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COST CONTROL PRACTICES AND SUCCESS OF ENERGY PROJECTS: LESSONS FROM KENYA POWER AND LIGHTING COMPANY LAST MILE PROJECTS IN SOUTH NYANZA COUNTIES, KENYA

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***Abstract*:** *Projects rely on reliable control measures to achieve their set objectives to be successful in the final outcome. This paper gives outcomes of control practices that have direct implications on the success of projects. Internal cost controls, M&E activities, risk mitigation and communication is analyzed. Findings review that there is positive and significant relationship between cost control variables and success of last mile power projects in rural Kenya. The paper concludes that in customer centered projects there is need to monitor the costs and institute proper control mechanisms especially internal controls so that project can be managed within budgets ad timelines. The paper recommends that internal controls, monitoring and evaluation systems and risk management efficiency need to be structured to provide basis of making decisions in project implementation. Future researches can focus on environmental influences to success of projects in rural areas.*

Keywords: *Cost Controls, Kenya Power and Lighting, Last Mile, South Nyanza*

1. Introduction and Background

Project cost control, a part of project cost management, is the process of monitoring how expenditure on a project deviate from baseline estimates during the project and developing corrective strategies as needed. Project cost controls enable the preceding cost management stages to be precise and effective across the project. When a business consistently completes projects on time and under budget, it increases profits, strengthens its brand and credibility, and can more precisely plan for future projects.

Cost control can only be successfully achieved with effective project cost control measures in place. Cost overrun and general cost management challenges have been encountered in several projects, and they greatly undermine the implementation and completion of development projects by reducing the output that can be realized from a given commitment of funding (Africa Infrastructure Country Diagnostic, 2008; Alexeeva, Queiroz, & Ishihara, 2011).

Project cost control has three facets: pre-control, which involves the cost budgeting process; in-process control of day-to-day operational costs in alignment with the set cost standards; and post-control (Minhang, 2017).

Ou-Yang and Chen (2017) linked risk assessment and cost minimization of an engineering-procurement-construction project at the design stage. The cost-effectiveness of project risk was identified using Monte Carlo simulation of the design process of a high value-added petrochemical plant in Taiwan. To avoid project cost

overrun, project managers need to conduct risk assessments from the project's design stage and not just at the execution phase.

Most construction and infrastructure projects experience cost and schedule overruns because of difficulties brought on by insufficient cost control measures during the design and implementation stages of the projects (Jin et al., 2018). Controlling project costs would aid in keeping them from becoming overly capital heavy, which might result in the project being abandoned, throughout the course of project execution (Emeka, 2022).

2. Problem and Focus

The Government of Kenya (GoK), through Kenya Power and Lighting Company, has been undertaking the Last Mile Connectivity Project since 2014. The Last Mile Connectivity Project is valued at KES 13.5 billion, funded by the Government of Kenya, coupled with financial leverage from the World Bank, the African Development Bank, Agence Française de Dévelopment, the European Union, and European Investment Bank (Kenya Power and Lighting Company, 2020). Its purpose is to contribute to the realization of universal access to electricity by extending the national supply of affordable electricity connectivity to 70 percent. One of the challenges encountered by KPLC in its previous connectivity expansion endeavors is the inflation of project implementation costs owing to time and budget overruns mostly from contractors and sub-contractors that KPLC heavily relies on for most of its projects.

The Kenya Last Mile Connectivity Project takes a novel approach to growing the country's distribution network. Due to the fact that, the current customer-driven growth is nearing overload, the GoK has resolved to expand the low voltage network from current distribution transformers to reach households within a 600-m diameter to enhance the country's connectivity rate. Furthermore, there was significant delay in Kenya Power and Lighting Company (KPLC) providing energy meters to contractors (Zegeye, 2018). The meters issued to contractors lacked essential accompanying data (such as plot numbers, customer names, meter numbers, village names, etc.), necessary for matching them with transformers and project site locations. As a result, this matching process caused a slowdown in connecting beneficiaries to electricity within the last mile (Feedback Infra Private Ltd, 2018).

