

# CAPACITY MANAGEMENT STRATEGIES AND OPERATIONAL PERFORMANCE OF SUGAR MANUFACTURING FIRMS IN KENYA

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**ABSTRACT: Purpose:** This study was set out to determine the capacity management strategies adopted by the sugar manufacturing firms in Kenya alongside the relationship between these firms' capacity management strategies and their operational performance. **Design/Research method:** Census survey study design was employed in the research in which all the entire population of the sugar-manufacturing firms were considered. Eleven sugar-manufacturing firms currently operational were sampled. Data was collected using structured questionnaires and the selection of respondents from each of these firms was non-probabilistic where the sample frame was selected based on their mandate and specialized knowledge in operations management. **Finding:** From the results obtained in this study, all the sugar firms in Kenya operated below their installed capacity and have adopted a mechanistic form of organization structure. Match (Chase) capacity management strategy emerged to be the most common strategy within the sugar firms in Kenya; this was closely followed by lead capacity management strategy. On challenges for the firms to effectively utilize their capacity, inadequate material supply, high cost of farm inputs and poor plant maintenance scheduling emerged to be the most outstanding factors. **Limitation:** The major limitation of the study is that its financial performance from all the firms was confidential and was not provided. Data on current capacity utilization and efficiency also proved difficult to be reported. **Implication:** To gain the sector productivity and hence competitiveness, this study recommends for sufficient funding through grants and loan schemes for technology enhancement, alignment of the existing policies that governs the sector supply chain to create an enabling business environment and spur growth.

**Keywords:** Capacity Management Strategies, Operational Performance, Sugar Manufacturing Firms, Kenya.

## 1. INTRODUCTION

The developments in industrialization globally has been at the forefront of nations to achieve sustainable development by providing cutting edge competitiveness hence providing employment, facilitating international trade, enabling efficient use of resources hence a major driver of poverty alleviation (United Nations Industrial Development Organization, 2017). In the present dynamic and competitive business environment world, organizations are continuously investing in efficient and innovative tools and approaches aimed at giving them a competitive advantage (Hana, 2013). According to Porter (1990), organizations that aspire to achieve competitive advantages must be innovative and adopt new and modern ways of doing things. Dekkers and Kanapathy (2012) noted that organizations that adopt adequate production capabilities while matching them with their organizational goals gain a competitive advantage.

In operations management research, the study of various manufacturing practices and strategies in relation to the organizational production capabilities have been of importance in establishing the overall organizational performance (Ward *et al.*, 1998). Grobler and Grubner (2006) noted that organizational production capabilities are characterised by the set of practices in use production systems i.e. capacity management strategies employed and operational performance measurements. Rudberg and Olhager (2003) noted that, systematic production efficiency in the long term is necessary for production firms as it has a direct implication on competitive performance in terms of product quality, cost, speed of delivery and flexibility.

Kirkley and Squires (1999), noted that understanding organizational capacity and its measurement is necessary to properly design a capacity management program, especially when capacity is managed by explicit limitations. Capacity utilization as a concept in production often arises in the discussions of applied and theoretical issues at both macro and micro economic levels as its importance is becoming more crucial for firms decision makers. The foremost work on the economic concept of capacity is attributed to Cassel (1937), he made a clear distinction between excess capacity of fixed factors (short-run cost curves) and excess capacity of all factors (long-run cost curves). Cassel further pointed out that since the absolute technical upper limit of the output obtainable from the fixed factors is likely to lie far beyond the realm of practical economic operations, capacity output should be taken as that which the average total costs are at their minimum.

Sugar processing in Kenya was first commissioned in 1922 at Miwani in Nyanza region. In 1927 the second sugar factory was set up in Ramisi in the coast region this is now the Kwale international sugar. After 1963, the Kenyan Government invested in the sugar production by enhancing its sugar farming and establishing more sugar companies namely Muhoroni started in 1969 with a production capacity of 2200 TED, Chemelil started in 1968 with a production capacity of 3000 TCD, Mumias started in 1973 with a production capacity of 8000 TCD, Nzoia (1978) with a production capacity of 3000, South Nyanza (1979) this a production capacity of 2700 TCD, West Kenya (1978) with a production capacity of 4000 TCD, Butali started in 2011 with a production capacity of 2500 TCD, Kibos started in 2007 with a production capacity of 3500 TCD, Sukari started in 2011 with production capacity of 1500 TCD and Transmara started in 2011 with a production capacity of 4000. Out of these factories only eleven factories are currently operational of which five (5) are government co-owned and six (6) privately owned (Kenya Sugar Board, 2013).

