# Time and Cost Overruns in Road Construction Projects in Kenya Under Kenya National Highways Authority

***Wainaina Gituro***
*(wainainagituro@yahoo.com)*
*and*
***Stanley Mwawasi***
*(Stanley.mwawasi@kenhaco.ke)*

## Abstract

Many projects in developing countries encounter considerable time and cost overruns, fail to realize their intended benefit or are even totally terminated and abandoned before or after their completion. This paper sought to investigate the factors that contribute to time and cost overruns in road construction projects in Kenya and was guided by the following specific objectives; to identify factors influencing road construction time and cost overruns in Kenya and to establish the relative importance of these factors. The paper utilized both primary and secondary data and the target population consisted of 24 successfully completed road projects undertaken by KeNHA in the last three fiscal years, where 10 projects was taken. A 4-point Likert scale was used to measure the output of each item answered by the participants, whereas Principal Component Analysis (PCA) was applied to extract the factors, which were increase in scope of work, delayed payments to the contractor, poor cost control, foreign exchange rate fluctuations, poor or inadequate specifications in the contract, and unpredicted weather. The Relative Importance Indicator (RII) was used to measure the likelihood or recurrence of the factors from the respondent's point of view and 35 variables had a high possibility of recurring in future similar projects. At macro-level, the paper recommends that policy makers both at county and national level formulate strategies geared towards mitigating the impact of these factors given the fact that most of them have a high chance of recurring in future road projects. At the micro-level, contractors, consultancies, and other stakeholders need to do proper definition of project scope and apply modern project management tools given the fact that increase in scope of work was a lead factor contributing to time and cost overruns on road projects.

**Keywords**: *Cost and time overruns, project implementation, project management*

## 1. Introduction

The increasing complexity of infrastructure projects and the environment within which they are constructed place greater demand on construction managers to deliver projects on time, within planned budget and with high quality. In many developing countries, major construction activities account for about 80 percent of total capital assets, 10 percent of their Gross Domestic Product (GDP), and more than 50 percent of the wealth invested in fixed assets. In addition, the industry provides high employment opportunity, probably next after agriculture (Ofori, 2006).

Despite the construction industry's significant contribution to the economy of developing countries and the critical role it plays in those countries development, the performance of the industry still remains generally low (Enshassi, 2008). Studies over the past 20 years reveals a trend of rising cost of construction input resources (Osei-Tutu, 2008) and this trend is expected to continue because the factors responsible for the increased cost trend remain the same. In Africa, the combined prices of labour and materials have increased by 1,229 percent between 1997 and 2010 (Ghana Statistical Services, 2010). According to Idoko (2008), many projects in developing countries encounter considerable time and cost overruns, fail to realize their intended benefit or even are totally terminated and abandoned before or after their completion. Moreover, the development of the construction industry in developing countries generally lags far behind from other industries in those countries and their counter parts in developed nations. Generally, construction industry in developing countries fails to meet expectations of governments, clients and society as a whole (Ofori, 2006; & Jekale, 2004).

In Kenya, major road projects have a history of problems; cost overruns, delays, failed procurement, or unavailability of private financing is common yet most overruns are foreseeable and avoidable with the right legal and institutional frame works. Researches on construction projects in some developing countries indicate that by the time a project is completed, the actual cost exceeds the original contract price by about 30 percent (Bruland & Mahamid, 2011). Risk is also under-managed in the later stages of infrastructure projects, destroying a significant share of their value. Apart from causing budget overruns, it also results in uncertain cost-benefit for decision-making (Jenpanitsub, 2011).

Cost overrun of transport projects is one of the most important problems in transport planning. Apart from causing budget overruns, it also results in uncertain cost-benefit for decision-making. Past empirical findings confirms that cost overrun problem is a global phenomenon and the average cost overruns in rail projects are always higher than in road projects. Although, risk in construction has been the object of attention because of time and cost overruns associated with construction projects, few studies have focused on factors leading to construction risks and failure of road projects in Kenya, hence this paper.

Time overrun is defined as the extension of time beyond planned completion dates traceable to the contractors (Kaming, Olomolaiye, Holt & Harris, 1997). Delays are incidents that impact a project's progress and postpone project activities; delay causing incidents may include weather delays, unavailability of resources, and design delays. In general, project delays occur as a result of project activities that have both external and internal cause and effect relationship (Vidalis, Allinson & Hayes, 2002). On the other hand, Choudhry (2004) and Chan (2001) defined the time overrun as the difference between the actual completion time and the estimated completion time measured in number of days. Project delays are those that cause the project completion date to be delayed (Al- Gahtani & Mohan 2007).

Lo, Fung and Tung (2006) define delay as the slowing down of work without stopping construction entirely and that can lead to time overrun either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project.

Syed, Azhar, Castillo and Kappagantula, (2002) classify delays into non-excusable delays, excusable non-compensable delays, excusable compensable delays and concurrent delays. Non-excusable delays are delays, which the contractor either causes or assumes the risk for. Excusable non-compensable delays are delays caused by factors that are not foreseeable, beyond the contractor's reasonable control and not attributable to the contractor's fault or negligence. Compensable excusable delays are excusable delays, suspensions, or interruptions to all or part of the work caused by an act or failure to act by the owner resulting from owner's breach of an obligation, stated or implied, in the contract. Concurrent delays occur when both owner and the contractor are responsible for the delay.

Causes of delays have been identified in various parts of the world such as Malasyia, Saudi Arabia, Jordan, Kuwait, Hong Kong and Thailand (Sambasivan & Soon, 2007; Al-Kharashi & Skitmore, 2008; Al-Momani, 2000; Kumaraswamy & Chan, 1998; Noulmanee, Wachirathamrojn, Tantichattanont & Sittivijan, 1999). The results reveal that there are differences and similarities as to the causes of delays. A degree of change can be, and to a certain extent should be, expected in construction, as it is difficult for clients to visualize the end product that they procure. Cost overrun is also known as "change orders". Cost overrun is defined as the deviation from the amount agreed, as per the contract sum, divided by the agreed original amount of the contract (Zawawi, Azman, Shamil & Kamar, 2010).

The KeNHA is responsible for the management, development and maintenance of national roads. The Kenya Roads Act, 2007 Section 22(1) 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. The 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 KeNHA is an autonomous road agency, responsible for the management, development, rehabilitation and maintenance of international trunk roads linking centres of international importance and crossing international boundaries or terminating at international ports (class A road), national trunk roads linking internationally important centres (class B roads), and primarily roads linking provincially important centres to each other or two higher-class roads (class C roads). Besides roads, KeNHA has 13 weighbridges, which are used to enforce the traffic regulations in the ferrying of goods across the country and the greater East African region.

