

## INFLUENCE OF TOTAL QUALITY MANAGEMENT PRACTICES ON SUPPLY CHAIN PERFORMANCE OF CEMENT MANUFACTURING FIRMS IN KENYA

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### ABSTRACT

The importance of Total Quality Management practices for a manufacturing company cannot be underestimated in terms of cost reduction, efficiency, effectiveness and supply chain performance through process and product improvement. With increasing demand for cement and intense competition in the industry improving supply chain performance is a continuous process that requires both an analytical performance measurement system, and a mechanism to initiate steps for realizing key performance indicators (KPI) goals. The objectives of the study were; to establish the influence of management commitment on supply chain performance of cement manufacturing firms in Kenya, to determine the influence of employee involvement on supply chain performance of cement manufacturing firms in Kenya, to find out the influence of customer orientation on supply chain performance of cement manufacturing firms in Kenya and to identify the influence of continuous improvement on supply chain performance of cement manufacturing firms in Kenya. Descriptive statistics methodology of data analysis was used and frequency distributions, percentages frequency tables were used to summarize and relate variables in the study. The study found out that to a greater extent management provided frequent training on quality as well as recognized employees after training. The study revealed that employees were actually involved in decision making processes on quality improvement matters in the organization. It was noted that majority of the organizations responded to their customer needs or complains fast. Further the study identified create partnership relationship as opposed to arms length relationship with suppliers and embracing mutually beneficial relationships between the organization and its suppliers would enhance the ability of both organizations to create value. Quality reviews were carried out quite often. continuously improving employee skills was the most preferred continuous improvement strategies by organizations was followed by Research and development, Benchmarking and Market surveys respectively. The study also found out that continuous improvement, employee involvement, customer orientation and management commitment were significantly related to supply chain performance in cement manufacturing firms in Kenya ( $r^2= 72.6\% > 70\%$ ). The study concluded

that continuous improvement, employee involvement, customer orientation and management commitment were key to supply chain performance of cement manufacturing firms in Kenya.

**Keywords:** *Total Quality Management Practices on Supply Chain Performance*

### Introduction

Total quality management (TQM Practices) has become a world-wide topic in the twenty-first century. Having its roots partly in the USA and partly in Japan, it was primarily adopted by some Japanese companies in the decades immediately after World War II. With the greater successes of Japanese companies during the 1980s, companies all over the world found that it was necessary to have good quality management practices in order to stay competitive (Lagrosen, 2002). Total quality management is an enhancement to the traditional way of doing business. It is a proven technique to guarantee survival in world class competition.

Only by changing the actions of management will the culture and actions of an entire organization be transformed (Hafeez *et al.*, 2006). TQM Practices as a management approach of an organization is centered on quality, based on the participation of all its members and aiming at long term success (Besterfield, 2003). TQM Practices and Supply Chain Management will only succeed in achieving improved performance in the organization with the continuous support of the top-management and their efforts.

Even though much attention has been focused on supply chain management (SCM) concepts in recent years, its interlinking with the TQM Practices perspective is often limited and tangential in nature (Oakland, 2005). As global markets evolve, supply chain managers are faced with many new challenges, as edit traditional approaches to managing supply chains prove increasingly ineffective. Oakland (2005) posits that the integration of Total Quality Management practices offers potential for broadening the perspective of supply chain management. Its traditional narrow focus on costs and competitive relationships, and on cooperative relationships between members of the supply chain and the strategic importance of supply chain management, helps to achieve competitive advantage.

In the past decade however, companies have begun to recognize not only the need for continual quality improvement and meeting the needs of their immediate customers, but also the necessity of competing quickly and efficiently in ever changing global markets. As a result, SCM has come to the forefront as a philosophy by which firms can operate inter organizationally, and merge both strategic initiatives and upstream and downstream processes in order to achieve business excellence (Dale *et al.*, , 2003).