## **1.1. Research Problem**

Production capacity planning and its management in an organization is responsible for organization growth and performance. These elements are responsible for matching the long-term capacity of a process to the demand for its products. Various capacity management strategies such as lead capacity management strategy, lag capacity management strategy, and match (chase) capacity management strategy are widely employed by organizations to meet the customer demands while enhancing competitiveness. These strategies are complemented by an effective and efficient organizational operation performance.

According to the World Bank (2015), Kenya has an estimate Gross Domestic Production (GDP) of US \$ 69.977, with a per capita GDP of US \$ 1.587. Key drivers of the Kenyan economy include tourism, agriculture, mining manufacturing and the service sector. In agriculture, sugar cane farming emerges before coffee, tea, maize and other fresh produce that collectively contribute about 7.5% of the GDP. The (Kenya Sugar Board, 2013) reports that, the sugar manufacturing industry in Kenya plays a major role the growth of the national economy as is a source of income for millions of people in the agro-processing and final products distribution

According to the (Kenya Sugar Board, 2010), the Kenyan sugar industry supports directly and indirectly six million Kenyans. Despite the sector significance to the national economic growth, it has been marked with gross mismanagement, use of obsolete technology, insufficient incentives to farmers, and inconsistent policy support base for both government and private sugar firms at micro (firm), macro (national) and supra-national levels, including trade liberalisation actions resulting in drastic decline in production levels and very low returns on investment to farmers.

Nearly all the factories now operate below capacity. Currently, the industry has a deficit of above 200, 000 metric tonnes of sugar for national consumption (Kenya Sugar Board, 2013). As a result, the country since 2002 been importing sugar from Brazil, Swaziland and the Common Market for Eastern and Southern Africa (COMESA) region to enable it take measures to improve competitiveness of its sugar industry. The average cost of production of sugar locally is \$870 per metric ton therefore cannot compete with some Common Markets within the Eastern and Southern Africa (COMESA) countries producing at \$ 400 per metric ton (Kenya Sugar Board, 2013). As a result, the consumers have been subjected to incessant high prices for locally produced sugar.

Over the years, scholars carry out various researches on capacity management and operational performance both in the manufacturing and service sectors have. Kaburu (2014) carried out a study whose aim was to determine the extent of liberalization within the sugar processing industry in Kenya and establish how sugar-processing companies are strategically positioned in response to liberalization of the sugar industry in Kenya. This study established that in Kenya, there is slow adoption of competitive

strategies by sugar processing firms towards the effects of intended liberalization. This study further noted the poor implementation of policies set by the sugar directorate in the registration and management of sugar firms.

[Kamau \(2014\)](#), In his study measured the performance measures index(level) by manufacturing firms in Kenya and established the relationship between operations performance measures index (level) with each component of performance measurement practices and factors affecting implementation of performance measurement. This study found that operational performance measures index by manufacturing firms in Kenya is at 63.95%. It also established that a positive association between operational performance measures index and components of performance measurement practices such as process, tools, systems metrics and approaches exists. Lastly, it revealed that the manufacturing firms in Kenya lack proper training and well-articulated vision.

[Gosselin \(2005\)](#) researched on the relationship between performance measurements among Canadian manufacturing firms. This study established that the firms that adopted modern approaches to performance measurement performed better than those that used traditional approaches while those that used traditional approaches performed better than those that did not measure performance.

## **1.2. Research Focus**

Organizational operations and their contribution to competitive advantage has been an epitome of research in operations management dating back 1960s in Skinners work in which the contributions of manufacturing were based on economies of scale and later complemented by the innovation to achieve quality, flexibility and speed of delivery ([Hayes and Wheelwright, 1984](#)).These scholars work demonstrates a linkage between capacity management strategies and organizational operations performance.

[Armistead and Clark \(1991\)](#) noted that operations managers deploy various capacity utilization and management strategies to balance resources use productivity, quality and delivery. On the other hand, managers enhance operational performance to meet the desired quality while optimising resources productivity. These aspects are vital in providing organizational strategic direction [Bowman \(1990\)](#). It is worth noting that scholars in the reviewed studies have vividly discussed the aspects of capacity management and operational performance but mostly in the service sectors. Despite the evident challenges the country is facing in regard to sugar production and meeting the consumption demands, none of these scholars has established the managerial and operation strategies these sugar factories have put in place to meet the national consumption demand . This scenario evokes the need to determine the capacity management strategies commonly adopted by the sugar-manufacturing firms in Kenya and to establish the links between capacity management strategies and the operational performance of sugar manufacturing firms in Kenya with a view to unveiling appropriate approaches for increased productivity

The overall objective of the study was to establish the influences of capacity management on operational performance of the sugar-manufacturing firms in Kenya with a view to strengthening the evidence base for increasing competitiveness of the sector. The objectives of this study were: to determine the capacity management strategies adopted by the sugar manufacturing firms in Kenya; and to establish the relationship between capacity management strategies and operational performance of sugar manufacturing firms in Kenya.

