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# RISK MANAGEMENT STRATEGY AND SUPPLY CHAIN PERFORMANCE AMONG MANUFACTURING COMPANIES IN KENYA

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## Abstract

***Purpose*:** The purpose of this study was to determine risk management strategy and supply chain performance among manufacturing companies in Kenya

***Methodology*:** The study adopted a cross-section survey of descriptive nature. The target population comprised of the 412 manufacturing companies within Nairobi County that were registered members of KAM. The fisher *et al* formula for calculating the sample size was used to yield a sample size of199. Data was collected using questionnaires and analysed using statistical package of social sciences (SPSS) version 21 as a tool of analysis. In trying to explain the relationship between different variables in the study, Odd ratio regression was adopted as an appropriate method of analysing the relationship between multiple variables requiring simultaneous comparison.

***Results:*** The study findings revealed that the constructs of risk identification management strategy combined together influenced supply chain performance as supported by a p value of 0.000.Further, most of the companies had risk analysis and evaluation management strategy in place. The study also concluded that the odds of observing better lead time and odds of improved quality were higher for those companies that conducted whole life costing of suppliers (p value- 0.023) and internal controls of suppliers (p value- 0.049)

***Policy recommendation*:** the study recommended that manufacturing companies should put in place a risk analysis and evaluation management strategy to enhance supply chain performance. In particular, companies should consider conducting whole life costing of suppliers and also internal quality of suppliers.

***Keywords:*** *risk management strategy, performance, manufacturing companies*

## 1.0 INTRODUCTION

Today's market place is characterized by turbulence and uncertainty. Market turbulence has tended to increase in recent years for several reasons the supply chain. Demand in almost every industry sector seems to be more volatile. Product and technology life-cycles have shortened significantly and competitive product introduction make life cycle demand difficult to predict (WB, 2012). Considerable 'chaos' exists in supply chains through the effect of such actions as sales promotion, quarterly sales incentives or decision rules such as quantities which results into continuous disruptions along the supply chain (Singhal& Hendricks, 2005).

Today, vulnerability of Supply chains to disturbances or disruptions has increased and has received considerable attention by practitioners as well as academics (Skipper & Hanna, 2009). It's not only the effect of external events such as natural disasters but also the impacts of changes in business strategy, the impact of one entity in the supply chain failing can as well lead to a number of entities closing down and in some instances the whole supply chain shuts down. The risk implications of the entwined global marketplace that characterize today's supply chains have also been evidenced vividly in the recent global financial crisis. Many companies have experienced a change in their supply chain risk profile as a result of changes in their supply chain profile and changes in their business models. The adoption of 'lean' practices, the move to outsourcing and a general tendency to reduce the size of the supplier base potentially increase supply chain vulnerability (Richard, 2008).

The level of decision making along supply chain in manufacturing companies, quality of service and the type of relationship with other organizations generally influences the level of outputs expected from the functional and tertiary groups (Cooper &Ellram, 2003). The diversity and complexity of organizations, growth, strategic conceptualization & pursuit of adaptive mechanisms coupled with adverse changes in technology, and the global competitiveness of different markets, is beyond the efforts of an organization alone but between the supply chains (Cox & Watson, 2001). Most literature reveal that supply chain performance in manufacturing companies is more appropriate as units of analysis than the entire organization management with the realization of the fact that those involved in the chain are in a position to lead in a number of possible directions (Miller & Ross, 2003).

Today's marketplace is shifting from individual company performance to supply chain performance: the entire chain's ability to meet end-customer needs through product availability and responsive, on-time delivery (Chen & Labadi, 2005). Supply chain performance crosses both functional lines and company boundaries. Functional groups (engineering/R&D, manufacturing, and sales/marketing) are all instrumental in designing, building, and selling products most efficiently for the supply chain, and traditional company boundaries are changing as companies discover new ways of working together to achieve the ultimate supply chain goal: the ability to fill customer orders faster and more efficiently than the competition (Abdullah & Abdel, 2004).The process of choosing appropriate supply chain performance measures is difficult due to the complexity of these systems in manufacturing companies. The performance of a supply chain in manufacturing companies is characterized by its ability to remain market-sensitive without losing the integration through the chain. One of the difficulties in designing and analyzing a supply chain in these companies is that its processes are governed by the strategic attributes of the supply chain (Lysons, 2006). In

today's world, supply chain management (SCM) is a key strategic factor for increasing organizational effectiveness and for better realization of organizational goals such as enhanced competitiveness, better customer care and increased profitability (Bosman, 2006).
The globalization of markets and outsourcing has made many manufacturing companies select supply chain and logistics to manage their operations. Most of these companies realize that, in order to evolve an efficient and effective supply chain, SCM needs to be assessed for its performance to reduce risk of disruptions (Van & Beulens, 2002). Supply chain management (SCM) has been a major component of competitive strategy to enhance organizational productivity and profitability as well as metric measure, however performance pertaining to Supply chain and risks pertaining to disruptions among manufacturing companies has not received adequate attention from researchers or practitioners today (Wegner & Bode, 2006).

### 1.1 Statement of the Problem

In the current global downturn, businesses are being hit by falling demand and unpredictable global supply costs which will expose these and other built in supply chain vulnerabilities. The key questions are, do business leaders understand these vulnerabilities and does their supply chain team have the capability to identify them and present the plans to mitigate them? In most cases the answer is no. In tough times businesses need to focus absolutely on profit, cash flow and eliminating unpredictable events from a declining demand profile (WB, 2012).Businesses processes today are endangered due to increased vulnerabilities as a result of risks along the process of enhancing performance in the organization (Suhong, Bhanu, Ragu, & Rao, 2006).
Several studies reveal that Supply chains collapses at an alarming rate due to continuous risk disruptions in developing nations in the world (Singhal& Hendricks, 2005). Past studies showed that most supply chains fail within first three years of business operations (Bosman, 2006). According to World Bank report (2013),companies with poor supply chain performance experienced 33-40%, lower stock of returns and approximately 70% to 80% of these companies' supply chains fail within 1-3 years (WB, 2013). It's also evident that share price volatility in the year after the supply chain performance drop goes to 13.5% higher compared with volatility in the year before the disruption (Hendricks &Singhal, 2005).

