EFFECT OF SUPPLY CHAIN OPERATIONS REFERENCE MODEL METRICS ON PERFORMANCE OF PLASTIC AND RUBBER MANUFACTURING FIRMS IN NAIROBI CITY COUNTY, KENYA

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ABSTRACT

Companies are on the run to remain operational and competitive in today's dynamic market. This has necessitated the need for adopting techniques and models such as SCOR which aligns the overall organizational operations focusing on key supply chain aspects of order fulfillment, flexibility, costs and cycle time metrics. Plastic and rubber manufacturing firms have in the recent been affected with economic and legislative issues but is nevertheless bouncing back as a result of employing models such as SCOR. This study pursued to establish the effect of Supply Chain Operations Reference Model Metrics on performance of Plastic and rubber manufacturing firms in Nairobi City County. The study was undertaken in Nairobi City County involving plastic and rubber manufacturing firms encompassing the procurement officers from those companies. Theories reviewed include; theory of constraints, complex adaptive systems theory, transaction cost theory and resource based view theory. Cross sectional survey research design was used. Further, purposive sampling technique was employed so as to arrive at the sample size. During data collection, primary data was collected using questionnaire which was made up of open and close ended items. The study findings established that Plastic and rubber manufacturing firms in Nairobi City County deliver products to customers at their preferred locations and ensures that the delivered goods are in their best possible deliverable state; suppliers of production input for the companies are accommodative to technological changes making it possible for them to avail the supplies on a relatively short notice. Moreover, companies have arrangements with their suppliers to keep at minimum the sourcing related costs necessitated by existing policies that are undertaken to cater for risk management costs. It was concluded that the supply chain model metrics have significant impact on the performance of plastic and rubber manufacturing firms. It was recommended that keen implementation and improvement of each specific metric need to be undertaken for great performance improvement to be realized by manufacturing firms. Since accuracy is paramount in delivery, firms should ensure promptness in meeting delivery timelines through advancement in order handling and procedures. On their side, suppliers should be ready to avail goods on short notice according to the urgency of the need.

Keywords: *Supply Chain Operations Reference Model Metrics, Performance, Flexibiblity, Order Fulfillment, Plastic and Rubber Manufacturing Firms*

1.0 INTRODUCTION

Supply Chain Operations Reference Model Metrics (SCOR) is a Supply Chain Management (SCM) analytical tool that helps manufacturing companies to comprehend the processes inherent in their organizational processes and recognize essential characteristics contributing to the ultimate desired customer satisfaction as they optimize their efficiency and profitability (Wieland, 2020). The SCOR model is concise, qualitative, and static by definition. This model, however, provides quantitative metrics of the supply chain's process efficiency. These indicators are the parameter metrics described in the SCOR Model's Performance portion. Metrics determine a supply chain's ability to attain strategic qualities (Pettit, 2018).

Plastic and rubber manufacturing firms make a significant contribution to both advanced and emerging countries' economic development. The effect of plastics and rubber manufacturing firms on GDP appears to be greater in emerging countries, according to (Bhandari & Frankel, 2015). As such, they observed that the provision of strategies appears vital in propelling these. Kamel and El-Haggar, (2016) observed that companies producing plastics and rubber face multiple obstacles to survival, development and innovation. They found that large percentage of the reported failure in plastic manufacturers' output are due to multiple factors such as weak cost control techniques, inadequate working capital, short term liquidity issues, poor order fulfillment, innovation challenges and poor administration.

Additionally, due to increased environmental anxiety across supply chains, the competitive product manufacturing environment is shifting each day leading to a high level of indecision which affects performance of firm dealing in plastics and rubber (Khan, 2020). To increase manufacturing productivity in plastics and rubber firms, production improvement strategies including the use of Supply Chain Operations Reference Model (SCOR) Metrics are employed to minimize costs majorly in terms of the input costs and maximize desirable results in terms of return on investment and delivery to the customers (Sood, 2020).

Most domestic manufacture of plastics and rubber in Kenya is undertaken by 47 plastic and rubber manufacturing companies (KAM, 2019) accounting for 95% of the manufacturing base of the plastics and rubber manufacturing industry. Plastic and rubber manufacturing companies are utilizing about 53% of capacity (KAM, 2019). Capacity utilization in the sector is therefore constrained both by the quantity and quality of supplies from the suppliers as well as the ever growing concern of environmental protection and conservation. Capacity utilization of the plastic and rubber sub-sector is becoming among the lowest in the manufacturing sector industries and also lower than the average of the Kenya plastics and rubber manufacturing industries over the past few years (Newkirk, 2019).

