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# An Investigation into Factors Causing Delays in Road Construction Projects in Kenya

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**To cite this article:**

Msafiri Atibu Seboru. An Investigation into Factors Causing Delays in Road Construction Projects in Kenya. *American Journal of Civil Engineering*. Vol. 3, No. 3, 2015, pp. 51-63. doi: 10.11648/j.ajce.20150303.11

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**Abstract:** The majority of road construction projects in Kenya do not get completed within the initially set targets of time. Project delays frustrate the process of development, have an immeasurable cost implication to the society, and also lead to loss of reputation of the parties involved in the projects' execution. The purpose of this study was to investigate the factors causing delays in road construction projects in Kenya. Project delays are a common problem internationally in the construction industry in modern times. Investigating the reasons for delay has become an important contribution to improved construction industry performance. Over seventy percent of projects initiated in Kenya are likely to escalate in time with a magnitude of over fifty percent. The study used purposive sampling technique and survey design. Data was collected using questionnaires which were distributed to consultants and contractors. The data was analyzed using the Relative Importance Index and Spearman's rank correlation. The top five causes of project delays were observed to be payment by client, slow decision making and bureaucracy in client organization, inadequate planning and scheduling, and rain. It is recommended that clients should improve their financial management systems so that they are able to pay contractors in a timely manner. Bureaucracy and red tape should be reduced in client organizations in order to speed up the slow decision making process. Efficient management of the construction process will also lead to a reduction in incidences of claims. Contractors should prepare adequate plans and schedules which can also be used to minimize the effects of rain.

**Keywords:** Delay Factors, Project Delays, Road Construction Projects

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## 1. Introduction

### 1.1. Background of the Study

Road construction projects in Kenya are procured through the traditional system where the Consultant Civil Engineer is in charge of design and construction processes on behalf of the Client. According to the traditional system, the design process ought to be completed prior to commencement of construction. The Client commissions the Consultant Civil Engineer who is briefed by the client. The Consultant Civil Engineer then develops the design and prepares contract documents. The tendering process begins by pre-qualifying contractors on the basis of experience, work capacity and past performance. The pre-qualified contractors are then invited to tender. The contract is normally awarded to the lowest bidder. The standard form of contract that is commonly used for civil engineering works in Kenya is FIDIC (International Federation of Consulting Engineers). The Consultant Civil

Engineer appoints a Resident Engineer to be permanently based on site to supervise the project. The Consultant Civil Engineer delegates some of his duties and powers under the contract to the Resident Engineer. The Resident Engineer holds monthly site meetings with the Contractor. The Consultant Civil Engineer and the Client usually attend these meetings. At the practical completion stage, an inspection is carried out and the project is handed over to the Client. The Contractor is expected to make good any defects within the Defects Liability Period that normally lasts for one year.

The study of causes of delay in road construction projects in Kenya was important because time is one of three pillars of construction project management: time, cost and quality. A study on project delays was expected to lead to a better understanding of the causes of inefficiency in road construction projects. Once the most important causes of significant delay causing factors are identified, the parties to the projects shall then be able to channel their energies and resources to the specific factors thereby reducing delays to the

projects. The study on road construction is important in the Kenyan context because roads contribute to economic growth and poverty reduction.

The study was restricted to the construction phase of the project only, although it is acknowledged that decisions made in other stages prior to the commencement of construction phase do affect the construction process. As argued by Talukhaba (1999), the conditions prevailing during design can be controlled, because unlike construction, design occurs in an enclosed environment. For instance, it may not be easy to control rain in a construction site. Therefore, the greatest challenges in implementation of projects are likely to be experienced during the construction phase. The data collection was restricted to consulting engineering firms and contractors situated in Nairobi. Besides the majority of consulting engineering firms and contractors operating in Kenya are based in Nairobi. Therefore, the study was concerned with the delays observed during the construction process. The delays that occur during the design process are not part of this study. The following were the assumptions of the study as adapted from Talukhaba (1999): Firstly, there was homogeneity in the management of projects under study and therefore project management as a factor had a constant and equal impact on project delays since all the projects were implemented using the traditional procurement system; secondly, there were no differences in the traditional procurement system that could be attributed to the process such that projects implemented using the system had an equal chance of showing similar characteristics in performance; thirdly, the productivity of workers in the projects being studied was the same, hence variation in delays due to differences in worker productivity was negligible; fourthly, the output of the plant and equipment in the projects being studied was the same, hence variation in delays due to differences in machine output was negligible; and lastly, the project contract period the parties agreed to adhere to was adequate for the completion of the project, and therefore the delays observed by the projects in the sample were not as a result of contract time underestimation.

Fan and Kang (2005) assert that roads contribute to economic growth and poverty reduction. Road infrastructure impacts on overall economic growth, agricultural growth, urban growth, urban poverty reduction, and rural poverty reduction. Without infrastructure, efficient markets, adequate health care, a diversified rural economy, and sustainable economic growth will remain elusive. Effective development strategies require good infrastructure as their backbone. Transportation infrastructure is an effective factor of production. Power consumption and health conditions are positively correlated with the availability of road infrastructure. Most of Africa's poor trade performance is the result of weak infrastructure. The availability and quality of road infrastructure also influences food prices. Road investments help the poor through their impact on the rural non-farm economy. An increase in paved roads is positively and significantly related to growth in Gross Domestic Product (GDP) per capita in urban areas.

Fan and Kang (2005) continue to argue that the different

phases of a highway project have different impacts. The construction period not only creates tremendous work opportunities, but also improves the skill of local people employed on the project. In the post-construction period, highways promote the development of goods production in poor regions, increase the volume of trade, reduce transportation costs, and improve social services. Highway construction also increases farm incomes.

Nadiri and Mamuneas (1998) argue that an increase in the stock of highway capital has an initial direct productivity effect on business: it reduces the total cost of producing a given level of output in almost all industries. Cost reductions permit products to be sold at lower prices and lower prices can be expected to lead to output growth. Road investments have a significant effect on the production sector's demand for labour, capital, and materials.

### **1.2. Research Problem**

The majority of road construction projects in Kenya do not get completed within the initial set targets of time. Talukhaba (1999) argues that project delay frustrates the process of development, has an immeasurable cost to the society, and also leads to loss of reputation of the parties involved in the concerned projects. Mbatha (1986) and Talukhaba (1988) revealed that time performance of construction projects in Kenya was poor to the extent that over seventy percent of projects initiated in Kenya were likely to escalate in time with a magnitude of over fifty percent.

