The Strategic JOURNAL of Business & Change MANAGEMENT
ISSN 2312-9492 (Online), ISSN 2414-8970 (Print)

www.strategicjournals.com
Volume 10, Issue 3, Article 024

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The Strategic JOURNAL of Business & Change MANAGEMENT
ISSN: 2312-9492 www.strategicjournals.com
Vol. 10, Iss.3, pp 289 – 301. August 26, 2023. www.strategicjournals.com, ©Strategic Journals

EFFECT OF FACILITY LOCATION ON PERFORMANCE OF STATE OWNED SUGAR FIRMS IN KENYA

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Accepted: August 11, 2023

ABSTRACT

The primary goal of supply chain design is to up service quality and improve interaction levels between service providers and customers. This study established the effect of facility location on performance of state owned sugar firms in Kenya. The research employed descriptive casual research design to provide cause effect relationship between study variables while applying simple stratified purposive sampling technique to collect data. The target population comprised all the four operating state owned sugar firms namely, Chemelil, Muhoroni, Sony and Nzoia. The composition of the target population constituted four (4) factory managers, four (4) Finance managers,five hundred and twenty four (524) Agriculture Extension Officers,four (4) Human Resource managers,One hundred and eighty (180) Agriculture services Personnel and four (4) Strategy and planning Managers bringing the total target population to 720. The researcher used questionnaires for data collection. Analysis of data was executed using descriptive and inferential statistics. Statistical Package for Social Sciences (SPSS) helped in the analysis. Results presentation was in form of tables, figures, charts as well as histograms. Descriptive analysis helped show the population and the objectives enabling the researcher get the opinion percentages on the research issue. Hypothesis was tested at 95% confidence level. We therefore concluded that facility location had significant positive impact on performance of state owned sugar manufacturing firms in Kenya. Simple Regression Analysis was used to determine the strength and direction of the relationship between the study variables. The study found that cost reduction opportunities a rise since economies and markets constantly change in line with supply chain partners, technologies and relationships. Facility location contributed greatly in the improvement of performance in, operational efficiency, production flexibility and quality of the products as well as services.

Key words; *Facility Location, Performance of State Owned Sugar, Firms in Kenya*

CITATION: Misiko, E. W., Kiongera, F. N., & Wanjere, D. M. (2023). Effect of facility location on performance of state-owned sugar firms in Kenya. *The Strategic Journal of Business & Change Management,* 10 (3), 289 – 301.

INTRODUCTION

The remarkable trend in the world economy over the past three decades has been growing global economic integration, (Adejumo, 2017). It has exposed manufacturers to regional and global competition especially where many players are producing similar products. The sugar industry has not been spared the steep competition. Presently under a liberalized industry, wholesalers buy directly from the sugar mills for distribution, (Wanyande, 2018). According to, (Wanyande, 2018), these circumstances make imported sugar much cheaper than locally produced sugar encouraging the dumping of cheap sugar in the local market. This threatens the survival of the local sugar industry and yet Sugar cane farming is a source of income to over 150,000 stake holders. (Marangu, 2016).

The sugar firms have opted for diversification strategies (Marangu, 2016). Every production firm aims at maximizing its profits by developing a competitive advantage over its rivals. Diversifying means developing a wide range of products, interests, or skills in order to minimize risks. It involves acquiring different investment alternatives to spread the risk. (Nickels, 2018). The other system that the Kenyan sugar industry could adopt is "supply chain" design generally involving processing and critically where to locate firms, distribution centers, weighbridges, bridges and culverts, (Conea, 2019). Supply chain is designed to control inventory hence inventory management models form critical aspects of supply chain design. Supply chain design is the set of policies and controls that monitor levels of inventory and determine what levels should be maintained, when stock should be replenished, and how large orders should be.

Problem Statement

A successful production has timely deliverables that depend on accuracy and timeliness of a vast amount of information, (Janvier- James, 2019). Field officers spend more than 50% of their time in the field where data is difficult to access away from the site office. Field operations and services experience extensive delays and rework due to information that is unavailable, inaccurate or outdated as a result of manual processes. Delays and rework reduce the overall productivity of the firms and increase indirect costs due to schedule delays or direct costs due to work, (Larson, Halldurson, 2019).