Customer focus is the core principle and idea of TQM Practices because quality effort comes of customer's needs and ends with customer's acceptance. In supply chain circumstance, customer includes not only the end user but also many in-between users, such as suppliers, manufacturers,

sellers, etc. However, more than half of the quality problems in supply chain are resulted by specifications because of the inadequate communications between the members of supply chain.

In many cases, the procurement specifications released by buyers are equivocal while suppliers dare not to argue against buyers on the specifications in the bidding process (Zhang, 2006). To this end, the core enterprise must pay attention to the needs and expectation of end users, and all the members of supply chain must pay attention to the needs and expectation of their backward users. The needs and expectation of end users should be deployed layer upon layer in the whole supply chain system. The end users will be satisfied if all members of supply chain can satisfy the needs of their backward users. Moreover, the operation efficiency of supply chain system can be improved through the satisfaction level of the end users. In supply chain quality management, some traditional tools of TQM Practices are also effective. For example, we can use Quality Function Deployment (QFD) to identify the distinct and potential needs and preferences of users, use Fishbone Chart to explore the factors affecting the satisfaction level of users and the Pareto Chart to identify the key factors.

A supply chain is the network of all the individuals, organizations, resources, activities and technology involved in the creation and sale of a product, from the delivery of source materials from the supplier to the manufacturer, through to its eventual delivery to the end user. (Douglas, 2004). Supply chain performance measures can be classified broadly into two categories qualitative measures such as customer satisfaction and product quality and quantitative measures such as order-to-delivery lead time, supply chain response time, flexibility, resource utilization, delivery and performance. [Supply Chain Management](#) is the oversight of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer. The three main flows of the supply chain are the product flow, the information flow and the finances flow. SCM involves coordinating and integrating these flows both within and among companies. (Chang & Huang 2005)

According to Besterfield, (2003) Managers need to understand the nature of the demand for their products and devise the Supply chain that can best satisfy that demand. The first step in devising an effective supply chain strategy is to consider the nature of the demand for the products one's company supplies. Many aspects are important for example, product life cycle, demand predictability, product variety, and market standards for lead times and service. The root cause of the problems plaguing many supply chains is a mismatch between the type of product and the type of supply chain. To understand the difference, one should recognize that a supply chain performs two distinct types of functions: a physical function and a market mediation function (Douglas, 2004).

A supply chain's physical function is readily apparent and includes converting raw materials into parts, components, and eventually finished goods, and transporting all of them from one point in the supply chain to the next. Less visible but equally important is market mediation, whose purpose is ensuring that the variety of products reaching the marketplace matches what

Consumers want to buy. Thakkar, J., Kanda, A., & Deshmukh, S. G. (2009). The predictable demand of functional products makes market mediation easy because a nearly perfect match between supply and demand can be achieved. Supply chain improvements will not only improve internal performance, but will also create benefits that will ripple through to customers and partners as well. Likewise, effective planning and execution can help companies and their customers adapt to the Market's demand shifts. According to Clifton, N. (2001). When the company can purchase, produce and distribute the right products to the right channels in the right quantities at the right time, both supplier and customer will increase revenue capture by channel and region. What is good for the supply chain becomes good for the company. Costs will go down and revenues will go up as supply chain performance improves. Even in the face of fierce competition, suppliers who participate fully and collaborate effectively will be valued and trusted partners.

### Statement of the problem

In the recent past, the country has seen rapid growth in the construction industry in all parts of the country and especially in the real estates and road sectors. This has spread the market demands of cement products within the country (Dyer & Blair, 2012). As a result, most cement manufacturing firms supply chain costs have increased by about 10%, (kestrel capital Report, 2002) This, according to East Africa Cement Producers Report (2010-2014), is affecting the profitability of cement manufacturing firms in Kenya. Consequently, a number of approaches such as outsourcing, quality management systems and vendor managed inventory management have been tried as a way of improving supply chain performance but with minimal success (Dyer & Blair, 2012).

Towards this end, a number of cement manufacturing firms have started investing in Total Quality Management as a way of addressing supply chain performance. According to McMahon (2001), TQM is capable of positively influencing supply chain performance. This is in agreement with Nazirn (2006) findings which established that TQM is positively related to supply chain performance. Another study by (Omufira, 2001) also confirms the positive association between TQM and supply chain performance.