Cost overruns are unexpected expenses over the budgeted cost due to underestimations at any phase of the project (Simanjuntak & Agung, 2018). They mainly arise from variable project costs, which are susceptible to various influential forces (Jackson, 2012). This is a major problem that is encountered globally, especially with publicly financed projects (Smith, 2014). Multiple techniques can be utilized in the estimation and control of project costs, and these include project management simulation software; analogous estimate; resource cost rate parameter modeling; bottom-up (detailed) estimating; suppliers' offer and reserve analysis; cash flow/S-curve; earned value (Aničić & Aničić, 2019).

This paper discusses the cost control practices being utilized by KPLC and the implications it has on success of the project. The case of KPLC last mile project was selected because access to electricity has been on top of the government agenda for the last decade and as a spur to economic growth and in line with vision 2030. Rural counties of Kenya have for the longest suffered lack electricity connectivity for the longest and hence the need to focus on this.

3. Purpose

The paper aims to bring out the implications of initiating cost control measures in project success. This is done using KPLC last mile connectivity project.

The paper seeks to answer the following question:

1. Does Cost Control practices Influence the Success of projects in Rural areas in Kenya?

2. How Does Kenya Power and Lighting Company through its Last Mile connectivity Project tap on benefits of cost control to successfully implement its rural connectivity projects?

The paper therefore seeks to provide answers to these questions and in the end provide the justification for instituting cost control measures in project implementation.

4. Theoretical Review

Theories provide a basis for understanding and interpreting findings They give a backing on key issues highlighted in academic discourse and human experiences.

The theory of Controlling has been used in project management in various scenarios. For ease of grasping, where control is broken into two dimensions of performance reporting and change control. Performance reporting necessitates corrections during the project's execution, whereas overall change control dictates modifications for the project's subsequent planning phase (Hanioğlu, 2022). The classical approach to controlling contains three stages, namely, measurement of the condition of the system; comparison of the measured findings with the ideal outcome, and making adjustments to get the system back to its ideal outcome or to minimize a given gradient descent. Project Cost Control can be viewed as a thermostat model or a scientific experimentation model with learning and improvement as the ultimate goal.

Cost-of-production theory of Value posits that the price of an object is dictated by the total cost of the resources utilized in its production (Dierkes & Siepelmeyer, 2019). The theory was developed in the 19th century, and it has found relevance in project management since the inception of the economics-based approach of project management. Since construction is treated as a type of production, the need to manage the costs associated with the production is critical. The actual value of a project can thus be determined in retrospect of the sum of costs incurred from the phase of planning to its ultimate completion.

Freeman (1984) developed stakeholder theory, which established a framework for organizations to involve stakeholders in a variety of their endeavors, including projects. The theory is applicable to the operating environment of last-mile projects, in which multiple stakeholders have competing interests in the projects. Jones and Wicks (2019) establish an extensive framework that is ideal and productive for applying stakeholders' theory to a firm's benefit. According to Donaldson and Preston, stakeholder theory is critical for comprehending the organization's environment during stakeholder engagement and developing appropriate strategies to accommodate or deal with stakeholder interests. Mitchell et al. (2018) posit that this approach aims to expand management's view of its accountabilities beyond the profit maximization function and the stakeholders recognized in the firm's input-output models to include interests and claims from non-stockholder groups. The fundamental premise of stakeholder theory is that an entity has relationships with various key

stakeholders. It can elicit and preserve their support by recognizing and balancing their pertinent interests. (Jones & Wicks, 2019).

5. Literature Review and Conceptual Framework

Project success is a function of various activities carried out by the project teams at various phases of project cycle. In the current paper we posit that project success is a function of project cost controls achieved through internal cost control practices; cost monitoring and evaluation practices; and cost risk management practices.

A Project Cost Control system is an integrated mechanism of monitoring and control activities; process management; risk assessment and management; control environment; communication and information; compliance/internal audit (COSO, 2019; Kazaz et al., 2019; Yao et al., 2017). An internal control system of cost comprises internal management control and internal accounting control (Minhang, 2017).

Internal management control entails supervision and inspection of cost centers through an existing structure of corporate governance which verifies and approves various project planning and implementation decisions. This entails having a board of directors playing an oversight role; and an authorization system that delineates the scope and responsibility for general authorization (for routine operational decisions) and special authorization for exceptional business decisions; (Minhang, 2017). Internal accounting control has three facets: pre-control, which involves the cost budgeting process; in-process control of day-to-day operational costs in alignment with the set cost standards; and post-control (Minhang, 2017).

