ROLE OF MATERIAL REQUIREMENT PLANNING IMPLEMENTATION ON SUPPLY CHAIN PERFORMANCE IN THE MANUFACTURING SECTOR IN KENYA: A CASE OF MABATI ROLLING MILLS LIMITED.

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ABSTRACT

Material Requirement planning (MRP I) is not plainly a software, but can be perceived as a marriage of people's skills, database accuracy, dedication and computer resources. It is therefore more of the company's management concept for using human resources more effectively and productively. MRP I has in the past few years provided a platform where various business functions are linked-up including capacity management, production planning, , business planning, marketing, purchasing, accounting, finance and even human resource management. The main objective of this study was to assess the role of MRP I implementation on supply chain performance in the manufacturing sector in Kenya with Mabati rolling mills limited as the case study. The management and employees of Mabati rolling mills limited were the target population. The study targeted 450 employees at Mabati rolling mills limited but only 45 employees (10 percent of 450) were included in the sample population. A descriptive survey design was adopted as the major research design. Both qualitative and quantitative data were collected in this study. Questionnaires were the major instrument for data collection. The quantitative data collected in this case was analyzed further for inferential and descriptive statistics by use of the SPSS Version 20 software. Qualitative data from the open ended questions was organized into subtopics. The

responses were further coded, processed and tabulated as per the data analysis procedure. Pie charts and frequency tables were in this case used to present the study result.

Keywords: *Material Requirement planning, Enterprise Resource Planning, Supply Chain Supply chain performance*

Introduction

In the recent past, globalization and technological advancements have led to evolution of the manufacturing sector of the world. According to Monk et.al (2006) with advancement on the assurance of technology and disappearance of the borders, emergence of complexities in the global supply chain management and revival of the inter-company rivalry has ensued. This has pushed the manufacturing companies of the world to not only seek new ways of improving on production operations but also managing the production materials in order to effectively meet the demands of the evolving markets of the world (Vorster, 2007).

In the recent past, manufacturing companies in most parts of the world have been faced by a new challenge-providing the consumers with quality products within the least time possible and effectively getting the ready products to the market in good time (Vorster, 2007).This challenge has threatened the prosperity of both the SMEs and the multinational corporations of the world. However, this has been observed to be a problem of the small and medium-sized manufacturers since most world-class manufacturers have already found the solution to this menace-integration of the Material Requirement planning system (Johansson, 2007). First introduced by Oliver Wight in the early 1970s, Material Requirement planning has today grown beyond manufacturing and operations to providing a link-up of the various business functions including production planning, capacity management, business planning, finance, purchasing, accounting, marketing and even human resource management (Kumar et al., 2014).

-supplier relationship (Ondiek and Odera, 2012).

Statement of the Problem

According to Salonen (2010) excellent supply chain performance can yield 25-50% reduction in total supply chain costs; 25-60% reduction in inventory holding; 25-80% increase in forecast accuracy and 30-50% improvement in order-fulfillment cycle time. Bourne et.al, (2005) further stated that the costs associated with production material; raw materials, Work In Progress (WIP), and finished goods account for 50% to 60 % of the company's total production cost. The

manufacturing sector's contributions to Gross Domestic Product (GDP) is about 10 percent (Economic Survey Report, 2015). In the year 2014, the manufacturing sector recorded a growth of 3.4 per cent as compared to a growth of 5.6 percent in 2013 (Economic Survey Report, 2015).

Research studies both local and international have been conducted and majorly in the manufacturing sector. Studies by Monk (2006), Vorster (2007), Henry et.al (2012), Ambrose et.al (2010) and Macharia (2015) have observed varied effects resulting from implementation of various integrated manufacturing systems on supply chain performance in the manufacturing sector. Some of the key findings include, and not limited to, customer satisfaction, supply chain relationships, improved customer service, cost reduction, improved collaboration, improved communication, organizational policies and buyer-supplier integration. However, the supply chain performance in the manufacturing sector has not been well covered.

Today, the manufacturing supply chain is more complex as a result of increased number of suppliers, sellers, buyers and even middlemen within the supply chain structure. The complexity of the manufacturing supply chain has been observed to call for highly integrated systems or models to coordinate the flow of goods, services, information and finances within the sector, to enhance supply chain performance. In Kenya, very few studies have been directed towards analyzing the role of the integrated manufacturing systems on supply chain performance, and especially in the manufacturing sector. This study, therefore, sets to bridge this gap by analyzing the role of MRP I implementation on supply chain performance in the Kenyan manufacturing sector.