## **2. LITERATURE REVIEW**

This section provides a theoretical foundations and review of organizational capacity management and operational performance measures set forth by various scholars by reviewing theories and empirical studies of existing literature in the same field.

[Locke \(1968\)](#), devised the goal setting theory of motivation which state that setting goals is essentially linked to task performance. This is based on the fact that goals provides the organization and its employees what need to be achieved and what strategies are essential better task performance. The urge to work towards attainment of certain goals in an organization is the motivating factor for employees and in return it enhances operational performance ([Salaman, 2005](#)).

The resource advantage theory devised by [Hunt and Morgan \(1995\)](#) is a theory of competition in which innovation and organizational learning are endogenic. This theory emphasises that the value of resources to firms is valued by their potential to enhance the organizational competitive advantage ([Olavarrieta and Ellinger, 1997](#)). [Wooliscroft and Hunt \(2012\)](#) emphasised the importance of market segmentation, heterogeneous firms resources with comparative advantage is vital to organization.

## **2.1. Capacity Management Strategies and Operational Performance**

Capacity management in accordance with [Armistead and Clark \(1991\)](#) is the organizational ability to meet its customer demands. According to [Waters \(2006\)](#) and [Sarvapriya \(2013\)](#), capacity management in an organization is achieved through capacity planning, which describes specific approaches for achieving this match as a vital indicator of economic performance.

[Hayes and Wheelwright \(1984\)](#) devised lead capacity management strategy which aspires for increasing the production output in expectation of an increase in customer demand ([Olhager et al., 2001](#)) categorised lag Capacity management strategy in which organizations increase capacity only when it's running at optimum while [Chase and Aquilano \(1985\)](#) devised Match (Chase) capacity management strategy in which organizations increase their capacity in smaller increments in response to the market demand.

**Level Capacity Management Strategy:** Level capacity management strategy helps organizations to maintain a steady input and production output rates over a planning period and work force rate as the surplus products inventory accumulated in the period of low demand are utilised to absorb the incremental demand ([Jacobs and Chase, 2008](#)). **Lead Capacity Management Strategy:** This is the strategy in which organizations increase the production capacity based on projections in increased customer demand. This strategy allows for the organization to rent its excess capacity to other companies in the same sector ([Hayes and Wheelwright, 1984](#)). **Lag Capacity management Strategy:** This is the opposite of lead capacity. In this strategy, organizations increase capacity only when it's running at optimum. Lag capacity management strategy yields to cost effective products ([Olhager et al., 2001](#)). **Match (Chase) Capacity Management Strategy:** This is a more moderate strategy in which an organization increases its capacity in smaller increments in response to the market demand ([Chase and Aquilano, 1985](#)). This strategy minimises the over and under capacity of the lead and lag strategies ([Gary, 2017](#)).

Organizational performance measurement is indispensable for managing organizations resources and providing a strategic direction for sustaining the organizational competitiveness ([Magutu et al., 2015](#); [Magutu et al., 2016](#); [Mose et al., 2013](#)). Inadequate performance measurement often leads to poor product delivery to customers hence low competitiveness. In accordance to [Venkataraman \(2014\)](#), measuring organizational performance is a key ingredient for achieving total quality management. [Harrington \(1991\)](#), quoted that "Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it. If you can't understand it, you can't control it. If you can't control it, you can't improve it".

## **3. RESEARCH METHODS**

This section gives highlight of the research design, the population, data collection and the technique applied.

### **3.1. Study Design**

A census survey research design approach was used in this study in order to enlist a rigorous analysis of capacity management strategies employed and operations design that ultimately determines the operational performance of the sugar firms in Kenya.

### **3.2. Population**

Since this was a census survey, the target population was all the sugar milling firms from in Kenya to better understand the influence of organizational forms and structure to the overall performance of these firms. A total of 11 sugar firms currently operational were surveyed and their responses analysed.