One of the most widely used measures of project success is time taken to complete the project. Talukhaba (1999) carried out research on factors causing construction project delays in Kenya based on a case study of high rise building projects in Nairobi but did not cover road construction projects. Road construction projects are more mechanised than building projects. Some of the materials used in road construction projects are different from the materials used in building projects. Activities in road projects are more exposed to the weather than activities in building projects. The Civil Engineer is largely the sole player in road projects with minimal involvement of other construction professionals as opposed to building projects where the various professionals play significant roles. Road projects are essentially public projects whereas building projects could either be public or private. It is therefore the purpose of this study to investigate the factors causing delays in road construction projects in Kenya.

### **1.3. Objectives of the Study**

The objectives of this study were:

1. To document the range of identified causes of delay in completing road construction projects in Kenya;
2. To document the most important causes of delay in road construction projects in Kenya; and
3. To document identified differences in perception of contractors and consultants regarding causes of delay in delivering projects by the intended completion date.

#### 1.4. Research Hypothesis

Ho: Road construction project delays are not caused by exogenous and endogenous factors.

Ha: Road construction project delays are caused by exogenous and endogenous factors.

Exogenous factors are external factors to the project such as politician's interference, inflation and interest rates. Endogenous factors are internal factors in the project such as contractor's cash flow, design change by engineer, and inadequate planning/scheduling.

#### 1.5. Significance of the Study

This work is important because time is one of three pillars of construction project management: time, cost and quality. A study on project delays will lead to a better understanding of the causes of inefficiency in road construction projects. Once the most significant delay causing factors are identified, the parties to the projects shall then be able to channel their energies and resources to the specific factors thereby reducing delays to the projects.

Walker (1994) carried out an investigation in Australia on construction time performance and concluded that through improving its productivity, the construction industry can have an important role in promoting national competitiveness, and therefore in defending living standards and achieving a satisfactory rate of growth. The benefits from such improvement would include increased attractiveness of Australia as a location for investment in new plants or projects. Measures that prevent or slow steps toward improving building and construction industry productivity are, in effect, an attack on the employment prospects and future welfare of Australian workers. Such measures would also be an attack on the potential performance of Australian industry and the economy generally.

The above view can also be applicable to Kenya and reinforces the argument for attention to construction time performance. The study on road construction is important in the Kenyan context because roads contribute to economic growth and poverty reduction.

## 2. Literature Review

Delays in construction projects are still very common in most parts of the world even with the introduction of modern management techniques. Studies conducted on the causes of construction project delays in 22 different countries of the world have been examined.

Talukhaba (1999) carried out an investigation into factors causing construction project delays in Kenya and found out that the major causes of delay were: Clients payment; Architect's instructions; Client's instructions; Rock; and Underground water. Assaf, Al-Khalil and Al-Hazmi (1995) studied the causes of delay in large building construction projects in Saudi Arabia and revealed that the most important causes of delay were: Approval of shop drawings; Delays in payments to contractors and the resulting cash-flow problems

during construction; Design changes; Conflicts in work schedules of subcontractors; and Slow decision making and executive bureaucracy in the Owners' organisations. Mansfield, Ugwu and Doran (1994) studied the causes of delay and cost overruns in construction projects in Nigeria and the results showed that the most important factors were: Financing and payment for completed works; Poor contract management; Materials shortages; and Improper planning.

Al-Tabtabai (2002) conducted a study on causes of delays in construction projects in Kuwait and found out that the major causes of delay were: Slow financial and payment procedures; Slow decision-making process; Limited authority among supervision staff; Risk allocation mainly on the contractor; and Lack of design drawings coordination. Memon, Rahman and Azis (2012) conducted a study on time and cost performance in construction projects in Malaysia and revealed that only 21% of public sector projects and 33% of private sector projects were completed within time. The results of the study showed that the most important delay factors were: Design and Documentation Issues; Financial Resource Management; Project Management and Contract Administration; Contractors Site Management; and Information and Communication Technology.

Owolabi et al. (2014) studied the causes and effects of delay on project construction delivery time in Nigeria. They stated that seven out of ten projects in Nigeria suffered delays in their execution. The results of the study indicated that the following were the five major causes of delay: Lack of funds to finance the project to completion; Changes in drawings; Lack of effective communication among the parties involved; Lack of adequate information from consultants; and Slow decision making. In Ghana, Frimpong, Oluwoye and Crawford (2003) carried out a research on Causes of delay and cost overruns in construction of groundwater projects in developing countries. The researchers indicated that 75% of the projects in Ghana exceeded the original project schedule. The study revealed that the most important causes of delay were: Monthly payment difficulties; Poor contract management; Material procurement; Inflation; and Contractor's financial difficulties. In Morocco, Challal and Tkiouat (2012) researched on the causes of deadline slippage in construction projects and found out the five major causes of delay were: Errors in initial budget assessment; Architecture and engineering volatility program (multiple modification requests); Site hazards; Failure of an actor; and Insufficiency or lack of prior study and feasibility.

Alinaitwe, Apolot and Tindiwensi (2013) carried out a study on causes of delays and cost overruns in Uganda's public sector construction projects and the results showed the major causes as: Change of work scope and/or changes in material specifications; High inflation, insurance and interest rates; Poor monitoring and control, due to incompetent and/or unreliable supervisors; Delayed payment to contractors, subcontractors and/or suppliers; and Fuel shortages. Memon (2014) conducted a study on contractor perspective on time overrun factors in Malaysian construction projects and the major factors causing delays were: Frequent design changes;

Change in the scope of the project; Financial difficulties of owner; Delays in decisions making; and Unforeseen ground conditions. In India, Desai and Bhatt (2013) studied the critical causes of delay in residential construction projects and found out that the most important delay factors were: Original contract duration was too short; Legal disputes between various parties; Ineffective delay penalties; Delay in progress payments by owner; and Delay to furnish and deliver the site to the contractor by the owner.

Sweis, Sweis, Hammad and Shboul (2008) studied delays in construction projects in Jordan and the major causes of delay were: Financial difficulties faced by the contractor; Too many change orders from owner; Poor planning and scheduling of the project by the contractor; Presence of unskilled labour; and Shortage of technical professionals in the contractor's organization. In India, Ravisankar, Anandakumar and Krishnamoorthy (2014) conducted a study on the quantification of delay factors in the construction industry. The researchers indicated that time overrun vary between 50% and 80% for projects completed worldwide. The study revealed that the most important causes of delay were: Shortage of unskilled and skilled labour; Design changes by owner or his agent during construction; Fluctuation of prices; High waiting time for availability of work teams; and Rework due to errors. Shanmugapriya and Subramanian (2013) investigated significant factors influencing time and cost overruns in Indian construction projects. The researchers indicated that 60% of projects in India suffered time overruns. The study found out that the following were the most significant factors causing time overruns: Material market rate; Contract modification; Rework of bad quality performance; Unclear specification; and Dependence on freshers to bear the whole responsibility.