Risk management depicts the organization's risk model: how foreseen obstacles are eliminated or how adverse impacts of environmental turbulence are mitigated (COSO, 2019; Kazaz et al., 2019). It refers to a systematic policy that has been put in place to detect possible systemic and structural malfunctions whose effects are likely to be catastrophic on an organization's strategic and business objectives such as technological lapse, bankruptcy risk, price escalations, environmental turbulence, liquidity problems, geotechnical anomalies, and breakdown of machinery (William Jr et al., 2016, as cited in Yao et. al, 2017). Financial risk management targeted at project cost control requires the provision of a contingency meant to cushion the impact of any retained risk during the project's life span.

Rokita, (2019) assessed the effectiveness of monitoring systems in detecting any deviations from a project's planned performance and cost. Through simulation, it was found that inflation rates, indicative of changes in project costs, can be detected and the impact mitigated through some but not all monitoring systems. Atieno (2015) explored the influence of monitoring and control on the performance of constituency development fund (CDF) projects in Kisumu. The study showed that change control systems could reduce unnecessary project expenses.

Evidently internal cost control, cost risk management as well project monitoring and evaluations leads to good performance of projects. The relationship of these variables are illustrated in the conceptual framework next page.

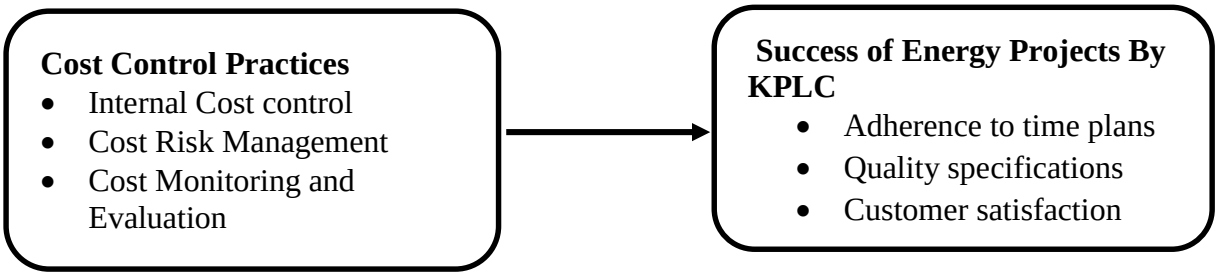


Figure 1: Conceptual Framework

6. Methodology and Research Design

This paper represents findings from a case study design in addressing the research questions about the last mile connectivity project's cost control by KPLC and its contractors and sub-contractors. The case study approach was appropriate for applied research where a business phenomenon can be explored to help understand why the interactions between different project management practices led to different outcomes to determine the best internal control measures (Jin et al., 2018). A population of 320 comprising of management staff of KPLC's contractors and sub-contractors in South Nyanza region was used. A census of the entire population was conducted to improve the response rate. The table below gives the population and the regional representation.

Table 1. Population Distribution

County	Number of Contractors
Kisii	100
Nyamira	115
Migori	50
Homabay	55
Total	**320**

Source: KPLC South Nyanza

Data was collected from the above population using a questionnaire, and analyzed using SPSS software version 27. Correlation and regression analysis models were generated to identify the relationship between key variables.

Validity and reliability tests were conducted using acceptable techniques and pilot data from 12 respondents. Experts' opinion was sought for validity and Cronbach's Alpha coefficient was used to ascertain the reliability. A reliability coefficient of 0.944 was obtained showing that the instrument was reliable.

7. Findings and Discussions

A response rate of 97% (312 out of 320 respondents) was attained. This was considered excellent. A descriptive analysis was undertaken on all the variables and the findings are in Table 2 next page.

Table 2: Summary of measures of project cost control

	N	Minimum	Maximum	Mean	Std. Deviation
Monitoring and Evaluation	312	1.83	3.83	2.97	.39266
Risk Management	312	2.00	4.00	3.00	.37328
Internal Controls	312	2.00	4.33	3.02	.41779
Valid N (list wise)	312				

From table 2 its evident that respondents, moderately agreed that cost control practices influenced project success rate. The mean scores for all the variable components ranged between 2.9 to 3.0, and the standard deviations were in the range of 0,37 to 0.41 showing high degree of consensus among the respondents. This implies that project control practices influence the success of projects.