Some cement firms have adopted TQM activities but its not yielding the best results in Kenya. There is a relationship between TQM practices and supply chain performance although much has not be discussed in Kenya Charan *et al.*, (2008). The study therefore aims to explore influence of TQM practices on the supply chain performance of cement manufacturing firms in Kenya. This makes this study timely and relevant.

### Research objectives

The general objective of this study was to establish the influence of Total Quality Management practices on supply chain performance of cement manufacturing firms in Kenya.

### **Specific objectives**

- i. Establish the influence of management commitment on supply chain performance of cement manufacturing firms in Kenya.
- ii. Determine the influence of employee involvement on supply chain performance of cement manufacturing firms in Kenya.
- iii. Find out the influence of customer orientation on supply chain performance of cement manufacturing firms in Kenya.
- iv. Identify the influence of continuous improvement on supply chain performance of cement manufacturing firms in Kenya.

### **Significance of the Study**

The findings of this study would assist the cement manufacturing firms to understand the factors influencing the success of TQM Practices initiatives as well as the various challenges that they face in implementing TQM Practices within their organizations. It would also provide managers with ways of utilizing TQM Practices as strategic tool for increased efficiency and effectiveness as a way of lowering production costs and continuous improvement of their product quality. This study would assist quality practitioners in proposing ways of performance optimization by effective resource allocation, and determining management practices which are key contributors of supply chain performance. The study is invaluable to the various stakeholders in the manufacturing industry such as the construction industry, real estate investors, home owners, the government, and local citizens in different ways.

The study would be significant to scholars and researchers by provide information on service and product quality practices in Kenya as well as adding to the body of knowledge on TQM practices in Kenya; its benefits and challenges, driving factors and potential. It could therefore serve as a point of reference for the researchers as they conduct studies on TQM Practices and other related topics. Enhanced performance would lead to reduced costs that will trickle down to real estate investors, road contractors and individual home owners who need cement for construction of new buildings of renovations. These lowered costs will consequently increase consumption and create employment for local citizens who work in the construction industry.

The findings of the study would equally enable policy makers to devise TQM Practices and Supply chain policies that are based on empirical evidence. The study could therefore help the cement manufacturing industry to understand and appreciate the role played by quality management in improving supply chain performance leading to increased customer satisfaction and loyalty. This study will also assist researchers in the area of Total Quality and Supply Chain Management systems in the manufacturing industry.

### **Scope of the Study**

This study geographically covered the entire Kenya as it dealt with all the cement manufacturing firms. The study focused on the 6 cement industry registered with Kenya Association of

manufacturers. In terms of content, the study included the meaning of TQM Practices, its benefits and implementation-related challenges; supply chain, supply chain performance and the influence of TQM Practices on supply chain performance.

This was alongside review of various related theories such as Kanter's Theory on Empowerment, The Kano Theory and Theory of Constraints (TOC). The study took the form of research in which in-depth theoretical and empirical literature review was done to discuss influence of TQM practices on supply chain performance of cement manufacturing firms in Kenya. The study however had some limitations.

### **Limitation of the Study**

The study faced difficulties in data collection as some respondents were not willing to provide information which they considered to be confidential. Some respondents also refused to participate as per prior appointments due to unexpected appointments and work commitments. The researcher overcame these by proper planning and prior appointments that helped secure meetings with the respondents, and assuring the respondents of anonymity and confidentiality as the basis of this study was purely academic.

### **Literature Review**

#### **Kanter's Theory on Empowerment**

Kanter believes that a leader's power will grow by sharing the power through empowering others and as a result, leaders will realize increased organizational performance Lawler, Mohrman, and Ledford (2002). Furthermore, Kanter posits that with tools, information, and support, people's skill base will help employees to increasingly make informed decisions and overall accomplish more, thus benefiting the organization. According to Kanter, two systemic sources of power exist in organizations, these being formal and informal power. Formal power is that which accompanies high visibility jobs and requires a primary focus on independent decision making. Informal power comes from building relationships and alliances with peers and colleagues (Ngowi, 2002). The six conditions required for empowerment to take place according to Kanter include; opportunity for advancement, access to information, access to support, access to resources, education and training. These conditions have formed the basis of the works and studies of behavioral theorists.

