education Level of Beneficiaries

The majority of respondents had primary education and secondary education, accounting for 48 %,(table 4.3 and figure 4.3) while those with post secondary education excluding university, comprised 28% of the respondents. Of the respondents, 16% and 4 % had attained first university degree and post graduate education respectively. Most of road construction workers have at least some basic education needed for the activities that involve comprehending some basic measurements.



Source: (Research data, 2012)

Figure 4.3 Education Level of respondents

4.2.5. Role of Respondents in the Construction Company

Most of respondents interviewed were mainly from human resource (36%). This could be as result of the reference point given by most of the workers who were usually asked to show a person who can speak on behalf of the company. The rest of the respondents from other departments were also referred to from the human resource department. Since in most road construction projects the employees are mainly on contract terms the human resource department is plays a major role in ensuring projects are well implemented. According to Young-Hoon Kwak (2005) the Human Resources Department works to assure the citizens and employees of road Construction Company equitable and cost-effective employment practices that comply with the letter and spirit of generally accepted employment practices. In this study the department wanted to be the major contributor of all issues of performance arising from the questionnaire provided to the company.

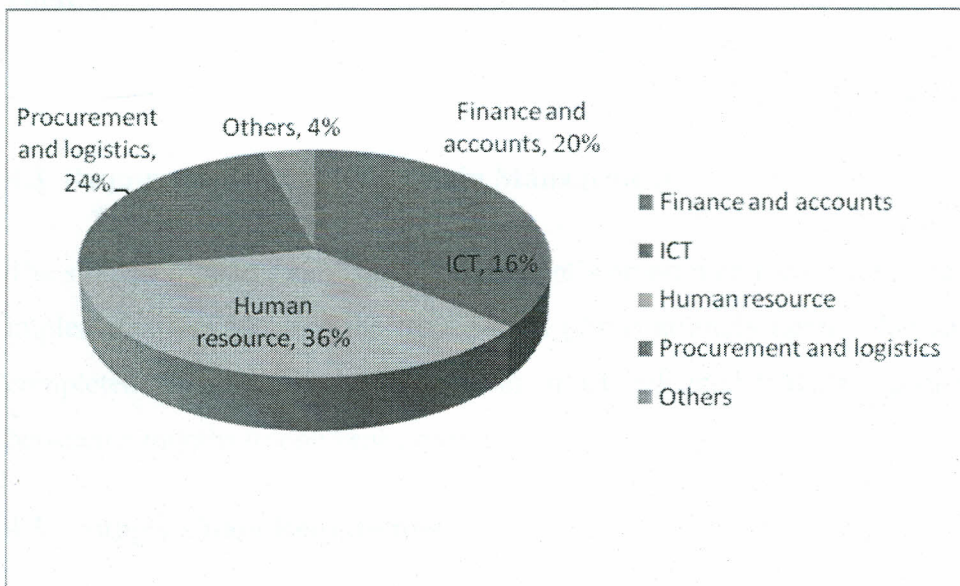


Figure.4.4 Role of respondents in the construction company

4.2.6. Professional work experience

Respondents were further asked if they have proper experience in road construction projects. Most of them, 64%, stated that they have over three years experience while 36% indicated that they have less than three years.

Table 4.6. Respondents experience in road projects.

Response	Number	Percentage
Over three years	48	64
Less than three years	27	36
Total	75	100

Source: (Research data, 2012)

4.3. Requirements of Supply Chain Management

The study sought to establish the respondent's opinion on the success rate during road project implementation. Most of the respondents (70%) strongly agreed that road projects are not completed on time. Of the 70 percent, most indicated that road projects are delayed by between 6 months to one year generally.

4.3.1 Supply Chain Requirements

The study investigated the effect of four supply chain requirements of visibility, connectivity, integration and responsiveness. Most of respondents (76%) in felt that these requirements are necessary for proper operation of the supply chain. A good SCM must be well coordinated in order to achieve the lowest total logistics cost. It must also lead to integration of processes through the supply chain to share valuable information, including demand signals (connectivity) forecasts, inventory, transportation, potential collaboration.

Table 4.4. Respondent's opinion on the effect of supply chain requirements

Level of agreement (1 to 5) for respondents on effect of SCM requirements.	Reading on scale	Average Frequency for the four requirements	Percentage
Strongly disagree	1	0	0
Disagree	2	6	8
Fairly agree (Neither agree or disagree)	3	12	16
Agree	4	9	12
Strongly agree	5	48	64
Mean score		112/N{25}=4.48	

Source: (Research data, 2012)

4.3.2 Information and Communication Technology

The study investigated the role of information and communication in road projects. Most of respondents (92%) (Table 4.5 and figure 4.4) felt that information technology and communication was essential ingredient to enhance service level.

