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The relationship between capacity utilization and value chain performance: Evidence from Kenyan tea processing firms

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Tea processing firms have increasingly recognized the role of capacity utilization and management in the creation and maintenance of competitive advantage. This study intended to determine the link between capacity utilization and value chain performance of tea processing firms. Specifically, the study determined the relationship between capacity utilization and value chain performance of tea processing firms in Kenya. To achieve this, a sample of eighty-five (85) Tea processing firms was used. The study adopted a cross-sectional research design. The unit of analysis of the study was the individual tea processing firm. Data were collected from both primary and secondary sources. Multiple linear regression model was adopted to study the linear relationships among the study variables. The study established that the relationship between capacity utilization and the firm's value chain performance is positive and significant. It is therefore recommended that management of the tea processing firms should improve the capacity utilization of the bottleneck resources if they are to increase the throughput and create competitive advantage of their firms. This study contributes by providing empirical insights from the tea processing on capacity utilization and value chain performance.

Key words: Capacity utilization, value chain performance, tea processing firms.

INTRODUCTION

Each industry is continuously doing self-appraisal and in search of tools for measuring its present performance in comparison with the set goals, past achievements, and capacity utilization. Policy formulation and business decision-making depend on economic indicators. Manufacturing capacity utilization is an important indicator of economic performance that explains changes in inflation, investment, long-run output growth

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(Sarbapriya, 2013). Capacity is very important but least understood concept in manufacturing and business world (Klammer, 1996). Different categories of people in business and manufacturing measure capacity differently. For example, some financial managers might measure plant capacity in terms of the equipment installed in the plant while operational supervisors might measure capacity in terms of worker efficiency. Klein and Summers (1996) defined an organization's productive capacity as "the total level of output or production that it could produce in a given time period". Capacity utilization is the percentage of the firm's total possible production capacity that is being used. Therefore, an organization should be most efficient if it is running at 100% capacity utilization. An organization's full capacity is the minimum point on total cost function, a full input point on the aggregate production function and a bottleneck point in a general equilibrium system. Full capacity should be defined as a realizable level of output that can be attained under normal input conditions without prolonging accepted working schedules, and allowing for usual vacations and for normal maintenance (Klein and Summers, 1996).

To positively affect inventory levels, cycle time, business processes, and customer service, modern Supply Chain Management (SCM) should reduce their constraints hence leading to increased firm profitability and competitiveness. According to Russom (2000) and Handfield and Nichols (2003), efficient, effective supply chains are critical to the survival of most organizations. Supply chain management, therefore, is a current research area for business management worth a study. This study tested whether the firm's capacity utilization had practical implications on the firm's value chain performance.A typical supply chain frequently involves three segments made up of the upstream segment, internal supply chain, and downstream segment. The upstream supply chain segment is where sourcing or procurement of materials from external suppliers occurs; internal supply chain segment is where transformation (operations), assembly, and packaging take place; and downstream supply chain segment is where distribution to customers takes place, frequently by external distributors, or a disposal takes place (Sandoe et al., 2001; Handfield and Nichols, 2003). Most studies (Russom, 2000; Drickhamer, 2002; Donovan, 2003; Chopra and Meindl, 2004) have in the past focused on the whole supply chain performance, failing to focus on performance measures for specific segments of the supply chain particularly the internal chain. This study will focus on the firm's internal supply chain segment analysis which can be easily related to the firm's capacity utilization and the firm's internal operational constraints. Based on the studies of Russom (2000), Drickhamer (2002) and Donovan (2003), this position is supported by the Supply-Chain Operations Reference (SCOR), which divides supply chain operations into various parts giving suppliers, manufacturers, distributors, and retailers a framework within which to evaluate the effectiveness of their activities along the same supply chains.

This study was grounded on Theory of Constraints (TOC) and the Resource Based View (RBV) theories which have played an important role in Supply Chain Management research (Grimm, 2004). The key theoretical perspectives that have been greatly used in supply chain management studies in the last twenty years are the TOC and RBV (Alain and Martin, 2009).

There are two approaches to measuring capacity utilization. The first approach measures capacity utilization using an estimated cost function. Another approach uses Federal Resource Board (FRB) or Wharton measure that investigates the macroeconomic implications of high or low capacity utilization. Sarbapriya, (2013) observed that very little research work has been undertaken on economic measurement of capacity utilization since most of the studies on capacity utilization had used conventional methods and had paid less attention to the possible theoretical problems. Therefore, there was a need to have a study to extend the concept of capacity utilization beyond conventional methods and build up some new theory.