The study on Kenya's SCOR performance metrics, nevertheless, not only is just in its inception (Tang & Tomlin, 2016), from the Kenyan marketing point of view, however, the importance of SCOR model metrics on production efficiency is still not well evaluated. Effective manufacturing performance management may also provide opportunities to minimize ineffectiveness from the supply chain and economics standpoint, which could result in improved macroscopic economic output (Koech & Munene, 2019).

1.1 Statement of the Problem

In Kenya, Plastics and rubber manufacturing sector output recovered towards the end of the decade and recorded growth rates of 6% in 2018 and a massive 16% in 2019-2020. Rubber and plastics products meanwhile have grown slowly over most of the period, with better performance also in 2018 (KAM, 2019). Despite the expectation that the manufacturing sector would be a key driver of foreign exchange earnings, many firms have either closed down or shifted business elsewhere as a result of poor order management, rigidity in their supply chains, non-efficient customer services, inability to manage supply chain operation costs as well as non-effective response to external influences and market changes (Mogaka & Odari, 2018). Stohler *et al.,* (2017) noted that the experience of established and emerging economies has shown the importance of adapting existing and already tested SCOR model to each particular organization and context. Notwithstanding the proven value of SCOR metrics in manufacturing firms, there is still little research in emerging countries to address the impact of SCOR model metrics on the productivity of manufacturing companies (Sagegg & Alfnes, 2020). A study by Mutegi *et al.,* (2017, recommended that the experience of firms from developed countries in modeling and improving the supply chains can be used as inputs to benefit the manufacturing industry in developing countries if transferred and

implemented appropriately. Additionally, Mogaka and Odari (2018), in their study on the role of SCOR metrics on performance of SMES in Kenya noted the SCOR metrics have a positive significant role on performance and recommended that comprehensive studies be done in other sectors of the economy including the manufacturing industry, a gap that this study seek to fill. Further, Kamau (2017) noted that most plastic and rubber manufacturers in Kenya are progressively embracing level 2 of the SCOR metrics in their operations although at a very slow pace. The purpose of this study was to establish the effect of supply chain operations reference model metrics on performance of plastic and rubber manufacturing firms in Nairobi City County.

1.2 Objectives of the Study

1.2.1 General Objective of the Study

To establish the effect of supply chain operations reference model metrics on performance of plastic and rubber manufacturing firms in Nairobi City County, Kenya.

1.2.2 Specific Objectives of the Study

1. To determine the effect of order fulfillment metrics on performance of plastic and rubber manufacturing firms in Nairobi City County.
2. To assess the effect of flexibility metrics on performance of plastic and rubber manufacturing firms in Nairobi City County.
3. To analyze the effect of cost metrics on performance of plastic and rubber manufacturing firms in Nairobi City County.
4. To examine the effect of cycle time metrics on performance of plastic and rubber manufacturing firms in Nairobi City County.

1.3 Significance of the Study

1.3.1 Academicians and Researchers

To the academicians and researchers, it may be the base for further study on how manufacturing firms' can effectively exploit the advantages of supply chain operations reference model to improve on their performance and control their supply chain. For academic purposes, this study serves to increase knowledge concerning supply chain operations reference model and performance of plastic and rubber manufacturing organization to the already existing body of knowledge.

1.3.2 Stakeholders

It may provide new knowledge to the managers and owners of plastic and rubber manufacturing firms in Kenya about how they can optimize their output by adapting SCOR to the key aspects of the firms. The study may also give managers better insight into the effects of SCOR on the success of their organizations.

1.3.3 The Government

The study will be useful to the government in terms of revealing the benefits of SCOR use in improving service delivery hence government will be in a position to make strategic decisions in the various ministries including the ministry of agriculture concerning educating supply chain practitioners to identify, implement and track the reference model of supply chain operations. The government can also influence management acceptance of the model in various sectors of the economy.