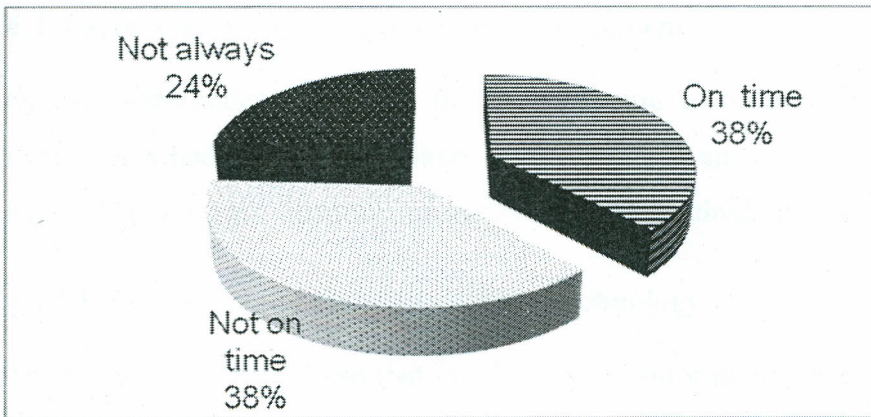
Table 4.5. Role of information and communication

Level of agreement (1 to 5) for respondents	Reading on scale	Average Frequency for the three parameters assessed	Percentage
Strongly disagree	1	0	0
Disagree	2	6	8
Average (Neither agree or disagree)	3	12	16
Agree	4	27	36
Strongly agree	5	30	40
Mean score		106/N{25}=4.24	

The above mean of 4.24 shows that the four essential supply chain requirements which connectivity, integration, visibility and responsiveness are critical and most of the respondents noted that they are also the ones that block SCM effectiveness.

4.3.3 Timing

The respondents gave opinion on the timeliness of road project implementation process. It was found out that most of them, 38%, thought the process was either on time or not on time. The rest that is 24% said that the process was not on time always. In total some projects are finished late, while others finish on-time and almost no one finish early. The sum of this is that road projects will finish late and that is exactly what the study shows. But while the project may finish on-time in our metrics, it often does so only at the expense of the original scope or the original budget. In reality then, even road construction with “better” than average on-time performance are being directly impacted by the methodology of focusing on completing tasks on-time

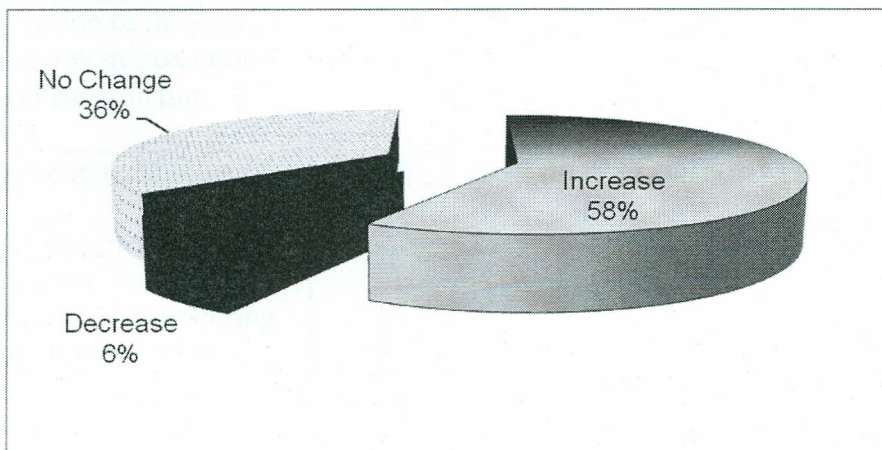


Source: (Research data, 2012)

Figure 4.5. Beneficiaries' opinion timing of projects

4.3.4 Cost of Construction

The road construction project respondents were asked to comment on what it means in terms of cost without a proper supply chain management system. Most the respondents, 58%, acknowledged that they have witnessed increased costs. However 36% and 6% either incurred no change or a decrease in cost respectively as a result of failed supply chain management system.



Source: (Research data, 2012)

Figure 4.6. Status of costs incurred by respondents from the road project without a proper SCM

4.4. Factors Affecting Supply Chain Management

On the independent variables the questionnaire administered by the researcher to the respondents had a five-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (5) provided next to some statements that required opinion rating.

4.4.1 Information and Communication Technology

Though the study found out that involvement of information and communication technology is low, most respondents agreed that its’ involvement enhances SCM and hence road project implementation. There was also a higher agreement that website technologies can often be insightful and useful in improving road project planning and implementation. However there was a neutral feeling on the use of integrated information system of purchasing and procuring of goods and services.

