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THE EFFECT OF MATERIAL HANDLING SYSTEMS ON THE PERFORMANCE OF TEA PROCESSING PLANTS IN KISII COUNTY

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Abstract

The purpose of this study was to evaluate the effects of materials handling systems on the performance of tea processing plants in Kenya,. It particularly intended to; determine the effect of automating material handling systems on the performance; assess the extent to which information directed systems affect the performance; examine the extent to which semi-automated systems affect the performance; and establish the influence of mechanized materials handling systems on the performance of Tea Processing Plants in Kisii County. This study was based on three theories namely: the control theory, Queuing theory and the theory of constraints. It was a survey research targeting 78 management staff at Tea Processing Plants in Kisii County who were selected using census method. Questionnaires were administered on both employees and interview schedule were given to CEO as data collection instruments. Data was analyzed using descriptive analysis; Pearson's correlations and regression analysis to test hypotheses was also used. The data was then presented in tables, graphs and charts with the aid of SPSS and the findings were useful to the staff and management. The findings revealed that there is significant correlation of 0.96 this implies that an increase in material handling systems increases the performance of tea firms by approximately 0.9. It was clear that respondents agreed that adequate training on matters of material handling systems facilitates efficient and effective performance of tea firms.

Keywords: Material Handling, automation, information systems, mechanized materials, performanve

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I. INTRODUCTION

1.1 Background of the Study

The tea industry is considered a highly capital-intensive sectors and being that it is a significant non-alcoholic drink around the globe, the mechanics of producing it become significantly important. Shamsuddoha, Tasnuba and Mohammad, (2011), argued that tea has become a major GDP booster and income earner for many countries, Brazil and Kenya being the most notable ones. The Kenyan situation is unique because in spite of the capital intensive nature of tea processing, it seems that many companies have had material handling challenges which has led to diminishing revenues. To maintain competitive advantage, many manufacturing firms must use their materials and handle them wisely (Kazim, 2008). Material handling systems is necessary for operational performance as it is the technology and skill that make firms run. Sila, Ebrahimpour, & Birkholz, (2006), expressed that the aim of material handling control is to meet customer demand.

Material handling as used in tea processing firms have helped to streamline operations. Chen, Frank, & Wu, (2005), noted that American firms have managed to improve material handling by expanding usage and improving innovativeness which has had a positive impact on their entrance into the financial markets. Further, an efficient material handling mechanism is one that shores up technical competence judged against measured goals as opposed to simply a strategic focus. Hardgrave, Langford, & Waller, (2008) asserted that getting the required technology is necessary for the growth of the entire business model. Brent & Travis, (2008), examined material handling systems through collaborative models. They further discussed the integration of traditional logistics decisions with contemporary management decisions using traditional control models. Material handling systems would integrate the farmers, tea factories and customers of the tea products.

Tea processing plants in Kisii County have made improvements and redesign of material transport systems and the development of procedures for effective material handling. Some of these improvements include automation of handling systems, training of staff and introduction of information systems. However even with these improvements the processors are still facing rising cost of sales of which most is associated with materials handling. This directly impacts on financial performance and competitiveness of the firms thus encouraging customers to turn to alternatives. This acts as the fundamental concept behind the present study.

1.2 Statement of the Problem

Material handling is an indispensable element in most production and distribution systems and has adverse effects on performance of organizations (Biles, 2006). Due to the amounts of

movements, problems can arise in a wide range of contexts, for example longer lead times, high amount of time spent on material handling and unnecessary movements can occur. This directly impacts on performance and competitiveness of the tea processing firms. From the year 2011 production cost in the tea factories in Kenya have increased by 11% contributing to low revenue hence low payment to the farmers (KTDA, 2013). One of major contribution to this increase is the problems in the efficiency of factories material handling activities. An annual audit conducted on July, 2013 in the Kenya Tea Development Agency factories in Zones 4 and 5, revealed that some critical items took too long and consequently a lot of much money was spent, further leading to hasty and detrimental decisions. The annual operational audit report claimed that the problem might have been attributed to poor materials handling. In this view the study proposes to assess the impact of material handling systems on organizational performance of tea processing plants particularly the Nyamache Tea Processing Plant

1.3 Research Objectives

1.3.1 General Objective

The general objective of the study is to establish the effects of materials handling systems on the performance of tea processing plants in Kisii County.