Kholif, Hosny and Sanad (2013) analyzed time and cost overruns in educational building projects in Egypt and found out that the major causes of time overruns were: Political insecurity (instability); Financial difficulties of contractor; Escalation of material prices (inflation); High cost of skilled labour; and Difficulties in getting work permits from government. Kagiri and Wainaina (2008) studied time and cost overruns in power projects in Kenya and revealed that the major causes of time overruns were: Delayed payment to contractor; Employer cash flow problems; Delays in disbursement of funds by financiers; Bureaucracy of government agencies; and Delay of access to site. In Sri Lanka, Dolage and Rathnamali (2013) carried out a study causes of time overrun in construction phase of building projects and found out that the following were the major causes of time overrun: Delay in progress payment by clients; Inaccurate planning and scheduling of projects by contractors; Rainy weather; Non availability of experienced technical staff of contractor; and Excessive work in hand of the contractors. Sweis (2013) investigated factors affecting time overruns in public construction projects in Jordan and revealed that the major causes of delay were: Too many change orders from owner; Poor planning and scheduling of the project by the contractor; Ambiguities and mistakes in specifications and

drawings; Slow decision making from owner; and Poor qualification of consultants, engineers and staff assigned to the project.

In South Africa, Baloyi and Bekker (2011) researched on causes of construction cost and time overruns and revealed that the following were the most important causes of time overruns: Incomplete drawings; Design changes; Clients' slow decision-making; Late issue of instructions; and Shortage of skilled labour. Alaghbari, Kadir and Salim (2007) studied the significant factors causing delay of building construction projects in Malaysia and found out that the major causes of delay were: Owners' financial difficulties and economic problems; Contractors' financial problems; Late supervision and slowness in making decisions; Consultants' slowness in giving instructions; and Lack of materials on market. Mohammed and Isah (2012) carried out a study on the causes of delay in Nigerian construction industry and the results showed that the major causes of delay were: Improper planning; Lack of effective communication; Design errors; Shortage of supply like steel, concrete; and Slow decision-making. Fugar and Agyakwah (2010) researched on delays in building construction projects in Ghana and found out that the most important causes of delay were: Delay in honouring payment certificates; Underestimation of cost of projects; Underestimation of complexity of projects; Difficulty in accessing bank credit; and Poor supervision. Kikwasi (2012) studied the causes and effects of delays and disruptions in construction projects in Tanzania and the results showed that the following were the major causes of delay: Design changes; Delays in payment to contractors; Information delays; Funding problems; and Poor project management.

Ibironke, Oladinrin, Adeniyi and Eboreime (2013) analysed the non-excusable delay factors influencing contractors' performance in Nigeria and revealed that the major delay factors were: Insufficient amount of equipment; Inaccurate time estimates; Monthly payment difficulties; Change orders; and Inaccurate cost estimates. Wong and Vimonsatit (2012) studied the factors affecting construction time in Australia and the results showed that the following were the major factors affecting construction time: Skills shortage, Financial difficulties; Shortage of labour; Unrealistic deadlines for project completion; and Unforeseen ground conditions. Hoai, Lee and Lee (2008) researched on delay and cost overruns in large construction projects in Vietnam and revealed that the most important causes of delay were: Poor site management and supervision; Poor project management assistance; Financial difficulties of owner; Financial difficulties of contractor; and Design changes.

Ayudhya (2011) evaluated the common delay causes of construction projects in Singapore and found out that the major causes of delay were: Delay in progress payment by owner; Adverse weather conditions; Main contractor financial problems; Evaluation of completed works; and Acts of God. Faridi and El-Sayegh (2006) studied the significant factors causing delay in the construction industry in the United Arab Emirates and revealed that the following were the most

important factors causing delay: Preparation and approval of drawings; Inadequate early planning of the project; Slowness of the owner's decision-making process; Shortage of manpower; and Poor supervision and poor site management. Mahamid (2013) researched on the causes of time overrun causes in road construction projects in Palestine and found out that the major causes of time overrun were: Segmentation of the West Bank and limited movement between areas; Political situation; Progress payments delay by owner; Lack of efficient equipment; and Difficulties in financing project by contractor. In Malaysia, Abdulla, Rahman and Azis (2010) studied the causes of delay in Construction Projects and the results showed that the major causes of delay were: Cash flow and financial difficulties faced by Contractors; Contractor's poor site management; Ineffective planning and scheduling by Contractors; Inadequate Contractor experience; and Shortage of site workers.

El-Razek, Bassioni and Mobarak (2008) conducted a study on causes of delay in building construction projects in Egypt and found out that the most important causes of delay were: Financing by contractor during construction; Delays in contractor's payment by owner; Design changes by owner or his agent during construction; Partial payments during construction; and Non-utilization of professional construction/contractual management. Sambasivan and Soon (2007) researched on the causes and effects of delays in Malaysian construction industry and the results showed the following major causes of delay: Improper planning; Site management; Inadequate contractor experience; Finance and payments of completed work; and Subcontractors. Kamanga and Steyn (2013) studied the causes of delay in road construction projects in Malawi and revealed that the following were the major causes of delay: Shortage of fuel; Insufficient contractor cash flow / difficulties in financing projects; Shortage of foreign currency (importation of materials and equipment); Slow payment procedures adopted by client in making progress payments; and Insufficient equipment. Patil, Gupta, Desai and Sajane (2013) researched on the causes of delay in Indian transportation infrastructure projects and the results showed that the following were the most important causes of delay: Delay due to Land Acquisition; Environmental issues related with project; Financial closure; Change orders by the client; and Poor site management and supervision by Contractor.