1.4 Conceptual Framework

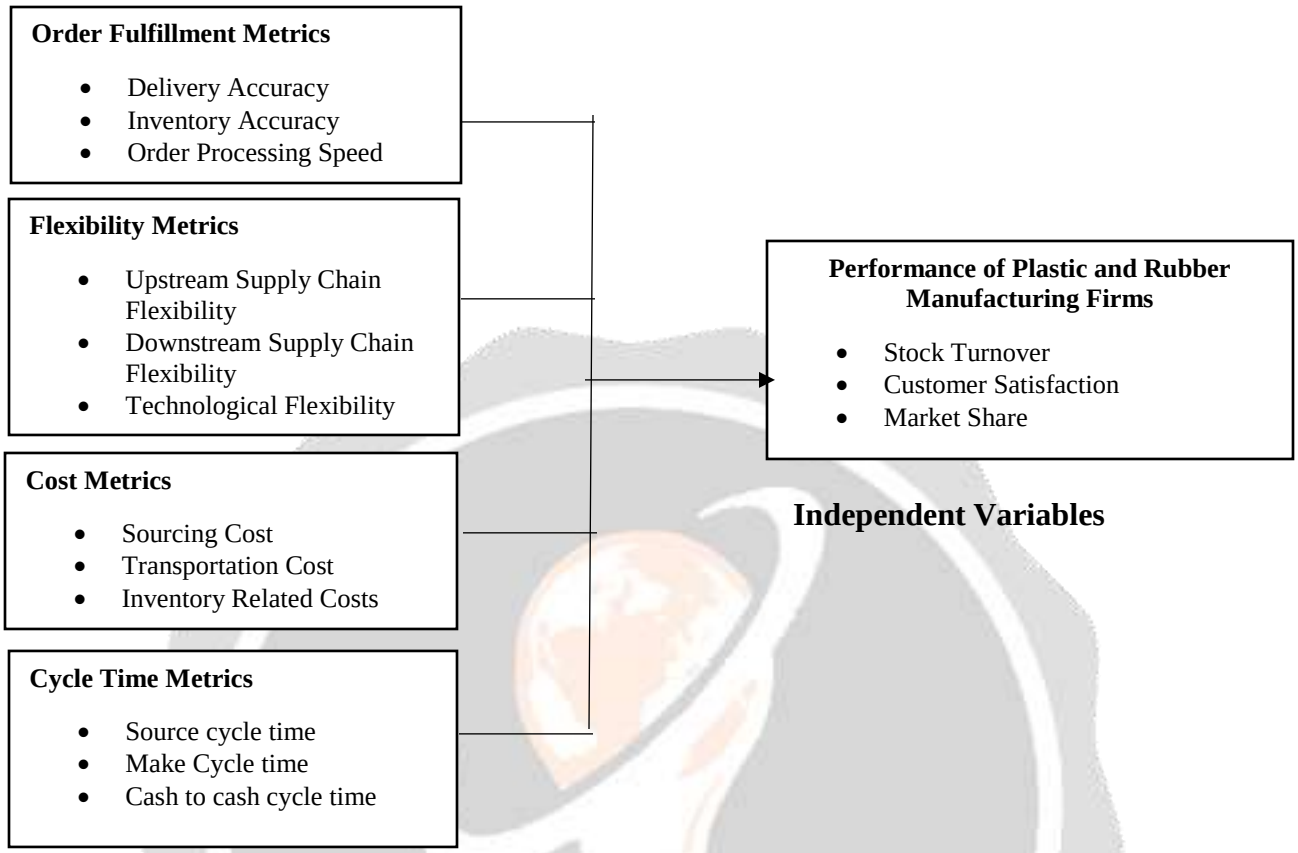

Figure 1 1 Conceptual Framework

2.0 DATA AND METHODOLOGY

2.1 Research Design

In this research cross sectional survey design was employed.

2.2 Target Population

The target population of this study was the 20,000 employees across the 61 plastic and rubber manufacturing firms in Nairobi County who are registered members of KAM (KAM, 2019).

2.3 Sampling Frame

The sample frame for this study was 183 employees in procurement, stores and finance departments from plastic and rubber manufacturing firms within Nairobi County.

2.4 Sample and Sampling Technique

This study adopted purposive sampling technique. The sample size was picked using the formulae adopted from Yamane (1967) at a confidence level of 90%.

$$n = \frac{Z^2 p.q.\ N}{e^2 (N-1) + Z^2 pq}$$

$$n = \frac{1.96^2 * 0.5 * 0.5 * 61}{0.05^2 (61-1) + 1.96^2 * 0.5 * 0.5}$$

$$n = \frac{58.5844}{0.15 + 0.9604}$$

Sample Size= 52.9284 rounded off to 53

= 53 companies

Sample Size 53*3 = 159 employees

Table 2. 1 Sample Size

Departments	No. of Companies	No. of Respondents	Total Questionnaires
Supply Chain/Procurement	53	1	53
Stores/Warehousing	53	1	53
Accounting/Finance	53	1	53
Total			**159**

2.5 Data Collection Instruments

Kothari (2004) states that, when we do a research of the descriptive nature and perform surveys, which could either be sample or census surveys, then primary data can either be collected through direct communication with respondents or through personal interviews and observation. Further, data collection through use of questionnaires is quite popular, particularly in case of big enquiries. For this study questionnaire was used to collect primary data. The questionnaire had both quantitative and qualitative questions.