Poor Supply chain performance reduces company's revenue, cut into market share, inflate company's cost, increase budget and threaten production up to 60%, damage a company's credibility with investors and other stakeholders, thereby driving up its cost of capital; such firms experienced 7% lower sales, 11% higher costs and 14% increase in inventories (Ruud & Bosman, 2006). According to a study by Sean and Kilcarr (2013) on Third-Party Logistics, economic losses due to poor supply chain performance among manufacturing companies increased by 465% over the last three years climbing from $62 billion in 2009 to well over $350 billion in 2011.

A study by the Public Procurement Authority (PPOA) (2013) revealed that most of the tendered products/services are being brought with a mark-up of 60% on the market price hindering the supply chain performance due to high costs (Kirungu, 2012). This means that supply chains performance in Kenya is at a high risk of inadequate risk interference and influence. Further Howarth and Fredericks (2012) identifies that Small and Medium Enterprises (SMEs) manufacturers contributed to 70% of the Kenyan Gross Domestic

Product (GDP) in 2011 whose operations are entirely depended on the performance of their supply chains, however increased non-performance of their supply chains due to risk interference, have resulted to a major stagnation in their profit margin reducing the GDP at an alarming rate. Statistics from Economic Survey (2014) show that Supply chain performance in manufacturing companies is a component of Kenya's overall GDP. In the last 31 years, it has been greatly fluctuating. In 1980, industry and manufacturing accounted for 21 percent of Kenya's overall GDP. In 1990, it decreased to 19 percent, and in 2000, the value added to GDP decreased again to 17 %. In 2011, there was a slight rise to 19% of Kenya's overall GDP (WB, 2013). This sudden change in GDP calls for immediate solution to the manufacturing companies' supply chains risk disruptions since Kenya's economy is market-based, and maintains a liberalized external trade system, hence the need for this study.

### 1.2 Research Objectives

I. To determine the relationship between risk identification management strategy and supply chain performance among manufacturing companies in Kenya.
II. To identify the relationship between risk analysis and evaluation management strategy and supply chain performance among manufacturing companies in Kenya
III. To explore the relationship between risks monitoring & control management strategy and supply chain performance among manufacturing companies in Kenya.
IV. To determine the relationship between hedging risk management strategy and supply chain performance among manufacturing companies in Kenya.
V. To analyze the moderating relationship of legal and regulatory environment between risk management strategy and supply chain performance among manufacturing companies in Kenya.

## 2.0 LITERATURE REVIEW

### 2.1 Theoretical Review

#### 2.1.1 Dynamic Risk Management Theory

The theory develops a continuous time, infinite horizon model of a firm which endogenously and dynamically adjusts its risk management contract which is a function of the firm's exogenous product price (frank, 2003). The model can be described by the following timeline: At time zero, the levered firm decides whether to initiate a risk management contract (guaranteeing a set of forward prices for a certain fraction of the firm's output), and chooses its maturity (Carter, 2004). At each subsequent time period, the firm produces one unit of product at a fixed cost and realizes cash flows that are determined by the current spot price and the price guaranteed by the risk management contract (if any) and whether or not the firm is in financial distress. The firm can default, in which case the debt holders recover part of the firm's value and the Equity-holders get nothing and are obligated to terminate (pay out or cash out) any outstanding risk management contracts, or, if not in default, the firm meets its periodic debt payments and pays production costs, and then makes a decision with respect to its risk management strategy; the firm can enter a risk management contract and choose its maturity; if the firm currently operates with a risk management contract in place, it

can choose to terminate the contract early and to cash out (or to pay out) its current position at a fair market value. Both the initiation and the termination of the risk management contract generate transaction costs (Klapper, 2001).

The residual cash flow after debt payments and production costs is paid to the equity-holders as dividends. The firm is assumed to default on its debt optimally; when the market value of the firm's equity becomes zero. The firm's decisions with respect to the risk management strategy are made from the perspective of the shareholders who maximize the value of their equity stake. Both equity and debt are priced fairly taking into account the risk management strategy of the equity-holders. Because of a need to limit the dimensionality of the model, we are forced to make several modeling compromises. First, the model does not allow the firm to change the structure of its debt over time. Second, it assumes that the firm holds no cash, which implies that it pays all its residual cash flows as dividends (Stulz, 2002). The understanding of corporate risk management is based on static models that describe how various capital market imperfections give firms an incentive to reduce risk. While existing models provide rich intuition as to why firms should manage risk, they provide fewer predictions about how firms translate the incentives to manage risk into actual decisions on the choice of risk management instruments and how these strategies evolve over time (Zsidisin, 2004). Dynamic model of corporate risk management present and tests a continuous-time and infinite-horizon framework. It analyzes issues, which are difficult to address in static models, including the optimal timing to initiate risk management contracts and frequency of adjustment (Brown, 2001).

Many static models assume that firms make one-period decisions to hedge and that these decisions are irreversible and costless. Therefore one-period models also often implicitly assume that the employed risk management instruments have the same duration as the lifetime of the firm. Treating risk management choices as irreversible limits the ability of the static models to recognize the value of dynamic risk management in adapting to changes in market conditions and firm characteristics. The fact that most risk management instruments have shorter maturities than the duration of the firm's operations has important implications for the timing and sequence of risk management decisions and it provides an intuition for the limited effect of risk management on firm exposure (Brown &Klapper, 2001). This theory explicitly explains the application and relevance of hedging against risk management strategy in this research.