Akogbe, Feng and Zhou (2013) studied delay factors for development construction projects in Benin and found out that the major causes of delay were: Contractor's financial capability; Owner's financial difficulties; Poor subcontractor performance; Materials procurement; and Changes in drawings. Mustapha (2013) researched on the factors of delays in project delivery in Ghana and found out that the major delay factors were: Delay in honouring payment certificates; Delay by sub-contractors; Fluctuation of prices; Difficulty in accessing bank credit; and Client initiated variations. Asiamah and Asiamah (2013) conducted a study on causes of delays in construction of public buildings in Ghana and revealed that the following were the most

important causes of delay: Method of construction; Long bureaucratic process of honouring certificates; Variation orders; Cash flow problems; and Lackadaisical attitude to decision making. Andi, Lalitan and Loanata (2010) carried out a study on factors causing delays in structural and finishing works in Indonesia and the results showed that the following were the major causes of delay: Slow contractor's payment; Design changes during construction; Force Majeure; Bad weather; and Slow delivery of material. According to Kivaa (2000), one cause of poor time performance in construction projects in Kenya is the inadequacy of initial contract periods. These have been found to be inconsistently and erroneously calculated. The initial contract period is estimated using the estimator's personal intuition, which is based on his skill and past experience. The method does not consider, objectively and accurately, all the factors that influence the construction time of a project.

### 3. Research Methodology

The study dealt with road projects in Kenya but whose consultants and contractors were based in Nairobi. The population of road projects and the identity of the consultants and contractors involved in the projects were obtained from the records at the headquarters of Ministry of Roads and Public Works in Nairobi. A list of consulting engineering firms was obtained from the secretariat of the Association of Consulting Engineers of Kenya situated in Nairobi. The total number of Consulting Engineering firms that were approached was 15 whereas the number of Contractors was 16. These were the firms that dealt with design and construction of roads and were based in Nairobi. Survey research design was used and questionnaires were delivered to participants in person to obtain primary data. Participants filled in the questionnaires in their own time without any assistance from the researcher. The questionnaires were collected from the participants after a period of about three weeks. This approach removed any undue pressure from the respondents and gave them the freedom to fill in the questionnaires as truthfully as possible.

The Likert rating scale was used in the questionnaire. An opportunity was left to the respondents to include and rate variables that might have been missed out. The variables in the questionnaire were adapted from the studies cited in the literature review. In total, 141 variables were identified. The 141 variables were grouped into 25 broad categories to facilitate objective analysis. The grouping considered variable relationships with each other as well as similarity in characteristics. For example, variables such as clay, rock, underground water and fossils were grouped together under the broad category of subsoil conditions. The variables identified were thus grouped under design problems, subsoil conditions, financial/economic problems, subcontractors problems, contractual disputes, permits/licences, weather conditions, labour availability, and site accidents. Other variables included politics, materials availability, proximity to required resources, equipment availability, shop drawings, site

layout, industrial relations disputes, and sample of materials / work approvals. The rest of the variables included material testing, natural hazards, underground services, working environment, supervision / management staff availability, advanced technology, suppliers, and client problems.

The questionnaire was designed in such a way that the stratification of the data was easy for analysis. The questions involved recording the contribution of each variable to delay in the project on a rating scale of: 1 – Very Low; 2 – Low; 3 – Slightly Low; 4 – Average; 5 – Slightly High; 6 – High; and 7 – Very High. The questions concentrated on past phenomena on the project. The interest was to show how the past events had affected the projects. The question that was asked in the questionnaire was “During the period of construction, what was the contribution of the given factors to delay in the project?”.

According to Talukhaba (1999) researchers on construction projects have in many cases worked with relatively small sample sizes. For example, Nkado (1992) (as cited in Talukhaba, 1999) investigated information system for the building industry with a sample of 29 cases. Ogunlana, Promkuntong and Jearkjirm (1996) (as cited in Talukhaba, 1999) investigated the causes of delay in projects in Thailand basing their research on a sample of 12 projects. Uher (1996) (as cited in Talukhaba, 1999) investigated the cost estimating practices in Australia construction industry using a sample of 10 projects. The sample of 31 consultants and contractors used in this study is therefore well above what has been used in other studies in the construction industry elsewhere. On the other hand, the sample size determines the type of statistics to be applied. Therefore, by using a suitable statistical tool, some of the problems that could be associated with the sample size are minimised. The 31 cases in this study produced 61.3% positive response. Kothari (1990) indicates that the percentage of responses for survey-type research is as low as 20 to 30%. Two methods were used to analyze the data: Relative Importance Index (RII) and Spearman's rank correlation. The data that was collected was presented in a tabular form. Analysis was then carried out on the data and the results were presented in a tabular form as well.

Kometa, Olomalaiye and Harris (1994) (as cited in Sambasivan & Soon, 2007) used the relative importance index method to determine the relative importance of various causes of delays. The same method was adopted in this study. The seven-point scale ranged from 1 (very low) to 7 (very high) was adopted and transformed to Relative Importance Index (RII) for each factor as follows:

$$RII = \Sigma W / (A * N)$$

Where ‘W’ is the weighting given to each factor by the respondents (ranging from 1 to 7); ‘A’ is the highest weight (7 in this case); and ‘N’ is the total number of respondents. The RII value had a range from 0 to 1 (0 not inclusive). The higher the value of RII, the more important was the cause of delays.

Assaf and Al-Hejji (2006) (as cited in Kamanga & Steyn, 2013) indicate that the Spearman's rank correlation is a relationship measure among different parties or factors and the

strength and direction of the relationship. This study uses Spearman's rank correlation to show the level of agreement between two parties.

$$r_s = 1 - 6 \Sigma d^2 / (n^3 - n)$$

Where ‘ $r_s$ ’ is the Spearman's rank correlation coefficient; ‘ $d$ ’ is the difference in ranking between any two parties; and ‘ $n$ ’ is the number of factors. The correlation coefficient varies between +1 and -1, where +1 implies a perfect positive relationship (agreement), while -1 results from a perfect negative relationship (disagreement). Sample estimates of correlation close to unity in magnitude imply good correlation, while values near zero indicate little or no correlation.

## 4. Findings and Discussions

The combined views for all delay factors for consultants and contractors are shown in Table 1. The overall top five causes of delay identified by both consultants and contractors were: Payment by client (RII = 0.759); Slow decision-making and bureaucracy in client organization (RII = 0.699); Claims (RII = 0.609); Inadequate planning / scheduling (RII = 0.602); and Rain (RII = 0.579). The ten most important views of the consultants are shown in Table 2. The top five causes of delay identified by consultants were: Payment by client (RII = 0.738); Slow decision-making and bureaucracy in client organization (RII = 0.595); Inadequate planning / scheduling (RII = 0.595); Different site conditions (RII = 0.583); and Proximity to borrow pit (0.571). The ten most important views of the contractors are shown in Table 3. The top five causes of delay identified by contractors were: Slow decision-making and bureaucracy in client organization (RII = 0.755); Payment by client (RII = 0.673); Engineer's certificates (RII = 0.633); Claims (RII = 0.633); and Rain (RII = 0.612). The Spearman's rank correlation coefficient between the consultants and contractors was calculated and found to be 0.64 which showed that there was a positive correlation between the views of consultants and contractors.

