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EFFECT OF CONTROL ENVIRONMENT ON COST EFFICIENCY OF KENYA TEA DEVELOPMENT AGENCY FACTORIES IN BOMET COUNTY

Kirui Victor Kimutai[1],
Johnmark Obura[2i],
Geoffrey Biwott[3]
[1]Postgraduate Student,
Department of Accounting and Finance,
Bomet University,
Kenya
[2]Associate Professor in Finance,
Department of Accounting and Finance,
Bomet University,
Kenya
[3]Lecturer,
Department of Management Science,
Bomet University,
Kenya

Abstract:
Agriculture remains an important sector of the Kenyan economy, playing a major role in rural livelihoods, job creation, and food security. However, the high cost of production and overhead costs remain a challenge to the profitability and sustainability of the tea sector. Kenya Tea Development Agency factories face challenges arising from increasing costs of production, which may result in low earnings and fluctuating bonus payments for the smallholder farmers. The objective of this study was to evaluate the effect of the control environment on the cost efficiency of Kenya Tea Development Agency factories in Bomet County. The study was guided by Agency and Contingency theory. The study targeted 11,647 employees from nine factory companies located in Bomet County, with a sample of 387 selected proportionally from each factory, using purposive sampling. Structured questionnaires were used to gather primary data. The descriptive analysis showed that the control environment had a mean score of 4.04 (SD = 0.86), which demonstrated the presence of internal control systems. Regression analysis showed that the control environment had a statistically significant influence on cost efficiency (R^2 = 0.538, β = 0.733, $p < 0.000$). Pearson correlation results showed positive and significant associations between cost efficiency and control environment (r = 0.733, p = 0.000). The study concludes that control environment significantly enhances cost efficiency in KTDA

[i] Correspondence: email johnmarkobura@bu.ac.ke

factories. The study would help policymakers to enhance internal control frameworks, optimize resource utilization, improve cost efficiency, and strengthen the sustainability of the tea sector.

JEL: G3, G18, G19

Keywords: control environment, cost efficiency, internal control, KTDA factories, Bomet County

1. Introduction

The tea industry in Kenya is a major source of earnings for smallholder farmers, national income, and foreign exchange earnings. Kenya ranks as the highest exporter of tea across the world. According to the Supplement to the ITC Annual Bulletin of Statistics (2024), Kenya has consistently ranked as the world's leading tea exporter over the past six years. During the period of 2018-2023, the average volume of Kenyan tea exports was 504 million kilograms per year, with Kenya having had a comfortable lead over other large producers like China, Sri Lanka, and India.

Despite this global dominance, Kenya Tea Development Agency (KTDA) factories continue to face challenges of rising production costs and cost efficiency, suggesting that Kenya's high export volumes do not necessarily translate into equitable financial gains at the producer level. From the KTDA report of 2020, Bomet County was ranked third across all tea-producing counties facing increasing operational costs, and it had the largest scale of operations, as shown by the highest net revenue. This large scale suggests more complex processes where internal control failures can have a significant impact.

Cost efficiency is the ability to deliver a desired product or service at the lowest cost while maintaining effectiveness and quality (Candio, 2023). COSO (2013) defines the control environment as "*the structure, policies and procedures that establish the foundation for all internal control within the organization*." It is made up of integrity and ethical values, organizational structure, authority, and human resources policies.

2. Literature Review

2.1 Theoretical Framework

This study is anchored on Agency Theory. According to Jensen and Meckling (1976*),* it examines how owners as principals relate to managers as agents in organizational structures. Agent conflict occurs because representatives select preferences that serve their own needs more than those of the organization's principal. COSO designed internal control systems that unite principals and their agents while ensuring agent activities serve organizational interests. In the context of KTDA factories, the principals are the thousands of smallholder tea farmers who own the factories through their shares, while the agents are the factory managers and employees responsible for daily operations. Agency Theory suggests that conflicts of interest occur when agents act in their own best

interests instead of the principals' best interests of maximizing their profits (Eisenhardt, 1989). These conflicts result in agency costs: monitoring costs.

The control environment involves ethical values, lines of authority and accountability structures to address agency problems. An effective control environment reduces the information asymmetry between principals and agents, and it is more difficult for the agents (managers) to act opportunistic. The integrity of management and ethical values lead to reduced self-interested actions by agents that raise operating expenses (Fama & Jensen, 1983). Hence, Agency Theory states that agency costs can be lowered and cost efficiency can be improved by having a good control environment which sets the tone downward in an organization.