Table 4.7. Role of Information and Communication Technology in SCM

Statement on IT and communication involvement	1		2		3		4		5		Mean	Std Dev
	No	%	No	%	No	%	No	%	No	%		
Role information technology department	0	0	6	8	9	12	9	12	51	68	4.4	0.986
Application of information technology in executions of road construction project	12	16	15	20	18	24	18	24	12	16	2.96	1.36
Web-based technologies	0	0	3	4	12	16	12	16	48	48	4.4	0.90
Use of integrated information system of purchasing and procuring of goods and services	15	20	15	20	21	28	12	16	12	16	2.77	1.371

Source: (Research data, 2012)

Website technologies received the highest approval of 80% and standard deviation of 0.89. According to Lambert and Cooper (2000), operating an integrated supply chain requires a continuous information flow. The role of IT in processing basic business transactions was the

core of SCM. Processes related to the subject of order management, in enhancing collaboration and coordination in supply chain management.

4.4.2 Materials Flows Management

Most respondents (77%) (Table 4.8) agreed that materials flow has been the preferred as the most crucial factor in SCM for smooth implementation of road projects however 70% of respondents said that some SCM models are both complex and challenging, particularly with respect to road projects that are exposed to the risk of political and community interference. Material requirement planning in the material flow management of SCM came out as the most important aspect.

Table 4.8. Materials flow Statements

Materials flow practices in SCM	1		2		3		4		5		Mean	Std dev
	No	%	No	%	No	%	No	%	No	%		
System or models used in planning your materials for the road projects.	6	12	12	16	12	16	12	16	30	40	3.56	1.454
Time required to produce those materials	6	8	6	8	6	8	18	24	36	52	4.04	1.288
Master resource scheduling	3	4	18	24	30	40	12	16	12	16	3.16	1.091
Material requirement planning	0	0	3	4	18	24	24	32	30	40	4.08	0.896

Source: (Research data, 2012)

Material requirement planning is the highest factor affecting materials flow with an approval rate of 77% and a standard deviation of less than one of 0.896. Several models exist as observed by Geoffrion and Powers (1993) and Arntzen, Brown, Harrison, and Trafton [1995] who provided the most comprehensive deterministic model for supply chain management is a key requirement in Materials flow because this has objective function to minimize a combination of cost and time elements.

4.4.3 Customer and Supplier's Relationship

The research indicated that 80% of the respondents agreed that back to back relationship between suppliers and material manufactures is crucial in SCM and strengthens the competencies and abilities of road project implementers. All respondents agreed that experience in road construction for suppliers is very important.

Table 4.9 Customer supplier relationship Statements

Customer/vendor Statements	1		2		3		4		5		Mean	Std Dev
	No	%	No	%	No	%	No	%	No	%		
Existence of Back to back contract between the supplier and the materials manufacturer is critical for effective implementation	6	8	9	12	9	12	45	60	6	8	3.453	1.056
Experience of supplier in similar projects, in similar industry is important.	0	0	0	0	3	4	6	8	66	88	4.84	0.466
Qualification of supplier is key determinant to effective implementation	9	12	9	12	12	16	18	24	27	36	3.573	1.377
Financial stability of the supplier is an important determinant of project success	3	4	6	8	9	12	18	24	39	52	4.12	1.150

Source: (Research data, 2012)

Experience of supplier in supplying materials for road construction ranked highest with a 100% approval rate and a very small standard deviation of 0.463. Experience, qualification and financial stability of supplier through interfaces with the company's production and distribution operations make the SCM successful to build customer relationships. This agrees with David Jacoby (2009), who said that in order for a SCM to be successful it must determine mutually satisfying goals for organization and customers, establish and maintain customer rapport and produce positive feelings in the organization and the customers.

4.4.4 Strategic alliances

The study also looked at factors associated with strategic alliances that affect SCM in road project implementation. Documentation and lack of it in SCM scored highest in terms of success and failure respectively.

Table 4.10.Strategic Alliances

Cultural Statements	1		2		3		4		5		Mean	Std Dev.
	No	%	No	%	No	%	No	%	No	%		
Collaborating on supply chain design and product service strategies	12	16	15	10	15	20	15	20	18	24	3.16	1.414
Poorly documented processes affect the project success.	3	4	18	24	21	28	21	28	12	16	3.28	1.1218
Partnering companies interface on a regular basis	6	8	18	24	18	24	18	24	15	20	3.24	1.250
Documentation of road projects should involve all the affected process/data owners.	6	8	9	12	15	20	18	24	27	36	3.68	1.296