1.3.2 Specific Objectives

1. To determine the effect of automating material handling systems on the performance of Tea Processing Plants in Kisii county
2. To assess the extent to which information directed systems affect the performance of Tea Processing Plants in Kisii county.
3. To examine the extent to which semi automated systems affect the performance of Tea Processing Plants within Kisii county
4. To establish the influence of mechanized materials handling systems on the performance of Tea Processing Plants within Kisii county

II. LITERATURE REVIEW

2.1 Theoretical Review and Conceptual Frameworks

2.1.1 Theoretical Framework

This study will be based on two theories namely: the control theory and the theory of constraints

The Theory of Constraints (TOC)

The theory of constraints is a management philosophy that seeks to increase manufacturing throughput efficiency or system performance measured by sales through the identification of those processes that are constraining the manufacturing system (Goldratt, 2004). Kazim, (2008), argues that theory of constraints is based on the principle that a chain is only as strong as the weakest link or constraint and to elevate and manage the constraint as necessary. The difficulties in the theory of constraints are: very long lead times, large number of unfulfilled orders or they are executed with much extra effort (overtimes), high level of unnecessary inventories or lack of relevant inventories, wrong materials order, large number of emergency orders and expedition levels, high levels of devolution, lack of key customers engagement, frequent changes or absence of control related to priority orders, which implies on schedule conflicts of the resources (Goldratt, 2004).

Control Theory

This is an interdisciplinary branch of engineering and mathematics that deals with the behavior of dynamical systems with inputs, and how their behavior is modified by feedback. The usual objective of control theory is to control a system, often called the plant, so its output follows a desired control signal, called the reference, which may be a fixed or changing value. To do this a controller is designed, which monitors the output and compares it with the reference. The difference between actual and desired output, called the error signal, is applied as feedback to the input of the system, to bring the actual output closer to the reference.

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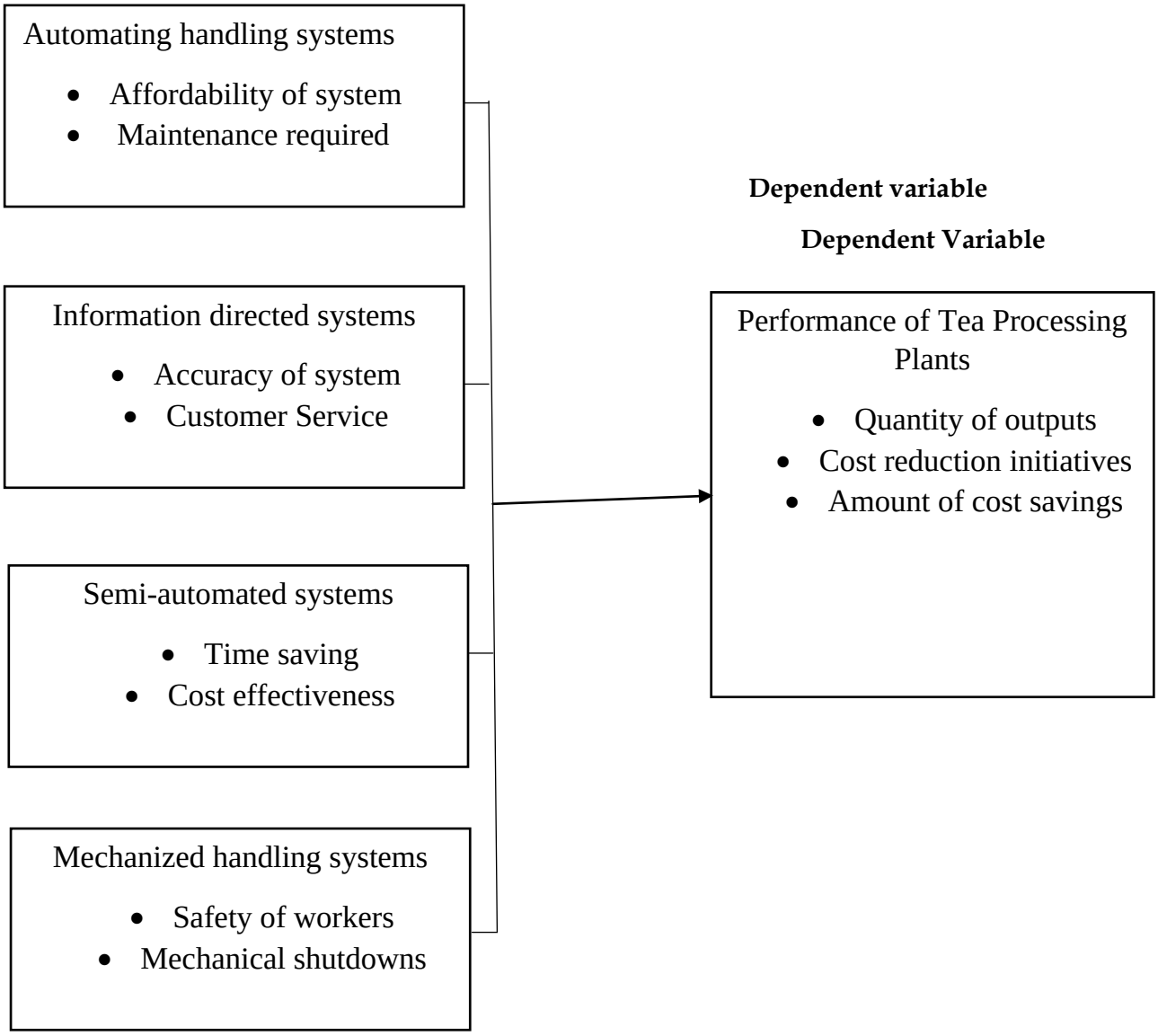
2.2 Conceptual Framework