8. Correlation and Regression Analysis

A Pearson correlation analysis was used to explore the relationship between overall perceived success of the LMCP projects and the 3 components of projects cost control; internal control, monitoring and evaluation, and risk management. The results were as tabulated in table 3 below.

Table 3: Correlation Analysis

		Success of LMCP
Success of LMCP	Pearson Correlation	1
	Sig. (2-tailed)	
	N	**312**
Monitoring and Evaluation	Pearson Correlation	.510**
	Sig. (2-tailed)	.000
	N	**312**
Risk Management	Pearson Correlation	.547**
	Sig. (2-tailed)	.000
	N	**312**
Internal Controls	Pearson Correlation	.671**
	Sig. (2-tailed)	.000
	N	312

A Pearson correlation analysis (table 3) revealed that there existed a moderately strong relationship between energy projects success represented by KPLC Last Mile Connectivity Projects and perceived level of monitoring and evaluation, r= .510, p= <.01; perceived level of; risk management, r= .547, p= <.01. and a strong positive relationship with perceived level of internal controls, r= .671, p= <.01. This implies that internal controls, monitoring and evaluation of cost and risk management practices impact positively success of energy projects in Kenya. Its important to note that internal cost controls were perceived more important in influencing success of projects followed by risk management practices.

This result agrees with the findings by Yao, Yusheng, and Bah, 2017 who critically examined the Project Cost Control in Ghana's public sector concerning alleviating financial irregularities. It was revealed that internal control systems were instrumental for effective financial management in the public sector.

9. Regression Analysis Results

For the main analysis in this study, regression analysis was be used to examine the impact of project cost control on the successful implementation of last-mile projects. A multiple regression analysis was conducted with the overall perceived average success of last mile projects as the dependent variables and four components of project cost control, internal controls, monitoring and evaluation, risk management and project communication as the independent variables. This regression model was used to answer this study's four research questions.

The regression model will take the following form;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where;

Y = *(Successful Project Cost Control) Implementation of Last miles Project*

β_0 = *Intercept term*

X_1 = *Monitoring & Evaluation*

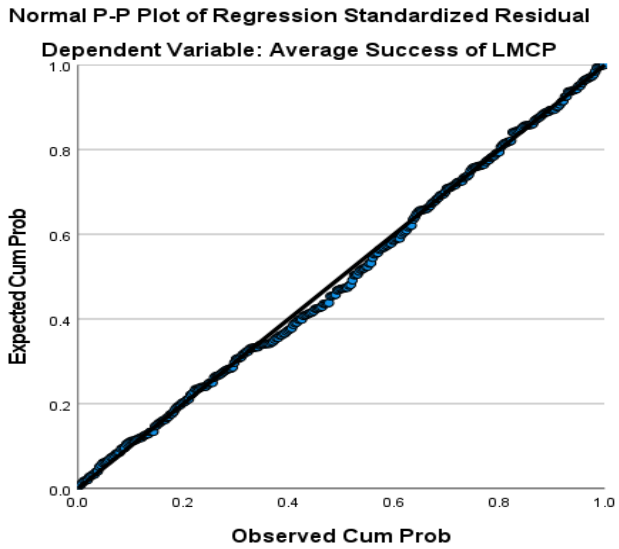
X_2 = *Internal Control*

X_3 = *Risk Management*

ε = *Error term*

By observation from both the dependent and independent variables were measured on a continuous scale, a scatter plot of regression residual revealed that there was a linear relationship between the two variables. Figure 2 gives the linear regression line.

Figure 1: Normal P-P Plot - Residual Errors of the Regression Line



For the goodness of fit, the coefficient of determination (R-Squared) and F-test (ANOVA) were used. Goodness of fit compares the observed values to the expected (fitted or predicted) values to determine how well data point fit into a model. The result of the Pearson's coefficient of determination was R2= .688. This means that, the predictor variables, internal controls, monitoring and evaluation, and risk management accounted for 68.8% of the variation in the dependent variable perceived success of last mile projects. The results of the multiple regression were also statistically significant, F (4,307) = 169.431, p= <.001. As a result, the model was a good fit for the data. These findings are given in tables 4 and 5 below.