### 2.1.2 Enterprise Risk Management Model

The Enterprise Risk Management (ERM) Model is a system used to analyze the cost and benefit of addressing risks. This system measures risk using a combination of qualitative and quantitative methods to set a standard method for analyzing risk across the many functions within the different departments in an organization. Risks generally fall within five categories regardless of the subject matter of the subsystem. These categories are (1) risks to people, (2) risks that hinder mission accomplishment, (3) risks to departmental physical assets, (4) financial risks, and (5) risks that destroy credibility and trust by the customers, stakeholders, and the general public (Cooper, 2003).
A comparison of rough costs estimates for potential risks and the controls that address them can help the Department ensure that all risks are sufficiently addressed through acceptance, monitoring, mitigation and avoidance. This system also ensures that controls are not applied when the cost of the controls exceeds the cost of risk acceptance (Sheffi, 2005).

Further the preliminary review of each subsystem begins with a risk analysis performed by a team of senior level representatives of a department in an organization. This team performs the risk analysis using five steps. First Identifying Risks which List all possible events that could occur in a subsystem if there are no controls. Once risks are identified, combine like risks according to the following key areas impacted by the risks, people, mission, physical assets, financial assets, and customer/stakeholder trust. Secondly, Evaluating Risks involves rating risks according to probability and impact (Brown, 2001). Also Identify Existing Risk Mitigation which includes listing all controls that would exist without subsystem-specific controls. Further Identify New Risk Controls Where there is a significant or extreme risk rating, list gaps between existing risks and existing controls. For risks rated moderate, proposed controls must demonstrate a clear benefit (approval of a mission need) level cost-benefit analysis. Lastly, Risk Register is a step that creates a register that documents the results of the risk evaluation, including the events, probabilities, impacts, and risk management strategy (Reck, 2005). This theory explicitly explains the application and relevance of the risk analysis and evaluation management strategy in this research.

### 2.1.3 Theory of Performance

The Theory of Performance (ToP) develops and relates six foundational concepts to form a framework that can be used to explain performance as well as performance improvements. To perform is to produce valued results. A performer can be an individual or a group of people engaging in a collaborative effort (Tomlinson & Burns 2002). Developing performance is a journey, and level of performance describes location in the journey. Current level of performance depends holistically on six components: context, level of knowledge, levels of skills, level of identity, personal factors, and fixed factors. Three axioms are proposed for effective performance improvements. These involve a performer's mindset, immersion in an enriching environment, and engagement in reflective practice (Pellegrino, 2001).

According to Top, to perform is to take a complex series of actions that integrate skills and knowledge to produce a valuable result. In some instances, the performer is an individual; in other instances, the performer is a collection of people who are collaborating, such as an academic department, research team, committee, student team, or a university (Brown, 2000).

Performing at a higher level produces results that can be classified into different categories. Quality increases results or products are more effective in meeting or exceeding the expectations of stakeholders, Cost decreases amount of effort or financial resources to produce a result goes down; amount of waste goes down, Capability increases ability to tackle more challenging performances or projects increases, Capacity increases ability to generate more throughput increases, Knowledge increases depth and breadth of knowledge increases, Skills increase abilities to set goals, persist, maintain a positive outlook. Increase in breadth of application and in effectiveness and Identity and motivation increases individuals develop more sense of who they are as professionals (Bransford*et al*. 2000). According to these roles model for effective teaching and learning includes knowledge-centered, learner-centered, assessment-centered, and community-centered components. The learner-centered component involves the performer's mindset. The knowledge-centered and community-centered components connote immersion in an enriching environment, while the assessment-centered component embraces elements of reflective practice (Caine, 2005). This theory explicitly explains the relevance of risk identification management strategy on supply chain performance among manufacturing companies in this research.

### 2.1.4 Theory of Constraints

The theory of constraints (TOC) is an overall management philosophy introduced by Eliyahu M. Goldratt in his 1984 book titled The Goal, that is geared to help organizations continually achieve their goals. The theory of constraints (TOC) adopts the common idiom "A chain is no stronger than its weakest link" as a new management paradigm. This means that processes and organizations are vulnerable because the weakest person or part can always damage or break them or at least adversely affect the outcome (Eliyahu, 2004).

The analytic approach with TOC comes from the contention that any manageable system is limited in achieving more of its goals by a very small number of constraints, and that there is always at least one constraint. Hence the TOC process seeks to identify the constraint and restructure the rest of the organization around it. The underlying premise of theory of constraints is that organizations can be measured and controlled by variations on three measures: throughput, operational expense, and inventory (Mabel & Zhu, 2002). Theory of constraints is based on the premise that the rate of goal achievement by a goal-oriented system (the system's throughput) is limited by at least one constraint. The argument by reduction ad absurdum is that if there was nothing preventing a system from achieving higher throughput (more goal units in a unit of time), its throughput would be infinite which is impossible in a real-life system. Only by increasing flow through the constraint can overall throughput be increased (Linhares, 2009).

The solution for supply chains is to create flow of inventory so as to ensure greater availability and to eliminate surpluses. The ToC distribution solution is effective when used to address a single link in the supply chain and more so across the entire system, even if that system comprises many different companies. The purpose of the ToC distribution solution is to establish a decisive competitive edge based on extraordinary availability by dramatically reducing the damages caused when the flow of goods is interrupted by shortages and surpluses (Mabel & Zhu, 2002). This theory explicitly explains the application and relevance of the risk control and monitoring management strategy in this research.

### 2.1.5 Supply Chain Operations Reference (SCOR) Model

The Supply Chain Operations Reference (SCOR) model was a grassroots initiative in SCM. The model can be applied to any and all product and information flow in the supply chain at high-levels of modelling abstraction. The company specific processes are then linked to the lowest layer of the SCOR model (Level 3) at the implementation phase (SCOR, 2007). Industry's response to the SCOR initiative is one of its most important features. As the SCOR model is more widely accepted and implemented, it gains critical mass. This means that the benefits derived from a de facto industry standard are realized (Huang, Sheoran, & Wang, 2004). The SCOR model describes high-level business processes associated with all phases of satisfying customer demand (SCC 2000). At the highest level the SCOR model is organized around four business process types (Plan, Source, Make, & Deliver). These processes represent the vertical-neutral abstractions from all demand/supply planning, purchasing/procurement, manufacturing, order entry and outbound logistics, and returns processing activities. The model, therefore, provides a business process framework with standard descriptions and interdependencies among processes. The aim is to meaningfully map supply chains and supply chain activities with varying complexities across multiple industry-verticals (Huang, Sheoran, & Wang, 2004).The hierarchical process framework decomposes to the third level. The Process Element Level, activity definitions are still