Kenya is currently the world's third largest producer of tea after India and China but the leading exporter of black tea. Kenya's tea industry is well developed and contributes about 20% of the Kenya's total export earnings. Since 2009, the Tea industry has been the highest foreign exchange earner generating Kshs 92 billion in 2010. The major markets for Kenya's tea include Pakistan, Egypt, United Kingdom, Afghanistan, Sudan, Russia Federation and Yemen. Kenya's tea exports mainly constitute of black CTC (crush tear and curl) teas in bulk and exports of green teas are still very low (http://epckenya.org).

Problem of research and research focus

Tea processing involves value addition as opposed to manufacturing. The concept of the value chain and capacity utilization fit well into the context of tea processing, but most studies have had a mismatch between the concept of capacity utilization and value chain management. Guy et al. (2005) did a study on impact of application of TOC in the health sector and found out that the number of patients in outpatient increased but there was no actual value addition, the reason might have been on issues to do with capacity. These findings further contradicted by Inman et al. (2009) who indicated that setup time reduction would have little effect on overall firm performance unless the setup time of a constraint was reduced. Choosing the tea processing as the context of value chain performance is a strong strength as the proper understanding of the local measurement of the firm's value chain performance can lead to global supply chain performance of the organization. This study tested the TOC philosophy that local performance does not necessarily translate to global performance. This study was conducted in the form of a survey covering the whole of Kenya in an effort to clear the contradicting TOC philosophy on performance using cross-sectional survey.

Capacity is the maximum level of output each plant in a given industry can achieve within the normal work schedule, considering the normal downtime and assuming that sufficient inputs to operate machinery and equipment are availability (Corrado and Mattey, 1997). According to Saikia (2012), simple indicators like the output gap based on designed capacity are used to measure capacity utilization. This direct measure of capacity output has limited use since it overlooks problems such as seasonal grown-up of certain proportions; expansion capacity due to fresh investment. Capacity utilization is a measure of the firm's productive capacity that influences the total level of output or production that could be produced in a given time period.

Another approach for defining capacity is developed by Consortium for Advanced Manufacturing International (CAM-I) which categorizes the capacity into three (productive, nonproductive, and idle) and uses the term "rated capacity" instead of the term "theoretical capacity" in its model. *Rated capacity* is equal to the sum of the idle, nonproductive, and productive capacity in the CAM-I model (Klammer, 1996). Capacity or plant capacity is the maximum rate of output that a plant can produce under a given set of assumed operating conditions (Stratton, 1996). Capacity of the plant includes all the facilities, equipment, and people used to make the product and the ways those facilities, equipment, and people are used. It is a measure of a manufacturing enterprise's ability to provide products to its customers when needed or a manufacturer's ability to meet demand (Stratton, 1996). Effectively managing capacity can help organizations to create a competitive advantage which is very crucial for the survival of those organizations. The purpose of managing capacity is to ensure that organizations provide the cost-justifiable resources needed to meet current and future business requirements.

Market constraints as a result of market demand lead to a reduction in capacity utilization in the organization. Market price changes have become so prevalent in today's business environment than the past situation making it difficult for organizations to manage their value chain activities. Various commodities like agricultural products, metals, and energy often experience significant and unexpected price fluctuations that have a direct financial effect on profitability, organizational cash flow and competitiveness (Zsidisin and Hartley, 2012). Falling commodity price changes force organizations to change their production levels in response to lower prices hence leading to idle capacity in organizations. Increasing commodity prices will force organizations to enhance their produce so as to benefit from the price increase. Price fluctuations if not well managed will lead to delays, request for price increases, supply disruptions that detrimentally affect the overall cost structures and sourcing options (Zsidisin and Hartley, 2012).

Shepherd and Günter, (2006) argued that performance measurement should measure supply chain relationships in the entire supply chain rather than measuring intra-organizational performance only. Supply chain performance measurement should complement human resource management and modern manufacturing practices (Shepherd and Gunter, 2006). Performance measurement system should be dynamic by responding to environmental and strategic changes in the organization. Organization's performance should based on the financial measures, the internal business process, the customer satisfaction, and the learning and growth aspects (balanced scorecard- BSC) (Kaplan and Norton, 1992, Bhagwat and Sharma, 2007b).

As a result, the main knowledge contributions (theoretical and practitioner) from this research stems from the concurrent treatment, in the same study, of an expanded approach tocapacity utilization and value chain performance within a key sector meant to deliver Kenya's vision into a developed economy.Even though the concepts of capacity utilization and value chain performance have been widely researched, a few studies have tried to study the trends and determinants of capacity utilization and value chain performance of organizations. Further, much prior scholarly discourse has studied the concepts of capacity utilization and value chain performance in isolation and no attempt has been made to study the two variables together; this leaves plausible research opportunities in this area to bridge the gap. Consequently, the study sought to determine the relationship between capacity utilization and value chain performance of tea processing firms in Kenya.The study sought to answer the question: Is there arelationship between capacity utilization and value chain performance of tea processing firms in Kenya? The specific research objective of this study was to determine the relationship between capacity utilization and value chain performance of tea processing firms in Kenya.