### **3.3. Data Collection**

Qualitative and quantitative data from primary sources on capacity management strategies and operational performance was collected in all the sugar firms using structured questionnaire. The selection of respondents from each of these firms was non-probabilistic where the sample frame was selected based on their mandate and specialized knowledge in operations management.

### **3.4. Data Analysis**

Data collected was analysed using the Statistical Package for Social Science (SPSS) software version 22. First the data was cleaned, validated and coded. Descriptive statistics was generated in which the frequency and percentile scores while inferential data analysis by linear regression function was used

explain relationship between the capacity management strategies as a function of organizational operational performance.

## 4. RESULTS AND DISCUSSIONS

### 4.1. Introduction

This section presents the results of obtained data analysis.

### 4.2. General Information

The data required was obtained from all the sugar manufacturing firms in Kenya operational at the time of the study. This data was provided by different personnel of the respective firms drawn across levels of management. The respondents were different in personal background, characteristics in terms of age and duration served in the firms. Table 1 summarises those details.

**Table 1.** Characteristics of respondents

Characteristic	Frequency	Valid %
Respondents age		
21-40 years	3	27.3
41-60 years	7	63.6
>60 years	1	9.1
<b>Total</b>	<b>11</b>	<b>100</b>
Position held		
Production manager	3	27.3
General manager	3	27.3
Process manager	1	9.1
Other management level	4	36.4
<b>Total</b>	<b>11</b>	<b>100</b>
Years of service to the firm		
2-5 Years	5	45.4
6-10 years	2	18.2
> 10 years	4	36.4
<b>Total</b>	<b>11</b>	<b>100</b>

Source: Research data (2018)

Form the results in table 1, it shows that the data came from people who are mature adults implying that data was provided by people who are likely to have a solid experience and intellectual capability to make sense of the response required. All of them were in top management positions an indication that they possessed the organization skills and knowledge critical to discerning capacity management and organizational performance of the representative sugar firms. In addition, over half of them served the firms for a period of over six years at 54.6%. Only 45.4 % had been in their firms for less than 6 years. These points out the possibility that the data obtained reliably expressed the true picture about the results attributes gained out of several years of experience.

**Table 2a.** Characteristics of the firms

Characteristic	Frequency	Valid %
Duration of operation		
6-9 years	4	36.4
>10 Years	7	63.6
<b>Total</b>	<b>11</b>	<b>100</b>
Current number of employees		
500-1000	1	9.1
>1000	10	90.9
<b>Total</b>	<b>11</b>	<b>100</b>
Current installed capacity		
2001 - 3000 TCD	7	63.6
3001-4000 TCD	3	27.3
>4000 TCD	1	9.1
<b>Total</b>	<b>11</b>	<b>100</b>

Source: Research data (2018)



**Table 2b.** Characteristics of the firms

Capacity Utilization %			
	39-50%	6	54.5
	51-70%	3	27.3
	>70%	2	18.2
	<b>Total</b>	<b>11</b>	<b>100</b>
Current Revenue (Ksh. Billions)			
	1-2	2	18.2
	3-4	1	9.1
	>4	5	45.4
	Not stated	3	27.3
	<b>Total</b>	<b>11</b>	<b>100</b>
Forms of organizational structure.			
	Organic	3	27.3
	Mechanistic	8	73.7
	<b>Total</b>	<b>11</b>	<b>100</b>

Source: Research data (2018)

Table 2 a&b shows that 63.6 % of the total Number of sugar firms in Kenya have been in operations for at least 10 years at the time of the study. Only 36.4% were less than 10 years in the bracket of 6 to 9 years. This demonstrates that the data used in the analysis were gathered for the firms with established pattern of production schedules that can be used to deduce their capacity management strategies and operational performance. The 90.9 % of the firms had a large size of employees reporting over 1000. Six firms (54.5%) of these firms were operating at a capacity utilization of below 50%, three firms (27.3%) were operating in the range of 51% to 70 % capacity utilization while only two firms were above 70% utilization of their total capacity. None of these firms operated at above 80% of the installed capacity. In terms of revenue, majority of the firms reported a revenue flow of above Ksh.4 billion for the current year at 45.4%. 18.2 % of the firms reported a revenue of Ksh.1-2 Billions while 27.3% did not provide the data as it was deemed confidential. Finally, the table shows that majority of the firms have a mechanistic forms of organizational structure in that their managerial decision making is vested at the top management at 73.7 % and organic at 27.3%.