generalized, so they still apply to a variety of product and information flows (including services). The model, for the top three levels, provides the framework for analysing, designing, and implementing actual operational supply chain execution or planning processes. Best-practices and enabling technology indexing/cataloging are also linked to the Process Elements, and they can be used to guide implementation. The model's business process framework provides a common language to facilitate horizontal process integration across different business units and players in the value chain. This framework is a strategic tool for describing, communicating, measuring, implementing and controlling, and fine-tuning complex SCM processes. The model offers the benefits of standardization if all value chain participants implementing the SCOR model adhere to the framework (SCOR, 2007).This model explicitly explains the application and relevance of supply chain performance in manufacturing companies in this research as the dependent variable.

## 3.0 METHODOLOGY

The study adopted a cross-section survey of descriptive nature .The target population comprised of the 412 manufacturing companies within Nairobi County that were registered members of KAM. The fisher *et al* formula for calculating the sample size was used to yield a sample size of199. Data was collected using questionnaires and analysed using statistical package of social sciences (SPSS) version 21 as a tool of analysis. In trying to explain the relationship between different variables in the study, Odd ratio regression was adopted as an appropriate method of analysing the relationship between multiple variables requiring simultaneous comparison.

## 4.0 RESULTS FINDINGS

### 4.1 Hypothesis Testing

The hypothesis was tested by running an ordinary least square regression model. The acceptance/rejection criteria was that, if the p value is greater than 0.05, the Ho is not rejected but if it's less than 0.05, the Ho fails to be accepted.

The null hypothesis for the fifth objective was: Legal and regulatory framework has no significant effect on supply chain performance among manufacturing companies in Kenya. The alternative hypothesis for the fifth objective was: Legal and regulatory framework has significant effect on supply chain performance among manufacturing companies in Kenya.

**Table 1: Legal and Regulatory Framework Model ANOVA**

| ANOVA | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 3.881 | 1 | 3.881 | 28.409 | .000b |
| | Residual | 16.118 | 118 | 0.137 | | |
| | Total | 19.999 | 119 | | | |

a Dependent Variable: Supply chain performance
b Predictors: (Constant), Legal and Regulatory framework

**Table 2: Legal and Regulatory Framework Model Summary**

| Model Summary | | | | |
|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .441a | 0.194 | 0.187 | 0.36959 |

a Predictors: (Constant), Legal and Regulatory framework

**Table 3: Legal and Regulatory Framework Model Coefficients**

| Coefficients | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 0.312 | 0.084 | | 3.727 | 0.000 |
| | Legal and Regulatory framework | 0.554 | 0.104 | 0.441 | 5.33 | 0.000 |

a Dependent Variable: Supply chain performance

The F statistic for the model was significant at 5% level of significance implying that the model fit well. The results of the regression model reveal that Legal and Regulatory framework explains 19.4% of the changes in supply chain performance.

The relationship between Legal and Regulatory framework and supply chain performance was significant at 5% level of significance. The p-value was 0.000 which indicated that the null hypothesis was not accepted at 5% level of significance hence Legal and Regulatory framework has significant effect on supply chain performance among manufacturing companies in Kenya.

**Table 4: Summary Hypothesis Testing**

| Objective No. | Objective | Null Hypothesis | Rule | P-value | Comment |
|---|---|---|---|---|---|
| 1 | To determine the relationship between risk identification management strategy and supply chain performance among manufacturing companies in Kenya. | Risk identification management strategy has no significant effect on supply chain performance among manufacturing companies in Kenya | Reject null hypothesis if p-value is less than 0.05 | 0.000 | Rejected null hypothesis |
| 2 | To identify the relationship between risk analysis and evaluation management strategy and supply chain performance among manufacturing | Risk analysis and evaluation management strategy has no significant effect on supply chain performance among manufacturing | Reject null hypothesis if p-value is less than 0.05 | 0.000 | Rejected null hypothesis |

| | | | | | |
|---|---|---|---|---|---|
| | companies in Kenya | companies in Kenya | | | |
| 3 | To explore the relationship between risks monitoring & control management strategy and supply chain performance among manufacturing companies in Kenya. | Risk control and monitoring management strategy has no significant effect on supply chain performance among manufacturing companies in Kenya | Reject null hypothesis if p-value is less than 0.05 | 0.000 | Rejected null hypothesis |
| 4 | To determine the relationship between hedging risk management strategy and supply chain performance among manufacturing companies in Kenya. | Hedging risk management strategy has no significant effect on supply chain performance among manufacturing companies in Kenya | Reject null hypothesis if p-value is less than 0.05 | 0.000 | Rejected null hypothesis |
| 5 | To analyze the moderating relationship of legal and regulatory environment between risk management strategy and supply chain performance among manufacturing companies in Kenya. | Legal and regulatory framework has no significant moderating effect on supply chain performance among manufacturing companies in Kenya | Reject null hypothesis if p-value is less than 0.05 | 0.000 | Rejected null hypothesis |

### 4.2 Supply Chain Performance

The three measures of performance that were used included cost of supply chain management, quality of firm's products and supply chain lead time.

#### 4.2.1 Cost of Supply Chain

The respondents were asked to state their approximate change in the cost of supply chain over the study period.

