



FACTORS AFFECTING COST OVERRUNS IN CONSTRUCTION PROJECTS

A CASE OF KENYA NATIONAL HIGHWAYS AUTHORITY

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Abstract: In Kenya the number of construction projects is increasing radically. However, it becomes difficult to complete projects in the allocated cost and time. Taking this into consideration, cost overrun is one of the major problems in Kenya construction projects. The main objective of the study was to determine factors affecting cost overruns in construction projects; a case of Kenya National Highways Authority. The study found out how the project schedule affects cost overruns in construction projects; explored the effects of contract management on cost overruns in construction projects; examined how resources affect cost overruns in construction projects and established how government policies influence cost overruns in construction projects. The study adopted a descriptive research with a study population of 150 staff from KENHA offices in Nairobi. The study applied probability sampling design by using a stratified random sampling technique to select a sample size of 110 respondents. The main data collection instrument was the questionnaires which contained both open ended and close ended questions. Descriptive statistics data analysis method was applied to analyze data aided by Statistical Package for Social Sciences (SPSS) to compute response frequencies, percentage mean and standard deviation results. Finally Linear Regression model was employed to establish the significance of the independent variables on the dependent variable. The study findings indicated that project schedule affects cost overruns in construction projects since challenges associated with land acquisition; project scope and project management tools delayed project commencement and completion time. It was noted that contract planning; types of contracts and qualification of contractors led to contract management challenges that led to projects cost overruns. The study concluded that the major factors affecting cost overruns in construction projects in Kenya includes; project schedule; contract management; resources and government policies. The study concluded that project schedule leads to cost overruns in construction projects due to land acquisition problems; project scope challenges and application of poor project management tools by many road contractors. The study recommended that projects management staff should liaise with the government and the affected communities and institutions to speed up the land acquisition process. Project scope should be clearly defined and effective project risk management strategies employed. The land acquisition process and settlement of legal land disputes in settlement of the affected communities should be shortened through community dialogues and effective undertaking and implementation of environmental impact assessment reports recommendations.

Key Words: Cost Overruns; Project Schedule; Contract Management; Resources, Government Policies.

Introduction

Construction industry, nowadays, is facing severe problem of poor cost management resulting in huge amount of cost overruns. The problem of poor cost management and overrun in project cost is serious issue in both developed and developing countries. This needs serious attention for improving the construction cost performance as rarely projects are completed within budget. In the past several decades, large construction projects have been known for their cost overruns and late completion times. Construction has since emerged among the top performing sectors in the period alongside financial services and transport and communication (Waithaka, 2011).

The global construction market is witnessing a significant surge, thanks to the rapid growth of the construction industry. The rapid rise in the construction industry, owing to the increase in commercial, infrastructure and non-residential construction activities, is the key factor that has driven this global market in the recent past. Analysts project the Asia Pacific infrastructure industry to remain dominant and register the fastest growth among other markets in the coming years. Malaysia's construction industry is one of major industry contributing significant growth to socio-economic development. In recent years, there has been rapid growth of the industry in Malaysia. Although a lot of money has been spent in construction, the industry is facing a lot of challenges such as expenditure exceeding the budget, construction defects and dependency on foreign workers.

In Malaysia, to control construction projects, various procurement strategies are commonly adopted. Many factors are responsible for these cost overruns such as underestimation of costs to make the projects more viable, addition of scope during later stages of project planning and even during construction, changed conditions, etc. One of the most important contributing factors to the magnitude of cost overruns in construction projects are the project schedule. Furthermore, the length of project development phase from planning to construction seems to be a major factor in the extent of cost overrun. The longer, larger projects tend to be more prone to cost overruns. (Markenson, 2016). The problem of cost overruns is critical and should be further explored to mitigate this problem in future. Cost overruns are a major problem in both developing and developed countries. The trend is more acute in developing countries where these overruns sometimes exceeds 100% of the estimated project cost. Lack of management system and lack of ability to prevent cost overruns or to control construction costs causes construction companies to fail. This leads to need of effective cost management system and cost control system (Adams, 2015). Kenya had the highest number of infrastructure deals in East Africa last year on the back of mega real estate projects and the standard gauge railway, says a report by financial consultancy Deloitte.

From a regional perspective, mining construction projects remain important for West, Central and Southern Africa, while in North and East Africa, spending on construction, transport and energy is more dominant. Of course, projects in the areas of energy/power, transport, water and real estate could be seen as providing either industrial or household benefit, or both. The key issue is that Africa's infrastructure development is no longer dependent on or dominated by capital. Four out of every ten mega construction projects in East Africa are related to transport. Increased regional integration over the past decade has necessitated and been supported by expanding and improving road and rail networks in addition to port facilities. (International Housing Coalition, 2015).