The few related studies done in the Kenyan sugar industry have been found to focus on diversification, (Marangu, Oyagi, & Gongera, 2021) and management Politics, (Wanyande, 2021). Studies on effect of facility location on performance of sugar firms are still lacking. This study seeks to fill this gap by determining the effect of facility location on performance of state owned sugar manufacturing firms of Kenya, (Coltrain, 2019).

Objectives of the Study

The study was guided by the following specific objective;

- To establish effect of facility location on performance of state-owned sugar firms in Kenya.

From the study objective, this study tested the following hypothesis;

- H_0: Facility location has insignificant relationship to performance of state-owned sugar firms in Kenya.

LITERATURE REVIEW

The chapter highlights literature review. Literature was reviewed from journals, books, working papers, reports and periodicals. Literature review helped acquit the researcher with existing theoretical issues and previous studies on supply chain designed manufacturing on firm's performance. This chapter sets out the theoretical review of manufacturing firm's production performance, empirical review, conceptual framework, and critique and research gap.

Dynamic Capabilities Theory

The concept was developed in management literature in 1980s and a theory published by (Teece and Pisano, 1994). (Zahra and Garvis, 2000), argued that dynamism reflects the instability of a firm's market conditions emanating from the constant

unpredictability of customers leading to shifting situations and provoking searches for new sources of competitive advantage. Further, (Edelman and Yli-Renko, 2010) observed that dynamism creates new sets of opportunities that could elevate the competitive ability of a company.

(Chang, 2012) used knowledge absorption, integrative ability, social networking and market oriented sensitivity to negotiate and communicate dynamic capability measures. (Feiler and Teece, 2014) noted that dynamic capability could be either geared toward transforming, seizing or sensing, (Wang and Ahmed, 2007) added that dynamic capability could be thought of adaptive, innovative and absorbtive capability components. Dynamic capabilities theory has been condemned as lacking a precise definition and clear theoretical foundation, empirical grounding and measurements, making it hard for scholars to study the way dynamic capability can be utilised in the development and assessment of hypotheses and predictions as well as decision making processes, (Pavlou & El Sawy, 2011).

Resource Dependence Theory

Originally composed this view, which is grounded on the firms interaction with the environment(Pfeffer and Salancik, 1978),. The theory proposes that organizations have a symbiotic relationship with their environment and this dependence on the environment leads them to be externally constrained and controlled. Organizations engage in exchange with their environment by forming coalitions, altering their organizational systems to obtain required resources. They reasoned that organizations need numerous kinds of resources to undertake their businesses and these resources define how firms generate and make deliveries of their products or services to the market, (Pfeffer & Salancik, 2003)

Organizations are interdependent in that they seek resources including monetary and physical resources, technology, management skills, marketing expertise, information and sociol legitimacy among others. Through such interdependence, organizations can combine their resource sets synergistic-ally with complimentary resources of partners thereby creating bundles that are unique and difficult to replicate, (Harrison, Hitt, Hoskisson & Ireland, 2001)**.** Therefore the study grounded its regarding organizations interdependence with supply chain on resource dependence theory as one of the theoretical underpinnings. The resource dependency theory has been criticized, as it does not explain the development or acquisition of new capabilities and adaptation to new situations by organizations.

Empirical Review

This research intended to bring out the link between facility location and production output of the mentioned state owned sugar firms in Kenya.

Facility Location and Manufacturing Firm Performance

The discussion highlights value of location decisions in “supply chain”. We revisit classical models and develop a summary on more recent research targeting to expand the concept of decisions including extra features of “supply chain”. It critically examines transport routes, management of inventory, robustness and reliability; (Al –Sultan, AL-Fawzan, 2019). (Simchi- Levi, Kaminisky and Samchi Levi 2003 p5). The figure is frequently much higher in some fields when the value of transporting a complete product to the user is considered.