The Kenya Vision 2030 aims to transform Kenya to a middle-income country by 2030. The Kenyan 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. Financial resources are so scarce in developing countries like Kenya, hence time and cost related issues in Kenya's construction industry are sensitive issues.

A number of studies have been carried out on construction time and cost overruns. Kagiri (2005) in his study of time and cost overruns in power projects in Kenya outlined underlying factors that contribute to time and cost overruns. He identified eight underlying factors including; improper project planning, resource planning, interpretation of requirements, works definition, timeliness, government bureaucracy, and risk allocation as having significantly contributed to time and cost overruns in the projects. While his study provided vital insights into the subject of time and cost overruns, it was conducted in a different study context.

Mahamid (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 fell short of investigating the cost drivers responsible for the deviation between actual and estimated cost.

Studying the significant factors that cause delay of construction projects in Malaysia, Alaghbari, Kadir, Salim & Ernawati (2007) used four categories for analysis, namely contractor, consultant, owner and external. As far as causes related to contractor actions were concerned; financial problems, shortage of materials and poor site management were ranked among the top three. Owner causes included delayed payments, slow decision-making and contract scope changes. The top three consultant causes were poor supervision, slowness to give instructions and lack of experience. Finally, external causes of delay included shortage of materials, poor site conditions and lack of equipment and tools in the market.

Anzinger and Kostika (2015) carried out a cross-sect oral analysis of large projects in Germany based on a database of 170 cases (119 finished, 51 unfinished projects) of projects between 1960 and 2014, and found out that there were significant variations in infrastructure project outcomes across sectors in Germany. The energy and Information and Communication Technology (ICT) sectors especially were facing significant cost overruns, with 136 percent and 394 percent on average for finished projects, respectively. In building and transportation, average cost overruns are lower, at 44 percent and 33 percent. By selecting specific examples, and by drawing attention to the most successful and most unsuccessful infrastructure projects, the study summarized possible explanations for this variation and offered recommendations for better management of large-scale public infrastructure projects.

While a-lot of literature exists on construction time and cost overruns, literature on construction time and cost overruns is limited to developed world with just a few focusing on Kenya. Despite the fact that road project time and cost overruns create a significant financial risk to the government with a history of road construction full of projects that were completed with significant cost overruns, literature on the road construction time and cost overruns in Kenya remains scanty. The paper aimed at answering the following research question; what factors cause time and cost overruns in road construction projects in Kenya?

## 2. Theoretical Framework

This study will be informed by the following theories; Construction Management Theory (CMT), Transformation-Flow-Value Theory (TFVT) and Planning Theory (PT). Advanced by Milan and Bennett (2012), CMT provides a "rigorous theory" based on a "tool kit of concepts and relationships" that will improve the efficiency and quality of "construction products". The distinction between the conventional approach of CMT, where contractors deliver projects, and the idea of companies producing a product is an important element in the thinking behind the theory proposed here. Following that intention they identify and define the concepts needed to understand CMT. Radosavljevic and Bennett (2012) self-consciously developed their theory without drawing on general management theories, rather wanting to base their ideas on construction industry projects and practice, which makes these definitions extremely important to their CMT and to the understanding of that theory.

The CMT is critical in road construction project management since it focuses on the concepts, construction products, processes, organizations, interactions, relationships, and learning and performance that constitute the successful project management principles. The theory, thus presents a model by which project managers can put in place critical success factors including communication, feedback lops, and how well established relationships are (called internal) or not (called boundary relationships).

Application of new production philosophy to construction production theory has developed into TFVT (Koskela, 2000). This is a theory that draws on the management literature and history as its base, and its origins are covered in Koskela (2000), where the roots of Lean Construction (LC) in production theory are explored. Koskela, Ballard and Tommelein (2002) argued that what is needed is production theory and related tools that fully integrate the transformation, flow and value concepts. As a first step toward such integration, we can conceptualize production simultaneously from these three points of view however; the ultimate goal should be to create a unified conception of production instead.

The relevance of TFVT to road project management emanates from the fact that ideas and methods of LC in particular offer an alternative to management theories. There are three reasons apart from the usefulness of conceptualizing production processes in a discipline traditionally preoccupied with practical matters. First, LC was prior to Radosavljevic and Bennett (2012), the only theory of production to have been developed specifically for the construction industry. Therefore, it provides insights into the range of processes that are involved, based on theory, that lead to propositions that can be tested by application to building and construction projects. The many case studies that have been published about LC over the years are all tests of the theory and practice of LC. These tests now add to a substantial body of evidence for the effectiveness of LC in a wide range of settings.

The term last planner refers to the hierarchical chain of planners, where the last planner acts at the interface to execution. Thus, this method concentrates on the detailed planning just before execution, rather than the whole planning process. The method of last planner distinguishes planned tasks according to can, should and will modalities. The tasks pushed from the higher planning levels belong to the 'should' category. In look-ahead planning (with a time horizon of three to four weeks), the prerequisites of up-coming assignments are actively made ready; they are transferred to the 'can' category. This, in fact is a pull system (Ballard 1999) that is instrumental in ensuring that all the prerequisites are available for the assignments. In conventional project management, the plan pushes tasks to execution; only the 'should' category is recognized.

The PT is relevant to construction project management given the fact that the model enables project managers mitigate the risk of variability propagation to the downstream flows and the tasks reducing the need for large material buffers on site. The last planner effectively combines the control and the improvement to fight back against variability and the waste caused by it. Thus, last planner combines the flow and the transformation view in short term planning, execution and control.

## 3. Research Methodology

This paper adopted a multiple case study; a multiple case study enables exploring differences within and between cases. The goal was to replicate findings across cases and because comparisons will be drawn, it was imperative that the cases were chosen carefully so that similar results across cases could be predicted, or predict contrasting results based on a theory (Yin, 2003). Examples of studies that have employed multiple case studies include Campbell and Ahrens (1998) 'Innovative Community Services for Rape Victims: An Application of Multiple Case Study Methodology and Kagiri (2005), 'Time and Cost Overruns in Public Sector Power Projects in Kenya: A Case Study of Kenya Electricity Generating Company Limited'. Tripsas and Gavetti's (2000) in-depth case study of the Polaroid Corporation. Case studies gives not only the possibility to describe certain relationships, but also to test theory for a special setting.