Onshore and offshore hydrocarbon discoveries and feverish prospecting activities have necessitated improved logistical options for foreign companies looking to get a foothold in the region's burgeoning

energy export market. However, the level of infrastructure development varies across countries, with construction groups from Europe, the US and China at the forefront of enterprises trying to narrow these gaps. Nairobi is expected to fast track the development of Kenya's infrastructure over the next mixed-use developments. The Kenya Vision 2030 aims to transform Kenya to a middle-income country by 2030. The government recognizes that the attainment of Vision 2030 will depend heavily on the quality of the road infrastructure through the reduction of transport costs, improvement of accessibility and road safety. The centrality of the road infrastructure in the Vision 2030 and the heavy annual budgetary allocations to the sector, underscores the need to investigate the time and cost drivers that contribute to time and cost overruns. Despite the fact that construction project time and cost overruns create a significant financial risk to the government with a history of construction projects that were completed with significant cost overruns, literature on the subject of road construction time and cost overruns in Kenya remains scanty (Adams, 2015).

In the past, KeNHA projects have surpassed their initial budget hence cost overruns. KeNHA is responsible for the management, development and maintenance of national roads. The Kenya Roads Act, empowers KeNHA to construct, maintain, operate, improve and manage the roads under its jurisdiction. The roads that fall under KeNHA are classified as A, B and C. KeNHA recognizes that road development is not only road construction and maintenance alone, but in the broader sense includes the management and protection of road reserves. The infrastructure has been given the highest priority to ensure that the main road projects under the economic pillar are implemented, according to the Ministry of Roads Service Charter (2008), there is a need for improvement of roads to a better condition because the road transport (mode of transport) carries about 80% of all cargoes and passengers in the country. Due to the importance of roads in socio-economic development of the country, the government has in the recent past steadily increased budget allocation to the road sub-sector. However, road projects in Kenya have been facing various challenges, which include delay in completion and cost overruns (Matthews, 2013).

Inevitably, governments are the biggest "spenders" world-wide (World Bank, 2007). The figure, varies from country to country, but according to (Knight et al.2011) government spending on public services accounts for anywhere between 15-45% of GDP. The sheer amount of this spending has a huge impact on the economy. According to Kenya Roads Board report, Kenya National Highways Authority is annually allocated approximately 30% of the total fund allocated to the ministry of roads. Many projects experience cost overrun and thereby exceed initial contract amount.

In Kenya, the number of public roads construction projects is increasing from time to time. However, it becomes difficult to complete projects in the allocated cost budget. Taking into account the scarce resources of the country, cost overrun is one of the major problems in Kenya. Statistics from the Republic of Kenya report show that KeNHA has been experiencing cost overruns in its Roads projects. For instance, in the construction of Thika Super Highway, the cost escalated from Kes.26.44 billion to Kes.34.45 billion (World Bank, 2014). In addition, the initial deadline of the Thika super highway project was July 2011, which was later revised to July 2013.

Cost overruns have obvious effects for the key stakeholders in particular, and on the construction industry in general. To the client, cost overrun implies added costs over and above those initially agreed upon at the onset, resulting in less returns on investment. To the consultants, cost overruns implies inability to deliver value for money and could well tarnish their reputations and result in loss of confidence reposed in them by clients. To the contractor, it implies loss of profit. To the industry as a

whole, cost overruns could bring about project abandonment and a drop in construction activities, bad reputation, and inability to secure project finance or securing it at higher costs due to added risks. All these consequences undermine the viability and sustainability of the construction industry (Markenson, 2016). Therefore, carrying out a research in this area will have a paramount importance. Identification of factors affecting cost overruns is a prerequisite to minimize or to avoid cost overrun in the construction projects. The study general objective was to determine factors affecting cost overruns in construction projects; a case of Kenya National Highways Authority. The study specifically aimed to; find out how the project schedule affects cost overruns in construction projects; explore the effects of contract management on cost overruns in construction projects; examine how resources affect cost overruns in construction projects and to establish how government policies influence cost overruns in construction projects.

Literature Review

Project schedule

According to global leading practices, land acquisition should be complete before a project is tendered. In Kenya projects are often awarded with only partial acquisition of land by project owners. Delay in subsequent land acquisition and inadequacy in project planning considering the impact of deferred land acquisition is possibly the single largest factor causing the project schedule to keep changing. This shift causes cost overruns and ultimately project delays. Successful completion of construction projects requires many important processes and one of them is bidding process during which selecting the most appropriate main contractor to implement the project is done.