Payment by client is overall the most important cause of delay. According to consultants, payment by client is also the most important delay factor. However, according to contractors the most important cause of delay is slow decision-making and bureaucracy in client organization. Overall, the second most important delay factor is slow decision-making and bureaucracy in client organization. This delay factor also appears second in the view of consultants. However, in the view of contractors, the second most important cause of delay is payment by client. Overall, the third most important delay factor is claims. According to consultants the third most important delay factor is inadequate planning / scheduling. Contractors view Engineer's certificates as the third most important cause of delay. Inadequate planning / scheduling is overall the fourth most important cause of delay. According to consultants, the fourth most important delay factor is different site conditions. For contractors, the fourth most important delay factor is claims. Overall, the fifth most important factor is rain. This delay

factor also appears fifth in the view of contractors. However, in the view of consultants, the fifth most important cause of delay is proximity to borrow pit. The findings of this research

should be of importance to both local and international engineering and construction firms entering the road construction market in Kenya.

**Table 1.** Relative Importance Index and Ranking of Delay Factors for both Consultants and Contractors

Delay Factors																				Total Weight $\Sigma W$	Highest Weight (A)	Total No. of Resp (N)	RII = $\Sigma W/(A \times N)$	Rank	
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19						
1. Design Problems																									
a) Conflicting design information	4	3	1	1	5	6	4	5	4	2	6	1	1	4	1	4	5	4	6	73	7	19	0.549	10	
b) Timeliness of revised drawings issue	3	3	1	1	5	4	4	5	1	2	1	1	2	1	1	5	6	4	5	55	7	19	0.414	41	
c) Missing information	2	2	1	1	5	4	3	2	4	2	6	1	1	5	1	6	7	2	2	63	7	19	0.474	26	
d) Dimensional inaccuracies	4	2	1	1	3	4	3	2	1	2	5	1	1	1	1	4	4	2	2	49	7	19	0.368	71	
e) Design change by Client	4	2	1	1	1	4	5	4	5	2	6	1	3	5	1	2	7	1	7	68	7	19	0.511	13	
f) Design change by Engineer	2	2	1	1	4	5	4	4	2	3	4	3	4	3	1	3	7	4	7	68	7	19	0.511	13	
g) Different site conditions	6	5	1	1	6	6	6	6	2	3	6	1	3	5	1	3	4	5	1	77	7	19	0.579	5	
2. Subsoil Conditions																									
a) Clay	4	4	1	3	6	1	6	4	1	2	6	1	1	1	3	4	2	2	2	60	7	19	0.451	28	
b) Rock	1	6	1	1	1	1	2	4	1	2	4	1	2	1	2	5	2	5	6	52	7	19	0.391	55	
c) Underground water	3	5	1	1	1	2	2	3	2	4	5	1	2	1	1	3	2	4	6	54	7	19	0.406	47	
d) Fossils	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	2	1	25	7	19	0.188	141	
3. Financial/Economic Problems																									
a) Payment by Client	6	7	5	7	2	5	1	7	7	6	6	3	2	1	4	7	7	7	5	101	7	19	0.759	1	
b) Engineer's Certificates	4	2	1	1	4	2	1	2	1	2	2	1	2	3	4	7	5	7	3	56	7	19	0.421	34	
c) Contractor's cash flow	5	7	6	1	4	1	1	2	3	7	2	4	2	1	6	6	2	4	4	70	7	19	0.526	12	
d) Interest Rates	2	6	1	1	5	5	1	2	6	5	2	1	1	1	1	6	2	5	3	58	7	19	0.436	31	
e) Inflation	2	3	1	1	5	5	1	2	5	5	4	3	1	4	2	3	2	5	5	63	7	19	0.474	26	
f) Insolvencies and bankruptcies	2	1	1	1	1	1	1	1	1	4	7	1	1	1	1	1	1	4	1	39	7	19	0.293	109	
4. Subcontractors Problems																									
a) Late nomination of subcontractors	1	2	1	1	4	3	1	2	3	1	4	1	1	1	1	1	2	4	2	40	7	19	0.301	105	
b) Poor workmanship	1	3	1	1	4	1	2	4	2	1	4	1	1	1	1	1	2	4	2	41	7	19	0.308	99	
c) Labour problems	1	5	1	2	3	1	7	4	2	1	1	1	1	1	1	1	2	7	2	44	7	19	0.331	88	
d) Material problems	1	3	1	1	3	1	6	4	5	1	1	1	1	1	1	1	5	5	5	47	7	19	0.353	77	
e) Late payment	1	6	1	1	4	1	1	7	7	1	5	1	1	1	1	1	7	7	6	65	7	19	0.489	21	
f) Relationship with main contractor	1	4	1	1	4	1	1	6	1	1	4	1	1	1	1	1	4	4	1	43	7	19	0.323	93	
g) Conflicts in work schedules of subcontractors	1	3	1	1	2	1	1	5	1	1	2	1	1	1	1	1	2	6	1	35	7	19	0.263	129	
5. Contractual Issues																									
a) Poor workmanship	2	6	1	1	2	7	1	4	2	2	6	1	1	1	1	2	2	4	2	54	7	19	0.406	47	
b) Variations	4	6	2	1	6	4	2	4	4	5	4	3	3	3	1	3	6	6	4	75	7	19	0.564	7	
c) Claims	2	7	1	1	6	5	3	4	7	5	4	1	2	3	4	6	6	6	4	81	7	19	0.609	3	
d) Inadequate planning/scheduling	2	7	1	1	5	6	6	5	2	4	7	4	1	1	3	6	3	5	4	80	7	19	0.602	4	
6. Permits/Licenses																									
a) Central Government	1	1	1	1	1	1	7	6	1	1	3	1	1	1	1	6	7	6	2	52	7	19	0.391	55	
b) Local Authority	3	5	1	1	3	1	7	7	2	1	4	1	1	1	1	6	7	7	2	65	7	19	0.489	21	
c) Kenya Power & Lighting	4	3	1	1	5	4	1	6	3	3	2	1	1	1	1	7	2	7	1	56	7	19	0.421	34	
d) Telkom Kenya	4	5	1	1	5	4	1	6	1	1	2	1	1	1	1	1	5	7	1	51	7	19	0.383	63	
e) NEMA	4	1	1	1	1	1	1	2	1	1	7	1	1	1	1	6	7	5	1	51	7	19	0.383	63	
7. Weather Conditions																									