The study is also guided by Contingency Theory, which posits that there is no single best way to manage an organization. Instead, the effectiveness of any control system depends on the specific internal and external context, including environment, technology, size, and strategy (Lawrence & Lorsch, 1967; Donaldson, 2001). According to Contingency Theory, internal control systems need customization based on organizational requirements for achieving cost efficiency (Chenhall, 2003). For KTDA factories in Bomet County, which operate with large production volumes and variable green-leaf quality, a one-size-fits-all internal control model is unlikely to yield optimal cost efficiency.

2.1 Empirical Review

The empirical evidence is very consistent in highlighting the importance of the control environment in improving organizational performance. The study by Mackline, Benedict and Maniagi (2022) in Kenya revealed a positive correlation between the control environment and financial performance of SACCOs, with a correlation of 0.764 and a p-value of 0.000. Otieno and Too (2023) found that there was a positive relationship between the control environment and financial performance of Equity Bank in Bomet. Nzimurinda (2023) studied Rwandan cooperatives and concluded that the control environment was the most important internal control among other internal control factors, having a coefficient of 0.482. Together, these studies show that an effective control environment has a significant positive effect on cost effectiveness and financial performance in many settings.

3. Objective and Hypothesis

The study objective was to evaluate the effect of the control environment on cost efficiency in KTDA factories in Bomet County.

The study hypothesis was: HO_1: The control environment has no significant effect on the cost efficiency of KTDA factories in Bomet County.

4. Methodology

4.1 Research Design

The study used a descriptive survey design. The study was conducted in Bomet County, specifically targeting nine KTDA factories: Kapkoros, Tirgaga, Olenguruone, Motigo, Kapset, Rorok, Mogogosiek, Kobel, and Boito tea factory companies.

4.2 Target Population and Sample

The target population was 11,647 employees drawn from the nine factory companies. A sample of 387 employees was picked proportionately from each factory company using the formula suggested by Yamane (1967). Purposive sampling was applied to choose respondents who possess specific characteristics relevant to the study.

4.3 Data Collection

Primary data were collected using structured questionnaires. Within each factory, respondents were purposively selected based on direct involvement in implementing or overseeing internal control activities affecting cost efficiency.

4.4 Data Analysis and Model Specification

The collected data were analyzed using both descriptive and inferential statistical methods. A regression model with cost efficiency as the dependent variable and control environment as the independent variable was fitted:

The multivariate regression model specified below was used in the analysis:

$$Y = \beta_0 + \beta_1 X_{1i} + \varepsilon_i \quad \text{(i)}$$

Whereby:
Y_i = Dependent Variable (Cost Efficiency),
β_0 = Constant (Coefficient of Intercept),
X_{1i} = Control Environment,
β_1 = Regression Coefficient for the Independent Variable,
εi = Random or Stochastic Term.

4.5 Diagnostic Test

Multicollinearity was tested using the Variance Inflation Factor (VIF), and results showed no issues (VIF = 1.997). Normality of the data was confirmed using the Shapiro-Wilk test ($p > 0.05$). Homoscedasticity was confirmed using the Breusch-Pagan test ($p = 0.2379$). Autocorrelation was tested using the Durbin-Watson test ($d = 2.069$), indicating no autocorrelation.

5. Results

5.1 Response Rate

Out of 387 questionnaires issued, 350 were completed and returned, giving a response rate of 90.44%, which was deemed sufficient for statistical analysis.

Table 1: Response Rate

Particulars	Targeted	Returned (%)
Distributed questionnaires	387	100%
Completed and returned	350	90.44%
Unreturned questionnaires	37	9.66%

5.2 Descriptive Statistics of Control Environment

Descriptive statistics revealed that the control environment had a mean of 4.04 (SD = 0.86), and a standard error of .20786 as presented in the table below, implying that most factories exhibited high cost efficiency.

Table 2: Descriptive Statistics of Study Variables

Descriptive Statistics					
	N	Range	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Std. Error	Statistic
Control environment	350	3.00	4.0392	.20786	

5.3 Descriptive statistics of control environment

The purpose of the study was to determine the effect of the control environment on cost efficiency in KTDA factories. The objective was measured by the following parameters: integrity and ethics, authority and Human resource rules and policies. The descriptive statistics of the constructs are presented in the table below.