**Table 5: Cost of Supply Chain Management 2010 to 2014**

| | Increased by over 50% | Increased by less than 50% | Decreased by less than 50% | Decreased by over 50% | Total Std. Dev. | Mean |
|---|---|---|---|---|---|---|
| Cost of supply chain management 2010 | 22.5% | 34.2% | 40.0% | 3.3% | 0.84 | 2.24 |
| Cost of supply chain management 2011 | 20.8% | 32.5% | 44.2% | 2.5% | 0.82 | 2.28 |
| Cost of supply chain management 2012 | 13.3% | 9.2% | 35.8% | 41.7% | 1.02 | 3.06 |
| Cost of supply chain management 2013 | 5.8% | 14.2% | 42.5% | 37.5% | 0.86 | 3.12 |
| Cost of supply chain management 2014 | 9.2% | 7.5% | 46.7% | 36.7% | 0.90 | 3.11 |
| **Average** | **14.32%** | **19.52%** | **41.84%** | **24.34%** | **0.89** | **2.76** |

The interpretation of the responses were as follows; "1" was " an increase in supply chain cost by more than 50%", "2", was an "increase in supply chain costs by less than 50%", "3" was a "decrease in supply chain cost by less than 50%", while "4" was a " a decrease in supply chain cost by more than 50%. This implied that higher mean scores were allocated to firms whose supply chain costs had declined. The mean cut off for firms with high cost saving and low cost savings was 2.5. A mean score of 2.5 or more indicated high reduction in supply chain costs and a mean score of less than 2.5 indicated low reduction or apparent increase in supply chain costs.

Results in Table 5 indicate that the average number of respondents who indicated an increase in the cost of supply chain management by over 50% were 14.32%, an increase in the cost of supply chain management by less than 50% were 19.52%, a decrease in supply chain

management cost by less than 50% were 41.84% and 24.34% indicated a decrease in the costs by over 50%. The mean response was 2.76 indicating that majority of the respondents indicated a decrease in the cost of supply chain management by less than 50%. A standard deviation of 0.89 indicated a small variation in the responses of the respondents on the cost of supply chain management over the study period of 2010 to 2014.

The study also performed the trend analysis of the average yearly change in cost of supply chain management. The trends indicated that the first 2 years (2010 to 2011), majority of the firms recorded a slight increase in cost of supply chain by less than 50% after which there was a decrease in the costs by less than 50% in the years 2012, 2013 and 2014. The implication is that firms who had introduced risk management strategies experienced a decline in supply chain costs for the five years (2010 to 2014). This further implies that the supply chain performance of the firms under study improved in the years 2010-2014.

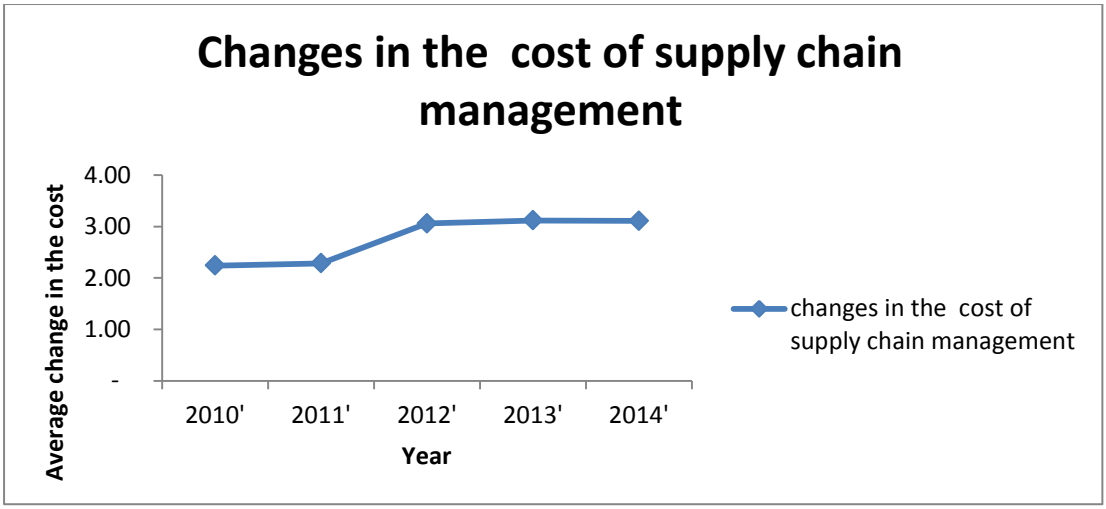


**Figure 1: Trend Analysis of Cost of Supply Chain Management 2010 to 2014**

### 4.2.2 Quality of Supply Chain

Another measure of performance used by the study was quality of the firm's products. The respondents were asked to rate the quality of their firm's products over the study period. The average percentage number of respondents who indicated that the quality of products was less than 25% of the quality control threshold was 8.66% while 29.68% of the respondents stated that the quality of their firm's products was between 26 to 50% of the quality control threshold. Majority of the respondents, 45.32%, indicated that the products were between 51 to 75% of the quality control threshold. Only 16.36% indicated quality greater than 75% of the quality control threshold over the study period as indicated in Table 6. The mean of 2.69 indicate that majority of the firm's products had a quality of between 51 to 75 % while a standard deviation of 0.84 indicate a large variation in the responses concerning the quality of firm's products.

**Table 6: Quality of Firm's Products**

| | Less than 25% | 26-50% | 51-75% | Over 75% | Total | Std. Dev | Mean |
|---|---|---|---|---|---|---|---|
| Quality of firm's products 2010 | 11.7% | 34.2% | 30.0% | 24.2% | 100.0% | 0.97 | 2.67 |
| Quality of firm's products 2011 | 7.5% | 35.0% | 30.0% | 27.5% | 100.0% | 0.94 | 2.78 |
| Quality of firm's products 2012 | 5.8% | 36.7% | 48.3% | 9.2% | 100.0% | 0.74 | 2.61 |
| Quality of firm's products 2013 | 8.3% | 24.2% | 58.3% | 9.2% | 100.0% | 0.76 | 2.68 |
| Quality of firm's products 2014 | 10.0% | 18.3% | 60.0% | 11.7% | 100.0% | 0.80 | 2.73 |
| **Average** | **8.66%** | **29.68%** | **45.32%** | **16.36%** | **100 %** | **0.84** | **2.69** |

Trend analysis conducted on mean of the yearly quality of products indicated that the quality has been fluctuating but notably ranging between 26 to 50% of the quality control threshold.