### 4.3. Capacity Utilization Strategies

The objectives of this study was determine the capacity management strategies adopted by the sugar manufacturing firms in Kenya and establish their relationship. To better understand this, this study exploited the strength of application of various capacity utilization practices, initiatives and strategies within the sugar manufacturing firms in Kenya. To determine the level of application of these management aspects, a series of possible capacity utilization practices, initiatives attributes were prepared in the questionnaire. Against this provisions, respondents were asked to rate their views on extent of their applications in their firms on a Likert type scale of (1) for very small extent, (2) for small extent, (3) for moderate extent, (4) for great extent (5) for very great extent and (X) for do not know. The results of the responses obtained are as presented in the sub section that follows.

The responses to this attributes are depicts that 54.5% of the sugar manufacturing firms have moderately leveraged their capacity above average in constant production output. 36.4% of the sugar firms assessed moderately believe that by organizations setting constant production schedule and sustaining a constant production output improves the capacity utilization of the firm. Based on this result, it is also evident that 36.4 % of the firms moderately have overtime work schedules during high demands period of the product. To greater extent, 27.3% of the firms achieves its capacity utilization optimally in situations where the production output level varies from time to time. Also to a greater extent 27.3% of the firms studied have overtime work schedules during high demands period of the product. On a very greater extent, 27.3% of the firms qualified that their capacity utilization if often above average in constant production output and 27.3% that constant production schedule and constant output improves their overall capacity utilization.

### 4.4. Capacity Management Initiatives

The study also sought to establish the various capacity management initiates put in place by the sugar firms. The findings of this attributes are as presented shows that a vast number of the sugar firms had adequate capacity management initiatives in place. The most outstanding area was respect to fact that

the firms have moderately set the maximum level of production output that can be achieved within their optimal resources and operational schedules at 54.5%. This is closely followed at moderate by these firms having set the total production output that optimally utilizes their machineries and resources and labour resources at 45.5%. At a great extent, most of the firms treat capacity management as a vital indicator for economic performance that provide insight of their investment at 45.5%. Only 27.3% of these firms on a very small and small extend incorporate extra capacity by hiring or subcontracting in their production schedules.

#### **4.5. Capacity Management Strategies**

Following the tradition of analysis adopted for the capacity management practices and initiatives, the corresponding results for the capacity management strategies shows that most of the sugar firms in Kenya on a moderate extend adopts match capacity management strategy in which they increase their capacity in smaller increments in response to the market demand at 54.5%. Respectively, these firms also adopts lead and lag capacity management strategies in which they increase their production in anticipation of an increase in the customer demand and as well increase their capacity only when they are producing optimally moderately at 45.5%. At great extent, some of these firms adopt lag capacity management strategy at 27.3% and 27.3% of them as well adopt level capacity at a very great extent. From the results obtained, it is well demonstrated that the match capacity management strategy is most adopted but nonetheless, no single factory maintained a single strategy.

In order to gain greater insight into the enabling factors and challenges these firms face in adoption of these capacity management strategies, opinions and views of the respondents were sought out. The responses received to this effect were numerous. they included lack of in adequate material as a result of poor husbandry hence low cane yield, competition for raw material among the firms and cane poaching,, unpredictable rainfall patterns, limited capital flow, existence of old production technologies, attracting and retaining skilled manpower, inefficacy in the existing technologies due to poor plant maintenance practices, inadequate human resource development, unpredictable sugar prices in the market, land subdivisions and completion from other food crops, high level of extraneous material in the cane delivered to the factory, high cost of plant maintenance, delays in farm inputs facilitation e.g. fertilizer hence staggered growth and plant down time. From the results analysis, the most outstanding factor across the firms was in adequate materials at 90.0% response, high costs of farm inputs at 36.4%, poor plant maintained scheduling at 27.3%.

#### **4.5. The Relationship Between Capacity Management Strategies and Operational Performance**

The second objective of this study ventured to unravel the operational performance measures employed by the sugar manufacturing firms in Kenya and establish their relationship to the capacity management strategies adopted in enhancing productivity. To answer this question in array, possible forms of operational performance measures were presented to the respondents. Results of this attributes are presented in the next subsections.

During the analysis of the responses on operational performance, these set attributes were further consolidated into four categories in accordance with Kaplan and Norton (1992) balanced score card as Cash flow, Continuous improvement, Shareholder and employee satisfaction and customer satisfaction. Based on the responses form the firms, it is evident that all the firms studied have moderately put on emphasis on all operational performance measures i.e. measures to support innovation and learning for continuous improvement of the firm at 45.47%, measures to sustain their financial position at 40.95%, measures to attain customer satisfaction at 43.95%, measures to maximise the shareholders expectations and satisfy employees at 41.57%. To a very greater extent, 20.8 % of the firms considered shareholder satisfaction key and to a great extent at 22.8 % of the firms strives for continuous improvement. On a small extent 27.3 % of the firms were keen on those attributes that aid their organization sustain a cash flow.