LITERATURE REVIEW

Quality in manufacturing can be termed as production of superior goods. In order to produce value and optimize profitability, it is fundamental to establish successful partnerships with the supply chain organizations that can be achieved by new models of cooperation, improved communication and integration among all the supply chain partners (Bozarth, 2009; Agus, 2011). In this context, the use of integrated approaches to quality management, logistics and SCM has become fundamental (Lin et.al, 2005). It is therefore of great importance to take advantage of QUALITY and SCM synergies in order to improve customer satisfaction, increase employee's motivation and to promote performance of the supply chain (Lin and Gibson, 2011).

Improving the quality of all supply chain processes leads to cost reductions, improved resource utilization, and improved process efficiency (Lin and Gibson, 2011).

Many studies have been undertaken to investigate how the quality management can be used to improve the performance of the entire supply chain and inclusive solve some problems within the supply network (Lin and Gibson, 2011). The study by Lin et.al (2005), concluded that key QM practices could be integrated in the supplier participation programs to provide needed collaboration, which in turn would result in improved organizational performance and also that organizational performance can be optimized when the organization considers its suppliers as important trading partners and members of the value chain (Lin and Gibson, 2011).

To a world class organization, a happy and satisfied customer is of the utmost importance Gunasekaran et al. (2004) argued that customer satisfaction is the customer's reaction to the value received from the purchase or utilization of the offering. Customer satisfaction represents the customer's reaction to his or her perception of the value received as a result of using a particular product or service (Cengiz, 2010). That reaction will be influenced by the desired value (ideal standard) as well as by the perceived value of competitive offerings (industry norms, expectations based on use of competitor products). Thus customer satisfaction is influenced by the perception of the value delivered as well as by the perception of the value offered by competition (Mosahab et al., 2010).

Today, customers are from every corners of the world; the supply chain strategies in this case are forced to plainly focus towards satisfying the customers. Without satisfied customer, the whole exercise of applying the supply chain strategy could be costly and futile (Cengiz, 2010). For improving performance, supply chain metrics must be linked to customer satisfaction.

Meeting the customer’s needs and demand has always been a key factor to the success of any company. Unfortunately, the concept of customer service and satisfaction are frequently misunderstood and poorly defined by the companies of the world. Emergence of the service hungry customers who possess tremendous channels power places tremendous pressure on the different firms throughout the supply chain to develop the needed capabilities to deliver value and real-time customer services (Bastos and Gallego, 2008).

To excel, different firms today are realigning their activities in way that will maximize revenue and minimize cost (Gachora et al., 2014). Different business firms are moving towards (1)

lowering operating costs, (2) decreasing procurement costs, (3) reducing marketing costs, and (4) lower distribution costs (Gachora et al., 2014). According to Shukla et al. (2011) supply chain involves the cost to convey the information, produce components, store them, transport them, and transfer funds.

According to Gachora et al. (2014) costs along the supply chain emanate from poor coordination among the supply chain members what results in dysfunctional operational performance. Further inventory costs, warehousing costs, transportation costs and distribution costs are the most common types of costs along the supply chain (Pasula et al., 2013). Ideally, improvement of the supply chain translates to benefits for all supply chain members. Costs decrease as a result of reduced redundancies, lower inventory assurances, shorter lead time and lessened demand uncertainties. Improved supply chain performance result in enhanced product quality, customer service, market responsiveness, and target market access. Supply chain performance is thus improved through better use of internal and external capabilities creating a seamlessly coordinated supply chain, elevating inter-company competition to inter-supply chain competition (Salonen, 2012).

According to Rajaniemi (2012), by reducing lead times, productivity can increase or more value can be added for the end-users. This could lead to a preferable market position. Risks can be reduced and trust can be increased (Fawcett et al., 2013). Short lead times in the order fulfillment process make it easier for the salesman to make reliable promises to the customer. Reduction of lead times will eventually contribute to the reliability of product delivery (Rajaniemi, 2012).

Proper management of lead time can be a competitive advantage to a manufacturing firm. Managing time may be the mirror image of managing quality, cost, innovation, and productivity (Fawcett et al., 2013). For reducing lead time it is essential to adopt Just in Time philosophy and need for continuous improvement focus on issues. In this case, integration of Material Requirement planning (MRPI) tools, flexible manufacturing cells (FMC) or flexible manufacturing systems (FMS), automation tools and efficient information technology tools is vital (Ding, 2014).

Supply chain performance

Manufacturing operations has its roots back to the late 19th and early 20th centuries with ideas espoused by Frederick W. Taylor, the father of applying scientific methods to running business.