Delay Factors	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	Total Weight ΣW	Highest Weight (A)	Total No. of Resp (N)	$RH = \Sigma W / (A * N)$	Rank
a) Rain	7	6	3	7	1	3	3	1	3	3	4	2	4	3	5	4	3	4	7	77	7	19	0.579	5
b) Hot temperatures	4	2	1	1	1	1	3	1	1	1	4	1	2	1	4	1	3	1	4	41	7	19	0.308	99
c) Cold temperatures	4	1	1	1	1	1	3	1	1	1	4	1	1	1	1	1	3	1	4	36	7	19	0.271	126
8. Labour Availability																								
a) Skilled	2	2	4	1	2	2	5	6	1	2	2	3	1	1	4	5	3	5	1	54	7	19	0.406	47
b) Unskilled	1	2	1	1	2	2	6	4	1	2	2	1	1	1	4	2	1	2	1	39	7	19	0.293	109
9. Site Accidents																								
a) Fatal	1	2	1	1	1	1	5	2	1	1	4	1	1	1	1	2	1	2	2	35	7	19	0.263	129
b) Serious injuries	3	2	1	1	1	1	4	2	1	1	4	1	1	1	1	2	2	2	2	37	7	19	0.278	123
c) Minor injuries	4	2	1	1	1	1	1	2	2	1	4	1	1	1	4	3	3	2	2	41	7	19	0.308	99
10. Politics																								
a) Politician's interference	6	5	1	1	6	3	4	7	2	1	5	1	1	1	1	5	6	4	2	67	7	19	0.504	16
b) Political wrangling between workers	1	2	1	1	1	1	6	2	1	1	4	1	1	1	1	2	2	2	2	37	7	19	0.278	123
c) Political decrees	1	2	1	1	3	1	7	5	1	1	4	1	1	1	1	1	6	3	2	47	7	19	0.353	77
d) Civil strife/riots	1	2	1	1	1	1	7	2	1	1	2	1	1	1	1	1	2	3	2	34	7	19	0.256	134
e) Protest action-groups	6	2	1	1	1	1	5	2	1	1	2	1	1	1	1	2	1	4	1	37	7	19	0.278	123
11. Materials Availability																								
a) Cement	5	1	1	1	1	1	6	1	1	2	4	5	2	1	1	6	2	3	3	51	7	19	0.383	63
b) Steel reinforcement	4	2	1	1	1	1	6	1	1	2	4	2	2	1	4	6	2	4	3	52	7	19	0.391	55
c) Timber	2	1	1	1	1	1	6	1	1	2	5	2	2	1	4	6	5	6	2	55	7	19	0.414	41
d) Sand	2	1	1	1	1	1	4	3	2	2	4	1	1	1	4	3	5	5	2	48	7	19	0.361	75
e) Aggregate	2	1	3	1	1	1	7	3	1	2	4	4	1	1	5	4	5	6	3	59	7	19	0.444	30
f) Bitumen	6	6	1	1	3	3	7	1	1	2	4	4	1	1	4	6	3	6	3	67	7	19	0.504	16
g) Murram	7	6	1	4	3	1	5	5	3	2	4	2	1	1	4	6	4	2	3	68	7	19	0.511	13
h) Water	4	2	1	1	1	1	6	4	1	2	4	1	1	1	4	5	7	3	1	54	7	19	0.406	47
i) Graded Crushed Stone	1	3	1	1	1	3	7	3	1	2	4	1	1	1	5	4	5	4	3	55	7	19	0.414	41
j) Hand packed stone	1	3	1	1	5	1	7	2	1	2	4	1	1	1	1	4	5	3	3	51	7	19	0.383	63
k) Lime	1	5	1	1	1	1	7	1	1	2	4	1	1	1	1	5	2	3	4	47	7	19	0.353	77
l) Structural steel	1	5	1	1	1	1	7	1	1	2	4	1	1	1	1	6	5	4	3	51	7	19	0.383	63
m) Explosives	1	3	1	1	1	1	7	1	1	2	4	1	1	1	1	5	2	5	3	46	7	19	0.346	80
n) Theft of materials	4	6	1	1	1	1	1	3	2	2	4	2	1	1	4	3	5	6	1	53	7	19	0.398	54
o) Wastage of materials	2	2	1	1	1	1	3	3	1	2	5	1	1	1	4	3	2	6	1	46	7	19	0.346	80
p) Double handling of materials	3	3	1	1	1	1	7	3	2	2	4	1	1	1	3	3	5	5	1	52	7	19	0.391	55
q) Disposal of construction waste	6	3	1	1	5	5	6	3	1	2	4	1	2	1	1	2	2	3	3	56	7	19	0.421	34
12. Proximity to Required Resources																								
a) Borrow pit	7	3	1	4	6	5	7	5	1	4	4	1	2	1	1	5	6	4	3	74	7	19	0.556	8
b) Quarry	6	4	1	1	6	5	7	5	1	4	4	2	2	1	1	5	7	4	4	74	7	19	0.556	8
c) Asphalt batching plant	6	3	1	1	6	3	1	4	1	4	4	1	1	1	1	4	6	2	4	58	7	19	0.436	31
13. Equipment Availability																								
a) Crane	1	2	1	1	6	1	7	3	1	3	4	1	1	1	4	3	1	4	3	52	7	19	0.391	55
b) Concrete mixer	1	4	1	1	2	1	1	1	1	3	4	1	1	1	4	3	1	2	1	38	7	19	0.286	117
c) Excavator	1	4	1	1	1	1	1	1	1	3	4	3	1	4	1	6	1	2	2	43	7	19	0.323	93
d) Concrete vibrator	1	4	1	1	1	1	1	1	1	3	4	1	1	1	1	4	1	2	1	35	7	19	0.263	129
e) Crushing plant	4	5	1	1	1	1	1	2	1	3	4	3	1	3	1	6	1	4	3	50	7	19	0.376	68
f) Asphalt Paver	1	5	1	1	1	1	1	2	1	3	4	1	1	5	1	5	1	2	1	42	7	19	0.316	96
g) Roller	5	6	4	1	1	1	1	1	1	3	4	3	1	3	1	5	1	2	1	49	7	19	0.368	71
h) Grader	4	7	4	1	1	1	1	1	1	3	4	2	1	3	1	6	1	2	1	49	7	19	0.368	71
i) Bulldozer	3	5	1	1	1	1	1	1	1	3	4	2	1	4	1	6	1	2	1	44	7	19	0.331	88
j) Wheel loader	3	5	1	1	1	1	1	1	1	3	4	2	1	4	1	6	1	2	1	44	7	19	0.331	88
k) Dump Truck	7	6	5	1	1	2	1	1	1	3	4	3	1	1	1	6	1	2	1	52	7	19	0.391	55
l) Dumper	1	3	1	1	1	1	1	1	1	3	4	3	1	3	1	6	1	2	1	40	7	19	0.301	105
m) Bowser	5	6	1	1	1	2	1	1	1	3	4	2	1	2	1	4	1	2	1	44	7	19	0.331	88
n) Lorry	4	5	1	1	1	1	1	1	1	3	4	4	1	1	1	5	1	2	2	44	7	19	0.331	88
o) Pick-up	4	3	1	1	1	1	1	1	1	3	4	1	1	2	1	5	1	2	1	39	7	19	0.293	109
p) Low loader	5	3	1	1	1	1	1	2	1	3	4	1	1	3	1	3	1	4	1	42	7	19	0.316	96