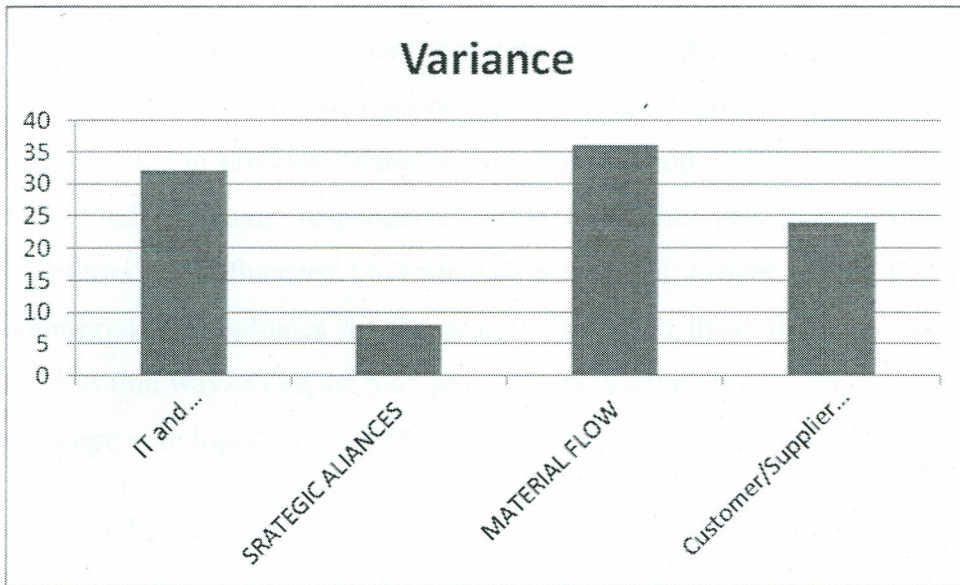
Source: (Research data, 2012)

Poorly documented procedures in SCM affect the effectiveness of SCM with 72% and standard deviation of 1.123. Strategic partnerships with suppliers, distributors, and customers, creating communication channels for critical information and operational improvements such as companies interface, stakeholders involved in documentation, and third-party logistics were found to be very critical in SCM.

4.5 Variance of factors

The research sought to establish the key factors affecting SCM on road project implementation. The following information was obtained from respondents. The respondents were asked to state what was most important. The majority, 36%, of the respondents

identified material flow as the key driver. IT and communication involvement and consumer and supplier relationships were also cited by many respondents, 32% and 24% respectively. Only 8% prioritized strategic alliances.



Source: (Research data, 2012)

Figure 4.7 Rating of factors affecting SCM in the implementation of the road projects

When respondents were asked to give suggestions on the success of SCM many sited other factors that may affect SCM number of supply chain actors and synchronization of material flow. Staff skills were also raised by a number of respondents. Others include: Customer service management, demand management style and returns management.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The results showed that there was low female involvement (20%) in road construction projects. Majority of the respondents identified financing as the key driver to all road implementation projects. Material flow, Information and communication technology were also cited by many respondents, while a number prioritized strategic alliances. Other indicators that influenced implementation included, proper timing, training and adoption of appropriate technologies for the project. Based on these findings, road project contractors need to find ways to adjust road project implementation programmes to involve stakeholders and cope with logistics of SCM.

5.1.1 Background Information

The response rate was found to be 89% of the sample. The researcher found out that most of the respondents were males as for the gender. The position of the respondents was having managerial capabilities because they were either in top managers or middle level supervisors. Most respondents about 48% of them held primary education and secondary education. In terms of experience in road construction projects most of those interviewed 64% had an experience of more than three years. While a good percentage acknowledged that lack of proper SCM increases cost of road construction a few were not sure probably due to their position in the construction company.

5.1.2 Information and Communication Technology

This study identified that there is a strong positive correlation between the role and/or importance ICT and performance of SCM participants. Therefore the role and/or importance of ICT in SCM is importantly dependent on SCM participants. Though the study found out that involvement of information and communication technology is low, most respondents agreed that its' involvement enhances SCM and hence road project implementation. There

was also a higher agreement that website technologies can often be insightful and useful in improving road project planning and implementation. However there was a neutral feeling on the use of integrated information system of purchasing and procuring of goods and services. Information and communication technology infrastructure has changed modern road construction practice. The concern about road construction competitiveness and development is closely linked to notions of the information sensitive community. Construction companies can emerge and grow rapidly by formulating and adopting the innovative practices. Information's impact is easily seen as substitute for inventory, speeds product design and delivery, drives process reengineering, and acts as a coordinating mechanism, helping different members of the supply chain work together effectively. While the potential of information sharing is widely promoted, relatively few companies have fully harnessed its capability to enhance competitive performance. Information and communication technology can be leveraged for supply chain value creation and make it possible to achieve synergy with customer relationship management. Recently the concept of SCM has become in prevalence and participating in one or more even SCs has become necessary for companies, in order to retain and/or gain competitive advantage. Modern ICT has an important influence at the organization form of SCM.

This can bring several benefits for all SCM participants. But the importance of ICT is not only to enable virtual organization of SCM but also ICT also enables inter-organizational collaboration. Main benefits of ICT usage among SC participants are: engagement in electronic business, flexibility and stability, share and/or exchange of transactional data, reduced bullwhip effect and reduced paperwork in transactions between organizations in SCM.