Table 4: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.830[a]	.688	.684	.29207	1.475

a. Predictors: (Constant), Monitoring and Evaluation, Risk Management, Internal Controls
b. Dependent Variable: Success of LMCP

Table 5: Regression model significance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	57.815	4	14.454	169.431	.000[b]
	Residual	26.189	307	.085		
	Total	84.004	311			

a. Dependent Variable: Average Success of LMCP
b. Predictors: (Constant), Monitoring and Evaluation, Risk Management, Internal Controls

Table 6: Regression model coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.081	.166		-6.507	.000
	Monitoring and Evaluation	.221	.049	.167	4.542	.000
	Risk Management	.222	.053	.159	4.194	.000
	Internal Controls	.396	.049	.318	8.030	.000

a. Dependent Variable: Average Success of LMCP

From table 6 above, all measured aspects of project cost control; monitoring and evaluation, risk management, and internal control contributed positively and significantly to the model, p= <.001.

The relationship was also positive meaning all components were crucial in cost control. From the findings Internal cost controls contributed more to overall success of projects with coefficient of 0.396.

These findings are in agreement with other studies which found from different settings that internal controls, Monitoring and evaluation and risk management contributed to success of projects. Yao, Yushang and Bao (2017) for example found after critically examined the Project Cost Control in Ghana's public sector concerning alleviating financial irregularities. It was revealed that internal control systems were instrumental for effective financial management in the public sector.

The findings also agree with the results of a study by Rokita, (2019) who assessed the effectiveness of monitoring systems in detecting any deviations from a project's planned performance and cost. In essence, monitoring and evaluation control systems could reduce unnecessary project expenses keeping project budgets in check, an argument supported by the theory of controlling which splits project control into performance reporting and change control. Performance reporting through monitoring and evaluation necessitates corrections during the project's execution.

the results of this study align with the results by Musta (2018) who investigated the impact of risk analysis on the timeliness, quality, and cost of construction projects in Albania. It was found that a well-defined risk management process minimized construction project costs, enhance its quality, and controlled the project's completion within the set timeline.

10. Summary Recommendations and Conclusions

This paper has brought out the influence of cost controls practices on the success of energy projects. Internal cost control, Monitoring and evaluation and risk management. The findings show that all the variables combined contributed significantly to project success, as follows; Internal controls 0.396, Risk Management 0.222 and Monitoring and evaluation 0.221. From the regression equation formulated earlier we now have: $Y = -1.081 + 0.221 + 0222 + 0396 + \varepsilon$

From the findings the paper recommends that project implementers pay attention to cost control practices and more so the internal controls systems. These have a higher chance of improving project success. They can also not ignore cost monitoring and evaluation as well as enhancing risk management practices.

The paper concludes that project success is a function of many factors and cost controls are significant among these factors. Evidently project initiators need to pay attention to cost control practices and put mechanisms in place to attain meaningful cost control outcomes.

The paper used energy project by KPLC in South Nyanza Counties which are basically rural in nature, future researches can focus on environmental influences to success of projects in rural areas.

References

Africa Infrastructure Country Diagnostic. (2008). Unit Costs of Infrastructure Projects in Sub-Saharan Africa. Washington DC: AICD/ The World Bank.

Alexeeva, V., Queiroz, C., & Ishihara, S. (2011). Monitoring Road Works Contracts and Unit Costs for Enhanced Governance in Europe and Central Asia. Washington DC: The World Bank Group

Aničić, D., & Aničić, J. (2019). Cost management concept and project evaluation methods. Journal of Process Management New Technologies, 7(4), 54-59. DOI: 10.5937/jouproman 7-21143.

Association for Project Management. (2020). What is project cost planning and control? Retrieved from Association for Project Management: https://www.apm.org.uk/resources/what-is-project-management/what-is-project-cost-planning-and-control/

Atieno, O. K. (2015). The Influence of Monitoring and Control on the Performance of

Constituency Development Fund Projects: A Case of Kisumu Town East and Kisumu Rural Constituencies in Kenya. Nairobi: Unpublished Master's thesis at the University of Nairobi.

Committee of Sponsoring Organizations of the Treadway Commission (COSO). (2019, January).