The target population consisted of 24 successfully completed road projects undertaken by KeNHA in the last three fiscal years (See Appendix I). A 40 percent random sample of 10 projects was taken from the sampling frame for the study. Three respondents were selected from each of the projects consisting of the project manager, a representative from the consultant agency and the main contractor. The selection was based on the time available for conducting the research work and the reliability of the respondents, so that the overall research work would indicate the reality of the situation.

Both secondary and primary data were utilized in the paper; primary data was collected using a semi-structured questionnaire to identify factors influencing road construction time and cost overruns in Kenya. Part A consisted of open-ended questions aimed at obtaining demographic information of the respondents and part B, respondents were required to identify factors, which they perceived to have contributed to time and cost overruns by responding to a Likert scale (1 = no extent, 2 = a very small extent; 3 = large extent; 4 = very large extent). Part C of the questionnaire aimed at covering emerging variables that may have risen during the study.

Secondary data was obtained from annual corporate reports, KeNHA database, contract documents, claims reports, project completion reports, expenditure databases, project progress reports, and donor agency reports on various road projects under KeNHA. Secondary data was used to evaluate magnitude of time and cost overruns and relationship between time and cost overruns and the successful completion of road construction projects undertaken by KeNHA. The data was analysed using descriptive statistics and PCA.

## 4. Results and Discussion

The first analysis to be done was the extent of contribution to cost and time overruns that involved computing mean and standard deviation. The calculated mean and standard deviations to the extent of contribution of the causes of delay and cost are shown in Table 1 below. The questionnaires sent to the respondents had listed 57 causes of time and cost overruns in road construction projects. From Table 1, poor or inadequate specifications in the contract had the highest mean of 3.68 implying that it affects the time and cost overrun to a large extent based on the Likert scale. The same findings indicate that poor organizational communication systems had the lowest mean of 1.71 and standard deviation of 0.15 indicating that it affects time and cost overruns to a small extent. Since the response to each statement varied from 1 to 4, a mean score of 2.4 (60 percent) was considered to affect cost and time. Based on this criteria, poor or inadequate specifications in the contract; delayed payments to contractors; employer cash flow problems; increase in scope of work; inaccuracy of bill of quantities; inadequate planning by the client; relocation of services; underestimation of project durations; unforeseen ground conditions; unpredictable weather; fluctuations in material, labour and plant costs; foreign exchange rate fluctuations; delay of access to site; poor resource planning by contractor; increase in scope of work; and poor cost control mechanisms were causes of delay in cost and time.

Other factors included planning capabilities and effective resource coordination, planning capabilities and effective resource coordination, contractor cash flow problems, contractor's lack of professional project management skills, environmental challenges, poor site management, in-appropriate organizational structure, government bureaucracy, lack of adequate scope and works specification, delays in approvals by engineer, dispute between key stakeholders, ambiguous client budgets, inadequate supervision of road projects, political interference, poor construction methods/approaches, low labour productivity, slow speed of decision-making, ability of the organization to manage risk, risk allocation, lack of sufficient contractor experience, poor contract management, cost increase due to environmental restrictions, poor sub-contracting, shortage of materials, finance and payment of completed works, procurement obstacles, delays in release of drawings, complex interfaces of various, work packages, lack of top management support, labour disputes, poor relationship between the lead engineers/managers and the contractor, inappropriate client organizational structure, poor safety measures, corruption, lack of adequate quality management systems, poor quality control, length of the project, poor infrastructure, for example telecommunications, access roads, lack of motivation among the project team managers, client relations with financier, poor interpretation of requirements, engineer's lack of adequate professional project management skills and poor organizational communication systems.

The standard deviation, varied between 0.79 and 1.21, for response scale of 1 to 4 a standard deviation of more than 1 was considered high. Twenty-eight variables (49.12 percent) had standard deviations of more than 1. This variability can be attributed to the degree of variation of the occurrences of the causes of time and cost overruns in the projects, technical and managerial capacity of the project's team.

**Table 1: Variables Extent of Contribution**

| Variables | Sample Size | Mean | Standard Deviation |
|---|---|---|---|
| Poor or inadequate specifications in the contract | 10 | 3.6786 | 0.04338 |
| Delayed payments to contractors | 10 | 3.2857 | 0.85449 |
| Employer cash flow problems | 10 | 3.1071 | 0.99403 |
| Increase in scope of work | 10 | 3.0357 | 0.99934 |
| Inaccuracy of bill of quantities | 10 | 2.8571 | 1.17739 |
| Inadequate planning by the client | 10 | 2.8571 | 1.00791 |
| Relocation of services | 10 | 2.7143 | 1.15011 |
| Underestimation of project durations | 10 | 2.7143 | 1.18187 |
| Unforeseen ground conditions | 10 | 2.6786 | 1.09048 |
| Unpredictable weather | 10 | 2.5714 | 1.06904 |
| Fluctuations in material, labour and plant costs | 10 | 2.5714 | 0.95950 |
| Foreign exchange rate fluctuations | 10 | 2.5357 | 1.03574 |
| Delay of access to site | 10 | 2.5357 | 1.13797 |
| Poor resource planning by contractor | 10 | 2.5357 | 0.88117 |
| Increase in scope of work | 10 | 2.5000 | 1.17063 |
| Poor cost control mechanisms | 10 | 2.4286 | 1.03382 |
| Planning capabilities and effective resource coordination | 10 | 2.3929 | 0.91649 |
| Contractor cash flow problems | 10 | 2.3929 | 1.16553 |
| Contractor’s lack of professional project management skills | 10 | 2.3571 | 1.06160 |
| Environmental challenges | 10 | 2.3214 | 1.09048 |
| Poor site management | 10 | 2.2857 | 1.01314 |