5.1.3 Materials Flows Management

Most respondents (77%) (Table 4.8) agreed that materials flow has been the preferred as the most crucial factor in SCM for smooth implementation of road projects however 70% of respondents said that some SCM models are both complex and challenging, particularly with respect to road projects that are exposed to the risk of political and community interference. Material requirement planning in the material flow management of SCM came out as the The product flow includes the movement of goods from a supplier to a customer, as well as any

customer returns or service needs. The information flow involves transmitting orders and updating the status of delivery. The financial flow consists of credit terms, payment schedules, and consignment and title ownership arrangements.

There are two main types of SCM software: planning applications and execution applications. Planning applications use advanced algorithms to determine the best way to fill an order. Execution applications track the physical status of goods, the management of materials, and financial information involving all parties.

Some SCM applications are based on open data models that support the sharing of data both inside and outside the enterprise (this is called the extended enterprise, and includes key suppliers, manufacturers, and end customers of a specific company). This shared data may reside in diverse database systems, or data warehouses, at several different sites and companies.

By sharing this data "upstream" (with a company's suppliers) and "downstream" (with a company's clients), SCM applications have the potential to improve the time-to-market of products, reduce costs, and allow all parties in the supply chain to better manage current resources and plan for future needs.

Increasing numbers of road construction companies are turning to Web sites and Web-based applications as part of the SCM solution most important aspect.

5.1.4 Customer and supplier's relationship

The research indicated that 80% of the respondents agreed that back to back relationship between suppliers and material manufactures is crucial in SCM and strengthens the competencies and abilities of road project implementers. All respondents agreed that experience in road construction for suppliers is very important. A long-term relationship between a buyer and a supplier characterized by teamwork and mutual confidence. The supplier is considered an extension of the road construction companies. The partnership is based on several commitments. The contractor provides long-term contracts and uses fewer suppliers. The supplier implements quality assurance processes so that incoming inspection

can be minimized. The supplier also helps the companies reduce costs and improve product and process designs managing relationships with suppliers helps a contractor to better manage its cost. If suppliers pass on rising costs to the contractor, this means that the cost of road construction will go up as well.

5.1.5 Strategic alliances

The study also looked at factors associated with strategic alliances that affect SCM in road project implementation. Documentation and lack of it in SCM scored highest in terms of success and failure respectively.

A relationship formed by two or more companies that share (proprietary), participate in joint investments, and develop linked and common processes to increase the performance of both companies. Many companies form strategic alliances to increase the performance of their common supply chain.

By focusing on a few suppliers, companies can reduce operating costs and improve supplier performance much more effectively than with many suppliers. But while the returns are usually greater, so too can be the risks. As suppliers take over more functions and perform more services for the company, the company can lose some control if they are not careful. But when implemented effectively, alliances can reduce more costs than any other supplier relationship.

Forming strategic supplier alliances is a strategy used to reduce total operating costs.

However, to effectively implement an alliance, everyone involved must understand what is required and their role in ensuring its success.

5.2 Conclusion

An analysis of the results shows that the key factors affecting SCM on road project implementation are material flow and ICT as the key driver. This study built upon the previous literatures by Agarwal, et al (2002) on supply chain management that IT and

communication involvement and consumer and supplier relationships is also a key factor affecting SCM although the actual practice in construction not only fails to address the issues of supply chain, but rather follows principles that make supply chain performance worse. The study found out that many companies have not fully embraced ICT in their SCM systems with most contractors indicating that manual supply chain management's methods or models takes a lot of time and are labor-intensive. There is therefore a need for a more effective way to manage the Supply chain process is with the use of information technology and communication. The study found out that poorly documented procedures in SCM affect the effectiveness of SCM.

On materials flow which this research found to be most crucial in SCM, the reduction of costs (especially logistical costs), lead-time and inventory in the supply chain. Though, the goal is to reduce site costs and duration for most construction companies as Geoffrion, A., and R. Powers. (1993) asserts., the primary consideration for most of them has been to ensure material (and labor) flows to the site for the sake of avoiding disturbances in the workflow.

Although alliances offer companies the greatest opportunities for reducing total costs, most alliances in road construction achieve only a fraction of the improvements possible. The study found out that most of the companies did not have successful alliances, and their employees did not understand them. Alliances can reduce a company's total operating costs if implemented well. If not, they can lead to higher costs and poor performance according to David (2006).

Strategic partnerships with suppliers, distributors, and customers, creating communication channels for critical information and operational improvements such as companies interface, stakeholders involved in documentation, and third-party logistics were found to be very critical in SCM. This is in line with Arntzen, B. C(1995) who says that as customers and suppliers band together in mutually beneficial partnerships, the need for better and better supply chain management processes and systems becomes more critical.