His ideas for time and motion studies of operations were successfully used to scientifically manage production lines and warehouse operations (Ketchen and Hult, 2007). These ideas, however, led to exaggerated business processes that transitioned into "running a business by the stopwatch" with employers treating human employees as if they were highly reliable, predictable machines to be monitored and controlled.

Throughout the last decade, companies have expended significant amounts of time and effort to re-engineer their supply chains through business process change and technology focused on implementing integrated Supply Chain Management (SCM) principles (Gibson et.al 2005). While substantial financial and human resources have been spent on doing this, there has been little sign of realized benefits. While consultants are recommending supply chain measurement, they generally lack formal approaches to it.

In addition, while SCM software providers are selling solutions that enable companies to drastically improve their supply chain performance, these same vendors do not adequately provide tools needed to measure these improvements (Stefanovic et.al, 2007). Key performance indicators are measurements that directly relate to key business requirements. KPI come in various forms from simple reporting measurements to very complex, cross correlated analytic results (Kumar et al., 2014). Information from supply chain management (SCM) processes must be collected, measured, analyzed and continuously monitored to cross-check the performance of the supply chain management (Bozarth et al., 2009).

Empirical Review

Over the centuries, a number of scholars have focused their attention plainly on the issue of MRP I implementation. However, there are few studies that have ideally focused on the role of MRP I implementation within the manufacturing sector. A study by Gill et al. (2010) established that MRP I implementation was vital for the small-scale manufacturing firms. In this case, one of the major motives to MRP I implementation was observed to be customer satisfaction. Vorster (2007) came close to establishing the role of MRP I implementation in his study to determine the need for MRP I system in the manufacturing companies with Euro-Plastifoam Industry as the case study. In this regard, lack of an advanced material resource planning system was observed to be the main cause on non-profitability of this industry (Vorster, 2007). Further, Quesada et al. (2012) established that the MRP I system was the backbone of the logistics system for almost all the

manufacturing firms of the world. In this case, MRP I system was observed to be vital in enhancing supply chain relationships among the different supply chain players (Quesada et al., 2012).

Also, Meticevic et al. (2008) observed that MRP I systems, JIT and OPT (Optimized Production Technology) could be integrated by the manufacturing firms to solve the operations scheduling problems. In this case, these researchers articulated that MRP I, JIT and OPT concepts were originally developed for discrete production (Meticevic et al. 2008). Similarly, Amalnik (2010) observed that advancement in computer software such as Material Requirement planning (MRP I), Enterprise Resource Planning (ERP); CAD/CAM systems have moved the manufacturing companies from the industrial age to knowledge and information era. Kumar et al. (2014) observed that most of the Indian manufacturing industries were more focused on advanced management systems than integration of the advanced manufacturing technology and integrated information systems. In this case, MRPI was viewed as a major integrated information system within the manufacturing sector (Kumar et al., 2014).

RESEARCH METHODOLOGY

This study will adopt a descriptive survey design. The target population (N) was 450 employees who were randomly picked. The primary data was collected by use of questionnaires that were administered by the researcher himself. Statistical Package for Social Sciences (SPSS) Version 20 and Excel 2016 software was the main tools for data analysis. The researcher further adopted a multiple regression model at 5 percent assurance of significance and 95 percent assurance of confidence to establish the direction of the association between the independent variables (Quality assurance, cost reduction, customer satisfaction and lead-time reduction) and the dependent variable (supply chain performance).

The regression equation was expressed as $Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + €\ldots$ (i)

Where:

Y= supply chain performance

$\beta 0$ = coefficient of intercept

X1= Quality assurance

X2 = Cost reduction

X3= Customer satisfaction

X4= Lead-time reduction

€ =error term

β1…β4 = regression coefficients of the independent variables

RESULTS AND FINDINGS

Regression analysis

A linear multiple regression analysis was used test the relationship between the independent variables and the dependent variable. The researcher applied the statistical package for social sciences (SPSS) to code, enter and compute the measurements of the multiple regressions for the study.

Coefficient of determination explains the extent to which changes in the supply chain performance of manufacturing sector in Kenya can be explained by the change in the independent variables (Quality assurance , cost, cost reduction and lead time support)

Table 4. 1: Model Summary

Model	R	R Square	Adjusted R Square	Change Statistics	
				F Change	Sig. F Change
1	.897[a]	.805	.8025	7.567	.029

According to the findings in the table above, the value of adjusted R^2 is 0.8025. This indicates that there was a variation of 80.25 % of supply chain performance of manufacturing sector due to the four independent variables at a confidence level of 95%. In addition other factors that were not studied in this research contribute to 19.75% of the supply chain performance of manufacturing sector in Kenya. Therefore, further research should be conducted to investigate the other factors which contribute to that 19.75% of supply chain performance in manufacturing sector in Kenya. The significance value was 0.029 which is less than 0.05 thus the model is statistically significance in predicting how the independent variables (Quality assurance, customer satisfaction, cost reduction and lead time support) vary on the dependent variable (supply chain performance of manufacturing sector). The F critical at 5% level of significance was 2.789. The F calculated (value =7.567) was greater than the critical value (7.567> 2.789) which indicates that the

independent variables (Quality assurance , customer satisfaction, cost reduction and lead time support) affect the supply chain performance of manufacturing sector in Kenya with reference to Mabati Rolling Mills ltd.