| Variables | Sample Size | Mean | Standard Deviation |
|---|---|---|---|
| In appropriate organizational structure | 10 | 2.2857 | 0.93718 |
| Government bureaucracy | 10 | 2.2857 | 0.97590 |
| Lack of adequate scope and works specification | 10 | 2.2500 | 0.96705 |
| Delays in approvals by engineer | 10 | 2.2143 | 0.99469 |
| Dispute between key stakeholders | 10 | 2.2143 | 1.19744 |
| Ambiguous client budgets | 10 | 2.2143 | 0.95674 |
| Inadequate supervision of road projects | 10 | 2.1786 | 1.12393 |
| Political interference | 10 | 2.1786 | 1.12393 |
| Poor construction methods/ approaches | 10 | 2.1429 | 1.11270 |
| Low labour productivity | 10 | 2.1429 | 1.04401 |
| Slow speed of decision-making | 10 | 2.1429 | 1.20844 |
| The ability of the organization to manage risk | 10 | 2.1429 | 0.89087 |
| Risk allocation | 10 | 2.1071 | 0.78595 |
| Lack of sufficient contractor experience | 10 | 2.1071 | 1.10014 |
| Poor contract management | 10 | 2.1071 | 1.06595 |
| Cost increase due to environmental restrictions | 10 | 2.0357 | 0.92224 |
| Poor sub-contracting | 10 | 2.0357 | 0.99934 |
| Shortage of materials, finance and payment of completed works | 10 | 2.0000 | 0.98131 |
| Procurement obstacles | 10 | 1.9643 | 1.03574 |
| Delays in release of drawings | 10 | 1.9643 | 1.07090 |
| Complex interfaces of various work packages | 10 | 1.9286 | 1.08623 |
| Lack of top management support | 10 | 1.8929 | 0.95604 |

| **Variables** | **Sample Size** | **Mean** | **Standard Deviation** |
|---|---|---|---|
| Labour disputes | 10 | 1.8929 | 0.99403 |
| Poor relationship between lead engineers/managers and contractor | 10 | 1.8929 | 0.95604 |
| Inappropriate client organizational structure | 10 | 1.8571 | 0.93152 |
| Poor safety measures | 10 | 1.8571 | 0.80343 |
| Corruption | 10 | 1.8571 | 0.97046 |
| Lack of adequate quality management systems | 10 | 1.8571 | 0.80343 |
| Poor quality control | 10 | 1.8214 | 1.02030 |
| Length of the project | 10 | 1.7857 | 0.95674 |
| Poor infrastructure, for example telecommunications, access roads | 10 | 1.7857 | 0.91721 |
| Lack of motivation among the project team managers | 10 | 1.7857 | 0.87590 |
| Clint relations with financier | 10 | 1.7500 | 1.04083 |
| Poor interpretation of requirements | 10 | 1.7143 | 0.80999 |
| Engineer lack of adequate professional project management skills | 10 | 1.7143 | 1.08379 |
| Poor organizational communication systems | 10 | 1.7143 | 0.80999 |

The relative importance to cost and time overruns was applied to analyse part B of the questionnaire where respondents were required to rate the chances of occurrence for each variable. The Relative Importance Index (RII) was computed as:

$$RII = \frac{\Sigma w}{A*N}$$

where:
w = weighting as assigned by each of the respondent in a range of 1 to 3, where 1 implied "low", 2 implied "medium" and 3 implied "high";
A = highest weight (3);
N = total number in the sample

The RII indicator measures the likelihood or recurrence of the variable from the respondent's point of view. The index was, therefore be used to determine the rank of each variable and the results are shown in Table 2 below.

By applying a criterion of over 60 percent or RII mean score of 1.8 to identify variable that had higher rating for occurrence, in appropriate organizational structure, unforeseen ground conditions, employer cash flow problems, poor sub-contracting, increase in scope of work, inadequate planning by the client, poor cost control mechanisms, lack of sufficient contractor experience, increase in scope of work, contractor cash flow problems, length of the project, unpredictable weather, underestimation of project durations, delayed payments to contractors, inaccuracy of bill of quantities, poor resource planning by contractor, relocation of services, shortage of materials, finance and payment of completed works, fluctuations in material, labour and plant costs, poor relationship between the lead engineers/managers and the contractor, corruption, political interference, poor contract management, dispute between key stakeholders, cost increase due to environmental restrictions, environmental challenges, government bureaucracy, Poor infrastructure, for example telecommunications, access roads, poor safety measures, poor or inadequate specifications in the contract, low labour productivity, lack of top management support, foreign exchange rate fluctuations, poor site management and ability of the organization to manage risk were seen as the most frequent variables to occur during implementation of similar road projects in Kenya.

**Table 2: Relative Importance Indices for the Variables**

| **Relative Importance** | **Sample Size** | **Relative Importance Indicator** |
|---|---|---|
| In appropriate organizational structure | 10 | 0.762 |
| Unforeseen ground conditions | 10 | 0.702 |
| Employer cash flow problems | 10 | 0.810 |
| Poor sub-contracting | 10 | 0.714 |
| Increase in scope of work | 10 | 0.619 |
| Inadequate planning by the client | 10 | 0.571 |
| Poor cost control mechanisms | 10 | 0.655 |
| Lack of sufficient contractor experience | 10 | 0.583 |
| Increase in scope of work | 10 | 0.679 |
| Contractor cash flow problems | 10 | 0.690 |
| Length of the project | 10 | 0.583 |
| Unpredictable weather | 10 | 0.667 |
| Underestimation of project durations | 10 | 0.714 |
| Delayed payments to contractors | 10 | 0.667 |
| Inaccuracy of bill of quantities | 10 | 0.643 |
| Poor resource planning by contractor | 10 | 0.619 |

| **Relative Importance** | **Sample Size** | **Relative Importance Indicator** |
| --- | --- | --- |
| Relocation of services | 10 | 0.929 |
| Shortage of materials, finance and payment of completed works | 10 | 0.643 |
| Fluctuations in material, labour and plant costs | 10 | 0.548 |
| Poor relationship between the lead engineers/managers and the contractor | 10 | 0.619 |
| Corruption | 10 | 0.940 |
| Political interference | 10 | 0.560 |
| Poor contract management | 10 | 0.560 |
| Dispute between key stakeholders | 10 | 0.595 |
| Cost increase due to environmental restrictions | 10 | 0.464 |
| Environmental challenges | 10 | 0.714 |
| Government bureaucracy | 10 | 0.643 |
| Poor infrastructure, for example telecommunications, access roads | 10 | 0.786 |
| Poor safety measures | 10 | 0.571 |
| Poor or inadequate specifications in the contract | 10 | 0.607 |
| Low labour productivity | 10 | 0.571 |
| Lack of top management support | 10 | 0.667 |
| Foreign exchange rate fluctuations | 10 | 0.881 |
| Poor site management | 10 | 0.690 |
| The ability of the organization to manage risk | 10 | 0.667 |
| Engineer's lack of adequate professional project management skills | 10 | 0.821 |
| Lack of adequate scope and works specification | 10 | 0.690 |
| Lack of motivation among the project team managers | 10 | 0.655 |