Independent Variable- Material handling Systems



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III. METHODOLOGY

3.1 Research Design

The study used survey study design the factors that influenced material handling process and the overall performance of tea processing plants in Kisii County, as such it was an intensive descriptive and holistic analysis and comparison of Tea Processing Plants. It is an investigation of multy- entity in order to gain insight into the many cases. Descriptive survey was the preferred method of data collection through interviews and questionnaires to a given sample (Orodho, 2003). Descriptive survey enabled the researcher to study a phenomenon in its context and it made respondents to be actively involved as they show their attitudes, opinions and habits as they respond to questionnaires.

3.2 Target Population

The population of the study consisted of the 156 management employees at the Kisii county Tea Processing Plants. These management employees were selected as they are the staffs that understood material handling issues comprehensively. Among them are transport managers, logistics officers, procurement managers, distribution managers, material handling agents.

3.3 Census Method

Since the target population is small and thus manageable, census method was used to get the entire 78 management employee staff.

3.4 Data Collection Instruments

Data was collected using questionnaires and interview schedule.

3.6 Data Analysis

The researcher analysed data using descriptive analysis. The data collected was systematically organized to facilitate analysis. The response in the questionnaire was assigned numerical value to aid in processing. Numbers were then assigned to the close ended questionnaires. Data was then converted to numerical codes representing attributes of variables. Code categories are exhaustive and mutually exclusive. Data was then described quantitatively using descriptive statistics which included frequencies, means, and percentages through tables, pie charts and bar charts. This was done with the aid of a computer programme-Statistical Package for Social Sciences (SPSS) version 22 for windows. Pearson's correlation analysis and regression analysis was used to test the hypothesis.

Regression Model: $Y_0 = \beta_0 + \beta_1 (X_1) + \beta_2 (X_2) + \beta_3 (X_3) + \beta_4 (X_4) + e$

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Where the variables are defined as:

Y_0- performance

X_1- automated systems

X_2- semi-automated system

X_3- information directed systems

X_4- mechanized handling systems

e- Error term

IV. RESULTS AND DISCUSSION

4.1 Introduction

This section made use of the regression analysis to summarize the results of the study. See Tables 1 and 2

Regression Analysis

Table 1 Model Summary of Regression Results

Table 1 Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.838[a]	0.7	0.692	0.156	2.361
a. Predictors: (Constant), material handling, automation, information systems					
b. Dependent Variable: Performance					