2.6 Pilot Test

Kombo and Tromp (2009) describe a pilot test as a replica and rehearsal of the main survey. Creswell (2003) and Cooper & Schilder (2011) agree that the respondents used in pilot test should constitute at least 10 percent of the sample used in data collection. In this study, 5 companies were involved in pilot testing with a total of 15 respondents participating. This tested the degree of accuracy of the research instrument as well as its consistency.

2.6.1 Validity of the research instruments

From data obtained from the pilot study, an analysis was undertaken for which validity was ascertained to determine if the variables met the threshold. Construct validity was undertaken through the help of the supply chain practitioners and the research supervisor.

2.6.2 Reliability of the research instruments

Internal consistency was measured using the statistic Cronbach's coefficient Alpha. Cronbach's alpha is a measure of internal consistency; that is, how closely related a set of items are as a group (Eisinga & Pelzer, 2013). This study adopted Cronbach's alpha internal consistency level of ≥ 0.7.

2.7 Data Processing and Analysis

Analysis implies the computation of certain measures along with searching for patterns of relationship that exist among data-category (Kothari, 2004). It is the process of applying tools and systems to transform the data to make it have some meaning out of the obtained facts by relating the results to some known judgments and reasoning

(Arani *et al.,* 2015). After data collection, the data was coded and entered in Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were generated for quantitative data to give descriptive element of analysis by obtaining mean, frequencies and the standard deviation (Choy,2014). Further, regression analysis was undertaken to determine the relationship and the degree of relationship between the study variables as per the study research questions.

Multiple linear regression model was applied to show this relationship.

The equation is as follows:

$Y= \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \acute{\varepsilon}$

3.0 RES ULTS AND DISCUSSION

3.1 Response Rate

The researcher administered 159 questionnaires out of which 123 were well filled and returned back; while 36 were defective. This represents a response rate of 77.36%. According to Howe and Peck (2017), a response rate of 75% and above is suitable. Thus, the response rate achieved in this study can be considered sufficient to give the findings adequate reliability.

Table 3. 1Response Rate

Particulars	Frequency	Percentage
Returned questionnaires	123	77.36
Unreturned questionnaires	36	22.64
Total	159	100.00

3.2 Pilot Study Results

With a view of validating the research instrument, a pilot study was undertaken encompassing 15 respondents from 5 companies. Cronbach Alpha range between 0 and 1 whereby a high alpha value indicates a high level of consistency of the items (Quansah, 2017). It measures the inter-correlations between the items, hence the test is known as the test of internal consistency of a questionnaire (Bryman, 2012).

Table 3. 2 Pilot Study Results

Variables	No. of Items	Cronbach's Alpha	Decision
Order Fulfillment Metrics	6	.853	Accepted
Flexibility Metrics	6	.836	Accepted
Cost Metrics	4	.811	Accepted
Cycle Time Metrics	5	.809	Accepted
Performance of plastic and rubber manufacturing firms	5	.813	Accepted

A value of 0.7 and above is seen as an acceptable value for Cronbach's alpha and is deemed to be showing adequate internal consistency reliability of the instrument; values substantially lower indicate an unreliable scale (Bryman, 2012). All the variables of the study met the required threshold of ≥ 0.7.

3.3 Demographic information

3.3.1 Respondent's Position

Respondents who were stores/warehousing officers formed the majority of the respondents at 51.2%(63 respondents). Procurement/supply chain officers were represented by 32.5% (40 respondents) while accounting

officers formed a constituent of 16.3% (20 respondents). With this respondents' composition, the respondents were able to familiarize with various specific supply chain terminologies used in the research tool and respond appropriately.

Table 3. 1 Respondent's Position

Position	Frequency	Percent
Procurement/Supply Chain officer	40	32.5
Stores/warehousing officer	63	51.2
Accounting Officer	20	16.3
Total	123	100.0

3.3.2 Education Level

Table 3.4 shows information about the respondents' level of education. Notably, the majority; 68.3% (84) of the sampled respondents had a university degree and (17.1%) diploma qualification. Master's degree holders were at 10.6% (13). Finally, Certificate and PhD holders formed the minority a representation of 3.2% (4) and 0.8% (1) respectively. The education characteristic was important in understanding how the various education levels affect the responses from the study respondents. It was worth concluding therefore, that based on their level of education, the sampled respondents would understand and respond to the items being in the questionnaires.