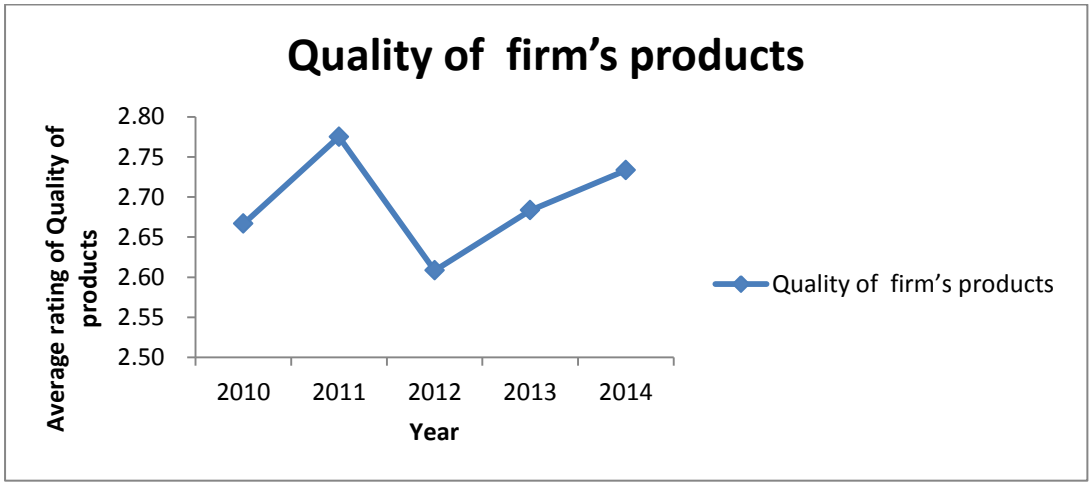


**Figure 2: Trend analysis Quality of firm's products**

### 4.2.3 Lead Time of Supply Chain

The respondents were asked to state their changes in supply chain lead time over the study period. The interpretation of the responses were as follows; "1" was "an increase in supply chain lead time by over 50%", "2", was an "increase in supply chain lead time by less than 50%", "3" was a "decrease in supply chain lead time by less than 50%", while "4" was a "a decrease in supply chain lead time by more than 50%. This implied that higher mean scores were allocated to firms whose supply chain lead time had declined. The mean cutoff for firms with high lead time was 2.5. A mean score of 2.5 or more indicated high reduction in supply chain lead time and a mean score of less than 2.5 indicated low reduction or apparent increase in supply chain lead time.

The supply chain lead time was also used to measure the performance. The respondents were asked to state the approximate change in supply chain lead time experienced by the firms in the study period from 2010 to 2014. The average percentage number of respondents who indicated that lead time increased by over 50% over the study period was 9.34% while 29.52% of the respondents indicated that over the study period, lead time increased by less than 50%. Majority of the respondents, 42.82%, indicated that lead time reduced by less than 50% and only 18.32% admitted that there was a decrease in lead time by over 50% as shown in Table 4.66. The mean supply chain lead time over the study period for all the firm's was 2.70 indicating that majority of the firms had a reduction in the supply chain lead time by less than 50% which is an indication of better performance. The standard deviation of 0.84 indicated that there was less variation in the responses indicating the changes in supply chain lead time among the firms.

**Table 7: Supply Chain Lead Time**

| | **Increased by over 50%** | **Increased by less than 50%** | **Reduced by less than 50%** | **Reduced by over 50%** | **Row %** | **Total Std. Dev** | **Mean** |
|---|---|---|---|---|---|---|---|
| Changes in supply chain lead time experienced by the firm in 2010 | 7.5% | 44.2% | 42.5% | 5.8% | 100.0% | 0.72 | 2.47 |
| Changes in supply chain lead time experienced by the firm in 2011 | 9.2% | 41.7% | 40.8% | 8.3% | 100.0% | 0.78 | 2.48 |
| Changes in supply chain lead time experienced by the firm in 2012 | 11.7% | 26.7% | 53.3% | 8.3% | 100.0% | 0.81 | 2.58 |
| Changes in supply chain lead time experienced by the firm in 2013 | 10.8% | 19.2% | 35.0% | 35.0% | 100.0% | 0.99 | 2.94 |
| Changes in supply chain lead time experienced by the firm in 2014 | 7.5% | 15.8% | 42.5% | 34.2% | 100.0% | 0.90 | 3.03 |
| **Average** | **9.34%** | **29.52%** | **42.82%** | **18.32%** | **100.00 %** | **0.84** | **2.70** |

The trend analysis drawn to indicate the annual average change in supply chain lead time indicated that the first three years saw most of the firm's experience an increase in supply chain lead time by less than 50% while the year 2013 and 2014 so a decrease in the supply chain lead time by over 50% as indicated in Figure 3.