The relationship between capacity management strategies and operational performance in the Kenya sugar firms was evaluated using correlation and regression analysis as described below:

**Table 3.** Correlation Matrix

		(1)	(2)	(3)	(4)	(5)
Operational performance(1)	(r)	1				
	Sig. (2-tailed)					
Level capacity management strategy(2)	(r)	.422*	1			
	Sig. (2-tailed)	.017				
Lead capacity management strategy(3)	(r)	.673*	.227	1		
	Sig. (2-tailed)	.000	.309			
Lag capacity management strategy(4)	(r)	.549*	.306	.091	1	
	Sig. (2-tailed)	.000	.121	.363		
Match(Chase) capacity management strategy(5)	(r)	.484*	.112	.412	.219	1
	Sig. (2-tailed)	.003	.106	.098	.170	

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

**Source:** Research data (2018)

Pearson Correlation Coefficient was used to test the direction and magnitude of the relationship between the dependent variable (operational performance) and independent variables (level capacity management strategy, lead capacity management strategy, lag capacity management strategy and match (chase) capacity management strategy) at 5% level of significance.

Results of the Pearson correlation, as shown in Table 3, indicate that there was a significant positive correlation between level capacity management strategy and operational performance measures employed by the firms ( $r=0.422$ ,  $p$  value= $0.017$  which was  $< 0.05$ ); a significant positive correlation between lead capacity management strategy and operational performance ( $r=0.673$ ,  $p$  value= $0.000$  which was  $< 0.05$ ); a significant positive correlation between lag capacity management strategy and operational performance ( $r=0.549$ ,  $p$  value= $0.000$  which was  $< 0.05$ ) and a significant positive correlation between chase capacity management strategy and operational performance ( $r=0.484$ ,  $p$  value= $0.003$  which was  $< 0.05$ ). This implied that level capacity management strategy, lead capacity management strategy, lag capacity management strategy and match (chase) capacity management strategy were critical capacity management strategies that had a significant influence on operational performance of the sugar manufacturing firms in Kenya. A regression analysis was performed in order to analyze the relationship between the study variables. The results are as summarized below:

**Table 4.** Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.904 <sup>a</sup>	0.817	0.695	1.3302

Predictors: (Constant), level capacity management strategy, leads capacity management strategy, lags capacity management strategy and chase capacity management strategy

**Source:** Research data (2018)

From Table 4, R square, which is the coefficient of determination, tells us the variation in the dependent variable due to changes in the independent variables. Based on Table 4, the value of R square was 0.817, which means that 81.7% variation in the operational performance of the sugar-manufacturing firms in Kenya was due to variations in level, lead, lag and chase capacity management strategies. Hence, 18.3% of variations in the operational performance of the sugar-manufacturing firms in Kenya was explained by other factors not in the model or not focused on in the current study.

**Table 5.** ANOVA (Analysis of Variance)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	71.113	4	17.77825	6.699	.0211 <sup>a</sup>
	Residual	15.924	6	2.654		
	Total	87.037	10			

a. Predictors: (Constant), level capacity management strategy, lead capacity management strategy, lag capacity management strategy and match (chase) capacity management strategy

b. Dependent Variable: Operational performance

**Source:** Research data (2018)



Analysis of Variance (ANOVA) consists of calculations that provide information about levels of variability within a regression model and forms a basis for tests of significance. The "F" column provides a statistic for testing the hypothesis that all  $\beta \neq 0$  against the null hypothesis that  $\beta = 0$ . From the findings in Table 4.5, the significance value is .0211 which is less than 0.05 implying that the study's regression model was statistically significant in predicting how the predictor variables (level capacity management strategy, lead capacity management strategy, lag capacity management strategy and match (chase) capacity management strategy) influenced the response variable (operational performance of the sugar manufacturing firms in Kenya). The F critical at 5% level of significance is 4.53. Since F calculated (F value = 6.699) was greater than the F critical value of 4.53, this also showed that the overall model was fit.