For many road construction companies, supply chain that best manages the flows of both information and material can significantly differentiate itself from its competitors. In

practice, these above factors are intimately interrelated. It is often difficult to improve the dependability of the deliveries of a supply chain without addressing the total supply chain. If activities are transferred from site upstream the supply chain, it is requisite that the resultant, more complex supply chain is orderly managed and improved in order to have the benefits intended.

5.3 Recommendations

In order to full utilization of information systems in the supply chain management, top management should consider development of integration of supply chain management in all stages and involve stakeholders in every process of documentation as the research found out.

The management of alliances that deal with supplier relationships effectively helps businesses avoid extra costs that the study found are usually incurred by most construction companies. The study therefore recommends that companies should enter into a price commitment contract with their suppliers to guarantee a certain long-term prices.

In order to reduce the total costs and duration on materials flow as the study found out, there should be a focus on transferring activities from the site to upstream stages of the supply chain. The rationale may simply be to avoid the inferior conditions of site, or to achieve wider concurrency between activities.

The very essence of supply chain management is effective information and material flow throughout a network of customers and suppliers. By using the Internet or web based technologies, road construction companies simply have better and more far-reaching ways to speed up the information flow process and make it more effective.

5.4 Recommendations for Further Research

It's recommended that further studies could be undertaken to establish Supply chain integration into road construction projects, Consideration for implementation of IT/communication systems, IT utilizations with strategic planning to enhance efficiency and effectiveness in SCM performances for the organizations. Studies also should be carried out

to establish Whether the cultural region in which the road construction operate moderates the effect of SCM on performance and the Influence of environmental dynamics on SCM and performance

5.5 Limitations of the study

The most serious limitation of the study was the widespread nature of road contractors all over the country making the administration of the tools quite expensive. Lack of cooperation and that suspicion by some of employees during data collection was also encountered.

REFERENCES

Arntzen, B. C., G. G. Brown, T. P. Harrison, and L. Trafton. Global Supply Chain Management at Digital Equipment Corporation. *Interfaces*, Jan.-Feb., 1995.

Agarwal, A., & Shankar, R. (2002). **Analyzing alternatives for improvement in supply chain performance** *WorkStudy*, 51(1), 32-37.

Alexander, M. (1985). **Creative marketing and innovative consumer product design** – some case studies.

Alvarado, U. Y., & Kotzab, H., 2001. **Supply chain management: The integration of logistics in marketing.** *Industrial Marketing Management*,

Anumba, C. J., Siemienmuch, C. F., & Sinclair, M. A. (2000). **Supply chain implications of concurrent engineering.** *International Journal of Physical Distribution & Logistics Management*, 30(7/8), 566-597.

Arzu Akyuz, G., & Erman Erkan, T. (2010). **Supply chain performance measurement: a literature review.** *International Journal of Production Research*, 48(17), 5137-5155.

Bode, C., Wagner, S. M., Petersen, K. J., & Ellram, L. M. (2011).

Understanding Responses To Supply Chain Disruptions: Insights From Information Processing And Resource Dependence Perspectives. *Academy of Management Journal*, 54(4), 833-856. <http://dx.doi.org/10.5465/AMJ.2011.64870145>

Bowerso, D.J; D.J.Closs; and M.B. Cooper. *Supply chain and logistics management*. New York: Irwin/mcgraw-hill, 2002

Boubekri, N. (2001). **Technology enablers for supply chain management.** *Integrated Manufacturing Systems*, 12(6), 394-399. <http://dx.doi.org/10.1108/EUM0000000006104>

Geoffrion, A., and R. Powers. (1993). 20 Years of strategic Distribution System Design: An Evolutionary Perspective, *Interfaces*

Hau L.Lee,"**aligning supply chain strategies with product incentives,**" *California management review* no.3 (spring 2002), pp 105-19.

M.L.Fischer,"**what is the right supply chain for your product?**" *Harvard Business Review*, March-April 1997,pp 105-16.

Lambert, Douglas M.(2008). *Supply Chain Management: Processes, Partnerships, Performance*, 3rd edition, 2008

Chopra, S., and P.Meindl. **Supply chain management: Strategy, planning and operations.** 2nd ed. upper saddle River, NJ: Prentice Hall,2003.

Hadfield, R.B., and E.L.Nichols Jr. **Introduction to supply chain management.** Upper saddle River, NJ: Prentice Hall, 1999.

Brookshaw, T., & Terziovski, M. (1997). **The relationship between strategic purchasing and customer satisfaction within a total quality management environment.** *Benchmarking: An International Journal*, 4, 244-258

Christopher, M.and Jutter, I. (2000). "**Developing strategic partnerships in supply chain : a practitioner perspective.**" *European journal of purchasing and strategic management*: 117-127

Daughety, D. (1990). "**Understanding New Market Products**". *Strategic Management Journal*. (Special Issue) 59-78.**Orientation and innovation in Japanese firms: "A quadrant analysis."** *Journal of Marketing*.57-(1) 23-37.