CONCEPTUAL MODEL AND HYPOTHESIS

The model provided in Figure 1 is emphasizing the inter-connection between capacity utilization and value chain performance in one comprehensive framework intended to aid the researcher in developing a more thorough understanding of the linkages between the above two concepts. The hypothesized relationship shows capacity utilization is the independent variable while value chain performance is the dependent variable. Capacity utilize-tion was hypothesized in terms of design capacity and actual output while value chain performance was hypothesized in terms of financial performance, customers' satisfaction, internal business process, and organizational capacity utilization.

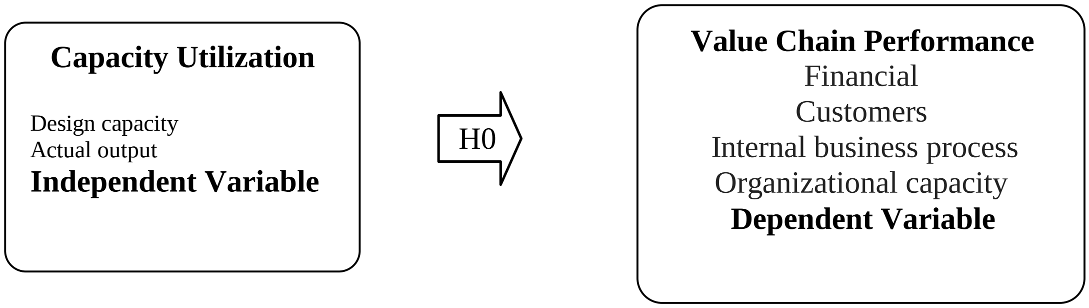

Figure 1. Conceptual Model.

Based on the study objective, the following hypothesis was tested:

H_o: There is no relationship between capacity utilization and value chain performance of tea processing firms in Kenya.

MATERIALS AND METHODS

General background of research

This study adopted a cross-sectional survey design. The appropriateness of a cross-sectional survey design in the proposed study is from the backdrop that conclusions about the research problem were based on the information collected at the time of enquiry records concerning events that have already taken place. Mugenda and Mugenda (2003) contend that cross-sectional studies are appropriate where the overall objective is to establish whether significant associations among variables exist at some point in time.

Sample size and sampling procedure

The tea processing firms in all the forty-seven (47) counties in Kenya were selected to capture the constructs of capacity utilization and value chain performance. The unit of analysis for this study was the individual tea processing firm. The sampling frame was obtained from the Tea Board of Kenya (www.teaboard.or.ke). Inspection of the list of tea processing firms in each county revealed that there were 107 registered in Kenya by May 2013. Therefore, the target population was 107 firms. Since the purpose of the research was to generalize the results obtained as much as possible, the target population was first stratified into forty-seven counties. Then proportionate sample was sorted from each of the groups for purposes of providing survey data. According to Cochran (1963), the appropriate sample size for a population-based survey is determined by the estimated percentage prevalence of the population of interest. A sub sample size was determined for each stratum. The total sample size required was calculated using Cochran (1963) formula by taking 5% as estimated percentage prevalence of the population of interest,

$$n = \frac{t^2 \times p(1-p)}{m^2} \qquad (1)$$

Where: n is the required sample size; t is the confidence level at 95% (standard value of 1.96); p is the estimated percentage prevalence of the population of interest. The conservative estimate and one that is often used is 50% (0.5 will be used in this formula); m is the margin of error at 5% (standard value of 0.05).

Therefore, the sample size (n_0) for this study was computed as follows:

$$n_0 = \frac{1.96^2 \times .5(1-.5)}{.05^2}$$

$$n_0 = \frac{3.8416 \times .25}{0.0025}$$

$$n_0 = \frac{.9604}{.0025}$$

$$n_0 = 384.16 \sim 385$$

Three hundred and eighty-five (385) tea processing firms in Kenya were determined. This gave a higher sample than the target population. The sample size (n_0) was adjusted using Equation 2.