**Table 6.** Regression analysis results

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	6.431	.812		7.920	.0000
Level capacity management strategy [X <sub>1</sub> ]	0.596	.186	.527	3.204	.0031
Lead capacity management strategy [X <sub>2</sub> ]	0.712	.192	.581	3.708	.0005
Lag capacity management strategy [X <sub>3</sub> ]	0.761	.168	.624	4.530	.0000
Match (Chase) capacity management strategy [X <sub>4</sub> ]	0.668	.213	.512	3.136	.0027

Source: Research data (2018)

Based on the regression results shown in Table 6, the regression model becomes:

$$Y = 6.431 + 0.596 X_1 + 0.712 X_2 + 0.761 X_3 + 0.668 X_4$$

From the regression equation above, taking all the predictor variables (level capacity management strategy, lead capacity management strategy, lag capacity management strategy and match capacity management strategy) constant at zero, operational performance of the sugar manufacturing firms in Kenya would be at 6.431. The results further indicate that a unit increase in level capacity management strategy would lead to a 0.596 unit increase in operational performance of the sugar manufacturing firms in Kenya; a unit increase in lead capacity management strategy would lead to a 0.712 unit increase in operational performance of the sugar manufacturing firms in Kenya; a unit increase in lag capacity management strategy would lead to a 0.761 unit increase in operational performance of the sugar manufacturing firms in Kenya while a unit increase in match (chase) capacity management strategy would lead to a 0.668 unit increase in operational performance of the sugar manufacturing firms in Kenya. At 5% significance level or 95% level of confidence all the predictor variables were significant as their p values were < 0.05. These findings imply that there was a significant positive relationship between level, lead, lag and match (chase) capacity management strategies and operational performance of the sugar-manufacturing firms in Kenya.

## 5. CONCLUSION

In conclusion, this study affirms that, capacity planning and its management is a vital element for any organizational productivity and performance. By evaluating and forecasting the market demand of a product, organizations are able to plan for their capacity utilization to meet this demand. Organizations with sound capacity management practices and initiative are always in a position to make sound decisions on which strategies to adopt to meet customer satisfaction. From this study, it is concluded that there is no single capacity management strategy best for an organization. Organizations ought to be flexible to the market demands to remain competitive. There exist a significant positive correlation between capacity management strategies adopted by a firm and its operational performance. Level capacity management strategy, lead capacity management strategy, lag capacity management strategy and match (chase) capacity management strategies were critical capacity management strategies that had a significant influence on operational performance of the sugar manufacturing firms in Kenya.

## 6. RECOMMENDATIONS TO POLICY AND PRACTICE

This study used structured questionnaires in data collection therefore, the reliability of the data collected entirely relies on the effectiveness of the questionnaire design as a tool and the views of the responded may be biased to produce valid results. Financial performance from all the firms was

confidential and was not provided. Data on current capacity utilization and efficiency also proved difficult to be reported. Given the size of the sugar industry in Kenya only few sample frame/size was available and the information provided from each firm came strictly from the top management therefore the sample size may not have been sufficient to draw conclusions.

Based on this research findings, the following recommendations are suggested: There is need for the sugar manufacturing firms to enhance their field extensions service to the farmers and provide farm input on timely basis as this will enhance material productivity; The government of Kenya need to enforce the regulations on sugar importation to cushion the local manufactures and further explore the opportunity of privatization of the government co-owned sugar firms to enhance productivity.

This research only focused on level, lead, lag and match (chase) capacity management strategies and operational performance measures adopted by the sugar firms in Kenya. To spur the growth of the sector, further research on product diversification within the sugar sector is encouraged to unearth opportunities for other sugar products.