Table 3: Summary Statistics for Control Environment Constructs

Item (n=350)	Strongly Disagree	Disagree	Neutral	Agree	Strong Agree	Mean	SD	Skewness	Kurtosis
Board of management demonstrates a strong commitment to transparency and accountability	0.0%	5.9%	5.9%	35.3%	52.9%	4.35	0.862	-0.492	-0.067
Ethical behavior is regularly communicated and reinforced through policies and training	5.9%	5.9%	5.9%	47.1%	35.3%	4.00	1.118	0.531	0.042
Employees clearly understand their levels of authority and responsibilities	0.0%	5.9%	11.8%	17.6%	64.7%	4.41	0.939	-0.680	-0.253

There is minimal overlap or conflict in the authority between departments or job functions	0.0%	17.6%	11.8%	47.1%	23.5%	3.76	1.033	0.739	0.357
Job recruitments are consistently based on employees ' qualifications and competencies	0.0%	17.6%	17.6%	29.4%	35.3%	3.82	1.131	-0.503	-.113
The factory has documented HR policies that guide recruitment, promotion, and discipline.	0.0%	11.8%	11.8%	52.9%	23.5%	3.88	0.928	0.229	0.009
Aggregated Score						**4.0392**	**0.857**		

As shown in the table above, it was recorded that 52.9% of respondents strongly agreed that the Board of Management demonstrates a strong commitment to transparency and accountability, with a mean of 4.35 and a standard deviation of 0.862 (skewness =-0.492, kurtosis =-0.067). Concerning whether ethical behavior is regularly communicated and reinforced through policies and training, 47.1% of respondents agreed, with a mean of 4.00 and a standard deviation of 1.118 (skewness =0.531, kurtosis =0.042). Also, 64.7% of employees clearly understand their levels of authority and responsibilities, with a mean of 4.41 and a standard deviation of 0.939 (skewness =-.680, kurtosis =-0.253). Based on whether there is minimal overlap or conflict in the authority between departments or job functions, 47.1% of respondents agreed, with a mean of 3.76 and a standard deviation of 1.033 (skewness =0.739, kurtosis =.357). On whether Job recruitments are consistently based on employees' qualifications and competencies, 35.3% of respondents strongly agreed, with a mean of 3.82 and a standard deviation of 1.131 (skewness =-0.503, kurtosis =-0.113). The factory has documented HR policies that guide recruitment, promotion, and discipline; 52.9% agreed, with a mean of 3.88 and a standard deviation of 0.928 (skewness =0.229, kurtosis =0.009).

5.4 Descriptive Statistics for Cost Efficiency

Descriptive statistics revealed that Cost Efficiency had a mean of 4.2745 (SD = .49980) and a standard error of .20786, as presented in the table below, indicating that most factories exhibited high cost efficiency.

Table 4: Descriptive Statistics of Cost Efficiency

Descriptive Statistics					
	N	**Range**	**Mean**		**Std. Deviation**
	Statistic	**Statistic**	**Statistic**	**Std. Error**	**Statistic**
Cost efficiency	350	1.50	4.2745	.12122	.49980
Valid N (listwise)	350-				

Cost efficiency was regarded as the dependent variable for the study. There are three constructs which were sufficient to measure cost efficiency, namely: operation process efficiency, employee engagement and innovation. The descriptive statistics of the items are presented in the table below.

Table 5: Summary Statistics for Cost Efficiency

Item (n=350)	Strongly Disagree	Disagree	Neutral	Agree	Strong Agree	Mean	SD	Skewness	Kurtosis
Factory operations are continuously monitored to identify and reduce resource wastage.	5.9%	0.0%	11.8%	29.4%	52.9%	4.24	1.091	0.345	0.013
Workflow systems are optimized to minimize delays and cut unnecessary costs.	0.0%	0.0%	5.9%	52.9%	41.2%	4.35	0.606	0.403	0.204
Employees are encouraged to suggest ways to reduce operational costs.	0.0%	0.0%	17.6%	52.9%	29.4%	4.12	0.697	-0.712	-0.117
Staff proposals on cost savings are taken seriously by management.	0.0%	0.0%	0.0%	64.7%	35.3%	4.35	0.493	-0.666	-0.019
Innovation has led to measurable improvements in factory cost efficiency.	0.0%	0.0%	0.0%	82.4%	17.6%	4.18	0.393	0.543	0.213
The factory has invested in alternative power sources such as hydro or solar to reduce energy costs.	0.0%	0.0%	0.0%	58.8%	41.2%	4.41	0.507	0.680	0.117
Aggregated score						**4.275**	**0.121**		