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}} \qquad (2)$$

Where n is the sample size and N is the population size. The sample size that was necessary for this study was determined as follows:

$$n = \frac{385}{1 + \frac{385-1}{107}}$$

$$n = \frac{385}{1 + \frac{384}{107}}$$

$$n = 83.9 \quad 84$$

The sub-sample size for each county was determined using the formula by Krejcie and Morgan (1970) given as:

$$s = \frac{p \times S}{P} \qquad (3)$$

Where:

s = Sub-sample size for each county; p = Subpopulation of tea processing firms in each county; S = Total sample size for the study; P = Total population for all the tea processing firms. The formula was preferred for its acceptable level of accuracy in generating a representative sample size at 5% level of confidence. After the population was stratified, and the sample size for each stratum determined, individual respondents were selected through purposive sampling. This technique was used because it ensured getting reliable information from those people who had knowledge about capacity utilization and value chain performance. The participants consisted of all the firm Chief Accountants, Production Managers, and the Environmental representatives.

The data were collected using a self-administered questionnaire over a period covering six months to ensure full extraction of the relevant information from archives and was picked later after giving respondents adequate period to fill it. A follow-up call was made after a period of two weeks to ensure that respondents filled the questionnaire and hence minimize non-response bias rate. The questionnaires and data forms were administered between September 2013 and March 2014 which is the period most of the tea processing firms'a ctivities are at the peak. The items that measured the dependent variable were measured using a five – point Likert scale, ranging from 1= Very Small Extent to 5 = Very Great Extent. The questionnaire items were constructed based on the literature on capacity utilization and value chain performance. (Saikia, 2012, Bhagwat and Sharma, 2007b, Stratton, 1996 and Kaplan & Norton, 1992).

Instrument and procedures

Data were collected from both primary and secondary sources. The researcher carried out a pilot study to appraise the questionnaire soundness of the items and to estimate the duration taken to answer the items. The pilot study covered ten (10) tea processing firms not covered in the sampled population. The results of the pilot study were discussed with the respondents and adjustments were made accordingly. During the pilot stage, most of the respondents indicated that they were comfortable to fill the research instrument by themselves rather than being interviewed since the study sought to get some information which they could not obtain easily. As a result, the questionnaire was designed so that the respondents could fill out the items on their own. The questionnaires were distributed by the end of September 2013 and follow-up calls were made at the end of each month for a period of six months up to 30th March 2014 to encourage the respondents to fill out the questionnaire since some data required extensive data mining from the firm archives.

All selected respondents received a letter of introduction that explained the intention and content of the study which emphasized that participation in the study was voluntary, and the information obtained was confidential. The respondents were requested to fill out the attached questionnaire. The primary data entailed responses on capacity utilization and value chain performance. Secondary data, particularly five-year historical data on firm performance were sourced from company annual reports, pamphlets, office manuals, circulars, policy papers, business plans as well as survey reports from Kenya Tea Board and Kenya Central Bureau of Statistics for the years 2008 - 2012. Secondary data obtained involved a 5-year information on factory design, level of output achieved, tea production, level of quality, total cost and profitability, environmental performance, response, and flexibility for each firm. For this study, the questionnaire and data forms were the principal tool for collecting primary data and secondary data respectively.

Validity and reliability of the study

The study ensured that the study findings were both reliable and valid. The validity of instruments measures the consistency of instruments. Best and Kahn (2006) consider the reliability of the instruments to be the degree of consistency that the instruments or procedure demonstrates i.e. what it measures it does so consistently. The reliability of any standardized test is usually expressed as a correlation coefficient, which measures the strength of association between variables. The coefficient vary between 0.00and 1.00 with the former showing that there is no reliability and the later showing there is perfect reliability. According to Nunnally (1978), the rule of thumb requires a reliability of 0.70. To measure the consistency of the scores obtained, the study used Cronbach's alpha (a measure of the internal consistency of the questionnaire items) using data from all the respondents. Cronbach's test had an alpha coefficient of 0.811.

Operationalization of the study variables

The construct in this study which was capacity utilization and value chain performance was measured. The dependent variable is the value chain performance was measured using metrics adopted from Gunasekaran et al. (2001). In this study, the value chain performance was broken into four domains of inbound value chain performance; processing value chain performance; outbound value chain performance; and environmental value chain performance. These four domains were assigned some weights that were further assigned to the sub-indicators. The inbound value chain performance was measured in terms of materials quality, procurement unit cost, supplier delivery performance, transport costs, and vendor lead time. The processing value chain performance was measured in terms of the following: changeover times, loading capacity utilization, manufacturing capacity utilization, manufacturing equipment reliability, manufacturing lead time, manufacturing machine reliability, product availability, product quality (rank), production costs, reliability of forecasts, resource utilization and warehouse or store utilization.

The outbound value chain performance was measured in terms of: customer price margin, customer response time, customer satisfaction, delivery flexibility, distribution costs, enterprise distribution effectiveness, empty runs, inventory cost, inventory turnover ratio, on-time delivery, on-time shipment, order fill rate, order lead time, product availability, range of products, reduction in unit costs, resolution of customer complaints, returns/refusals from customers, volume flexibility and volume transported costs. The environmental value chain performance was measured in terms of level of product recycled/ reused, level of bio-gradable materials used, level of carbon (Co_2) emission, and level of spillages, water consumption, and energy consumption.