According to Averbakh, (2020), location decisions are the most difficult in designing. Raw material availability, labor costs are all factors that influence transportation and inventory decisions. Changes in business alliances and partnerships may necessitate revisions to policies governing the release of corporate information that critically influences location decisions (Balicik, 2019). Inefficient locations for manufacturing plants, distribution centres, shall result in extra costs in the facilitie’s lifespan, regardless of the level of organization of the production plans.

However, at the times these decisions reflect uncertainity about the long-term operating conditions of manufacturing plants and distribution

centres. Uncertainity surrounds expenses such as shipping and stock storage. When deciding where to locate a facility, planners must consider the inherent uncertainity of future conditions, (Simchi- Levi, 2003). We start with the tried-and –true fixed charge location model and then move on to some alternative, similarly tried-and-true facility location models. We then show how, as suggested by (Barahoma and Jensen, 2008), the tree model can be adjusted to incooporate other aspects of the problem, including more accurate depictions of shipping and receiving processes, inventory management options, and other considerations.

Each location has a fixed cost, and we have customer locations with known demands and candidate sites between any given location and any customer, there exists fixed unit shipment costs.

(Jaillet, 2015), examine how the fixed charge obstacle is solved using an algorithm similar to that proposed by (Hemsen and Mladenovic; 2017), due to its similarities, (Glover, and Laguna, 2020), The algorithm has been tested on problems ranging in size from very small to moderately large, yielding positive results. Lagrangian relaxation algorithim, as discussed by (Galvaro and Daskin, 2019) can eliminate the charge location problem, (Geoffrion, 2020).

The fixed charge limitation is extended by (Geoffrion and Graves, 2020) to include plant to distribution centres, shipments and multiple commodities. Delivery costs are fixed when transporting a full truckload regardless of the number of stops or the orders made. However, when transporting a smaller quantity, these factors become important considerations, (Eylon, Watson-Gandy and Christofides, 2020) raised the issue of treating LTL shipments as full truckloads. Many studies on developing Integrated location/ routing models have been published over the last three decades. The intergrated location / routing problem brings together the supply chain design processes.

Documentation indicates NP-hard vehicle routing challenges are frequently combined to create a problem that is notoriously difficult to solve, Laporte, (2018), compiles recent work on location routing problems; providing various formulations, solution algorithms, and computational results of previous studies in the area. The information was classified according to the problem and the method used to solve it. Shipping products from the factory via centres to ultimate consumers is a common three layer problem, wherea's two layer problems focus on only those two steps. The formulation by, (Perl, 2013), (Pearl and Daskin, 2015); is a good three layer location routing problem.

(Perl, 2013), uses a three-stage heuristic to reach a conclusion. Our first step is to look for the least expensive options. The second stage involves making plans for which facilities will be operational. The routes discovered in the first stage will be divided. Third, the available nodes get stabilized and work to improving solution by rerouting customers and solving any outstanding routing issues, (Louvesex, 2017). When the rate of improvement falls below a pre-determined thresh-hold, (Wu, Low, and Bai, 2020), try a related double phase heuristic.

In (Laporte, Nobert and Taillefer, 2018), the vehicle routing problem is typically an interger of the linear programming model. It is an equivalent of three layer Perl formulation (VRP). Indices of flow variable are typically sorted in the VRP's flow formulations, enhanced by the succesful implementation of real algorithims. (Berger's 2019), formulation in many ways avoids using traditional locations and routes, she formulates the routes, paths which delivery vehicles may not require in making final trip back to the distribution centre once all deliveries have been completed.

METHODOLOGY

The research used descriptive correlation design to achieve stated objectives. The coverage was the four operating state-owned sugar firms of Western and Nyanza regions namely, Nzoia, Chemelil, Sony and Muhoroni Sugar companies Ltd. The geographical distribution was a fair representation of other sugar manufacturing firms

due to population under study.Target population constituted all factory managers (4), Finance managers (4), Agriculture Extension Officers (524), Human Resource managers (4) Agriculture services Personnel (180) Strategy and planning Managers, (4) yielding the total target population of 720 from the four sugar firms.