Delay Factors	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	Total Weight ΣW	Highest Weight (A)	Total No. of Resp (N)	$RH = \Sigma W / (A * N)$	Rank
q) Conveyor	1	1	1	1	1	1	1	2	1	3	4	1	1	2	1	3	1	2	1	33	7	19	0.248	136
r) Cement Silo	1	1	1	1	1	1	1	2	1	3	4	1	1	1	1	1	1	2	1	30	7	19	0.226	138
s) Compressor	4	4	1	1	1	2	1	1	1	3	4	1	1	2	1	3	1	2	1	39	7	19	0.293	109
t) Pump	4	3	1	1	1	2	1	1	1	3	4	1	1	2	1	3	1	2	1	38	7	19	0.286	117
u) Plate Compactor	1	3	1	1	1	1	1	2	1	3	4	1	1	2	1	3	1	2	1	35	7	19	0.263	129
v) Chips Spreader	4	3	1	1	1	1	1	2	1	3	4	3	1	5	1	4	1	3	1	45	7	19	0.338	84
w) Theft of machines/machine parts	3	6	1	1	1	1	1	2	2	3	4	2	1	4	1	2	1	5	1	46	7	19	0.346	80
14. Shop Drawings																								
a) Preparation	1	2	1	1	6	5	5	6	1	1	6	1	2	1	4	2	6	4	3	64	7	19	0.481	24
b) Approval	1	2	1	1	5	5	5	5	2	1	5	1	3	1	4	2	6	6	4	65	7	19	0.489	21
15. Site Layout																								
a) Access to site entry/exit points	1	2	1	1	3	4	1	2	3	1	4	1	2	1	4	2	2	4	2	45	7	19	0.338	84
b) Congestion at site entry/exit points	1	2	1	1	3	4	1	2	1	1	4	1	2	1	4	3	2	5	2	45	7	19	0.338	84
c) Storage space	1	2	1	1	2	4	1	2	1	1	3	1	1	1	4	3	2	5	3	42	7	19	0.316	96
16. Industrial Relations Disputes																								
a) Wages	5	4	3	4	1	2	6	4	2	1	4	3	1	4	4	3	2	5	2	64	7	19	0.481	24
b) Safety	3	4	1	1	1	2	6	5	2	1	4	1	1	1	4	3	6	4	2	56	7	19	0.421	34
c) Welfare	3	4	1	1	1	2	6	6	2	1	4	1	1	1	4	3	2	5	2	54	7	19	0.406	47
d) Site communication	4	3	1	1	1	2	6	5	2	1	4	1	1	6	4	2	4	4	2	58	7	19	0.436	31
e) Labour camps	3	4	1	1	1	1	6	4	2	1	4	1	1	4	4	2	2	4	2	52	7	19	0.391	55
f) Discipline of workers	2	3	1	1	2	1	6	5	2	1	4	3	1	2	6	2	3	5	1	55	7	19	0.414	41
g) Absenteeism	3	3	1	1	1	1	6	4	3	1	4	3	1	1	6	2	2	6	1	54	7	19	0.406	47
17. Sample of Materials/Work Approvals																								
a) Client approval	1	2	1	1	1	1	6	7	3	1	4	1	2	3	4	2	2	5	4	55	7	19	0.414	41
b) Engineer approval	1	2	1	1	3	6	2	4	2	1	2	1	2	3	4	5	3	5	4	54	7	19	0.406	47
c) Re-work	3	2	1	4	5	3	4	3	3	4	4	2	2	4	1	2	3	4	2	60	7	19	0.451	28
18. Material Testing																								
a) Cement	1	2	1	1	1	1	2	5	1	1	2	2	3	1	1	2	2	5	2	38	7	19	0.286	117
b) Steel reinforcement	1	2	1	1	1	1	2	5	1	1	2	2	3	1	1	2	3	5	2	39	7	19	0.293	109
c) Timber	1	2	1	1	1	1	2	5	1	1	4	1	3	1	1	2	2	5	2	41	7	19	0.308	99
d) Sand	2	2	1	1	1	1	2	5	1	1	2	1	3	2	1	1	2	5	2	38	7	19	0.286	117
e) Aggregate	2	2	1	1	1	1	2	5	1	1	2	2	3	2	1	2	2	5	2	40	7	19	0.301	105
f) Bitumen	6	2	1	1	2	1	2	5	1	1	2	1	4	2	1	2	2	5	2	45	7	19	0.338	84
g) Murrum	7	2	1	1	4	1	2	5	1	1	2	2	2	3	1	3	2	5	2	49	7	19	0.368	71
h) Water	1	2	1	1	1	1	2	5	1	1	2	1	1	1	1	1	2	5	2	34	7	19	0.256	134
i) Graded Crushed Stone	1	2	1	1	1	1	2	5	1	1	2	3	2	4	1	2	2	5	2	41	7	19	0.308	99
j) Hand packed stone	1	2	1	1	4	1	2	5	1	1	2	1	2	1	1	2	2	5	2	39	7	19	0.293	109
k) Lime	1	2	1	1	1	1	2	5	1	1	2	1	1	1	1	2	2	5	2	35	7	19	0.263	129
l) Structural Steel	1	2	1	1	1	1	2	5	1	1	2	1	3	1	1	2	3	5	2	38	7	19	0.286	117
m) Asphalt	5	2	1	1	3	1	2	5	1	1	4	1	4	3	1	2	2	5	2	50	7	19	0.376	68
n) Soil	1	2	1	1	3	1	2	5	1	1	2	1	2	1	1	3	2	5	2	39	7	19	0.293	109
o) Rock	1	2	1	1	2	1	2	5	1	1	2	1	2	1	1	3	2	5	2	38	7	19	0.286	117
19. Natural Hazards																								
a) Fire	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	2	2	4	1	28	7	19	0.211	139
b) Floods	2	3	3	7	1	1	6	2	3	1	4	1	1	1	1	2	5	5	3	56	7	19	0.421	34
c) Landslides	2	2	1	4	1	1	1	2	1	1	3	1	1	1	1	1	3	4	2	36	7	19	0.271	126
d) Wind	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	2	4	1	27	7	19	0.203	140
20. Underground Services																								
a) Electricity cables	3	2	1	1	6	6	1	7	2	7	4	1	2	3	6	1	2	6	1	66	7	19	0.496	20
b) Telephone cables	3	2	1	1	6	6	1	7	2	7	4	1	1	2	6	1	5	6	1	67	7	19	0.504	16
c) Water pipes	5	3	1	1	6	6	1	7	3	7	4	1	2	3	6	2	2	6	1	71	7	19	0.534	11
d) Petroleum fuel pipes	1	1	1	1	6	1	1	2	1	2	4	1	1	1	1	1	2	6	1	39	7	19	0.293	109
e) Stormwater pipes	1	3	1	1	2	1	1	7	1	7	4	1	1	4	1	1	2	6	1	50	7	19	0.376	68
f) Data cables	1	1	1	1	1	1	1	7	1	7	4	1	1	1	6	1	1	6	1	48	7	19	0.361	75