| **Relative Importance** | **Sample Size** | **Relative Importance Indicator** |
|---|---|---|
| Contractor's lack of professional project management skills | 10 | 0.643 |
| Planning capabilities and effective resource coordination | 10 | 0.738 |
| Poor quality control | 10 | 0.643 |
| Labour disputes | 10 | 0.595 |
| Risk allocation | 10 | 0.762 |
| Poor organizational communication systems | 10 | 0.655 |
| Ambiguous client budgets | 10 | 0.774 |
| Complex interfaces of various work packages | 10 | 0.643 |
| Delays in release of drawings | 10 | 0.583 |
| Clint relations with financier | 10 | 0.536 |
| Procurement obstacles | 10 | 0.738 |
| Inappropriate client organizational structure | 10 | 0.845 |
| Delays in approvals by engineer | 10 | 0.595 |
| Poor construction methods/approaches | 10 | 0.643 |
| Delay of access to site | 10 | 0.786 |
| Poor interpretation of requirements | 10 | 0.595 |
| Lack of adequate quality management systems | 10 | 0.595 |
| Slow speed of decision-making | 10 | 0.595 |

To establish multivariate interrelationships among the variables identified as significant contributors to time and cost overruns, and to further explore the structure of the data, PCA technique was applied. The technique's appropriateness for factor extraction was examined through the Keiser-Meyer-Olkin (KMO) static. Sixteen highly ranked variables based on their extent of contribution indices (mean scores) were selected for factor analysis since their extent of contribution was perceived above “moderate extent” to “very large extent”. Their mean scores approximated to or more than 2.4 (60 percent) on scale of 1 to 4. Before factor extraction, there were 16 eigenvectors, which corresponded to the highly ranked factors causing time and cost overruns. Six principal components were extracted for time and cost overruns causes, which accounted for 75 percent of the total variation in time and cost overruns as shown in Table 3 below.

To achieve factor loadings that were easier to interpret, varimax rotation was done. Table 4 below shows extracted factors and their respective variables that have loadings greater than 0.5. As indicated in Table 4, the variables were then clustered into six most influential factors causing time and cost overruns; increase in scope of work; delayed payments to the contractor; poor cost control; foreign exchange rate fluctuations; poor or inadequate specifications in the contract; and unpredicted weather. Increase in scope of work had the greatest influence on time and cost overruns since it accounted for up to 24.2 percent of the total variation followed by delayed payments to the contractor (15.6 percent). Poor cost control was next accounting for 10.7 percent and foreign exchange rate fluctuations at 10 percent. The fifth most influential factor was poor or inadequate specifications in the contract, which account for 8.1 percent of the variation. Unpredicted weather was the least influential of the six variable variables accounting for 6.5 percent of the total variation in time and cost overruns.

## Table 3: Factor Influencing Time and Cost Overruns

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Percent of Variance | Cumulative Percent | Total | Percent of Variance | Cumulative Percent | Total | Percent of Variance | Cumulative Percent |
| 1 | 3.875 | 24.222 | 24.222 | 3.875 | 24.222 | 24.222 | 2.776 | 17.350 | 17.350 |
| 2 | 2.495 | 15.591 | 39.813 | 2.495 | 15.591 | 39.813 | 2.419 | 15.116 | 32.467 |
| 3 | 1.708 | 10.675 | 50.488 | 1.708 | 10.675 | 50.488 | 1.999 | 12.495 | 44.962 |
| 4 | 1.606 | 10.034 | 60.523 | 1.606 | 10.034 | 60.523 | 1.695 | 10.596 | 55.557 |
| 5 | 1.288 | 8.050 | 68.572 | 1.288 | 8.050 | 68.572 | 1.584 | 9.901 | 65.458 |
| 6 | 1.033 | 6.459 | 75.031 | 1.033 | 6.459 | 75.031 | 1.532 | 9.573 | 75.031 |
| 7 | 0.871 | 5.444 | 80.475 | | | | | | |
| 8 | 0.754 | 4.714 | 85.190 | | | | | | |
| 9 | 0.671 | 4.192 | 89.381 | | | | | | |
| 10 | 0.489 | 3.053 | 92.435 | | | | | | |
| 11 | 0.379 | 2.371 | 94.806 | | | | | | |
| 12 | 0.315 | 1.967 | 96.773 | | | | | | |
| 13 | 0.205 | 1.279 | 98.052 | | | | | | |
| 14 | 0.177 | 1.105 | 99.158 | | | | | | |
| 15 | 0.109 | 0.681 | 99.839 | | | | | | |
| 16 | 0.026 | 0.161 | 100.000 | | | | | | |

Extraction Method: Principal Component Analysis

**Table 4: Factors (Rotated) Influencing Time and Cost Overruns**

| Variables | Component | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Poor or inadequate specifications in the contract | | | | | 0.921 | |
| Delayed payments to contractors | | 0.860 | | | | |
| Employer cash flow problems | | 0.742 | | | | |
| Increase in scope of work | 0.870 | | | | | |
| Inaccuracy of bill of quantities | 0.527 | | | | | |
| Inadequate planning by the client | 0.810 | | | | | |
| Relocation of services | 0.803 | | | | | |
| Underestimation of project durations | | | | | | |
| Unforeseen ground conditions | | 0.703 | | | | |
| Unpredictable weather | | | | | | 0.813 |
| Fluctuations in material, labour and plant costs | | | | 0.695 | | |
| Foreign exchange rate fluctuations | | | | 0.855 | | |
| Delay of access to site | | | 0.753 | | | |
| Poor resource planning by contractor | | | | | | |
| Environmental challenges | | | | | | 0.697 |
| Poor cost control mechanisms | | | 0.803 | | | |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 10 iterations.

## 5. Conclusion

Firstly, the paper was guided by the objective of identifying variables influencing road construction time and cost overruns in Kenya. The paper focused on 57 variables that were deemed to have had significant contribution to time and cost overruns. The analysis of the variables' extent of contribution to overruns gave 16 highly ranked variables based on their extent of contribution indices (mean scores) since their extent of contribution were perceived above "moderate extent" to "very large extent". Their mean scores were approximated to or more than 2.4 (60 percent) on a scale of 1 to 4. According to the findings, poor or inadequate specifications in the contract had the most influence on time and cost overruns. Others were delayed payments to contractors, employer cash flow problems, increase in scope of work, inaccuracy of bill of quantities, inadequate planning by the client, relocation of services, underestimation of project durations, unforeseen ground conditions, unpredictable weather, fluctuations in material, labour and plant costs, foreign exchange rate fluctuations, delay of access to site, poor resource planning by contractor, increase in scope of work, and poor cost control mechanisms.