These were a true representation of their organization as their day to day duties cover the entire aspects of the questionnaire and involvement of more managers would be expensive but just yield similar responses. In their absence; their deputies were requested to fill the questionnaire. The study used a census design since the 82 respondents from one firm plus 81 respondents from each of the three firms was attainable using this method. Questionnaires were designed to collect information from respondents as needed to measure, (Fraenklel and Wallen, 2009) posit that the instrument ought to be given to the entity that can be expected to render an intelligent deduction concerning adequacy of the instrument.

The researcher sought to establish if the questionnaires were duly completed. Data on questionnaire was cleaned, coded, classified and summarized for analysis. The most ideal model for analysis of data was the linear regression model. Statistical Package for Social Sciences (SPSS version 20) helped analyse data. It helped correct flaws that had gone undiscovered, and improve quality of the data utilized in investigation.The data collected was subjected to qualitative analysis. Hypotheses was tested at 95% confidence interval. Simple regression analysis helped determine the strength and direction of relationship between study variables.

RESULTS

This section presented the results for the study.

Response Rate

Out of the three hundred and twenty five (325) questionnaires administered, one hundred and eighty two (182) returned the duly completed questionnaires and as such, were considered responsive instruments forming the basis for analysis.

Table 1: Response Rate

State of Questionnaire	Number Of Questionnaires	Percentages
Retrieved	182	56.35
Not Retrieved	143	43.65
Total	325	100

This represents 56.35 % response rate of the issued research instruments. This was fair response rate bearing in mind that some respondents work on shift and outreach centers which were geographically distributed widely leading to a despondence rate of 43.65 %. (Mugenda & Mugenda 2009), posit that a response rate of 50% is ideal for analysis and reporting hence this being 56 % return rate is adequate enough for conclusions to be drawn from the study.

Normality Tests

It was used to asses if data tallies a normal distribution. Variables exhibiting any realistic deviations from normality can change relationships. (McCabe, Moore and Craig, 2014), submitted normalcy test as being critical in determining if data was appropriately described. Normalcy was examined using histograms and the "Kolmogorov-Sminov" normality test. Normal distribution was an important precondition for carrying out regression analysis. (Miot, (2017), observed that good and descent data for study is that which is normally dispersed.

A insignificant result of p ≥0.05 (at a 5% significant level) implies normal distribution. The sig. Value being .000 for each of SCD values. The variables of facility location and performance of the firm had a significant value of .024 and .001 correspondingly. This implies that SCD constructs, facility location and performance of manufacturing

firm had not violated the normality requirement. Operation assessment on the other hand, had a value of .002, which was significant at 5% level. This imply that the premise of normalcy was violated by operation assessment, which is typical in large samples (Pallant, 2005).

Table 2: Normality Test

	"Kolmogorov–Simonov			Shapiro– wilk		
	Statistic	Df	sig.	Statistic	df	sig.
FL	273	75	0.00	0.770	75	0.00
OA	0.187	75	0.00	0.937	75	0.00
IR	0.176	75	0.00	0.88	75	0.00
PE	0.193	75	0.00	0.877	75	0.00
BE	0.065	75	0.20	0.973	75	0.09
FP	0.12	75	0.02	0.968	75	0.00

Effect Of Facility Location On Perfomance

An analysis was done on effect of facility location onperformance. The analysis focused on various areas of facility location that have effect on organizational performance.

Table 3: Percentages on Facility Location and Performance:

Facility location and performance	Disagree (% &*f*)	Agree (% &*f*)	Neutral (% &*f*)	Totals
Improved performance after maximum utilization of cane yard space	25.80(47)	74.18(135)	0.02	100% (182)
Increased performance after automation of ware house and weighbridges	12.64(23)	87.36(159)	0.00	100% (182)
Improved performance after efficiency and streamlining of processes in ware house and weighbridge	6.59(12)	93.41(170)	0.00	100% (182)
Increased performance as a result of low carrying costs, (quick build to shop times).	8.79(16)	91.21(166)	0.00	100% (182)
Increased performance due to low obsolescence costs (short lead times) i.e fast flow of raw materials from out growers to the processing facility.	11.54(21)	88.46(161)	0.00	100% (182)
There is streamlined structure of bill of materials to enable fast and accurate communication of needs to manufacturing.	82.97(151)	11.54(21)	5.49(10)	100% (182)
There was a lot of savings on the cost of transport due to full truck load technique, FTL	2.10(4)	97.90(178)	0.00	100% (182)
There was improved performance after adoption of mobile field weighbridges.	12.64(23)	68.68(125)	18.68(34)	100% (182)

Source; field data, 2022.