Everything around us is constantly moving, and standing still means falling back. The construction industry, much like any other industry, is continuously evolving. However, as major towns in Kenya continues to experience rural-urban migration which is driving growth in demand for both residential and commercial property and property developers are not able to satisfy this demand. In view of the projects being affected by resistance from local community and social organizations, the risk of delays has grown many folds in past years. However, the survey observed that project planning and mitigation strategies have not been reengineered to accommodate the global leading practices to undo the effect of such initial delays during the course of project. In addition, lack of clarity on Resettlement & Rehabilitation (R&R) related issues adversely affect the sentiments of people about the project. Land acquisition leads to displacement and unemployment.

Mahmid (2011) investigated the statistical relationship between actual and estimated cost of road construction activities based on a sample of 100 road construction projects awarded in the West Bank in Palestine. The findings revealed that the average cost deviation in the investigated activities was as follows; earthworks -15.7 percent, base works 12.9 percent, asphalt works 18.5 percent and furniture works 36.4 percent. His findings, however did not investigate the cost drivers responsible for the deviation between actual and estimated cost.

Furthermore, land acquisition often requires cutting of trees (deforestation) for space creation, destruction of water bodies, etc. which leads to soil erosion and land degradation affecting the local environment and the lifestyle of people. Also, if the acquired land falls under the category of heritage site, forest reserve or wild life sanctuary, it faces stiff resistance from social activists and locals alike. Land acquisition issues are spread across sectors. For instance, in steel sector, one of the largest Foreign Direct Investment (FDI) project in India has been stalled due to people's agitation against the land acquisition. Locals fear that once the forest land is acquired, they will lose their agro-based

sustainable livelihood. The land acquisition problem is more pronounced in transportation sector such as Highway-Roads and Railway projects. For example, for a new rail line project in the India, land for the first phase of the project was to be acquired by October 2009. However, due to delays in initiating the land acquisition process and inter- State disputes, the land was re-scheduled to be acquired by January 2011. Similarly, one of the most prestigious projects in road sector was delayed by around six years due to the land acquisition issues. The project which was started in 2000 with scheduled completion date of December 2004 got completed only in January 2012.

Contract management

Contract management is the process of systematically and efficiently managing contract creation, execution and analysis for maximising operational and financial performance and minimising risk. (Bell, 2013). Most professionals operating in Africa use their accumulated experience and judgment. Track performance, financial capacity and technical capacity are the most important criteria considered crucial by the selection of main contractor to undertake the construction project (Arazi, 2011). Xiaohong (2011) concurs and says that construction contractors have big influences upon projects and their successes. It is quite critical to select a qualified contractor in the process of construction management as a competent construction contractor is one of the indispensable conditions of a proper process and completion of a construction project.

Material price escalation is a business risk faced by all contractors. In recent years, costs of key inputs such as iron and steel, cement, bitumen, concrete, crude oil, etc. have fluctuated sharply. The risk of material cost fluctuation is inherent in infrastructure projects, and to some extent is taken into consideration in overall project cost estimates. However, the volatility in material prices makes forecasting a challenging exercise and leads to inaccurate forecasts. Furthermore, the cost estimate assumes the project completion as per the schedule and does not account for inflation beyond the schedule date. Thus, any delay in project completion makes the initial cost quite often, an increase in material cost over the agreed percentage leads to dispute between project owners and contractors. For example, the dispute between one of the India's largest State owned power Generation Company and its initial equipment supplier on price escalations. Many a times, the variables used for cost estimation during project cost scheduling are not adequate to cover all aspects of project costs. As a result, various cost items that are necessary for the project budget estimation remain either unidentified or inadequately defined at the planning stage and lead to cost overruns at a later stage. Project team's need to be extensively experienced (should have costing personnel/ engineers) and adequately equipped with scientific tools and techniques to develop a realistic budget estimate for the project.

Resources

Over the past few years there is a shortage of manpower across categories; however, non-availability of highly-skilled professionals can have an adverse impact on the project delivery and cost. By 2022, Kenyan infrastructure sector is expected to have a shortage of around three million project professionals including project managers, civil engineers, planners, surveyors, safety professionals, etc. Hence, it is imperative to increase investment in training and mentoring to develop the requisite skill set in the professionals, deployed across various departments. (Robert, 2000).