Young-Hoon Kwak (2005). "A brief History of Project Management". In: *The story of managing projects*. Elias G. Carayannis et al. (9 eds), Greenwood Publishing Group, 2005.

Appendix 1:

**RESEARCH QUESTIONNAIRE
DETERMINANTS OF EFFECTIVE SUPPLY CHAIN MANAGEMENT
PERFORMANCE IN ROAD CONSTRUCTION PROJECTS IN KENYA**

Kenyatta University School of Business

Research Description

The purpose of the study is to gather information on the determinants of supply chain management performance in road construction projects in Kenya with a case study on selected organisations. In this study I intend to establish those factors and issues which must be put in place for an effective and successful implementation of such projects. Your participation will help identify these critical success factors.

Instructions

It is important that you personally fill the questionnaire for the result to be meaningful. Select answers that best represent your views. On each section there is a provision to allow you to provide general comments and suggestions concerning the subject matter.

Important

Taking part in this survey is voluntary. By returning the questionnaire you are indicating your willingness to participate. This research is purely for academic purposes and the results will not be used for any other purpose.

Section One: Background Information

1.1 Your _____ company _____ name
(Optional).....

1.2 Your _____ Name _____ (Optional)
.....

1.3 Your Gender (Please tick one only): 1. Male () 2. Female ()

1.4 Your highest academic qualification (Choose only one).

(a) Primary School (),

(b) Secondary School (),

- (c) Diploma ,
- (d) First Degree ,
- (e) Masters Degree ,
- (f) PhD .

1.5 Which category best describes your position in your organisation's Organisational structure.

- (a) Top Management- Head of Division ,
- (b) Senior Management- Head of department ,
- (c) Middle Management –Head of section ,
- (d) Officer-Lower Management & Supervisor .
- (e) Support Staff- Unionisable staff
- (f) External Consultant/Vendor/Supplier/Other

1.6 Your role in this road construction company is?

- (a) ICT
- (b) Finance and Accounts
- (c) Human Resource
- (d) Procurement & Logistics
- (g) Other (Specify: e.g. Medical, Engineering).....

1.7 Year of professional work experience

- (a) Less than 3 yrs ,
- (b) 3 to 5 yrs ,
- (c) 5 to 10 yrs ,
- (d) 10 to 15yrs ,

(e) more than 15 yrs (),

1.8 Years of experience with Road projects

a) None (),

b) Less than 3 yrs (),

c) 3 to 5 yrs (),

d) 5 to 10 yrs (),

e) 10 to 15yrs (),

f) more than 15 yrs ().

Section Two: Response on requirements and determinats of supply chain management

2.1 Kindly rate the success (in percentage) of your organization's road project against the objectives of meeting construction requirements (Choose only one)

a. 0-25% success rate (),

b. 26-50% success rate (),

c. 51-75% success rate (),

d. 76-100% success rate (),

2.2 Do you think the road projects you undertake are completed on schedule: YES- ()
NO- () NOT ALWAYS ()

2.3 (a) If the answer to 2.2 is NO, and then what is your estimation of the project lateness?

a. 3 months late (),

b. 6 months late (),

c. 9 Months late (),

d. 12 Month late (),

e. More than a year late. (),

2.4 In your opinion how do you think lack of supply chain management will affect the cost of road construction?

- INCREASE ()
- DCREASE ()
- NO CHANGE ()

2.5 On a scale of 1-5 (1-being the lowest and 5-being the highest) rate the effect in your organization of following supply chain requirements

Supply chain requirement	1-Strongly disagree	2-Disagree	3-Fairly agree	4-Agree	5-Strongly Agree
Visibility	()	()	()	()	()
Connectivity	()	()	()	()	()
Integration	()	()	()	()	()
Responsiveness.	()	()	()	()	()

Please provide any general comments and suggestions regarding the requirements of supply chain

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2.6.1 Section Three: Information and Communication Technology

Supply Chain Performance	1-Strongly disagree	2-Disagree	3-Fairly agree	4-Agree	5-Strongly Agree
Role information technology department	()	()	()	()	()
Web-based technologies	()	()	()	()	()
Application of information technology in executions of road construction project	()	()	()	()	()
Use of integrated information system of purchasing and procuring of goods and services	()	()	()	()	()

Please provide any general comments and suggestions regarding adopted information technology services

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2.6.2 Section Four: Materials Flows Management.

Does the following affect the quality of the project deliverables?

Materials flow practices	1-Strongly disagree	2-Disagree	3-Fairly agree	4-Agree	5-Strongly Agree
System or models used in planning your materials for the road projects.	()	()	()	()	()
Time required to produce those materials	()	()	()	()	()
Master resource scheduling	()	()	()	()	()
Material requirement planning	()	()	()	()	()

Please provide any general comments and suggestions regarding the materials flow management

.....