Kanter describes a learning organization as an organization where the members are continually gaining knowledge and enhancing their capabilities to aid the organization in adapting to dynamic environments and remain competitively superior over competitors. The driving force behind such an organization is its ability to effectively manage knowledge. According to him, knowledge is not the same as information; but rather knowledge is 'purposeful coordination of action' (Lawler, Mohrman, & Ledford, 2002). According to Lawler, Mohrman, and Ledford (2002), a learning organization is able to use knowledge so to accomplish their goals.

Supply chain partners (individual organizations) become learning partners, the supply chain then becomes a 'learning supply chain' that is able to use knowledge to attain its purposes and remain



competitive in dynamic markets (Sengeeta & Banwe, 2004). For supply chain partners to turn information into knowledge and manage that knowledge effectively, education and training of employees becomes key. Supply chain education and training provides employees with vision and understanding as to why SCM need and how it yield benefit. Such education and training is further necessary because people tend to resist change, especially when change requires yielding up control, exposing weakness or valuable information to others, and changing one's mindset (Ngowi, 2002).

SCM requires more than a change in mindset from adversarial to collaborative company interaction. It requires a change in day to day decision making strategy, practices, and human interaction. This means that people will have to change their mindset and behavior. People cannot be forced to change; rather they must be enrolled to generate buy-in to allow their passions to manifest in making the supply chain succeed (Gufreda & Maynard, 2000). By providing these conditions to employees, it has been found that there is increased job satisfaction, commitment, trust and a marked decrease in job turnout. Kanter's theory has proven to have measurable impact on employee empowerment and job satisfaction as well as organizational morale and success. It has also been noted that retention rates improve when empowerment principles such as decreased work pressure, greater peer cohesion, support from supervisors, and staff autonomy are put in place (Lawler, Mohrman, & Ledford, 2002). Kanter's theory still resonates as one of the most basic frameworks to guide practice and improve organizational efficacy.

### The Kano Theory

So how do organizations analyze the customer needs? How do they understand what the basic needs are and what will mean more than just satisfaction? To address and understand this situation, a technique has been developed by Professor Noriaki Kano. The Kano theory of customer classifies products attributes based on how they are perceived by customer and their effect on customer satisfaction (Dettmer, 2001). These classifications are useful for guiding design decisions in that they indicate when good is good enough. It focuses on basic needs, which help the company to get into the market, and performance needs, which help the company to sustain themselves in the market and generally will improve customer satisfaction. An absent or weak performance attribute reduces customer satisfaction. Of the needs customers verbalize, most will fall into the category of performance attributes.

These attributes will form the weighted needs against which product concepts will be evaluated. The price for which customer is willing to pay for a product is closely tied to performance attributes (Evans & Lindsay, 2008). In supply chain performance context, a successful company typically starts with a deep understanding of customer needs in a segment and translates these needs into a value proposition. Then it develops its supply chain capability to deliver on its value proposition. Many companies have a clear and compelling customer value proposition but fail to reap the benefits because their supply chain capabilities are inadequate and their supply chains are not correctly linked to their customer value proposition (Dettmer, 2001).

Actual demand is only generated by a customer order. This means that each entity needs to carry inventory in anticipation of customer orders. A customer wants the right product, at the right time, in the right place, and at the lowest possible price. From a supply chain perspective, various combination in terms of availability, high availability means that all the items are almost always in stock; there are very few stock outs (Gufreda & Maynard, 2000). In a 'synchronized supply chain', the actual demand captured at the point-of-sale can be communicated up the supply chain, using information technology, greatly reducing the amount of inventory that each entity needs to maintain in order to support customer service goals.