The growth of skilled and semi-skilled manpower in Kenya has not kept pace with the growth in infrastructure projects. This fact is supported by World Bank's report according to which the Kenya road construction industry is expected to face a labour shortage of 18-28 percent if the country grows

at a medium rate and a shortage of 55-60 percent if we see high growth.¹⁰ Unavailability of welders, carpenters, masons, trained workers often impact project progress. This has constrained the availability of skilled labour for some projects/States. Another issue impacting the progress of infrastructure projects across industries is the low productivity of labor due to socio-cultural-political reasons. For instance, work is often halted in affected areas. Other issues, such as extended holiday seasons, unreliability of non-local labor frequent strikes by workers, etc. adversely affect productivity at construction sites and impact the project schedule. These risks are usually not planned during the planning phase, but have an impact on project delivery.

Government Policies

Government policies guide decision making towards achieving a rational outcome in matter of public interest. A strategic and broad based approach to formulating construction policies should be based on certain fundamental criteria such as equitable national integration , accessibility to public and private construction products, health and safety, economic viability, technical viability, political and administrative considerations, environment soundness and addressing the basic need for shelter. Another issue that leads to delays in regulatory approvals is the multiplicity of approval requirements from Central, State and local Government (Markenson, 2016).

There is often a recurring delay in securing regulatory approvals from governing bodies and various ministries. For Example, inability to secure forest approvals for tree cutting required for a highway expansion project led to substantial project delays. Similarly, a major highway project could face a delay of around one year due to delay in executing the State-support agreement towards shifting the utilities to make way for construction. In many cases even after securing clearances, it has been observed the time taken for activities such as tree cutting is often prolonged to as much as 32 months, primarily due to resistance from local communities. The complexity and size of infrastructure projects being undertaken in India has increased substantially during the last decade. As a result, the regulatory frameworks related to infrastructure projects have also witnessed a significant transformation. Considering large scale magnitudes, these infrastructure projects require an explicit consideration of the regulatory issues during the planning stage to avoid any delays during the implementation stage. For timely action, project developers should ensure early identification of the required regulatory compliances and the corresponding procedural difficulties associated with it. This could help in detection and prevention of cost and schedule overruns with better control on projects. The construction industry in Kenya has not had a regulating body since the disbandment of the National Construction Cooperation in 1988. The National Construction Authority (NCA) was then established in 2012 to regulate the construction sector and was mandated to register and regulate the undertakings of contractors. The need to establish the NCA was due to increase of quack contractors in the construction industry and the lack of regulation of the construction sector as a whole, cases of collapsed buildings and corruption as contractors offered bribes so as to obtain compliance certificates from the respective authorities. (Esther N G, 2015).

Labour law mediates the relationship between workers (employees), employers, trade unions and the government. Collective labour law relates to the tripartite relationship between employee, employer and union. Individual labour law concerns employees' rights at work and through the contract for work. Employment standards are social norms (in some cases also technical standards) for the minimum socially acceptable conditions under which employees or contractors are allowed to work. Labor laws protect the employees however this may turn into hurting the project. An example is a radical increase

in labour wages. This usually affects the contractor especially large scale projects whereby the type of project with the employer is fixed contract. This affects the project being that the contract is not flexible to allow these changes; this directly impacts the cost performance (Bell, 2013).

Cost overruns

The factors that lead to successful projects include: Clearly defined goals and objectives, a well-defined project management process, a proven set of project management tools, a clear understanding of the role of project management. For a project to be termed as successful, it has to be implemented as per the plan, within the budget and as per the objectives. (Matthews, 2013). The growing need for construction of all types coupled with a tight monetary supply has provided the construction industry with a big challenge to cut cost. The remaining part of the twentieth century would involve corporations, institutions and government in a race to survive. The attendant dwindling economic fortune of nations' economies around the World have geared up the participant in these sectors (the client in particular) to take up the challenge of ensuring efficient use of their resources to obtain value for money in terms of performance.

The total cost of construction in normal circumstances is expected to be the sum of the following cost: Materials, Labor, Site Overheads, Equipment/Plant, Head office Cost and Profit but in many parts of the world, there are other costs to be allowed for. Poor cost estimation leads to poor cost control thus poor cost performance of a project. This can also lead to underestimation, which subsequently translates into increases in project cost as errors and omissions are exposed. Estimation documentation must be in a form that can be understood, checked, verified, and corrected. The foundation of a good estimate is the formats, procedures, and processes used to arrive at the cost. Poor estimation includes general errors and omissions relating to plan details and project quantities as well as general inadequacies and poor performance in planning and estimation procedures and techniques (David, 2012).