Data analysis

In order to determine the relationship between capacity utilization and value chain performance of tea processing firms in Kenya, the positivistic approach to research guided data analysis. Positivism advocates for hypotheses testing using quantitative techniques (Stiles, 2003). Thus, information required for testing the study hypotheses was generated using quantitative data analytical techniques. Consequently, data analysis followed Sekaran (2003)'s four-step process for data analysis i.e. getting data ready for analysis, getting a feel for the data, testing the goodness for the data, and testing the hypotheses.

The researcher used descriptive statistics including measures of central tendency especially the mean, median and mode for Likert scale variables in the questionnaire. Likert scale was chosen because it yields higher reliability coefficients with fewer items than the scales developed using other methods; and is widely used in market research and has been extensively tested in both social science and marketing (Malhotra, 1999). A multiple linear regression model was adopted to study the linear relationships between capacity utilization and value chain performance. Multiple regression analysis (stepwise method) was conducted on the data where each variable was entered in sequence and its value assessed.

In order to determine the relationship between capacity utilization and value chain performance of tea processing firms in Kenya, equation (4) was modeled as:

$$WFVCPI = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon_i \quad (4)$$

Where;
WFVCPI is the Weighted Firm Value Chain Performance Index constrained and is a linear function of X_1 plus ε_i as computed from equation (4) above.
$\beta_0$is the regression constant or intercept
$X_{i=}$ Capacity Utilization Index in processing (firm) ($CPPF_{Index}$) constrained as computed from equation (5) below
β_i is the regression coefficient/ change induced in *WFVCPI* by $CPPF_{Index}$
ε_i is a random variable, an error term that accounts for the variability in *CPPF* that cannot be explained by the linear effect of the i predictor variable.
The capacity utilization was computed for individual outcome measures of the actual outcome and design capacity for each of the five years as in equation (5):

$$CPMF_t = \frac{Actual\,output}{Design\,Capacity} \quad (5)$$

Where;
CPMF is Individual firm Capacity Utilization
Actual output = rate of output actually achieved and cannot exceed effective capacity.
Design capacity = maximum output rate or service capacity of an operation, process, or facility is designed for.
*t*is the year: Five year planning period is a common characteristic in organization. The focus here is the years 2008 – 2012.

In the basic equation for price formation, the manufacturing deflator a non-linear transformation of capacity is one of the most significant variables:

$$CPPF_t = \log \frac{1}{1 - CPMF} \quad (6)$$

Where;
t is the year: Five year planning period is a common characteristic in organization. The focus here is the years 2008 – 2012.

CPPF is capacity utilization in the firm constrained to lie between 0 .87 and 0.99. In this nonlinear transformation, stronger upward pressure on prices develops as CPPF comes closer to its limiting value, 0.99.

The capacity utilization in processing (firm) constrained Index (*CPPF*) in equation (7) below was computed as an average of the five year's capacity utilization for each firm based on CPPF from equation (6) above.

$$CPPF\,index = \frac{CPPF_{Year\,1} + CPPF_{Year\,2} + CPPF_{Year\,3} + CPPF_{Year\,4} + CPPF_{Year\,5}}{5} \quad (7)$$

Where;
$CPPF_{Index}$ = Capacity Utilization Index in processing (firm) constrained

$CPPF_{Yeart}$= Capacity Utilization Index in processing (firm) Composite done for each of the five years Thus, the computation of the firm's value chain performance as the dependent variable was written in the following forms as in equation8, 9 and 10:
The Individual Weighted Firm Value Chain Performance ($WFVCP_i$) was computed for individual domain (A, B and C) measures for each of the five years by multiplying the achievement of a specific year by the weight as in equation (8) below:

$$WFVCP = Achievement(i)of Yeart * Weight \quad (8)$$

Where;
WFVCP = Weighted Firm Value Chain Performance
i is the domain i.e. A = Input Material Cost Performance; *B* = Value chain Surplus Performance and *C* = Output product Cost Performance, *t* is the year- Five-year planning period is a common characteristic in organization. The focus here is between 2008 – 2012.