Table 3. 2 Education Level

Level of Education	Frequency	Percent
Certificate	4	3.2
Diploma	21	17.1
Bachelor's Degree	84	68.3
Master's Degree	13	10.6
PhD level	1	0.8
Total	123	100.0

3.3.3 Work Experience

As displayed on table 3.5, the last demographic information was based on respondents' work experience. Majority indicated to have worked for a period of 4-6 years as represented by 61.8% (76). Those who had an experience of 7-10 years were at 13.8% (17) while <3 years and >15 years gathered representation of 13.0% (16) and 11.4% (14) consecutively. This is an indication that most of the respondents have been working for over three years hence were able to provide relevant and reliable information for the study. This also implies that plastic and rubber manufacturing firms in Nairobi had attracted and retained skilled labour as evidenced by their experience and the duration of the employee in the job.

Table 3. 3 Work Experience

No of Years	Frequency	Percent
< 3 Years	16	13.0
4-6 Years	76	61.8
7-10 Years	17	13.8
> 15 Years	14	11.4
Total	123	100.0

3.4 Descriptive Statistics for the Study Variables

3.4.1 Order Fulfillment Metrics

The first variable of the study was order fulfillment metrics. The study sought to analyze views of the respondents in respect to order fulfillment metrics, based on the provided statements as displayed on the table 3.6. The findings indicate that the respondents agreed (Mean = 3.9268; Std Dev = .60287) to the statement that we process with high speed customer orders once received. The respondents also agreed to the statements that we audit accuracy of transaction documents to avoid potential errors (Mean = 3.7805; Std Dev = .68397) and that we check on our inventory to ensure right inventory is delivered to the customers (Mean = 3.7724; Std Dev = .67524) while a neutral response was given on the statement that we deliver products to our customers at their preferred location and in their required state to satisfy them each (Mean = 3.7236; Std Dev = .96920). The findings above agree with Saha *et al.*, (2016) who researched on the role of perfect order fulfillment on the performance of manufacturing firms and established that order fulfillment attributes are quickly becoming a standard for performance delivery amongst manufacturing firms and is representing a notable source of competitive advantage for every efficient supply chains.

Table 3. 4 Order Fulfillment Metrics

Statement	Mean	Std. Deviation
We deliver products to our customers at their preferred location and in their required state to satisfy them.	3.7236	.96920
We audit accuracy of transaction documents to avoid potential errors.	3.7805	.68397
We check on our inventory to ensure right inventory is delivered to the customers.	3.7724	.67524
We process with high speed customer orders once received	3.9268	.60287
We meet customer required delivery time lines	3.6341	.61761

Further, the respondents were asked to indicate other order fulfillment techniques employed in their respective firms. After thematic grouping of their responses, thematic analysis of their responses was done and was as tabulated above. 59.3496% of the responses were skewed towards the use of stores as distribution nodes while 50.4065% of the responses were inclined to third-Party order fulfillment. Drop shipping related order fulfillment gathered a response rate of 25.2033%.

Table 3. 5: Other Order fulfillment techniques employed

Technique	Percentage (%)
Third-Party order fulfillment	50.4065
Dropshipping	25.2033
Using Stores as Distribution nodes	59.3496

3.4.2 Flexibility Metrics

The second objective of the study was flexibility metrics. When asked to rate the statement that our production systems are accommodative to technological changes, respondents agreed (Mean=3.92683; Std Dev= .976534). Similarly, agreed response was obtained from the statements that we maintain the constant flow of products to our customers in times of risks (Mean = 3.7886; Std Dev = .87076), our processes are adjustable in case of inefficiencies or changes (Mean = 3.7805; Std Dev=.95417) and that our suppliers can supply on short notice (Mean=3.7642; Std Dev=.85967). The findings agree with Tang and Tomlin, (2016) who posited that because the supply chain operates in an uncertain environment, supply chain flexibility is critical to its success. It is important in enhancing the ability of the suppliers to respond and supply on short notice; firms to maintain constant flow of products to customers and accommodate changes in production methods and patterns.