Secondly, the paper looked the relative importance of the variables causing time and cost overruns in road construction projects. The paper sought to elicit those factors that were considered to have high frequency of occurrence in future on similar project environment. The relative importance of these factors in contributing to time and cost overruns on future projects was achieved through ranking using the extent of contribution index and in particular RII and 35 factors were identified as having a high chance of occurrence.

Thirdly, PCA was applied to categorize the various variables for easy analysis and identify any multivariate inter-relationships among the 16 variables identified as contributors to time and cost overruns. Six factors causing time and cost overruns were extracted; increase in scope of work, delayed payments to the contractor, poor cost control, foreign exchange rate fluctuations, poor or inadequate specifications in the contract, and unpredicted weather. Among these factors, increase in scope of work had the most influence on the time and cost overruns followed by delayed payments to the contractor while unpredicted weather had the least influential of the six factors accounting for the total variation in time and cost overruns in the road projects.

The findings from this paper corroborate past empirical literature on challenges associated with successful implementation of construction projects as outlined in the literature review. Although several factors have contributed to time and cost overruns in road construction projects in Kenya, the most significant of them include unpredictable weather, foreign exchange rate fluctuations, poor cost control mechanisms, increase in scope of work, delayed payments to contractors and poor or inadequate specifications in the contract with increased scope of work having the biggest impact on time and cost overruns in road construction projects. These variables have a high chance of occurrence, hence the need for respective agencies to devise ways of mitigating their impact on future road projects. Increase in scope of work can be considered to have been the lead factor in contributing to time and cost overruns on the road projects. The other factors in order of significant were delayed payments to contractors, poor or inadequate specifications in the contract, foreign exchange rate fluctuations, unpredictable weather and poor cost control mechanisms. Based on this paper, it can be inferred that the variation in time and cost overruns can be attributed to the six factors above and that there exists a positive relationship between these factors and time and cost overruns. From the findings of this paper, it can also be concluded that the occurrence of these factors is contextual, hence will largely depend on the project environment.

The findings of this paper portray challenges facing the implementation of infrastructural projects in Kenya and their economic impact consequently; the paper makes the following recommendations. At macro-level, policy makers both at county and national levels formulate strategies towards mitigating the impact of these factors given the fact that most of them have a high chance of recurring in future road projects. There is need for the line ministries and other agencies allied to infrastructural development in Kenya to establish enabling factors for successful implementation of road and other infrastructural projects in Kenya.

At micro-level, contractors, consultancies, and other stakeholders need to do proper definition of project scope and apply modern project management tools given the fact that increase in scope of work was lead factor in contributing to time and cost overruns on road projects. At the preliminary stages, enough material and time resources should be committed to ensure that adequate feasibility studies are conducted to avoid duality. This will go a long way in ensuring that specifications are well prepared, scope is well-defined, proper materiel and time estimates are done. In addition, geographical and socio-economic risk determinant like weather, inflation and exchange rates should be factored in the initial planning stages.

Having identified the factors causing time and cost overruns in road projects in Kenya, there is need for further research to focus on the critical success factors in the implementation of road construction projects in Kenya. In addition, the fact that the degree to which various factors affects time and cost overruns varies from one road project to the other, calls for further research efforts to identify optimal project management practices and on the possibility of setting benchmarks in Kenya's construction industry. The need for further research into this aspect of project management is further compounded by the fact that operations management practice is a relatively new phenomenon particularly in the building sector in Kenya where most project managers are oriented towards engineering professional and academic qualifications.

## References

Ahamed, F., Zahra, L., & Juma, T. (2010). Causes and effects of cost overrun on public building construction projects in Ethiopia. *International Journal of Project Management*, 9, 365-478

Aibinu, A. A., & Jagboro, G. O. (2002). The effects of construction delays on project delivery in Nigerian construction industry. *International Journal of Project Management,* 20 (6) 593-599

Aiyetan, O. A., Smallwood, J. J., & Shakantu, W. (2008). Influences on construction project delivery time performance. *In the Proceeding of Third Built Environment Conference, Cape Town, South Africa*

Al-Khalil, M. I., & Al-Ghafly, M. A. (1999). Delay in public utility projects in Saudi Arabia. *International Journal of Project Management*, 17(2), 101-106.

Alaghbari, M. W., Razali, A., Khadir, S. A., & Ernawati, H. (2007). The significant factors causing delay of building construction projects in Malaysia. *Journal of Engineering, Construction and Architectural Management,* 14 (2), 192-206.

Al-Gahtani, K., & Mohan, S. (2007). Total float management for delay analysis. *Journal of Cost Engineering, 49 (2),* 32-37.

Al-Khalil, M., & Al-Ghafly, M. (1999). Important causes of delay in public utility projects in Saudi Arabia. *Journal of Construction Management and Economics*, 17(5), 647-655.

Al-Kharashi, A., & Skitmore, M. (2009). Causes of delays in Saudi Arabian public sector construction projects. *Construction Management and Economics*, 27(1) 3-23.

Arteaga, R. S., Cortijo, V., & Javed, U. (2014). Students' perception of Facebook for academic purposes. *Computers & Education* Vol. 70, 138–149

Azinger, N., & Kostika, G. (2015). Large infrastructure projects in Germany: A cross – sectoral analysis. *A Working Paper*, Hertie School of Governance

Ballard, G., Tommelein, I., Koskela, L., & Howell, G. (2002) 'Lean construction tools and techniques', in Best, R. and de Valence, G. (eds.) *Building in Value: Design and Construction*, Oxford, Butterworth-Heinemann, 227-255

Bruland, V., & Mahamud, A. (2014). Contracted price overrun as contracted construction time overrun function. *Technical Gazette*, 17(1), 23- 29.

Campnell, J., & Aharens. F. (1998). *Business research methodology*. Hallmark International Edition (115-267). St. Martin's Press.

Chan, A. P. C. (2001). Time cost relationship of public sector projects in Malaysia. *International Journal of Project Management*, 11, 200-321

Chan, D., & Kumaraswamy, M. M. (1996). An evaluation of construction time performance in the building industry. *Journal of Building and Environmental*, 31(6), 569-578.