The Annual Firm's Value Chain Performance (*AWFVCP*) Composite was computed by summation of the weighted achievements for individual domain (A, B and C) measures for each of the five years as in equation (9) below. This was done for each of the five years.

$$AWFVCP_{Composite} = WFVCP_A + WFVCP_B + WFVCP_C \quad (9)$$

Where;
AWFVCP = Annual Weighted Firm's Value Chain Performance
WFVCP = Weighted Firm Value Chain Performance for the domains A, B & C

The Weighted Firm Value Chain Performance Index (WFVCPI) was computed as an average of the five year's Annual Weighted Firm's Value Chain Performance ($AWFVCP_{composite}$) from equation (9) above.

$$WFVCPI = \frac{WFVCP_{Year\,1} + WFVCP_{Year\,2} + WFVCP_{Year\,3} + WFVCP_{Year\,4} + WFVCP_{Year\,5}}{5} \quad (10)$$

Where;
WFVCPI is the Weighted Firm Value Chain Performance Index
AWFVCP is Annual Weighted Firm's Value Chain Performance Composite for each of the five years

Table 1 provides a summary of the hypothesis which was tested, the appropriate statistical test (s) and their corresponding interpretations.

RESULTS AND DISCUSSIONS OF RESEARCH

The respondents to this study were firm unit managers, field service coordinators, production managers and the environmental representatives in the tea processing firms in Kenya. The main aim was to ascertain the relationship between capacity utilization and value chain performance of tea processing firms in Kenya. Out of the eighty-five (85) respondents from the tea processing firms in Kenya that were sampled and contacted to participate in the study, only forty-four (44) of them responded giving a response rate of fifty-one point eight (51.8%) percent.

Table 1. Summary of statistical tests of hypotheses.

Objective	Hypothesis	Statistical test	Analytical model	Interpretation
To determine the relationship between capacity utilization and value chain performance of tea processing firms in Kenya	HA: There is no relationship between capacity utilization and value chain performance of tea processing firms in Kenya	Pearson's product moment correlation Hierarchical regression analysis Factor analysis	$WFVCPI = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_i$............(4)	Full effect of Capacity Utilization if β_i is significant while β_0 is not Partial effect of Capacity Utilization if all β_i are significant

Table 2. Composite capacity utilization.

Year	2008	2009	2010	2011	2012
Composite Factory Design Capacity Available	537077695	559195695	568011795	503008896	542528898
Composite Factory Actual level of output	247896471	313137423	380665655	341202670	343682614
Composite Capacity Utilization	46.156538	55.997824	67.01721	67.832333	63.348259

Source: Research Data, 2014.

Table 3. Correlation between capacity utilization and value chain performance.

Variables	Pearson Correlation Coefficient	
	Capacity Utilization	Value Chain Performance
Capacity Utilization	1	
Value Chain Performance	.639(**)	1

** Correlation is significant at the 0.01 level (2-tailed). Source: Research Data, 2014.

The drop and pick method was deemed the limiting factor in the response rate of the survey. However, when reviewing many researches which had used the self-administered method indicate that the method has a higher non-response rate compared with face-to-face interview mode (Anne et al., 2013). The study required information to be retrieved from the archives, hence the respondents required more time to gather the required information and fill the questionnaire. In this study, the non-response rate was as a result of the nature of the information that was sought which required a high level of goodwill and commitment to compile the data for the five-year period.

Capacity utilization is a measure of the firm's productive capacity that influences the total level of output or production that could be produced in a given period.

The firms gave their level of design capacity at factory level and the actual output over a five-year period which was used to compute capacity utilization as the percentage of the organization's total possible production capacity that was actually being used as shown in Table 2. The design capacity and actual output in the table above are a composite of the design capacities and actual output from all the firms that participated in this study.

Correlation analysis on the relationship between capacity utilization and value chain performance

The results of the analysis on the correlation between capacity utilization and value chain performance are presented in Table 3. There is a strong relationship observed between capacity utilization ($r = 0.639$, $p < 0.01$) and value chain performance. The details about the variables are as shown.

These results in Table 3 imply that capacity utilization is highly related to value chain performance of tea processing firms in Kenya.

Hypothesis testing on the relationship between capacity utilization and value chain performance

The primary objective was to establish the relationship between operations capacity utilization and value chain

Table 4. Model summary on the relationship between capacity utilization and value chain performance.

Model Summary: Objective 1					ANOVA(f)		
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Mean Square	F	Sig.
1	.814(a)	.662	.645	23.52622	21287.218	38.460	.000(a)

a Predictors: (Constant), Capacity Utilization. Source: Research Data, 2014.

Table 5. Regression Coefficients (a) for the Relationship between Capacity Utilization and Value Chain Performance.

Regression Coefficients	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.152	2.719		1.895	.065
Capacity Utilization	.648	.122	.639	5.317	.000

a Dependent Variable: Value Chain Performance. Source: Research Data, 2014.

performance of tea processing firms in Kenya. The literature review and theoretical reasoning led to the belief that operations capacity utilization is associated with value chain performance. Hence, the hypothesis that there is no relationship between operations capacity utilization and value chain performance of tea processing firms in Kenya was tested.