According to Sengeeta and Banwe (2004), this is one of the many ways that a customer oriented approach to Supply Chain performance will improve customer service and profitability. Key performance factors such as reliability, responsiveness, flexibility, lower costs, and better resource management can be achieved faster and more effectively through a collaborative supply chain than by the individual efforts of any one member of the supply chain. The relevance of this theory to this study is based on its customer orientedness. Any change in business approach should have the customer in focus so that it may play a key role in meeting the business objectives of constantly and timely meeting its customers' needs efficiently and effectively.

### Theory of Constraints (TOC)

According to Dettmer (2000), Theory of Constraint (TOC) is a set of concepts, principles, and tools designed to help manage systems better. TOC is also defined as an example of a management philosophy built upon a limited number of assumptions and designed to provide a process of continuous ongoing improvement (Sivasubramanian *et al.*, , 2003). Generally, TOC is a combination of philosophy, concepts, principles, and tools conceived to maximize the performance of any system by identifying, managing and breaking the most restrictive limiting factor that constraints system performance.

Rahman (2001) summarized the concept of TOC that every system must have at least one constraint and the existence of constraints represents opportunities for improvement. In regard to supply chain performance, you may find organization databases at different operating sites that describe system environment, inventory/backlog status, future production plans, and so on, may not be linked causing duplication of tasks and waste of resources. Consequently, retrieving information can be a tedious, manual process.

For Effective operational control of a supply chain requires centralized coordination of key data from the different entities. Key data would include order forecasts, inventory status at all sites, backlogs, production plans, supplier delivery schedules, and pipeline inventory. The databases should be linked so that managers from any point in the supply chain can retrieve accurate information quickly. With advances in information technology, databases can also be integrated between companies.



The trend towards stronger vendor-vendee relationships certainly supports the need for database integration between different companies in an expanded supply chain (Dettmer, 2000). The principles of a TOC based on TQM Practices serve as guidelines to help in understanding how to focus efforts in maximizing supply chain performance through the implementation of TQM Practices. It has the objective of establishing an effective supply chain system designed to implement the process of continuous profit improvement while meeting the necessary condition of good quality (Zhang *et al.*, 2000).

### Empirical review

Mwangi (2004) assessed the impact of TQM Practices on stock prices in responsive sectors of specific companies listed at the Nairobi Securities Exchange (NSE) and established that organizations concentrate more on reducing defects and errors in their goods and services. Omachonu and Ross (2000) on an empirical study entitled ‘What impact can suppliers have in achieving quality?’ it was found that some organizations collaborate with their suppliers in some way to increase the quality of component parts. Often these organizations send out “quality action teams” to consult with their major suppliers. The objective is to help suppliers use TQM Practices to analyze and improve their work processes.

The findings were in line with the recommendation of TQM authorities (Slack & Lewis, 2008) that organizations work directly with raw material suppliers to ensure that their materials are of the highest quality possible. This study explored the relationship between TQM practices, service quality, and Market orientation. Results have shown that management commitment and supplier involvements had significant effect on service quality and market orientation. There are different factors Influencing service quality and another different set of practices influencing market orientation. According to Chin and Pun (2002), TQM Practices stresses the mutual cooperation of everyone in an organization and associated business processes to produce services that meet the needs and expectations of customers. Also, quality is generally corporate-driven. Sometimes quality is sacrificed in meeting the bottom line output or immediate customer requirements.

In some circumstances, organizations will never sacrifice quality. All these are also very much dependent on management style and organizational culture. Another study by Charan *et al.*, (2008) on fast moving consumer goods, petroleum, rubber, processing, media and publishing found that the implementation of TQM practices has impacted positively on Fast Moving goods consumers. This meant that the employment of TQM Practices contributed positively to the running of the above-mentioned companies. Charan *et al.*, (2008) also postulated that quality management research has taken a less holistic approach to TQM Practices, mostly focusing on the Human Resource Management and recommended that more holistic TQM Practices survey studies be undertaken within the context of manufacturing industry to ascertain various evidence and arguments raised by different scholars on TQM Practices.