2.6.3 Section Five: Customer and suppliers relationship

Supplier/ Vendor factors	1-Strongly disagree	2-Disagree	3-Fairly agree	4-Agree	5-Strongly Agree
Existence of Back to back contract between the supplier and the materials manufacturer is critical for effective implementation	()	()	()	()	()
Experience of supplier in similar projects, in similar industry is important.	()	()	()	()	()
Qualification of supplier is key determinant to effective implementation	()	()	()	()	()
Financial stability of the supplier is an important determinant of project success	()	()	()	()	()
The suppliers supported by various road material manufacturers to successfully implement the project	()	()	()	()	()

Please provide any general comments and suggestions regarding suppliers/Vendors of such projects

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2.6.4 Section Six: Strategic Alliances

Strategic Alliances	1-Strongly disagree	2-Disagree	3-Fairly agree	4-Agree	5-Strongly Agree
Collaborating on supply chain design and product service strategies	()	()	()	()	()
Poorly documented processes affect the project success.	()	()	()	()	()
Partnering companies interface on a regular basis	()	()	()	()	()
Documentation of road projects should involve all the affected process/data owners.	()	()	()	()	()

Please provide any general comments and suggestions on the need strategic alliances in road construction supply chain management.

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2.6.5 Section Eight: Please rank (1-low importance, 5-High importance) the following factors according to their importance in implementing SCM in road projects.

Critical Success Factors	1-Lowest	2- Low	3-Average	4-High	5-Highest
Communication and information technology	()	()	()	()	()
Strategic Alliances	()	()	()	()	()
Customer and suppliers relationship	()	()	()	()	()
Materials Flows Management.	()	()	()	()	()

Please provide any general comments and suggestions on the key challenges of supply chain management

Appendix II: Research Budget

Budget

No	Item	Cost
	PART A	
	Stationery	10,000
	Secretarial services	6,000
	Printing & Binding	8,000
	Correspondence & transport and other miscellaneous	10,000
	SUB TOTAL A	34,000
	PART B	
	Data collection	10,000
	SUBTOTAL B	10,000
	Total	44,000.00

Appendix III: Work Plan

No	Activity	Period						
		May	June	July	August	Sept	Oct	Nov
1	Proposal writing							
2	Defense							
3	Appointment letters							
4	Distribution of questionnaires /data collection							
5	Data combination and analysis							
6	Report writing							
7	Submission							

Appendix IV

List of Companies

CATEGORY A

- 1) Xuzhou Highway Engineering Corporation Group Ltd
- 2) Associated Construction Co. Ltd
- 3) Intex Construction Company Limited
- 4) Kundan Singh Construction
- 5) Crescent Construction Company
- 6) Nyoro Construction Co. Ltd.
- 7) Aegis Construction Ltd
- 8) Kimemiah Engineering Construction Ltd.
- 9) Westbuild General Contractors ltd.
- 10) Intex Construction Ltd
- 11) Victory Construction Co. Ltd.
- 12) Kimilili Hauliers Ltd.
- 13) Northern Construction Co. ltd.
- 14) Hayer Bishan Singh & Sons ltd
- 15) S.S. Mehta & Sons Ltd.
- 16) B.N. Kotecha & Sons Ltd.
- 17) Coastal Kenya Enterprises Ltd.
- 18) Talewa Road Contractors
- 19) Jomwak Enterprises
- 20) Glencarrick Construction (K) Ltd.
- 21) Pride Enterprises
- 22) Kirinyaga Construction (K) Ltd.
- 23) Spencon Kenya Ltd.
- 24) TM/AM Construction Group
- 25) Buldel Enterprises Ltd

CATEGORY B

- 1) Njuca Consolidated Co.Ltd
- 2) Territorial Works Ltd
- 3) Mutech Motors And Civil Engineering Contractors
- 4) Vineyard Holdings Ltd
- 5) Rhino Technical Works Ltd
- 6) Karathi General Building Contractors
- 7) Karuri Civil Engineering Ltd
- 8) Sivad Construction Ltd
- 9) Raflo Services
- 10) Don-Woods Co.Ltd
- 11) Petwa Construction Co.Ltd
- 12) Jomwark Enterprises Ltd
- 13) Danaff Kenya Limited
- 14) G Issaias & Company (K) Limited
- 15) Triple Eight Construction Limited
- 16) Nyoro Construction Limited
- 17) Kimemia Engineering Construction Limited
- 18) Mattan Contractors Limited
- 19) Don Woods Limited
- 20) Petwa Construction Company Limited
- 21) Ongata Works Limited
- 22) Shengli Engineering Construction Company Limited
- 23) Coastal (K) Enterprises Limited
- 24) Lee Construction Limited
- 25) Jianxi Zhongmei Engineering Co.
- 26) Kabuito Contractors Limited
- 27) Pepco (K) Limited
- 28) Beza Consulting Engineers.
- 29) Kin Consult Associates Ltd.
- 30) Vermart Engineering

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