From table 1, the column headed 'Unstandardized Coefficients', gives us firstly the value of the constant, **a**, which is the intercept or the predicted value of *X* if *Y* is 0, in other words if Total cost of mechanized systems is 0 the Profit after tax is 5896877.903. It also gives us our **b** (dependent variable – Profit after tax) coefficient, the value that *Y* will change by if *X* changes by 1 unit. That value is .328, so if Total Cost of mechanized systems goes up by 1, reading scores

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are predicted to go up by .328.The column headed 'Standardized Coefficients' contains the Beta coefficient. This is .837. If you look back at the section on Pearson's r correlation coefficient, you will see that this is in fact the same value. The final column in this box gives us the statistical significance of the relationship between the independent and the dependent variable. In other words, how likely is it that we would have found a relationship this strong in our sample, if there was not one in the actual population under study. As you can see, the relationship is statistically significant at the .001 level.

Table 2: The Regression Model (Coefficients[a])

Table 4 Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	2.237	0.301	0.237	7.228	0.001
	Automated System	0.335	0.058	0.323	5.068	0
	Mechanized material	0.328	0.063	0.293	2.693	0.001
	Information system	0.354	0.065	0.304	4.343	0
	Semi-Automated	0.241	0.152	0.213	3.987	0.003
a. Dependent Variable: Performance						

The result here shows that the p-vales were below 0.05 thus showing that the variables, automated system, semi-automated system, mechanized material and information system had a positive effect on performance in Tea processing zones. This agrees with literature considering that According to Grant et al (2006) automated systems provide benefits as well, for example automated materials handling operations eliminates labour and non-value-adding processes. However, advantages and disadvantages with automated systems can be held against each other. According to Kulak (2005), effective use of labor, providing system flexibility, increasing

productivity, decreasing lead times and costs are some of the most important factors influencing selection of automated material handling systems. According to Dias, (2005) the function of inventory control is to measure and monitor the stocks on which is major concern to the administrators. The study challenges the entrepreneurs to find formula to reduce inventory without compromising production and without increasing cost. Rajeev (2010) argues that inventory management practice is a way of acquiring competitiveness.

V. CONCLUSION AND RECOMMENDATIONS

The researcher drew the following conclusions from the study based on the research objectives highlighted in chapter one. The findings reaffirmed that automating material handling systems arises because of changing customer needs and predicting demand for a product or service is absolutely difficulty for uncertain demand products prices are not steady and vary depending on demand levels but using technology to monitor sales over time can help offset demand that fluctuates from one period to another and this influences performance of tea firms. For better management of the financial performance of tea processing firm it was reported that one way to improve performance is to adopt information directed systems that analyze risks and develop a checklist to measure how well information directed systems are helping the tea firms in tracking the records and performance.

A semi-automated system is an important aspect for the improvement and development of the financial capability of an organization. In order to keep the tea processing industry in course, semi – automated systems should be used for effective training on product quality to enhance performance since any inherent quality problems in any of the supply members triggers a domino effect that spread through and could affect the performance of the firm. According to findings, the respondents agreed that mechanized material handling systems affected the performance of the tea processing to a large extent. Attendance of the work force in trainings of mechanized material handling systems and the effectiveness of trainings are critical to any positive performance in tea firms. It was clear that respondents agreed that adequate training on matters of mechanized material handling systems facilitates efficient and effective service delivery to customers. A good training arrangement will facilitate participation which will eventually lead to information sharing that is vital in tea processing firms.

From the conclusions made, based on the objectives of the study, the researcher came up with the following recommendations: The study recommends that tea firms should integrate their training arrangements on automating material handling systems on the performance of tea firms. This is aimed at achieving an all-participatory approach to trainings by all stakeholders.

This study further recommends that training contents and context are vital considerations to ensuring adequate performance of tea firms using automating material handling systems. Secondly, the study recommends that proper mechanisms should be put in place to ensure that laxity on the part of information directed systems is curbed. In addition, information on the performance of the tea firms should be availed and performance contracting engaged to enhance acceptable information directed systems that will lead to high performance in tea firms. Thirdly, there is need to integrate semi- automated systems performance appraisals ant this will enhance performance in the tea firms. Emphasis should be focused on mechanized material handling systems and enhance team players in building good product quality from the tea firms.

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