In yet another empirical study by Gustafsson *et al.*, (2003) on the relationship between TQM practices and performance of small size firms, it was established that the relationship between

total quality management practices performance is dependent on the firm size. This is after studying a small firm of few employees and found that the fewer the employees the better since they will be managed easily and the process implementation will be easy to adapt to (Charan *et al.*, 2008). These findings made Antony *et al.*, (2002) to describe TQM practices as a role of the quality department, since they are entrusted in implementing and controlling quality the findings were that a single department cannot handle quality if the other stakeholders in the organization are not involved thus the need to involve everyone.

### Research Methodology

The study adopted descriptive research design to investigate influence of total quality management practices on supply chain performance of cement manufacturing firms in Kenya. Descriptive research method permits the researcher to explore and describe the phenomena as it is and give actual information that can be used to solve some problems (Ngechu, 2004). According to Cooper and Schindler (2003), it describes the characteristics of the target group under study by focusing on the what, where and how of a phenomenon.

Descriptive survey design allows for the collection of large data from sizable population. This enabled the researcher to provide a cohesive summary of issues or events as described by the participants who included firm managers, supply chain officers, stores officers and quality assurance officers (Sandelowski, 2000). This research method was chosen as the most effective method that fitted well with the purpose of the study. It also reports the way things are which include behaviour, attitudes, values and characteristics are (Mugenda & Mugenda, 2003).

### Data Analysis/Findings

#### Regression and Correlation Analysis

This section covered statistical inference used to test on the influence of total quality management practices on supply chain performance of cement manufacturing firms in Kenya. Correlation analysis was used to check on the strength and magnitude of the relationship while regression analysis was used to express the relationship.

#### Multicollinearity Test

Multicollinearity is a statistical phenomenon in which two or more predictor variables in a multiple regression model are highly correlated. It affects calculations regarding individual predictors. Correlation matrix was used to check on multicollinearity.

A factor of 0.5 was used to check multicollinearity. As shown in table 4.3.2, none of the predictor variables had coefficient of correlation between themselves of equal to or more than 0.5 thus all of the predictor variables were included in the model.

#### Table 4.14: Pearson Correlation Correlations

**Predictors:** Mgmt commitment Customer orientation Continuous improvement Employee involvement

Mgmt commitment	1.00			
Customer orientation	.254	1.00		
Continuous improvement	.311	.207	1.000	
Employee involvement	.402	.265		.323
1.000				

**Determining How Well the Model Fits**

Table 4.15 is the Model Summary. This table provides the R, R<sup>2</sup>, adjusted R<sup>2</sup>, and the standard error of the estimate, which can be used to determine how well a regression model fits the data:

**Table 4.15 model summary**

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
.852	.726	.682	.81116	.726528	16.502		4	.000

a. Predictors: (Constant), continuous improvement, employee involvement, customer orientation and management commitment

R which is the square root of R-Squared is the correlation between the observed and predicted values of dependent variable The "**R Square**"(also called the coefficient of determination) a value of 0.726, indicates a good level of prediction. Technically, this is the proportion of variation accounted for by the regression model above and beyond the mean model. It further indicates that independent variables explain 72.6% of the variability of the dependent variable, leaving only 27.4% unexplained (error term).

From the Adjusted R-square, it is indicated that as predictors are added to the model, each predictor will explain some of the variance in the dependent variable simply due to chance. One could continue to add predictors to the model which would continue to improve the ability of the predictors to explain the dependent variable, although some of this increase in R-square would be simply due to chance variation in that particular sample. In this line, the adjusted R-

square of 0.682 attempts to yield a more honest value to estimate the R-squared for the population.

The findings therefore indicate that 72.6% of the variance in the dependable variable is explained by the independent variables in the model. It therefore means that the predictor variables (management commitment, customer orientation, employee involvement and continuous improvement) have a strong positive contribution to supply chain performance. The Standard error of estimate of .811 is the standard deviation of the error term.