According to study in table. 3. Above, 135 respondents conforming to the statement that performance improved after cost of occupancy reduced. The 159 respondents involved in the study acknowledged to the statement that performance improved after lowering value of relative cost. Results revealed that 170 respondents agreed that improved production was realized on identifying saving opportunities. There was a lot of savings on the cost of transport after FTL hence increasing performance. This had a direct bearing on the speedy flow of raw materials to the processing facility from the out growers as a result boosting performance.

Diagnostic Tests

Before proceeding with regression analysis, the ensuing regression model had to be examined for adequacy. The model needs to meet minimum

threshold, including normalcy, multicollinearity, and heteroscedasticity. Deviations exposes the study to the risk of yielding false results, (Brooks, 2008). The results of these tests are presented in the proceeding section.

Normality Tests

A normality test asseses if data complies with normal distribution. Variables showing remarkable variations from normality likely can change relationships. (McCabe, Moore and Craig, 2014) submitted test for normalcy as vital to examining wether data was appropriately described by a normal distribution. Data normality was ascertained by histograms and the "Kolmogorov-Sminov" normality test. Normal distribution was an important precondition for carrying out regression analysis. (Miot, 2017) observed descent data for study as that which is normally dispersed. The output table 4 below was used to check for normalcy.

An insignificant result of p ≥0.05 (at a 5% significance) implied normal distribution. the sig. Value of .000 for each of the SCD values. The predictors of facility location and firms performance had significant value of .024 and .001 correspondingly. This implies that SCD constructs, facility location and performance of manufacturing firm had not violated the normality requirement. Operation assessment on the other hand, had a value of .002, which was significant at 5% level. This imply that the premise of normalcy was violated by operation assessment, which is typical in huge samples, (Pallant, 2005).

Multicollinearity Test

Table 4: Multicollinearity Test

Variable	Tolerance	PEF
Facility location	.985	1.017

Dependent Variable; Performance of manufacturing firm

Source; field data, 2022

On examining data for normalcy using histograms, The findings of scores distribution were graphically tabulated in the histograms in the figures 1 Results were captured in the ensuing section.

Facility Location

Figure 1 showed a symmetrical histogram, indicating facility location was normaly distributed. Exactly, the variable tabulated normal distribution with mean of 2.47 and .322 as the standard deviation hence bringing to conclusion that facility location model conformed to normality condition. Results are shown in the figure below;

Facility Location	0	5	4	5	15	8	23	13	8	8	5	4	3
Frequency	0	0.2	1.25	1.5	2.5	3	3	3	2.5	2	3.0	1.25	0.75