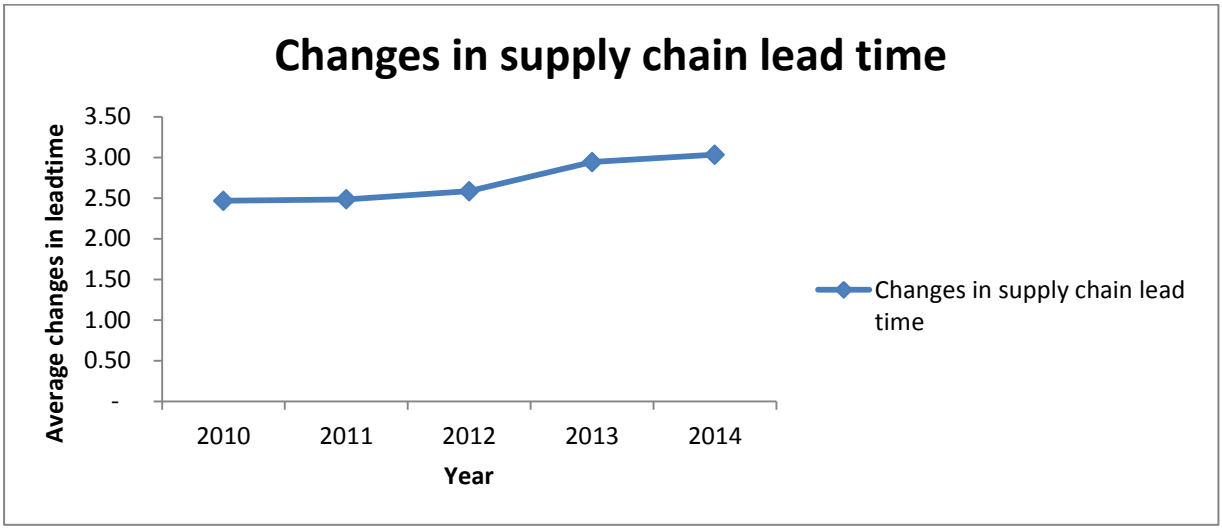


**Figure 3: Trend analysis for changes in supply chain lead time**

## 5.0 SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Summary of Finding

#### 5.1.1 Risk Identification Management Strategy

The first objective of the study was to determine the effect of risk identification management strategy on supply chain performance among manufacturing companies in Kenya. Results revealed that majority of the companies conducted pre-screening of suppliers' capacity. Pre-screening of suppliers' capacity resulted to decreased lead time, improved quality and reduced cost. Results also revealed that majority of the companies conducted periodic procurement audits. Periodic procurement audits resulted to decreased lead time, improved quality and reduced cost. Further, the results also revealed that majority of the companies conducted inventory forecasting. Conducting inventory forecasting resulted to decreased lead time, improved quality and reduced cost.

The bivariate regression results indicated that the odds of improved lead time were higher for those companies practicing pre-screening of suppliers' capacity and periodic procurement audits. The results indicated that the odds of improved quality were higher for those companies practicing pre-screening of suppliers' capacity, periodic procurement audits and inventory forecasting. Further, the results indicated that the odds of improved cost were higher for those companies practicing pre-screening of suppliers' capacity, periodic procurement audits and inventory forecasting.

The multivariate regression results indicated that the odds of observing improved lead time were higher for those companies that had a risk identification management strategy in place. The results also indicated that the odds of observing improved quality were higher for those companies that had a risk identification management strategy in place. Further the odds of observing improved cost were higher for those companies that had a risk identification management strategy, risk analysis and evaluation management strategy and risk control and monitoring management strategy in place. The results indicated that the odds of better supply chain performance were higher for companies that had a risk identification management strategy in place.

### 5.1.2 Risk Analysis and Evaluation Management Strategy

The second objective of the study was to determine the effect of risk analysis and evaluation management strategy on supply chain performance among manufacturing companies in Kenya. Result showed that most of the companies had a written down policy on whole life costing of suppliers. Having a written down policy on whole life costing of suppliers resulted to decreased lead time, improved quality and reduced cost. Results also showed that most of the companies conducted cost benefit analysis of potential risks. Conducting cost benefit analysis of potential risks resulted to decreased lead time, improved quality and reduced cost. Further, the results revealed that most of the companies assessed the internal quality of suppliers. Assessing the internal quality of suppliers resulted to decreased lead time, improved quality and reduced cost. The bivariate regression results indicated that the odds of improved lead time were higher for those companies practicing whole life costing of suppliers and internal controls of suppliers. These results indicated that the odds of improved quality were higher for those companies practicing whole life costing of suppliers and internal controls of suppliers. The multivariate regression results indicated that the odds of observing improved cost were higher for those companies that had a risk analysis and evaluation management strategy in place. The results indicated that risk analysis and evaluation management strategy influence the odds of better supply chain performance.

### 5.1.3 Risk Monitoring and Control Management Strategy

The third objective of the study was to explore the effect of risk monitoring and control management strategy on supply chain performance among manufacturing companies in Kenya. Result showed that most of the companies that conducted pre-shipment inspection of suppliers. Pre-shipment inspection of suppliers resulted to decreased lead time, improved quality and reduced cost. Results also showed that most of the companies had insurance policy of suppliers. The bivariate regression results indicated that the odds of improved lead time were higher for those companies having insurance policy of suppliers and contract with suppliers. The regression results indicated that the odds of improved quality were higher for those companies having contract with suppliers. These results also indicated that the odds of better cost were higher for those companies conducting pre-shipment inspection of suppliers, having insurance policy of suppliers and having contract with suppliers. The multivariate regression results indicated that the odds of observing improved cost were higher for those companies that had a risk control and monitoring management strategy in place. This indicated that the odds of better supply chain performance were higher for companies that had a risk control and monitoring management strategy influence.

### 5.1.4 Hedging Against Risk Management Strategy

The fourth objective of the study was to determine the effect of hedging risk management strategy on supply chain performance among manufacturing companies in Kenya. Result showed that most of the companies that increased buffer stock at various levels in the supply chain. Increasing buffer stock at various levels in the supply chain resulted to decreased lead time, improved quality and reduced cost. Results also showed that most of the companies ‘conducted reduce order cycle times. Conducting reduce order cycle times resulted to decreased lead time, improved quality and reduced cost. Further, the results revealed that most of the companies shared supply chain costs with partners. Sharing supply chain costs with partners resulted to decreased lead time, improved quality and reduced cost.

The bivariate regression results indicated that the odds of improved lead time were higher for those companies that increased buffer stock at various levels in the supply chain and shared

supply chain costs with partners. The results further indicated that the odds of improved quality were higher for those companies that increased buffer stock at various levels in the supply chain and shared supply chain costs with partners. The multivariate regression results indicated that the odds of observing improved cost were higher for those companies that had a hedging against risk management strategy in place. The results indicated that hedging against risk management strategy did not influence the odds of better supply chain performance in any way.

### 5.1.5 Legal and Regulatory Framework

The fifth objective of the study was to identify the moderating effect of legal and regulatory environment on supply chain performance among manufacturing companies in Kenya. Result showed that most of the companies had policy on how to handle regulatory changes. Having policy on how to handle regulatory changes resulted to decreased lead time, improved quality and reduced cost. Results also showed that most of the companies had supply chain ethical statement. Having a supply chain ethical statement resulted to decreased lead time, improved quality and reduced cost. Further, the results revealed that most of the companies had procurement rules. Having procurement rules resulted to decreased lead time, improved quality and reduced cost.