As shown in the table above, it was observed that 52.9% of respondents strongly agreed that factory operations are continuously monitored to identify and reduce resource wastage, with a mean of 4.24 and a standard deviation of 1.091 (skewness =0.345, kurtosis =0.013). Regarding whether workflow systems are optimized to minimize delays and cut unnecessary costs, 52.9% of respondents strongly agreed, with a mean of 4.35 and a standard deviation of 0.606 (skewness =0.403, kurtosis =0.204). Similarly, 52.9% agreed that employees are encouraged to suggest ways to reduce operational costs, with a mean

of 4.12 and a standard deviation of 0.697 (skewness =-0.712, kurtosis =-0.117). Based on whether Staff proposals on cost savings are taken seriously by management, 64.7% of respondents agreed, with a mean of 4.35 and a standard deviation of 0.493 (skewness =-0.666, kurtosis =-0.019). On whether innovation has led to measurable improvements in factory cost efficiency, 82.4% of respondents agreed, with a mean of 4.18 and a standard deviation of 0.393 (skewness =0.543, kurtosis =0.213). Regarding the investments of the factory in alternative power sources such as hydro or solar energy and their effect on power costs, 58.8% agreed, with a mean of 4.41 and a standard deviation of 0.507 (skewness =0.680, kurtosis =0.117).

5.5 Factor Analysis of Study Variables

The suitability of the data for factor analysis was checked with the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The KMO was calculated and was 0.712, which is above the recommended value of 0.6, thus showing adequate sampling. Bartlett's test for sphericity was significant ($\chi^2 = 664.436$, df = 15, $p < 0.001$), and the correlation matrix showed significant associations among variables.

Table 6: Factor Analysis Results

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.712
Bartlett's Test of Sphericity	**Approx. Chi-Square**	664.436
	df	15
	Sig.	.000

5.6 Factor Analysis for Control Environment

The research conducted factor analysis on each and every one of the constructs that constituted the control environment. The table below presents the findings of the analysis. All the control environment statements had factor loadings greater than 0.5. Besides, all parameters demonstrated a KMO test statistic greater than 0.5. The parameters that explained the variance in the control environment were integrity and ethics ($\sigma^2 = 65.389$), authority ($\sigma^2 = 11.959$), and Human resource rules and policies ($\sigma^2 = 22.652$). These results showed that integrity and ethics had a significant contribution to the greater (65.389%) variability in the control environment and thus is the most important component of the construct.

Table 7: Reliability and Factor Analysis for Control Environment

Reliability and factor analysis for Control Environment						
Construct	**Item**	**Cronbach's Alpha**	**Total to Item correlation**	**KMO**	**Loadings**	**Explained Variance**
Integrity	Integrity1	0.918	0.705	0.702	0.623	65.389
	Integrity2		0.750		0.533	
Authority	Authority1	0.901	0.869	0.691	0.460	11.959
	Authority2		0.823		0.608	
Human Resource Rules	HR_rules1	0.910	0.761	0.656	0.505	22.652
	HR-rules2		0.815		0.536	

5.7 Factor analysis for cost efficiency

The study conducted factor analysis on each and every one of the constructs that constituted cost efficiency. The findings are presented in the table below. All cost efficiency statements had factor loadings greater than 0.5. Consequently, all parameters had a KMO test statistic greater than 0.7. The parameters that explained the variance in cost efficiency were operation process efficiency (σ^2 = 55.624), employee engagement (σ^2 = 26.738), and innovation (σ^2 = 17.638). These results indicated that operation process efficiency contributes to greater variability (55.624%) and is the most dominant component of the construct.

Table 8: Reliability and Factor Analysis for Cost Efficiency

Construct	Item	Cronbach's Alpha	Total to Item correlation	KMO	Loadings	Explained Variance
Operation efficiency	Operation1	0.823	0.605	0.712	0.699	55.624
	Operation2		0.795		0.637	
Employee engagement	Engagement1	0.791	0.774	0.723	0.617	26.738
	Engagement2		0.739		0.778	
Innovation	Innovation1	0.830	0.614	0.734	0.671	17.638
	Innovation2		0.517		0.546	

5.8 Correlation Analysis

Pearson correlation analysis was conducted to determine the association between cost efficiency and control environment.

Table 9: Correlation Matrix

		Control env	Cost efficiency
Control env	Pearson Correlation	1	.733**
	Sig. (2-tailed)		.000
	N	350	350
Cost efficiency	Pearson Correlation	.733**	1
	Sig. (2-tailed)	.000	
	N	350	350

5.9 Regression Analysis

5.9.1 Effect of Control Environment on Cost Efficiency

A regression model with cost efficiency as the dependent variable and control environment as the independent variable was fitted. A r-squared of 0.538 was recorded, implying that 53.8 percent of the variation in cost efficiency is explained by variations in the control environment.