Poor quantity survey leads to inconsistent contingencies. This causes confusion as to exactly what is included in the line items of an estimate and what is covered by contingency amounts. Contingency funds are typically meant to cover a variety of possible events and problems that are not specifically identified or to account for a lack of project definition during the preparation of planning estimates. Misuse and failure to define what costs contingency amounts cover can lead to estimation problems. In many cases, it is assumed that contingency amounts can be used to cover added scope, and planners seem to forget that the purpose of the contingency amount in the estimate is lack of design definition. Projects run into problems when the contingency amounts are applied inappropriately. During project execution, contingency funds are often inappropriately used to cover project overruns, instead of being applied to and available for their intended purpose (Adams, 2015).

Conceptual Framework

It is pictorial or diagrammatic representation of the relationship that exist between independent variable and dependent variable. In this case project schedule, contract management, resources and government policies are independent.

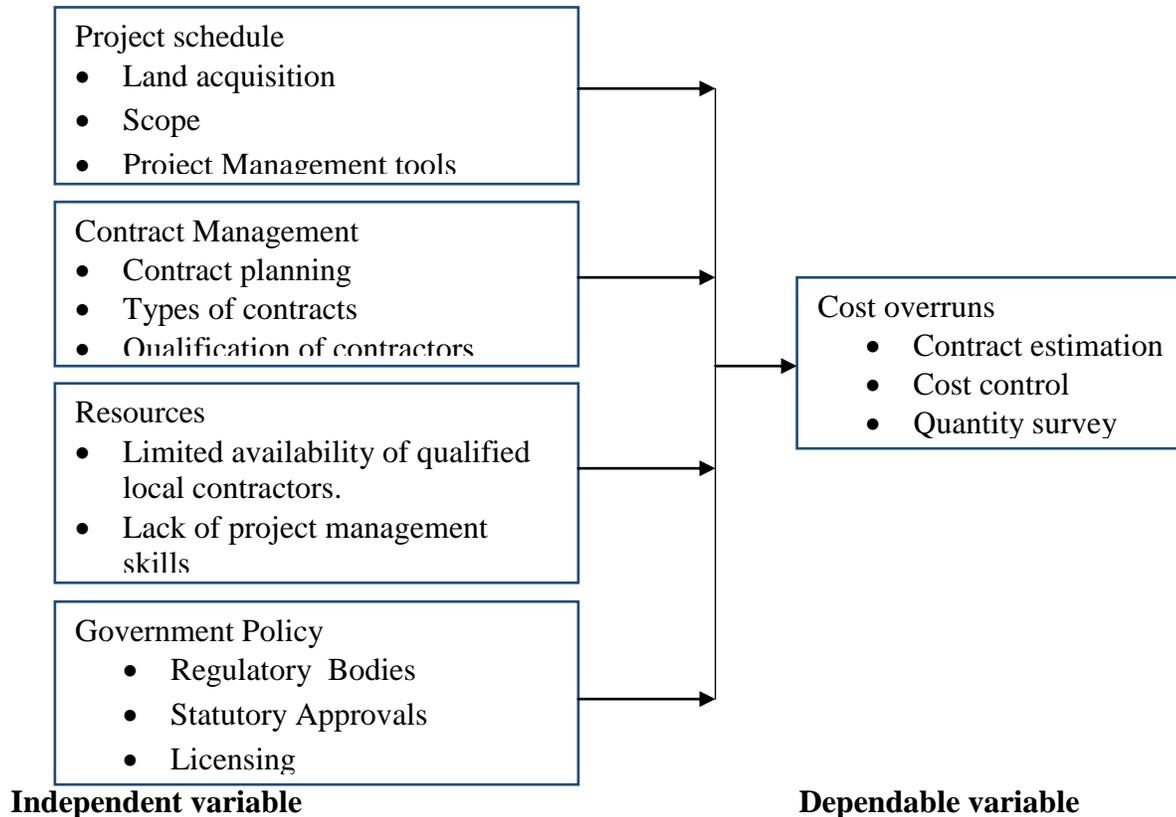


Figure 1: Conceptual framework

Methodology

The study adopted a descriptive research design. The target population was 150 contractors and KeNHA officials. The study applied purposive sampling technique to select a sample size of 110 respondents. The main data collection instrument was the questionnaires which contained both open ended and close ended questions. Descriptive statistics data analysis method was applied to analyze data aided by Statistical Package for Social Sciences (SPSS) to compute response frequencies, percentage mean and standard deviation results. Finally egression model was employed to establish the significance of the independent variables on the dependent variable.