Table 3. 6 Flexibility Metrics

Statement	Mean	Std. Deviation
Our suppliers can supply on short notice	3.7642	.85967
We maintain the constant flow of products to our customers in times of risks	3.7886	.87076
Our processes are adjustable in case of inefficiencies or changes	3.7805	.95417
Our production systems are accommodative to technological changes.	3.92683	.976534

The study sought to determine whether the firms accept back the returned defective goods or not. 78.8618% (97) of the respondents indicated consensus while 21.1382%(26) indicated that their firms could not accept back the returned defectives. To a large degree, this finding is an indication of good customer services

Table 3. 7: Acceptance of Returned Defective Goods

Response	Frequency	Percentage
Yes	97	78.8618
No	26	21.1382
Total	123	100.0

When asked to indicate other ways their firms used to solve customer complaints, the respondents' views were as thematically grouped above. 95.1220% indicated to be applying apologizing and thanking customers; 69.9187% follow-up and finally 45.5285% document and act on customer responses.

Table 3. 8: Other Ways of Solving Customer Complaints

Items	Percentage
Apologizing and thanking customers	95.1220
Follow-up	69.9187
Document and act on customer responses	45.5285

3.4.3 Cost Metrics

As tabulated on table 3.11, cost metrics related statements' responses were sought from the respondents and are as presented. An agreed response was achieved on the statement that firms have arrangements with their suppliers to keep at minimum the sourcing costs (Mean=4.0000; .54321). There was also agreed response on the statements that we have undertaken policies to cater for risk management costs (Mean=3.7805; Std Dev=.78444) and that we have in place good inventory management policies which has been keeping inventory related costs at bare (Mean=3.7724; Std Dev= .77685). However, a neutral response emerged when asked to rate whether their logistics strategies had helped in controlling transportation costs (Mean= 3.5610; Std Dev=.73714). Innes and Mitchell (2016) found in their study that in order to increase profitability and survival, cost control must be an ongoing and continuous improvement operation within the organization undertaken. They noted that the costs could be controlled through collaboration with the suppliers to keep minimum sourcing costs and implementing working inventory management policies.

Table 3. 9 Cost Metrics

Statement	Mean	Std. Deviation
We have arrangements with our suppliers to keep at minimum the sourcing costs	4.0000	.54321
We have undertaken policies to cater for risk management costs	3.7805	.78444
Our logistics strategies has helped in controlling transportation costs	3.5610	.73714
We have in place good inventory management policies which has been keeping inventory related costs at bare minimum	3.7724	.77685

3.4.4 Cycle Time Metrics

The last independent variable was cycle time metrics. Upon request to rate the statement that we are able to keep our cash-to-cash cycle time shortest possible, an agreed response was achieved (Mean=3.7073; Std Dev=.97284) while a neutral response was realized on the statements that using manufacturing scheduling and timing, our production team manage deliver on time (Mean=3.6423; Std Dev=.72576), our employees understand the various cycle time metrics used in our company and their importance (Mean=3.4959; Std Dev=.63212), and that through management of ordering cycle time, we are able to eliminate delays (Mean= 3.3659; Std Dev=.82251). This is in line with Kaplan and Norton, (2015) who in their research concluded that, cycle time is a crucial metric as it connects inbound logistics with suppliers to improve the productivity of the supply chain with small and medium enterprises customers through operations and outbound logistics. Elsewhere, Mapes, (2015) established that by reducing inventory costs and boosting cash-to-cash cycle times of manufacturing firms, innovative industrial enterprise styles driving the advancement of cost chain strategies have greatly advanced the delivery chain efficiency of businesses.

Table 3. 10 Cycle Time Metrics

Statement	Mean	Std. Deviation
We are able to keep our cash-to-cash cycle time shortest possible.	3.7073	.97284
Our employees understand the various cycle time metrics used in our company and their importance.	3.4959	.63212
Through management of ordering cycle time, we are able to eliminate delays.	3.3659	.82251
Using manufacturing scheduling and timing, our production team manage deliver on time.	3.6423	.72576

Further, the respondents were requested to specify or describe other types of supply chain cycle metrics applicable to their respective firms and the thematically classified responses tabulated above. Those that cited supply chain lead time related answer were at 75.6098% while those inclined to customer order cycle time/order delivery lead time were 68.2927%.