## REFERENCES

- Armistead, C. G. and Clark, G. R. (1991). Capacity management in service and the influence on quality and productivity performance, working paper 56/91. Cranfield School of Management. Bedford, UK
- Bowman, C. (1990). Personal Communication, Cranfield. United Kingdom
- Cassel, J. M. (1937). Excess capacity and monopolistic competition. *Quarterly Journal of Economics*, 51: 426-43.
- Chase, R. and Aquilano, N. (1985). Production and operation management. 4th edition, IRWIN Homewood, Illinois. USA.
- Dekkers, R. and Kanapathy, K. (2012). *Practices for Strategic Capacity Management in Malaysian Manufacturing Firms. International (summer) conference on business innovation and technology management, Genting, Malaysia, Procedia-Social and Behavioural Sciences*, 57, 466-476. Elsevier Ltd. New York City USA.
- Gosselin, M. (2005). An empirical study of performance measurement in manufacturing firms. *International Journal of Productivity and Performance Management*, 54(5): 410-38.
- Grobler, A. and Grubner, A. (2006). An empirical model of the relationship between manufacturing capabilities. *International Journal of Operations and production Management*, 26(5): 458-85.
- Hana, U. (2013). Competitive advantage achievement through innovation and knowledge. *Journal of Competitiveness*, 5(1): 82-96.
- Harrington, H. J. (1991). Business process improvement: the breakthrough strategy for Total Quality, productivity and competitiveness; McGraw Hill, New York.
- Hayes, R. H. and Wheelwright, S. C. (1984). Restoring our competitive Edge: Competing Through Manufacturing. John Wiley & sons. New York, USA.
- Hunt, S. D. and Morgan, R. M. (1995). The Comparative Advantage Theory of Competition. *Journal of Marketing*, 59: 1-15.
- Jacobs and Chase (2008). Operations and Supply Management: The Core McGraw-Hill/Irwin series operations and decision sciences. 415.
- Kaburu, M. E. (2014). Liberalization and competitive strategies adopted by sugar processing firms in Kenya, Unpublished MBA project, School of Business, University of Nairobi.
- Kamau, M. S. (2014). Performance measurement practices and operational performance of manufacturing firms in Kenya. Unpublished MBA project, School of Business, University of Nairobi.
- Kenya Sugar Board (2010). The Kenya Sugar Industry Value Chain Analysis: Analysis of the Production and Marketing Costs for Sugarcane and Sugar Related Products, Nairobi.
- Kenya Sugar Board (2013). Kenya Sugar Industry Strategic Plan 2010-2014. Available at: <http://www.kenyasugar.co.ke>.
- Kirkley, J. and Squires, D. (1999). Measuring capacity and capacity utilization in fisheries. FAO Fisheries Technical Report No. 386. Food and Agriculture Organization of the United Nations, Rome.
- Locke, E. A. (1968). Towards a theory of task motivation and incentives. *Organizational behaviour and Human Performance*. 3(2): 157-89.
- Magutu, P. O., Aduda, J. and Nyaoga, R. B. (2015). Does supply chain technology moderate the relationship between supply chain strategies and firm performance? Evidence from large-scale manufacturing firms in Kenya. *International Strategic Management Review*, 3(2): 43-65.

- Magutu, P. O., Mbeche, I. M., Njihia, J. M. and Nyaoga, R. B. (2016). The relationship between supply chain strategies and supply chain performance among large-scale manufacturing firms: the moderating.
- Mose, M., Njihia, M. and Magutu, P. (2013). The critical success factors and challenges in e-procurement adoption among large scale manufacturing firms in Nairobi, Kenya. *European Scientific Journal*, 9(13): 375-401.
- Olavarrieta, S. and Ellinger, A. E. (1997). Resource-based theory and strategic logistics research. *International Journal of Physical Distribution & Logistics Management*, 27(9): 559-87.
- Olhager, J., Rudberg, M. and Wikner, J. (2001). Long-term capacity management: Linking the perspectives from manufacturing strategy and sales and operations planning. *International Journal of Production Economics*, 69(2): 215-25.
- Porter, M. (1990). Competitive Advantage of Nations. *Competitive Intelligence Review*, Free press, Harvard Business review. USA. 1(1): 14-14.
- Rudberg, M. and Olhager, J. (2003). Manufacturing networks and supply chains: an operations strategy perspective. Omega. *International Journal of Management Science*, 31: 29-39.
- Salaman, G. (2005). Models and Theories of performance measurement systems, A performance Management journal, sage publication, New Delhi.
- Sarbapriya, R. (2013). Close look into research studies on capacity utilization in India and abroad. *International Journal of Economics, Finance, and Management*, 22(2): 247-63.
- United Nations Industrial Development Organization (2017). Industrial Development report 2018. Demand for Manufacturing: Driving inclusive and sustainable industrial Development. Vienna.
- Venkataraman, R. (2014). Musing of a strategy; Notion Press. Chennai India.
- Ward, P. T., McCreery, J. K., Ritzman, L. P. and Sharma, D. (1998). Competitive priorities in operations management,. *Decision Sciences*, 29(4): 1035-46.
- Waters, C. D. J. (2006). Operations strategy, Thomson learning. London UK.
- Wooliscroft, B. and Hunt, S. D. (2012). The evolution of resource-advantage theory: Six event, six realization, six contributions. *Journal of Historical Research in Marketing*, 4(1): 7-29.
- World Bank (2015). International Monetary Fund World Economic Outlook. World Bank. Washington, D.C. USA.