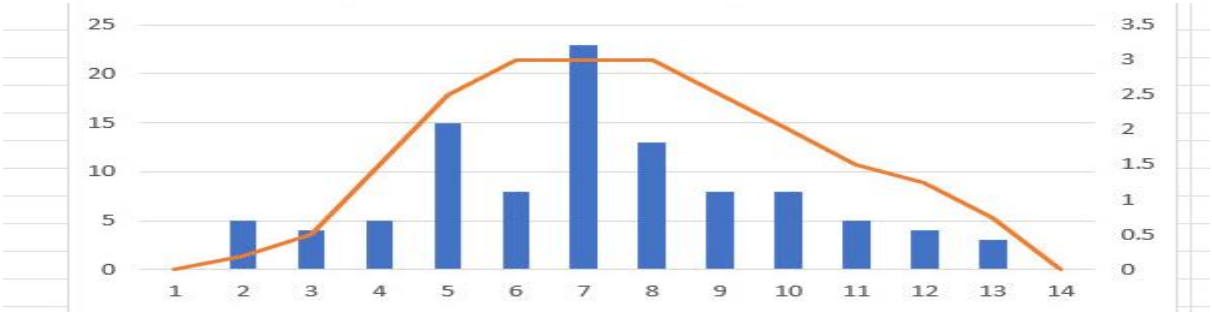

Figure 1: Facility location

Source: Field data 2022

Simple Linear Regression Analysis

This tested direct effect of independent variables (facility location) on dependent variable (perfomance of state owned sugar firms)

Simple Linear Regression Results on facility location

Simple linear regression analysis was conducted to establish the link between facility location and production output of selected sugar firms in Kenya. R square was used to establish contribution of facility location on performance of state owned sugar firms in Kenya as shown in the table below;

Table 5: Simple Linear Regression Results on Facility Location:

Model Summary

					Change statistics				
Model	R	R Square	Adj R square	Std.er of estim	Rsq Change	F Change	Df1	Df2	Sig f change
1	.504[a]	0.266	0.256	0.615	0.266	26.759	1	74	0

ANOVA

Model	Squares Sum	Df	Square Mean	F	Sig
Regression	10.124	1	10.124	26.759	0.001[b]
Residual	27.996	74	0.378		
Total	38.119	75			

Coefficients[a]

Model	Unstd Coeff B	Unstd Coeff Std. Error	Std Coeff Beta	T	Sig
Constant	1.344	0.406		3.311	0.001
Facility location	0.563	0.109	0.504	5.173	0.000

Source, field data, 2022.

Table 5 showed positive significant association between facility location and performance in supply chain design of selected state owned sugar firms in Kenya. Facility location accounted for 26.6% (R^2=0.266) variations. The F value was more than zero, F=.000, therefore facility location is a significant factor on production output of state-owned firms in Kenya. Facility location had linear, positive measurable (P<0.05) association with performance in state-owned sugar manufacturing firms {B=0.563, t=5.173, P=0.001}. Results are shown as a model below;

Model: $Y = ß_o + ß_a\dot{X}_a + €$

Where Y= Performance of state owned sugar firms,

$ß_o$= 1.344 (constant)

$ß_i$= 0.563

X_a= Facility Location

Replacing in the equation above : Y= 1.344 + .563X_a + e

The equation constant value is 1.344, P = 0.000, Facility location has regression value of .563 as the coefficient value. Every unit gain in facility location results in a proportionate gain that is significant in performance of state- owned sugar firms by 56.3%. This study agrees with (Onyango, Obrien and Ghodsypour, 2015) who studied the association between facility location and production output of cement manufacturing companies in Kenya.

The research is further in agreement with (Otieno & Getuno, 2017), on investigation of effect of supplier information shared regarding it to be positively significant to performance of state-owned secondary schools in Nairobi City, Kenya. The results further agreed with the study by (Arrowsmith and Hartley, 2016) who established a positive significant linkage between facility location basically on performance. Similarly, it disagrees with (Kiarie 2017) who found that facility location

implementation had insignificant effect on general efficient output of huge manufacturing companies in Kenya.

Limitation and recommendation for future research

Lack of funding for the study, which was a significant drawback limited a smooth flow of the research being that the firms were geographically apart.Time was also a huge issue for me because I had to balance working on the research with my other tasks and obligations.

Hence, a recommendation was made that facility location had positively and significantly affected performance of functional areas of state-owned sugar manufacturing firms in Kenya. Further, the study recommends the regulator in sugar industry to avail a conducive environment that will boost technology innovations in sugar industry to gain the entire benefits of supply chain design.

CONCLUSION

This study concluded that time wasted in searching for information, lack of interoperability, lack of proper decision making approaches and lack of planning can squeeze the Operation cost and influence cost of facility management. Decisions on ideal location of facilities can determine the ultimate effect of cutting costs of operations, distribution and manufacturing hence determining enterprise profitability. Public and private companies to employ facility location strategies for sustainability

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