Table 3. 11: Other Types of Supply Chain Cycle Time

Items	Percentage (%)
Supply chain Lead time	75.6098
Customer order cycle time (Order to delivery lead time)	68.2927

3.4.5 Performance

Table 3.14 shows responses on various statements concerning the study's dependent variable. There was agreement to the statement that keeping in check the supply frequency has enabled our organization achieve desirable stock turnover (Mean=4.0813; Std Dev=.68465). Other statements acquired agreed response including; Flexibility in our supply has increased our market size (Mean=3.8862; Std Dev=.72658), Order fulfillment has facilitated repeated purchase by our customers (Mean= 3.8780; Std Dev=.63485) and that control of our cycle time has played a great role in production costs management (Mean=3.8699; Std Dev=.71241). The above findings concur with those of Ketchen and Hult (2016), who suggested that manufacturing companies aim to increase efficiency by using resources effectively, managing costs and enhancing their ability to adapt to customer requirements, thereby creating a better functioning company. Additionally, the findings are in tandem with those of Fuchs and Otto, (2015) who concluded that the ability to measure profitability and efficiency using order fulfillment metrics offers the shortest path to improved execution and better preparation in both manual and automated processes to improve supply chain performance.

Table 3. 12 Performance of plastic and rubber manufacturing firms

Statement	Mean	Std. Deviation
Keeping in check the supply frequency has enabled our organization achieve desirable stock turnover	4.0813	.68465
Order fulfillment has facilitated repeated purchase by our customers	3.8780	.63485
Flexibility in our supply has increased our market size	3.8862	.72658
Control of our cycle time has played a great role in production costs management	3.8699	.71241

The study endeavored to establish the performance rates based on various spectrums of measures including stock turnover, customer satisfaction and market share. For all the measures, annual increase was evidenced as reported on table 3.15 above. Stock turnover was at 56.8781% in 2018, increased to 62.7317% in 2019 and further increase to 76.5528% reported in 2020. Customer satisfaction was at 47.7968% in 2018, significantly increased to 62.8537% in 2019 and more increase of 74.7317% registered in 2020. The market share was at 52.2846% in 2018, improved to 68.6911% in 2019 and further escalated to 76.9268% in the year 2020.

Table 3. 13 Rate of performance of the organization during the past 3 years

Measures	2018 %	2019 %	2020 %
Stock Turnover	56.8781	62.7317	76.5528
Customer Satisfaction	47.7968	62.8537	74.7317
Market Share	52.2846	68.6911	76.9268

3.5 Correlation of Study Variables

Correlation analysis was conducted to determine both the significance and degree of the association of the variables as presented in Table 3.16. The results in the table above indicates that there was a significant relationship between order fulfillment metrics and performance ($r = 0.401$; $p = 0.006$). This suggests a strong positive relationship hence suggesting that order fulfillment metrics have much effect on performance of plastic and rubber manufacturing firms in Nairobi City County. Further, the study established a positive significant relationship between flexibility metrics and performance ($r = 0.343$, $p = 0.000$) denoting much effect on flexibility metrics on performance of plastic and rubber manufacturing firms. However, a moderate level of positive significant relationship was established on the relationship between cost metrics and performance ($r = 0.317$, $r = 0.016$) depicting a medium level of influence of the variable on the performance of plastic and rubber manufacturing firms. Finally, a positive significant relationship was noted between cycle time metrics and performance ($r = 0.363$, $p = 0.002$) therefore, a much influence of cycle time on the performance of plastic and rubber manufacturing firms in Nairobi City County

Table 3. 14 Correlation Analysis of Study Variables

		Order Fulfillment Metrics	Flexibility Metrics	Cost Metrics	Cycle Time Metrics	Performance
Order Fulfillment Metrics	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	123				
Flexibility Metrics	Pearson Correlation	.408**	1			
	Sig. (2-tailed)	.000				
	N	123	123			
Cost Metrics	Pearson Correlation	.387**	.464**	1		

	Sig. (2-tailed)	.000	.000			
	N	123	123	123		
	Pearson Correlation	.281**	.453**	.176	1	
Cycle Time Metrics	Sig. (2-tailed)	.002	.000	.031		
	N	123	123	123	123	
	Pearson Correlation	.401	.343**	.317*	.363	1
Performance	Sig. (2-tailed)	.006	.000	.016	.002	
	N	123	123	123	123	123

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

3.6 Regression Analysis

3.6.1: Model Summary

Table 3.17 of the model summary indicate that there is a positive relationship between the supply chain operation reference model metrics (independent variable) and performance (R=.375, R^2=.141). The R^2 explains the variations in the dependent variable that can be explained by the independent variables. R^2 of .141 indicates that 14.1% of the variations in performance of plastic and rubber manufacturing firms can be attributed to supply chain operations reference model metrics. Therefore, the finding confirms that there is a significant effect of supply chain operation reference model metrics on the performance of plastic and rubber manufacturing firms.