Capacity utilization index was the $\log \frac{1}{1 - capacity\, utilization}$ where capacity utilization is a ratio between the actual output and design capacity obtained from the secondary data for each firm over a period of five years. Value chain performance index was computed using the balanced scorecard from the secondary data for each firm over a period of five years. The Pearson's correlation showed a strong relationship between capacity utilization (r = 0.639, p< 0.01) and value chain performance. Further analysis using multiple regression analysis generated the following regression models as presented in Tables 4 and 5. From the regression results in Table 4, multiple regression model on the relationship between capacity utilization and value chain performance is significant at the set confidence interval of 95% (sign. = 0.000). This model is a good predictor of the relationship between capacity utilization and value chain performance. This regression model shows a very strong significant relationship between capacity utilization and value chain performance of tea processing firms in Kenya, implying that capacity utilization explains 64.5% of the changes in the firm's value chain performance level.

The coefficients of this predictive model on the relationship between capacity utilization and firm's value chain performance level are given as in Table 5. From the specific beta coefficients for the firm's capacity utilization in Table 5, effective capacity utilization in the firm makes contribution to the firm's level of firm's value chain performance. With standardized coefficients, the capacity utilization (Beta = 0.639) has a significant (p≤0.000) positive effect on the firm's level of the value chain performance. Thus, firms should invest more in effective capacity utilization through enhanced levels of outputs compared to the design capacity in order to improve the throughput and value chain performance.

In order to determine the relationship between capacity utilization and value chain performance of tea processing firms in Kenya, equation (4) above was used. The predictive model on the relationship between capacity utilization and value chain performance of tea processing firms in Kenya, therefore, takes the form of:

$$Firm\, Value\, Chain\, Performance = 0.639 \times Capacity\, Utilization$$

As shown in Tables 4 and Table 5, capacity utilization has a strong positive effect on firm's value chain performance level with a correlation coefficient of R^2 = 0. 662 (a) and adjusted R^2 = 64.5%, F = 38.460; Sig. = .000(a). This is a clear indication that capacity utilization is a significant predictor of the firm's value chain performance. Hence, alternate H_A is accepted. This implies that 64.5% of the variance in the firm's value chain performance is explained by the capacity utilization thus; relationship between capacity utilization and the firm's value chain performance is positive and significant.

Conclusion

The objective of the study was to establish the relationship between operations capacity utilization and value chain performance of tea processing firms in Kenya. The findings that the relationship between capacity utilization and the firm's value chain performance is positive and significant have been supported by Sarbapriya, (2013) who claims that manufacturing capacity utilization is such a key indicator of performance and a measure of performance indicators of an industry with a long history of research. The empirical evidence indicated that firms should invest more in effective capacity utilization through enhanced levels of outputs compared to the design capacity in order to improve the throughput and value chain performance. The position that capacity utilization has a strong positive effect on firm's value chain performance level further clears the contradictions by Guy et al. (2005) who did a study on impact of application of Theory of Constraints in the health sector and found out that the number of patients in outpatient increased but there was no actual value addition, the reason was with issues to do with capacity, which is now cleared that capacity utilization has a strong positive effect on firm's value chain performance.

Contributions to knowledge

By empirically determining the relationship between capacity utilization and value chain performance among tea processing firms in Kenya, the present study adds to academic knowledge by providing empirical evidence on capacity utilization and value chain performance. This study has justified and has shown how to measure the relationship between capacity utilization and value chain performance of tea processing firms in Kenya. This study also widens the avenue for further research on the relationship between capacity utilization and value chain performance. Scholars can use the results to extend capacity utilization and value chain performance metrics, study comparisons of different sample sets, and look at longitudinal data for break-even points on the different levels of capacity utilization and value chain performance.

Implicationsto policy

This study is beneficial to all managers at all levels of management in most organizations particularly the tea processing firms who will gain a better understanding of how capacity utilization relate to value chain performance. By properly managing capacity, managers will be able to improve the constrained capacities of their organization hence increasing the throughput and create competitive advantage.There is a need for various managers to focus on the capacity utilization in their long term planning especially on how it can affect their long-term performance. Efforts should be made by the managers to make sure that they utilize the firm's capacities to the optimum by being flexible through making short-term adjustments to firm's effective capacity.

Limitations of the study

Firstly, this study used a cross-sectional research design which cannot establish a cause-effect relationship between Capacity Utilization and value chain performance. Only Longitudinal research design can confirm causality of the two variables over time. Secondly, the response rate was low at 51.8% hence making it difficult to generalize the findings to other sectors of the economy.

Future research directions

Future research should use a longitudinal study to establish causal relationships between capacity utilization and value chain performance. The study should also use a different approach to collect data so as to increase the response rate which may give different conclusions.