COSO- Internal Control Integrated Framework. Retrieved from Committee of Sponsoring Organizations of the Treadway Commission: https://www.coso.org/Documents/COSO-CROWE-COSO-Internal-Control-Integrated-Framework.pdf

Dierkes, S., & Siepelmeyer, D. (2019). Production and cost theory-based material flow cost accounting. Journal of Cleaner Production, 235, 483–492. https://doi.org/10.1016/j.jclepro.2019.06.212

Emeka, O. H. (2022). Evaluation of construction contract management in the Nigerian Construction Industry. European Project Management Journal, 12(1), 32–45. https://doi.org/10.56889/okvu9986

Feedback Infra Private Ltd, (2018). Annual Energy Report.

Freeman, R.E. (1984) Strategic Management: A Stakeholder Approach, Pitman, Boston, MA.

Hanioğlu, M. N. (2022). Management, Project Management, and construction projects. A Cost Based Approach to Project Management, 17–37. https://doi.org/10.1201/9781003172710-2

Jin, H., Shen, L., & Wang, Z. (2018). Mapping the influence of project management on project cost. KSCE journal of civil engineering, 22, 3183-3195.

Jones & Wicks. (2019). Convergent Stakeholder Theory. Academy of Management Review.

Jackson, G. (2012). Contingency for cost control in project management: a case study. Australasian Journal of Construction Economics and Building, 3(1), 1-12.DOI: 10.5130/ajceb.v3i1.2906.

Kazaz, A., Ulubeyli, S., & Imre, A. E. (2019). A Model On The Implementation Of Internal Control And Corporate Risk Management System İn Contractor Construction Firms. International Conference on Civil and Environmental Geology and Mining Engineering (pp. 593-600). Trabzon: ICOCEM.

Kenya Power and Lighting Company. (2016). Kenya Electricity Expansion Project Additional Financing. Nairobi: KPLC.

Kenya Power and Lighting Company. (2020, 11 3). Last Mile Connectivity Program Q & A. Retrieved from Kenya Power: https://www.kplc.co.ke/content/item/1694/last-mile-connectivity-program-q---a

Kenya Power and Lighting Company. (2020). Review of KPLC Business Operations at The Counties. Retrieved from Kenya Power and Lighting Company: https://www.kplc.co.ke

Mitchell, Marie & Greenbaum, Rebecca & Vogel, Ryan & Mawritz, Mary & Keating, David. (2018). Can You Handle the Pressure? The Effect of Performance Pressure on Stress Appraisals, Self-Regulation, and Behavior. Academy of Management Journal. 62. 10.5465/amj.2016.0646.

Minhang, F. (2017). Design of Internal Control System of Cost. Advances in Economics, Business and Management Research (AEBMR), 26, 579-584.

Musta, A. (2018). Impact of risk analysis related to time, quality and cost in construction projects. Berlin: Unpublished Master Thesis at the Joint Study Programme of Metropolia UAS and HTW Berlin.

Ou-Yang , C., & Chen, W.-L. (2017). Applying a risk assessment approach for cost analysis and decision-making: a case study for a basic design engineering project. Journal of the Chinese Institute of Engineers; 40 (5), 378-390, DOI: 10.1080/02533839.2017.1335620.

Project Management Institute. (2019, August 1). Cost Control. Retrieved from Project Management Institute: https://www.pmi.org/learning/featured-topics/cost-management

Simanjuntak, M. R., & Agung. (2018). Analysis of Project Cost Management and The Effect On Cost Overrun In Construction Projects. International Journal of Innovative Research in Science, Engineering and Technology, 7(7), 8049-8054. DOI:10.15680/IJIRSET.2018.70707072.

Smith, P. (2014). Project Cost Management – Global Issues and Challenges. Procedia - Social and Behavioral Sciences, 119 , 485-494.

ROKITA, S. (2019). Project Management and planned cost accounting. Humanities and Social Sciences Quarterly. https://doi.org/10.7862/rz.2019.hss.44

Yao, P. L., Yusheng, K., & Bah, F. B. (2017). A Critical Examination of Internal Control Systems in the Public Sector , A Tool for Alleviating Financial Irregularities: Evidence from Ghana. Research Journal of Finance and Accounting; 8 (22), 94-110.

Zegeye, H. (2018) Climate Change in Ethiopia: Impacts, Mitigation and Adaptation. International Journal of Research in Environmental Studies, 5, 18-35.