Table 3. 15 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.375[a]	.141	.111	.60735

a. Predictors: (Constant), Order Fulfillment Metrics, Flexibility Metrics, Cost Metrics, Cycle Time Metrics

3.6.2 Analysis of Variance

Table 3.18 shows ANOVA model used to show the ability of the independent variables to predict the study dependent variable. The output resulted in F=4.827, p = .001. Since the p value is less than 0.05, it implies that the independent variables significantly predicts the dependent variable i.e. performance.

Table 3. 16 ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	7.123	4	1.781	4.827	.001[b]
Residual	43.527	118	.369		
Total	50.650	122			

a. Dependent Variable: Performance

b. Predictors: (Constant), Order Fulfillment Metrics, Flexibility Metrics, Cost Metrics, Cycle Time Metrics

3.6.3 Multiple Regression Analysis

The results in table 3.19 indicate that the relationship between order fulfillment metrics and performance was positive and significant (Beta = 0.049, p = 0.003). For every unit increase in Order fulfillment, performance increase by 0.049. A positive and significant relationship was as well noted between the rest of the independent variables i.e. flexibility metrics (Beta = 0.389, p = 0.001), Cost metrics (Beta = 0.080, p = 0.002) and (Beta = 0.140, p = 0.009).

Table 3. 17 Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.011	.482		6.249	.000
Order Fulfillment Metrics.	.047	.092	.049	.508	.003
Flexibility Metrics	.290	.081	.389	3.576	.001
Cost Metrics	.097	.120	.080	.805	.002
Cycle Time Metrics	.125	.086	.140	1.451	.009

a. Dependent Variable: Performance

Multiple Linear Regression Equation:

Performance = 3.011 + 0.049 Order Fulfillment metrics + 0.389 Flexibility Metrics + 0.080 Cost Metrics + 0.140 Cycle Time Metrics

4.0 CONCLUSION

4.1. Summary of Findings

4.1.1 Effect of Order Fulfillment Metrics on Performance of Plastic and Rubber Manufacturing Firms in Nairobi City County

The study noted that products are delivered to customers at their preferred locations and ensures that the delivered goods are in their best possible deliverable state. Some of companies used third-party to fulfill the order by delivering on behalf of the firm while others employ drop-shipping while another sect use stores as their distribution nodes to facilitate on time delivery. The findings indicated that fims audit the accuracy of their transaction documents so as to minimize the probability of error occurrence. After receipt and processing or customer order, checking on inventory quality and quantity aspects was undertaken.

4.1.2 Effect of Flexibility Metrics on Performance of Plastic and Rubber Manufacturing Firms in Nairobi City County

The suppliers of production input for the companies are accommodative to technological changes. Findings show that they could avail the supplies on a short notice. Consequently, with possibility of adjustments in times of inefficiencies; the firms are able to maintain a constant flow of products to the customers even in times of risk. The firms accept back the faulty items. In case of customer complaints, an apology is sent to offended customer, follow-up mad and documentation of customer responses made with a specific intention of ensuring no future repeat of the same.

4.1.3 Effect of Cost Metrics on Performance of Plastic and Rubber Manufacturing Firms in Nairobi City County

The companies have arrangements with their suppliers to keep at minimum the sourcing related costs. Existing policies are undertaken to cater for risk management costs. The ability to keep at minimum the transportation costs were was low. Inventory management policies enhanced significantly low inventory keeping costs.

4.1.4 Effect of Cycle Time Metrics on Performance of Plastic and Rubber Manufacturing Firms in Nairobi City County

The firms are able to keep shortest their cash-to-cash cycle time. Employees' had little understanding on the various cycle time metrics used in their respective companies and their importance; therefore, some delays were still evident regardless of using manufacturing scheduling and timing. Both supply chain lead time and customer order cycle time/order delivery lead time were the practised forms of a cycle time.

4.2 Conclusions

The study general objective was to establish the effect of supply chain operations reference model metrics on performance of plastic and rubber manufacturing firms in Nairobi City County, Kenya. from the findings, it is concluded that the supply chain model metrics have significant impact on the performance of plastic and rubber manufacturing firms.

The study concludes that outsourcing and use of stores as distribution nodes, customer order fulfillment is fairly scored by the firms. Multiple regression analysis shows that flexibility is the most important factor in determining performance of those firms. Particularly, acceptance of returned defective goods was at the core of managing customer complaints. Performance of plastic and rubber manufacturing firms has been positively influenced by supply chain operation model metric over the past three years.

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