Chan, D., & Kumarswamy, M. (2002). Compressing construction duration: lessons learned from Hong Kong building projects. *International Journal of Project Management*, 20 91, 23-35.

Chimwaso, K. D. (2001). An evaluation of cost performance of public projects: Case of Botswana. Department of Architecture and Building Services. *International Journal of Project Management, 31, 621-744*

Choudhury, I., & Phatak, O. (2004). Correlates of time overrun in commercial construction, ASC Proceeding of 4th Annual Conference, Brigham Young University- provo-Utah, April 8-10. *Arabian international Journal of Project Management*, 17(2), 101-106.

Cruthers, G. K., Kuotcha, W., McCaffer, R., & Edum, F. (2008). Construction contractors claim process framework. *Journal of Construction Engineering and Management*, 309-314.

Enshassi, A. (2008). Risk management and responsibility allocation of large EPC turnkey construction projects in Ethiopia. Addis Ababa University, School of Graduate Studies.

Flyrbjerg, T. B. R.; & Lund, H. (2005). Policy and planning of large infrastructure project problems, causes, cures. *World Bank Policy Research Working Paper 3781, December 2005*.

Fong, N., Wong, L. Y., & Wong, L. T. (2006). Fire services installation related contributors of construction delay. *Journal of Building and Environment*, 41(8), 211-222.

Frimpongs, Y., Oluwoye, J., & Crawford, L. (2003). Causes of delay and cost overruns in construction of groundwater projects in a developing countries; Ghana as a case study. *International Journal of Project Management*, 21(.5), 321-326.

Ghana Statistics Service (2010).http://www.government data/.erte.com.accessed; 20/7/2015.

Howick, S., Ackermann, D., Eden, F., & Terry,W. (2009). Understanding the causes and consequences of disruption and delay in complex projects: How system dynamics can help. *Unpublished Project Paper School of Management, Southampton, University Southampton.*

Idoko, D. (2008). Fire services installation related contributors of construction delay. *Journal of Building and Environment*, 41(1), 211-222.

Jahren, M. C., Curtis, B., Chrissis, M. B., & Weber, C. V. (1990). The capability maturity model for software, version 1.1. Technical Report, Carnegie Mellon University, Software Engineering Institute, Pittsburgh.

Jenspanitsub, P. (2011). Structural equation model of trust and partnering success. *Journal of Management in Engineering*, 21(2), 70–80.

Kaliba, C., Muya, M., & Mumba, K. (2010). Cost escalation and schedule delays in projects in Zambia. *International Journal of Project Management*, 27(4), 522–531.

Kagiri, D. (2005). Time and cost overruns in power projects: A case study of Kenya Electricity Generating Company. *Unpublished MBA Project, University of Nairobi.*

Kaming, P., Olomolaiye, P., Holt, G., & Harris, F. C. (1997). Factors influencing construction time and cost overruns on high-rise projects in Indonesia, *Journal of Construction Management and Economic*, 15(1), 83-94.

Kartam, N. (1997). Integrating safety and health performance into construction CPM. *Journal of Construction Engineering and Management*, 123(2), 121–126.

Kenya National Bureau of Statistics. (2014). *Economic Survey*. Nairobi: Government Printer.

Kessing, S. (2003). Delay in joint projects. *Unpublished MBA Project,* Freie University Berlin and European University Institute.

Khamidi, M. F., Khan, W. A., & Idrus, A. (2011). The cost monitoring of construction projects through earned value analysis. *Paper Presented at the International Conference on Economics and Finance Research, Singapore.*

Kleinbaum, D. G., Kupper, L. L., & Muller, K. E. (1988). *Applied regression and other multivariate methods (2nd Edition)*, PWS-KENT publishing Company, Boston.

Koskela, L. (2000). An exploration towards a production theory and its application to construction. Espoo, VTT Building Technology. VTT Publication 408.

Koskela, L., Howell, G., Ballard, G., & Tommelein, I. (2002). 'The foundations of lean construction', in Best, R. and de Valence, G. (eds.) *Building in Value: Design and Construction*, Oxford, Butterworth-Heinemann, 211-225

Koskela, L. (2008). Is a theory of the built environment needed? *Building Research and Information*, 36 (3), 211-15

Kothari, R. (2011). *Research methodology: Methods & techniques*. New Age International.

Koushki, P. A., Ali, R., Khalid, T., & Kartam, N. (2005). Delays and cost increases in the construction of private residential projects in Kuwait. *Journal of Construction Management and Economics*. 23(3), 285-294.

Kumaraswamy, M., & Chan, D. (1998). Contributors to construction delays, *Journal of Construction Management and Economics,* Vol.16, No.1, pp.17-29.

Kusurkar, R. A., Ten Cate, T. J., Vos, C. M. P., & Westers, P., Croiset, G. (2013). How motivation affects academic performance: a structural equation modelling analysis. *Advances in Health Sciences Education*. Vol. 18, Issue 1, 57–69

Liu, O. L., Bridgeman, B., & Adler, R. M. (2012). Measuring learning outcomes assessment in higher education: Motivation matters. *Educational Researcher*, 41(9), 352 – 362

Lo, T., Fung, I., & Tung, K. (2006). Construction delay in Hong Kong civil engineering projects. *Journal of Construction Engineering and Management*, 132(6), 636-649.

Lyneis, R., Ptero, L.,Tang, J., & Wiliamson, T. (2010). Dealing with cost and time in the Portuguese construction industry. *Paper presented at the CIB World Building Congress.*

Mahamadi, Y. (2011). Problems of projects and effects of delays in the construction industry of Pakistan. *Australian Journal of Business and Management Research, 1(5), 41-50.*

Mezher, T. C., & Tawil, W. (1998). Causes of delay in the construction industry in Lebanon. *Engineering Construction and Architectural Management*, 5(3), 252-260.

Monyane, T. G. (2013). Identifying causes of cost overruns and effective cost control measures of public projects in the Free State province. http://flybjerg.Plan.aau.dk/JAPAASPUBLISH ED.pelf

Morris, S. (1990). Cost and time overruns in public sector projects. *Economic and Political Weekly*, 24(47), 154-168.

Moungrous, W., & Charoenngam, C. (2003). Operational delay factors at multi – stages in Thai building construction. *The International Journal of Construction*, 13(1), 15-30.

Mugenda, M., & Mugenda, A. (2003). *Research methods in education: Quantitative and qualitative approach, Nairobi*. Acts press

Naoum, S. G. (1998). *Dissertation writing for construction students.* Oxford Butterworth.