The following multiple regression model was used to test the significance relationship of independent variables against the dependent variable;

$$Y = B_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon_i$$

Where:

- Y=Project Cost Overruns(Dependent Variable)
- X₁ = Project Schedule (Independent Variable)
- X₂ = Contract Management(Independent Variable)
- X₃= Resources (Independent Variable)
- X₄= Government Polices(Independent Variable)

ϵ . = error term

B0 = constant of regression

Results and Discussion

project schedule

The study findings indicated that project schedule affects cost overruns in construction projects since challenges associated with land acquisition; project scope and project management tools delayed project commencement and completion time. These findings were supported by majority of the respondents who agreed that project schedule factors notably; land acquisition; project scope and project management tools led to cost overruns in construction projects. The study results showed that land acquisition had a mean score of 4.208; project scope had a mean score of 4.236 and project management tools had a mean score of 4.111. The study noted that land acquisition process for road construction projects was a difficult process that involved many legal procedures and financial settlement for the affected communities. First the environmental impact assessment had to be first undertaken and its report recommendations be complied with by the road contractors. The local communities' resistance to move out of road reserve and surveyed land led to inter-state disputes that led to much time spent in legal battles and settlement of the affected communities hence lengthening the projects schedule against the planned time. The project scope was also found to be affected by factors such as environmental issues like floods and land disputes settlement process and many projects managers lacked capacity to employ effective projects management tools that helped to keep project schedule hence leading to increased cases of cost overruns on many road construction projects.

Table 1 Project schedule Mean, Std Deviation and Variance Results

Project schedule	N	Mean	Std. Deviation	Variance
Land acquisition	72	4.208	1.0200	1.040
Scope	72	4.236	1.0547	1.112
Project Management tools	72	4.111	.9124	.833
Average	72	4.185	0.9957	0.995

Contract Management

The study identified that contract management led to cost overruns in many road construction projects. It was noted that contract planning; types of contracts and qualification of contractors led to contract management challenges that led to projects cost overruns. The study findings indicated that contract planning had a mean score of 4.361; types of contracts had a mean score of 4.472 and qualification of contractors had a mean score of 4.333. These implied that majority of the respondents agreed that all the contract management factors notably; contract planning; types of contracts and qualification of contractors affected cost overruns in construction projects. It was also noted that poor contract planning methods; award of road projects to unqualified contractors resulted of projects cost overruns and this affected successful completion of road construction projects in Kenya. The study further noted that contractors track performance, financial capacity and technical capacity were not given much emphasis during the selection of main contractor to undertake the construction project. These were found to influence selection of contractors with limited capacity to successfully undertake various road

construction projects hence leading to poor projects management methods that resulted to cost overruns and projects delay.

Table 2 Contract Management Mean, Std Deviation and Variance Results

Contract Management	N	Mean	Std. Deviation	Variance
Contract planning	72	4.361	.6982	.487
Types of contracts	72	4.472	.7115	.506
Qualification of contractors	72	4.333	.6500	.423
Average	72	4.388	0.686	0.472

Resources

Findings from the study showed that resources led to high rate of cost overruns in many road construction projects. The study revealed that many road construction companies experienced cost overruns challenges due to limited availability of qualified local contractors; lack of project managers with professional project management skills and shortage of construction equipment's among many local contractors. The study results showed that limited availability of qualified local contractors had a mean score of 4.361; lack of project management skills had a mean score of 4.541 and shortage of equipment had a mean score of 4.402. These findings indicated that majority of the respondents agreed that all the resources factors notably; limited availability of qualified local contractors; lack of project management skills and shortage of equipment affected cost overruns in construction projects. The study further identified that many local contractors lacked good engineering equipment's and qualified project implementation staff that capable of executing complex infrastructure projects. It was noted that there are few companies in Kenya with desired experience of executing large and complex infrastructure projects. Availability of these contractors was found to be a challenge as their order books are already overbooked and this sometimes influenced award of road construction contracts to unqualified contractors with no sufficient and desired resources to execute major road projects and these led to cost overruns due to resources challenges.

Table 3: Resources Mean, Std Deviation and Variance Results

Resources	N	Mean	Std. Deviation	Variance
Limited availability of qualified local contractors.	72	4.361	.6777	.459
Lack of project management skills	72	4.541	.6036	.364
Shortage of equipment	72	4.402	.5216	.272
Average	72	4.435	0.6010	0.365

Government Policies

The study noted that government policies influence cost overruns in many road construction projects. The study identified that regulatory bodies; statutory approvals and licensing procedures for road construction companies took a long time than anticipated and this led to increased project cost hence leading to cost overruns. Findings from the study showed that regulatory bodies had a mean score of 4.361; statutory approvals had a mean score of 4.541 and licensing procedures had a mean score of

4.402. The study findings thus indicates that majority of the respondents agreed that all the government policies notably; regulatory bodies; statutory approvals and licensing procedures caused cost overruns in construction projects. The study noted that in road construction sector, the existing regulatory bodies; and licensing procedures of road construction companies fails to set high standards of contractors' qualifications and these leads to award of tenders to unqualified road contractors who lack projects management skills hence leading to increased cases of cost overruns in their respective road construction projects.