The bivariate regression results indicated that the odds of improved lead time were higher for those companies that had policy on how to handle regulatory changes. The results indicated that the odds of improved quality were higher for those companies that had policy on how to handle regulatory changes and supply chain ethical statement. These regression results also indicated that the odds of improved quality were higher for those companies that had policy on how to handle regulatory changes and procurement rules. The multivariate regression results indicated that legal and regulatory framework had no moderating effect on the relationship between risk management and the odds of observing better lead time. The multivariate regression results indicated that legal and regulatory framework had no moderating effect on the relationship between risk management and the odds of observing improved quality. The multivariate regression results indicated that legal and regulatory framework had no moderating effect on the relationship between risk management and the odds of observing better cost. This indicated that legal and regulatory framework had no moderating effect on the relationship between risk management and the odds of better supply chain performance.

## 5.2 Conclusion

Based on the study findings the study concluded that most of the companies had risk identification management strategy in place. This conclusion was arrived at by observing that the companies conducted pre-screening of suppliers' capacity, periodic procurement audits and inventory forecasting. The study concluded that the odds of observing better lead time, odds of improved quality and the odds of observing better cost were highest for risk identification management strategy. Further, the study concluded that risk identification management strategy influenced supply chain performance.

The study concluded that most of the companies had risk analysis and evaluation management strategy in place. This conclusion was arrived at by observing that most companies were practicing whole life costing of suppliers, cost benefit analysis of potential risks and internal controls of suppliers. The study concluded that the odds of observing better lead time and odds of improved quality were higher for those companies that conducted whole life costing of suppliers and internal controls of suppliers. This implies that having a

risk analysis and evaluation management strategy in place influence supply chain performance in manufacturing companies in Kenya.

According to the study most of the companies had risk monitoring and control management strategy in place since most of the companies conducted pre-shipment inspection of suppliers, had insurance policy of suppliers and contract with suppliers. The study concluded that the odds of observing better lead time was higher for those companies that had insurance policy of suppliers and had contract with suppliers. The odds of improved quality were higher for those companies that had contracts with suppliers. The odds of observing better cost were higher for companies that conducted pre-shipment inspection of suppliers, had insurance policy of suppliers and had contract with suppliers. This implies that having a risk monitoring and control management strategy in place influence supply chain performance in manufacturing companies in Kenya.

Based on the study findings the study concluded that most of the companies had hedging against risk management strategy in place. This conclusion was arrived at from the observation that most companies increased buffer stock at various levels in the supply chain, reduced order cycle times and shared supply chain costs with partners. The study concluded that the odds of observing better lead time and improved quality were higher for increasing buffer stock at various levels in the supply chain and sharing supply chain costs with partners. The study concludes that having hedging against risk management strategy in place does not determine the performance of supply chain in manufacturing companies.

The study concluded that most of the companies had legal and regulatory framework in place. This conclusion was arrived from the observation that most companies had a policy on how to handle regulatory changes, had a supply chain ethical statement and written down procurement rules. The study concluded that the odds of observing better lead time were higher for companies that had a policy on how to handle regulatory changes. The odds of improved quality were higher for companies that had a policy on how to handle regulatory changes and a supply chain ethical statement. The odds of observing better cost were higher for companies that had a policy on how to handle regulatory changes and written down procurement rules. Further, the study concluded that legal and regulatory framework did not have any moderating effect on the relationship between risk management and supply chain performance.

## 5.3 Recommendations of the Study

### 5.3.1 Risk Identification Management Strategy

Following the study results, it was recommended that manufacturing companies should continue having risk identification management strategies in place since it improves the supply chain performance. In particular, the manufacturing companies should conduct pre-screening of suppliers' capacity, periodic procurement audits and inventory forecasting. The study recommended that these companies should make risk identification a priority before getting into other aspects of risk management. Supply chain risk strategy development should be part of the business unit planning process.

### 5.3.2 Risk Analysis and Evaluation Management Strategy

It was recommended that manufacturing companies should put in place a risk analysis and evaluation management strategy to enhance supply chain performance. In particular, companies should consider conducting whole life costing of suppliers and also internal quality of suppliers. This would assist to boost supply chain performance.

### 5.3.3 Risk Monitoring and Control Management Strategy

The study also recommended that manufacturing companies should put in place risk control and monitoring management strategies. In particular, the companies should consider conducting of pre-shipment inspection of suppliers, having an insurance policy of suppliers and also have contract with suppliers. This would assist to boost supply chain performance.

### 5.3.4 Hedging Against Risk Management Strategy

The study also recommended that manufacturing companies should put in place hedging against risk management strategies. In particular, the companies should consider increasing buffer stock at various levels in the supply chain and sharing supply chain costs with partners. This would assist to boost supply chain performance.

### 5.3.5 Legal and Regulatory Framework

The study also recommended that manufacturing companies should put in place legal and regulatory framework management strategies. In particular, the companies should consider having well formulated policy on how to handle regulatory changes, have written down supply chain ethical statement and have procurement rules. The manufacturing companies should practice effective regulatory risk management practices such as development of appropriate regulatory framework for current and potential operations and legal status. This would significantly improve the supply chain performance.

## 5.5 Suggested Areas for Further Study

Further studies can be done on the effect of risk management strategies that influence the supply chain performance of service delivery companies. In addition further studies are recommended in the area of competitive strategies and strategic responses adopted by manufacturing companies in order to improve supply chain performance. In addition, further studies may investigate the influence of demographic factors on the risk management strategies of manufacturing companies. For instance, are manufacturing companies with a high male gender composition more likely to put in place effective risk identification, risk analysis and evaluation, risk monitoring and control and hedging against risk management strategies? What is the potential effect of the type of company on risk management strategies? What is the potential effect of the age of company on risk management strategies? What is the impact of gender composition, experience, age of manufacturing companies' employees on supply chain performance? Studies may be carried out to find answers to these questions.

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