Table 4. 2: ANOVA[a]

Model		Sum of Squares	df	F	Sig.
1	Regression	4.120	4	7.567	.029[b]
	Residual	50.048	78		
	Total	53.168	82		

$Ys = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$ become::

$Y= 0.164+0.047X_1+0.132X_2+0.491\ X_3 + 0.279X_4$

Where Y is the dependent variable (supply chain performance of manufacturing sector) X_1 is the Quality assurance, X2 is Customer satisfaction, X_3 is Cost reduction, X_4 is lead time support.

Taking all independent variables constant at zero, the supply chain performance of Mabati Rolling Mills ltd will be will be 0.164. The data findings also showed that taking all other independent variables at zero, a unit increase in the Cost reduction will lead to a 0.491 increase in the supply chain performance of manufacturing sector, a unit increase in the lead time support will lead to a 0.279 increase in the supply chain performance of manufacturing sector, a unit increase in Customer satisfaction will lead to a 0.132 increase in the supply chain performance of manufacturing sector; while a unit increase in Quality assurance will lead to a 0.0.047 increase in supply chain performance of manufacturing sector.

Therefore cost reduction contribute more to the supply chain performance of manufacturing sector. At 5% level of significance and 95% level of confidence; cost reduction showed a 0.001 level of significant; lead time support showed a 0.013 level of significant; Customer satisfaction showed a 0.019 level of significant and Quality assurance showed a 0.024 level of significant.

Multiple Regressions

Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	.164	.472		.029
	Quality assurance	.047	.083	.141	.024
	Customer satisfaction	.132	.341	.193	.019
	Cost reduction	.491	.037	.506	.001
	Lead time support	.279	.110	.168	.013

Summary of the findings

Quality assurance

The study established that Quality assurance affect supply chain performance to a great extent. Quality assurance is dependent on the factors that influence supply chain performance. The study showed that measuring efficiency is MRP I implementation planning strategy towards supply chain performance. The findings of the study showed that Creating the work breakdown structure and selection of operational teams is key in implementation of MRP I strategy in regard to supply chain performance.

Customer satisfaction

The study showed that Customer satisfaction affect supply chain performance to a great extent. Lower Customer satisfaction s improve supply chain performance of manufacturing firms in Kenya. The study showed that reduced profits, lower labor turnover and improved sales values and Identifying corrective actions to address issues affect supply chain performance in manufacturing sector in Kenya. The study revealed that cost can be reduced by limiting the number of suppliers used by the firm and providing them with necessary training and technology.

Cost reduction

Cost reduction is necessary in implementation of MRP I and is coordinated in time.

Implementation of MRP I reduces cost of sourcing appropriate goods and services and therefore cost reduction significantly improves the implementation of MRP I. The study established that cost reduction equips staff with the necessary skills and techniques of implementing of MRP I in the achievement of its aims and objectives (Stahl, 1995).

Lead time Support

The study found out that lead time make efforts to establish quality assurance management systems, make efforts to standardise the Supply chain processes in the organization and they are willing to take accountability for MRP I management and delivery time lines. The implementation of the practices includes the constructs of management commitment contribute to improve the quality of service to the customers. The study revealed that lead time is committed to staff development and MRP I adoption creates the organizations systems that determine how products and services are produced and quality improvement process must begin with management's own commitment to MRP I adoption.

Conclusion

The study concluded that investment in MRP I can make a statistically significant positive contribution to business performance as it enhances information exchange, accuracy, documentation and monitoring. Lack of awareness and readiness by public authorities to understand markets and technologies can be regarded as an additional barrier. The study concluded that there's need for quality awareness to among employees through education.

Recommendation

The study suggested that the effectiveness of Quality assurance should be measured by the degree of integration with their supplier bases because supplier quality management is a critical component of Quality assurance. There should be availability of adequate supply of people who are educated in the philosophy and technical aspects of quality to improve the supply chain performance. The study recommended that the lead time should communicate MRP I adoption to the entire organization to create awareness, interest, desire and action.

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