Nasiru, A. D., Touran, T., & Schneck, D. C. (2006). Trends in US rail transit project cost overrun. *Journal of Planning Education and Research.* http:// 2009 - jpe.sagepub.com

Odeh, A., & Battaineh, T. (2002). Causes of construction delay: traditional contracts. *International Journal of Project Management*, 20(1), 67-73.

Ofori, L. (2006). A comparative analysis of tender sums and final costs of public construction and supply projects in Nigeria. *Journal of Financial Management of Property and Construction*, 13(1).

Ogunlana, S., Promkuntong, K., & Jearkjirm, V. (1996). Construction delays in a fast- growing economy: comparing Thailand with other economics, *International Journal of Project Management,* 14(1), 37-45.

Ogunsmi, D., & Jagboro, G. (2006). Time cost model for building projects in Nigeria. *Journal of Construction Management and Economics,* 24(3), 253-258.

Okuwoga, A. (1998). Cost – time performance of public sector housing projects in Nigeria, *HABITAT INTL*, 22(4), 389-395.

Oladapo, M. (2001). A framework for cost management of low cost housing. *International Conference on Spatial*

*Information for Sustainable Development, Nairobi, Kenya. 2-5 October 2001.*

Osei-Tutu, Y. (2008). Project management process maturity- PM2 model. *Journal of Management in Engineering*, 150-155.

Radosavljevic, M., & Bennett, J. (2012). *Construction management strategies: A theory of construction management*, Oxford, Wiley-Blackwell, 2012

Salgado, J, F., & Tauriz, G. (2012). The five-factor model, forced-choice personality inventories and performance: A comprehensive meta-analysis of academic and occupational validity studies. *European Journal of Work and Organizational Psychology*. Vol. 23, Issue 1, 3-30

Sambasivan, M., & Soon, Y. (2007). Causes and effects of delays in Malaysian construction industry. *International Journal of Project Management*, 25(5), 517-526.

Scandura, T. A., & Williams, E. A. (2000). Research methodology in management: Current practices, trends, and implications for future research. *Academy of Management Journal,* 43(6), 1248-1264.

Snow, T., & Thomas, K. (2013). *Current approaches to research methods in social science*, 4th edition (200-245). New age international

Syed, M., Salman, A., Mauricio, C., Castillo, G., & Pragnya, K. (2002). Construction delays in Florida: *An Empirical Study http://www.cm.fiu.edu/pdfs/Research-Reports*

Taherdoost, H., Sahibuddin, S., & Jalaliyoon, N. (2013). Exploratory factor analysis: Concepts and theory. *Advances in Applied and Pure Mathematics*. ISBN: 978-960-474-380- 3, 375-382

Takim, R., Akintoye A., & Kelly J. (2004), Analysis of measures of construction project success in Malaysia. *Association of Researches in Construction Management*, 2(9), 1123-113.

Vidalis, D. P., Allinson, C. W., & Hayes, J. (2002). Transferring the western model of project organisation to a bureaucratic culture: The case of Nepal. *International Journal of Project Management, 14*(1), 53-57.

Womack, J. P., Jones, D. T., & Roos, D. (1990). *The machine that changed the world: Based on the Massachusetts Institute of Technology 5-million dollar 5-year study on the future of the automobile*. Rawson Associates, Toronto, Collier Macmillan

Yang, J. (2015). An analysis of the influence factors of the financial status of employee basic old age insurance system: A study on the social pooling system. *Journal of Renmin University of China*, No. 3, 12-18

Yin, T. (2003). Research methods knowledge bases. *Academy of Management Journal,* 30 (4), 841-987.

Zawawi, K., Azman, S., & Shamil, J. (2010). Structural equation model of construction contract dispute potential. *Journal of Construction Engineering and Management* 126(4), 268–277.

Zou, P. X. W., Zhang, G., & Wang, J. (2006). Identifying key risks in construction projects: life cycle and stakeholder perspectives. http://www.prress.net/papers/Zou_risks construction

## Appendix I Successfully Completed Projects

| | Length (km) | Year | Time Variance | Cost Variance | |
|---|---|---|---|---|---|
| Nairobi – Thika | 12.4 | 2012 | 7 | 3,513.4 | Project under |
| Nairobi – Thika | 14.1 | 2012 | 7 | 3,169.08 | Project under |
| Nairobi – Thika | 23.88 | 2012 | 12 | 1,205.26 | Project under |
| Isiolo – Merille | 136 | 2012 | No informati | 1,442.72 | Project under |
| Athi River – | 136 | 2011 | 16 | 1,609.58 | Project under |
| Kendu Bay – | 38 | 2012 | 9 | 0 | Project under |
| Athi River – | No informati | No informati | No informati | 0 | No informatio |
| Lanet – Dundori | 30 | 2012 | 0 | No informati | Project under |
| Ndori – Ng'iya | 40 | 2013 | No informati | 148.67 | Project under |
| KCC (Sotik)- | 57.4 | 2014 | 11 | 225.7 | Project under |
| Londiani - Fortenan | 63 | 2014 | 29 | 871.88 | Project under |
| Modika - Nuno | 12 | 2014 | No informati | 0 | Project under |
| Marsabit – Turbi | 121 | 2015 | 25 | 320.12 | Project under |
| Timboroa - Eldoret | 73 | 2015 | 10 | 2,100.05 | Project under |
| Eldoret - Webuye | 6 | 2015 | 36 | 2,005.55 | Substantial ly |
| Homa Bay – | 43 | 2015 | 27 | 499.81 | Substantial ly |
| Miritini - Maji ya | 40 | 2007 | 2 | 291.92 | Complete |
| Lanet – Njoro | 16 | 2008 | 1.8 | 551,.51 | Complete |

| | **Length (km)** | **Year** | **Time Variance** | **Cost Variance** | |
|---|---|---|---|---|---|
| Njoro Turnoff – | 84 | 2010 | No informati | 1,901.70 | Complete |
| Sultan Hamud - | 55 | 2013 | 15.8 | 1,756.64 | Complete |
| Machakos Turn off - | 33 | 2013 | 18.9 | 4,054.97 | Complete |
| Kericho - Nyamasar | 76 | 2014 | 20 | 2,320.97 | Complete |
| Kericho - Mau | 58 | 2015 | 25 | 320.12 | Complete |
| Nyamasar ia - | 24 | 2015 | 10.4 | 1,530.65 | Complete |

Source: Kenya National Highways Authority 2014