Table 4: Government policies Mean, Std Deviation and Variance Results

Government policies	N	Mean	Std. Deviation	Variance
Regulatory Bodies	72	4.305	.6637	.441
Statutory Approvals	72	4.416	.5993	.359
Licensing	72	4.430	.4986	.249
Average	72	4.384	0.5872	0.349

Cost Overruns

The study sought to determine the factors that determine cost overruns in construction projects. From the study results, contract estimation had a mean score of 4.250; cost control had a mean score of 4.388; quantity survey had a mean score of 4.458 and land tenure had a mean score of 4.250. The study findings thus indicated that majority of the respondents agreed that all the cost overruns factors notably; contract estimation; cost control; quantity survey and land tenure determined cost overruns in construction projects.

Table 5: Cost Overruns Mean, Std Deviation and Variance Results

Cost Overruns	N	Mean	Std. Deviation	Variance
Contract estimation	72	4.250	.6660	.444
Cost control	72	4.388	.6403	.410
Quantity survey	72	4.458	.5550	.308
Land Tenure		4.250	.6660	.444
Average	72	4.336	0.6318	0.401

Regression Analysis

Regression analysis results in table 6 showed that the regression model coefficient of determination (R²) is 0.661 and R is 0.815 at 0.05 significance level. This is an indication that the four independent variables notably; (X₁) project schedule; (X₂) contract management; (X₃) resources and (X₄) government policies are significant in affecting the dependent variables Y= cost overruns in construction projects. The coefficient of determination thus indicates that 66.1% of the variation on cost overruns in construction projects is affected by the four independent variables. The remaining 33.9% of the variation on cost overruns in construction projects can be explained by other variables not included in the model. This shows that the model has a good fit since the value is above 70%. This concurred with Graham (2002) that (R²) is always between 0 and 100%: 0% indicates that the model

explains none of the variability of the response data around its mean and 100% indicates that the model explains all the variability of the response data around its mean. In general, the higher the (R²) the better the model fits the data.

Table 6 Regression Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.813 ^a	.661	.636	.35727

a. Predictors: (Constant), X5, X2, X3, X1, x4

The study further used one way Analysis of Variance (ANOVA) in order to test the significance of the overall regression model. Green & Salkind (2003) posits that one way Analysis of Variance helps in determining the significant relationship between the research variables. Table 2 thus presents the results of ANOVA test which reveal that all the independent variables notably; (X₁) project schedule; (X₂) contract management; (X₃) resources and (X₄) government policies have a significant effect on the dependent variables Y= cost overruns in construction projects. Table 4.10 shows that the P value is 0.00 which is less than 5% level of significance and the high value of F (19.855) with significant level of 0.00 is large enough to conclude that all the independent variables significantly affect cost overruns in construction projects.

Table 7 Analysis of Variance (ANOVA).

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.450	5	3.290	25.776	.000 ^b
	Residual	8.425	66	.128		
	Total	24.875	71			

a. Dependent Variable: Y

b. Predictors: (Constant), X2, X3, X1, x4

Table 8 presents the results of the test of beta coefficients which indicates that the significant effect of each independent variables on dependent variable. As presented in table 3, (X₁) project schedule coefficient of 0.283 was found to be positive at significant level of 0.004 and this indicates that project schedule significantly affect cost overruns in construction projects. (X₂) contract management coefficient of 0.134 was found to be positive at significant level of 0.005 and this indicates that contract management significantly affects cost overruns in construction projects. (X₃) resources coefficient of 0.816 was found to be positive at significant level of 0.000 and this indicates that resources significantly affect cost overruns in construction projects. Lastly, (X₄) government policies coefficient of 0.484 was found to be positive at significant level of 0.000 and this indicates that government policies significantly affect cost overruns in construction projects. These the results of all coefficients of independent variables thus demonstrates that all the independent variables significantly affects cost overruns in construction projects but the relative importance of each independent variable was different. However, since the significance values were less than 0.005, all the coefficients were significant and thus the regression equation was;

$$Y = 1.251 + 283X_1 + 134X_2 + 816X_3 + 484X_4 + e$$

Table 8 Regression Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.251	.355		3.522	.001
X1	.283	.103	.299	2.742	.004
X2	.134	.089	.151	1.506	.005
X3	.816	.095	.848	8.557	.000
X4	.484	.185	.578	2.612	.001