Table 10: Summary Statistics for Cost Efficiency

Model Summary					
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**Durbin-Watson**
1	.733[a]	.538	.536	.26489	2.196

The control environment had a positive and statistically significant effect on cost efficiency (β = 0.733, $p = 0.000$). This means that for a one-unit increase in the control environment, there will be 0.733 units increase in cost efficiency. This indicates that a strong ethical and organizational environment improves cost efficiency.

Table 11: Regression Coefficient for Control Environment

Coefficients						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	2.361	.362		6.519	.000
	Control environment	.474	.088	.733	5.394	.000

5.10 Hypothesis Testing

The regression coefficients in Table 9 were used to test hypotheses. If the p-value was less than 0.05, the null hypothesis was rejected.

H_{01}: Control environment has no significant effect on cost efficiency in KTDA factories in Bomet County. Results indicated a p-value of 0.000 < 0.05, implying rejection of the null hypothesis. Therefore, the control environment had a significant effect on cost efficiency in KTDA factories in Bomet County.

Table 12: Summary of Hypothesis Testing

Hypotheses	**P-value**	**Verdict**
H_{01}: Control environment has no significant effect on cost efficiency in KTDA factories in Bomet County.	0.000 < 0.05	Reject

Source: Researcher, 2026.

6. Discussion

6.1 Control Environment and Cost Efficiency

The study found that the control environment had a positive and significant effect on cost efficiency (β = 0.733, $p < 0.01$). This outcome is in line with several previous studies. Mackline, Benedict, and Maniagi (2022), in their study of deposit-taking SACCOs in Kenya, reported a strong positive association between control environment and financial performance (r = 0.764, p = 0.000), with a beta coefficient of 0.323 ($p < 0.05$).

On the same note, Otieno and Too (2023) reported a positive correlation between the control environment and the financial performance of Equity Bank, Bomet branch. Nzimurinda (2023), in his research on Zigama Credit and Saving Society in Rwanda, also found the control environment to be the most significant internal control factor, with a coefficient of 0.482. Further, Nguyen (2021) observed that in Vietnamese commercial banks, a strong control environment significantly reduced credit risk, with the results significant at the 5% level.

Despite this support, some studies report different results. Ayimpoya (2020), in research on publicly listed banks in Ghana, found that risk assessment had a stronger influence on financial performance, while the effect of control environment was

comparatively weaker. In addition, Mjaku (2019) noted that in public sector entities in Kosovo, control activities contributed more significantly to performance (56%) than the control environment.

The strong coefficient ($\beta = 0.733$) indicates that the control environment has a substantial positive effect on cost efficiency. This finding supports Agency Theory, which suggests that a strong control environment reduces agency costs and information asymmetry between smallholder farmers (principals) and factory managers (agents).

7. Conclusions

The objective was to assess the effect of the control environment on the cost efficiency of KTDA factories in Bomet County. The study concluded that the control environment had a positive and significant effect on cost efficiency in Kenya Tea Development Agency factories in Bomet County. This finding supports both Agency Theory and Contingency Theory. From an Agency Theory perspective, a strong control environment reduces agency costs and information asymmetry between smallholder farmers (principals) and factory managers (agents). From a Contingency Theory perspective, the effectiveness of the control environment depends on the specific organizational context of KTDA factories.

The key aspects of the control environment included integrity and ethics, authority, and human resource rules and policies. The null hypothesis that the control environment has no significant effect on cost efficiency was rejected. The descriptive findings confirmed that both the control environment (mean = 4.04) and cost efficiency (mean = 4.27) are well established in KTDA factories. Factor analysis revealed that integrity and ethics are the most important components of the control environment, while operational process efficiency is the most important component of cost efficiency.

The regression results showed that the control environment explains 53.8% of the variation in cost efficiency ($R^2 = 0.538$), with a strong standardized beta coefficient of 0.733. This indicates that strengthening the control environment should be a priority for KTDA management seeking to improve cost efficiency.

Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Authors

Kirui Victor Kimutai is a Postgraduate Student pursuing Masters of Business Administration in the Department of Accounting and Finance, Bomet University, Kenya.
Johnmark Obura is an Associate Professor in Finance in the Department of Accounting and Finance, Bomet University, Kenya. His research interest is in quantitative finance and financial time series analysis.
ResearchGate: https://www.researchgate.net/profile/Johnmark_Ouma
Google Scholar: https://scholar.google.com/citations?view_op=list_works&hl=en&hl=en&user=AuTe98gAAAAJ.
Geoffrey Biwott is a Lecturer in the Department of Management Science, Bomet University, Kenya.

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