### Statistical significance

The *F*-ratio in the ANOVA table tests whether the overall regression model is a good fit for the data. The table shows that the independent variables statistically significantly predict the dependent variable,  $F(4, 50) = 16.502, p = .000 < .05$  (i.e., the regression model is a good fit of the data).

### ANOVA

Model	sum of squares	df	mean square	F	Sig
Regression	30.232	4	7.558	16.502	.000
Residual	22.900	50	.458		
Total	53.132	54			

a. Predictors: (Constant), continuous improvement, employee involvement, customer orientation and management commitment

b. Dependent Variable: Supply chain performance

From Table 4.16 above, the *F* statistic test value of 16.502 and a small significance value of 0.000 that is  $P = 0.000 > \alpha = 0.05$ , indicates that there is a regression relationship between the dependent variable (supply chain performance) and the predictor variables. At the fourth degree of freedom, the sum of squares for regression was 30.232 with a mean square of 7.558, *F* statistic of 16.502 and a significance of .000<sup>a</sup> attest to the variation relating to the regression model which is 30.232 out of 53.132 implying that the predictor variables contribute 72.6% of the Supply chain performance.

From the findings, it is clear that calculated *F* statistic is greater than the critical test value. This means that the regression is statistically significant at the 0.05 level of confidence

because 16.502 is greater than 7.5. It therefore appears that the predictor variables management commitment, customer orientation, employee involvement and continuous improvement are not equal to each other and therefore can be used to predict the dependable variable supply chain performance as is indicated by F value of 16.502 and a low significance level 0.000.

The F statistic and the p value are key in noting whether the independent variables reliably predict the dependent variable. The F-value is the Mean Square Regression divided by the Mean Square Residual giving  $F=16.502$ . The p-value associated with this F value was very small (0.000). The p-value is compared to the alpha level of 0.05 at 95% significance is smaller as the p value at 0.05 is 0.000. This means that the independent variables reliably predict the dependent variable.

### Estimated model coefficients

The general form of the equation to predict Supply chain performance from continuous improvement, employee involvement, customer orientation and management commitment is. Predicted Supply chain performance =  $0.288 + 0.363$  management commitment +  $0.443$  continuous improvement +  $0.163$  employee involvement +  $0.204$  customer orientation. This was obtained from the Coefficients table (Unstandardized coefficients), as shown below: Unstandardized coefficients indicate how much the dependent variable varies with an independent variable, when all other independent variables are held constant. Consider the effect of continuous improvement. The Unstandardized coefficient,  $B_2$ , for continuous improvement is equal to 0.443. This means that for each 1 unit increase in continuous improvement, there is an increase in Supply chain performance of 0.363 units other factors held constant.

**Table 4.17 Coefficients**

<b>Predictors:</b>	<b>B</b>	<b>Std. Error</b>	<b>Beta</b>	<b>t</b>	<b>sig</b>
Constant	.288	.980			.294
	.770				
Mgmt commitment	.363	.147	.344		2.469
	.025				
Customer orientation	.204	.008	.182		2.519
	.000				
Continuous improvement	.443	.146	.400		3.034
	.012				

Employee involvement	.163	.049	.113	3.327
	<u>.001</u>			

a. Dependent Variable: Supply chain performance

### Statistical Significance of the Independent Variables

This tests whether the Unstandardized (or standardized) coefficients are equal to 0 (zero) in the population. If  $p < .05$ , then one can conclude that the coefficients are statistically significantly different to 0 (zero). The corresponding  $p$ -value are located in the "Sig." columns, respectively, indicates that that all independent variable coefficients are statistically significantly different from 0 (zero)  $p\text{-value} < 0.05$ . it further confirms that each independent variable is linearly related with the dependent variable thus a four predictor variable model could be used in forecasting supply chain performance in cement manufacturing firms in Kenya.

### Conclusion

In line with the objectives, the study concludes that continuous improvement, employee involvement, customer orientation and management commitment were key to supply chain performance of cement manufacturing firms in Kenya. The study further concluded that the establish regression model was good for foresting and could be used for prediction of new cases of supply chain performance in cement manufacturing firms in Kenya.

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