In an effort to test external validity of this study findings, future research can use case studies of tea processing firms in an effort to determine the relationship between capacity utilization and value chain performance improvements to investigate the consistency of the case studies with one another.

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Conflict of Interests

The authors have not declared any conflict of interests.

REFERENCES

Alain H, Martin B (2009). Mastery of operational competencies in the context of supply chain management. Supply Chain Management: An Int. J. 14(1):49-63.

Anne IC, Ola E, Charlotte G, Knud J (2013). Effect of survey mode on response patterns: comparison of face-to-face and self-administered modes in health surveys. Euro. J. Public Health. 24(2):327–332.

Best WJ, Kahn VJ (2006). Research in Education. New Delhi, India:Prentice-Hall of India (Pvt).

Bhagwat, R. and Sharma, M.K. (2007b) "Performance measurement of supply chain management: a balanced scorecard approach," Comput. Ind. Eng. 53(1):43-62.

Carol C, Joe M (1997). Capacity utilization. J.Econ. perspect. 11(1):151-167.

Chopra S,Meindl P (2004).Supply Chain Management, 2nd ed. Upper Saddle River, NJ: Prentice-Hall.

Corrado C, Mattey J (1997). Capacity utilization. J. Econ. Perspect. 11(1):151-167.

Cochran WG (1963). Sampling Techniques, 2nd Ed., John Wiley and Sons, Inc. New York. Retrieved July. 12, 2013, from edis.ifas.ufl.edu/pd006

Donovan RM (2003).. “Supply Chain Management: Cracking the Bullwhip Effect.” Material Handling Management, Director Issue (2002–2003).
Drickhamer D (2002). “Value-Chain Management Moves from Dream to Reality.” Industry Week, April.
Grimm CM (2004). The practice of Supply Chain Management; where theory and applications converge. Transportat. J. 43(2):59-61.
Gunasekaran A, Patel C, Tirtiroglu E (2001). Performance measures and metrics in a supply chain environment. Int J. Prod. Oper. Man. 21(1/2):71–87.
Guy L, Christine D, John V (2005). The impact of Theory of Constraints (TOC) in an NHS trust. J. Manage. Dev. 24(2):116-131.
Handfield RB, Nichols Jr. EL (2003).Introduction to Supply Chain Management2^{d}ed, Upper Saddle River, NJ:Prentice-Hall.
Inman RA, Sale ML, Green KW (2009). Analysis of the relationships among TOC use, TOC outcomes, and organizational performance.Inter.J. Oper. Prod. Manage. 29(4):341-356.
Malhotra NK (1999). Marketing research: An applied orientation, 3rd ed, Prentice Hall, New Jersey.
Klammer T (1996). Capacity Measurement &Improvement: A Manager’s Guide to Evaluating and Optimizing Capacity Productivity: CAM-I, Irwin Professional Publishing, Chicago.
Klein L, Summers R (1996).The Wharton Index of capacity Utilization, Studies in Quantitative Economics, No. 1, University of Pennsylvania.
Kline P (1999). The handbook of psychological testing, 2nd ed, London, Routledge.
Krejcie, R V, Morgan DW (1970). Determining sample size for research activities. Edu. Psychol. Measure 30:607-610.
Mugenda OM, Mugenda AG (2003). Research Methods. Qualitative and Quantitative Approaches. ACTS Press-African Centre for Technology Studies Nairobi, Kenya.
Nunnally JC (1978). Psychometric Theory, 2nd ed. New York: McGraw-Hill.
Russom P (2000). Increasing Manufacturing Performance through Supply Chain Intelligence.” DM Review (September).
Saikia H (2012). Capacity Utilization in small scale industries of India: some empirical evidence from underdeveloped industrial structure. J. Soc. Econ. Stat. 1(1):34-54. http://epckenya.org/images/stories/Publications/summary%20epc%20sp%202012-2017.pdf
Sandoe K, GailC,Raymond B (2001). Enterprise Integration. New York: Wiley.
Sarbapriya R (2013). Close Look into Research Studies on Capacity Utilization in India and Abroad, Inter. J. Econ. Finance , Manage. 2(1): 52-59.
Sekaran U (2003). Research methods for business, 4th ed. Hoboken, NJ: John Wiley & Sons.
Stiles J (2003). A philosophical justification for a realist approach to strategic alliance research, Qualitative Market Research: An Int. J. 6(4): 263-271.
Stratton A J (1996). Capacity Management: Back to the Future, CMA, February, pp.15-18.
Zsidisin AG, Hartley LJ (2012), “Managing commodity price risk: a supply chain perspective”, Business Expert Press, New York, NY.