a. Dependent Variable: Y

The regression model implies that, a unit increase in project schedule leads to a 0.283 increase in cost overruns in construction projects; a unit increase in contract management leads to a 0.134 increase in cost overruns in construction projects; a unit increase in resources leads to a 0.816 increase in cost overruns in construction projects and a unit increase in government policies leads to a 0.484 increase in cost overruns in construction projects. The study results thus demonstrated that resources followed by government policies; then project schedule and lastly contract management affects cost overruns in construction projects. These findings relate to findings by Chinn and Kramer (2010) that the major factors that lead to cost overrun in many construction projects includes resources availability and allocation, government policies, contract management methods and project schedule.

Conclusions

Based on the study findings, the study concluded that the major factors affecting cost overruns in construction projects in Kenya includes; project schedule; contract management; resources and government policies. The study concluded that project schedule leads to cost overruns in construction projects due to land acquisition problems; project scope challenges and application of poor project management tools by many road contractors. Land acquisition often requires cutting of trees for space creation, destruction of water bodies, etc. which leads to soil erosion and land degradation affecting the local environment and the lifestyle of people.

The study also concluded that contract management led to cost overruns in many road construction projects due to poor contract planning; types of contracts and lack of qualified contractors with capacity to undertake major road construction projects. The use of poor contract planning methods by many contractors and award of road projects to unqualified contractors resulted of projects cost overruns and this affected successful completion of road construction projects in Kenya. Contract management is the process of systematically and efficiently managing contract creation, execution and analysis for maximising operational and financial performance and minimising risk.

The study then concluded that resources lead to high rate of cost overruns in many road construction projects. Many road construction companies experienced cost overruns challenges due to limited availability of qualified local contractors; lack of project managers with professional project management skills and shortage of construction equipment's among many local contractors. Many local contractors lacks good engineering equipment's and qualified project implementation staff that capable of executing complex infrastructure projects and these led to cost overruns due to resources challenges.

The study further concluded that government policies influence cost overruns in many road construction projects. Many road regulatory bodies fail to enforce policies on road construction; delay in statutory approvals and lengthy licensing procedures for road construction companies leads to increased project cost hence leading to cost overruns. The study finally concluded that cost overruns in construction projects is determined by; contract estimation; cost control; quantity survey and land tenure determined cost overruns in construction projects.

Recommendations

As a measure to control cost overruns in construction projects in Kenya, the study gave the following recommendations. To ensure that project schedule does not lead to cost overruns in construction projects. The projects management staff should liaise with the government and the affected communities and institutions to speed up the land acquisition process. Project scope should be clearly defined and effective project risk management strategies employed. The land acquisition process and settlement of legal land disputes in settlement of the affected communities should be shortened through community dialogues and effective undertaking and implementation of environmental impact assessment reports recommendations.

To improve on contract management, projects managers in construction companies should embrace effective contract planning methods; award proper types of contracts to relevant qualified contractors and select only qualified contractors with capacity to undertake major road construction projects. Effective contract management should be implemented through systematically and efficiently managing contract creation, execution and analysis for maximising operational and financial performance and minimising risk. Contractors past track performance, financial capacity and technical capacity should be used and used as the key criteria during award of construction tenders.

To improve on resources and eliminate cases of cost overruns in construction projects. Project managers should source qualified local contractors; award road construction tenders to construction companies with project managers with professional project management skills and look the capacity of contractors in terms of construction equipment's. Many local contractors should train their staff on good engineering and acquire modern construction equipment's through leasing, hiring and engage in subcontracting activities. Local contractors should also acquire qualified project implementation staffs that are capable of executing complex infrastructure projects.

The government should enact and enforce effective government policies that help in promotion of construction sector in the country. The road regulatory bodies should enforce policies on road construction and prosecute contractors who fail to complete projects in time. The government should speed up statutory approvals and lengthy licensing procedures for road construction companies should be reduced. The study finally recommend that a similar study should be undertaken in other road construction organizations in order to find out if similar factors leads to cost overruns. Further studies should also be carried out to identify other factors affecting cost overruns in construction projects.

Suggestions for Further Studies

The study determined factors affecting cost overruns in construction projects; a case of Kenya National Highways Authority. The study looked on how the project schedule affects cost overruns in construction projects; explored the effects of contract management on cost overruns in construction

projects; examined how resources affect cost overruns in construction projects and established how government policies influence cost overruns in construction projects. Similar study should be undertaken in other construction organizations in order to find out if similar factors leads to cost overruns. Further studies should also be carried out to identify other factors affecting cost overruns in construction projects.

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