Delay Factors																				Total Weight $\Sigma W$	Highest Weight (A)	Total No. of Resp (N)	RII = $\Sigma W / (A * N)$	Rank
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19					
21. Working Environment																								
a) Requirement for restrictive working hours	2	2	1	1	2	3	4	2	2	1	4	1	1	1	1	2	1	5	1	41	7	19	0.308	99
b) Ambient noise conditions	2	2	1	1	2	3	1	2	1	1	4	1	1	1	1	1	2	4	1	36	7	19	0.271	126
c) Ambient light conditions	2	2	1	1	2	1	1	2	1	1	4	1	1	1	1	1	2	3	1	33	7	19	0.248	136
22. Supervision/Management																								
Staff Availability																								
a) Resident Engineer	6	5	1	1	1	1	1	5	1	2	4	1	1	4	4	2	6	4	1	55	7	19	0.414	41
b) Inspector of Works	4	3	1	1	1	1	1	5	1	2	4	1	1	1	4	1	5	4	1	46	7	19	0.346	80
c) Site Agent	2	7	4	1	1	1	1	4	1	2	4	1	1	3	4	3	7	4	1	56	7	19	0.421	34
d) General Foreman	3	3	4	1	1	1	1	4	1	2	6	2	1	3	4	3	5	4	1	56	7	19	0.421	34
23. Advanced Technology																								
a) Computers	2	2	1	1	1	2	1	2	1	1	4	1	1	4	4	2	3	2	1	40	7	19	0.301	105
b) Automated machines	2	2	1	1	1	2	1	2	1	1	4	1	1	4	4	2	6	2	1	43	7	19	0.323	93
24. Suppliers																								
a) Late nomination of suppliers	4	2	1	1	3	2	7	6	1	3	4	1	1	1	1	2	2	4	2	52	7	19	0.391	55
b) Late deliveries of materials by suppliers	7	2	1	1	3	2	7	4	2	3	5	3	1	6	1	5	2	5	2	67	7	19	0.504	16
25. Client Problems																								
Slow decision making and bureaucracy in Client Organization	7	7	1	6	2	1	1	7	6	5	6	1	3	6	6	7	7	5	3	93	7	19	0.699	2

**Table 2.** Relative Importance Index and Ranking of Delay Factors for Consultants

[illegible]

Murram	7	6	1	4	3	1	5	5	3	2	4	2	43	7	12	0.512	10
6. Proximity to Required Resources																	
a) Borrow pit	7	3	1	4	6	5	7	5	1	4	4	1	48	7	12	0.571	5
b) Quarry	6	4	1	1	6	5	7	5	1	4	4	2	46	7	12	0.548	6
7. Underground Services																	
Water pipes	5	3	1	1	6	6	1	7	3	7	4	1	45	7	12	0.536	8
8. Client Problems																	
Slow decision making and bureaucracy in Client Organization	7	7	1	6	2	1	1	7	6	5	6	1	50	7	12	0.595	2

Table 3. Relative Importance Index and Ranking of Delay Factors for Contractors

Delay Factors	W13	W14	W15	W16	W17	W18	W19	Total Weight $\Sigma W$	Highest Weight (A)	Total No. of Resp (N)	$RII = \Sigma W / (A * N)$	Rank
1. Design Problems												
a) Design change by Client	3	5	1	2	7	1	7	26	7	7	0.531	7
b) Design change by Engineer	4	3	1	3	7	4	7	29	7	7	0.592	6
2. Financial/Economic Problems												
a) Payment by Client	2	1	4	7	7	7	5	33	7	7	0.673	2
b) Engineer's Certificates	2	3	4	7	5	7	3	31	7	7	0.633	3
3. Contractual Issues												
a) Variations	3	3	1	3	6	6	4	26	7	7	0.531	7
b) Claims	2	3	4	6	6	6	4	31	7	7	0.633	3
4. Weather Conditions												
Rain	4	3	5	4	3	4	7	30	7	7	0.612	5
5. Materials Availability												
Timber	2	1	4	6	5	6	2	26	7	7	0.531	7
6. Shop Drawings												
Approval	3	1	4	2	6	6	4	26	7	7	0.531	7
7. Sample of Materials/Work Approvals												
Engineer approval	2	3	4	5	3	5	4	26	7	7	0.531	7
8. Client Problems												
Slow decision making and bureaucracy in Client Organization	3	6	6	7	7	5	3	37	7	7	0.755	1

## 5. Conclusions and Recommendations

This study was aimed at finding the causes of delay in road construction projects in Kenya. There were 141 causes of delay that were extracted from the literature on the subject. The 141 causes of delay were divided into 25 broad categories. The overall top five causes of delay identified by both consultants and contractors were: Payment by client; Slow decision-making and bureaucracy in client organization; Claims; Inadequate planning / scheduling; and Rain. The

Spearman's rank correlation coefficient between the consultants and contractors was found to be 0.64 which showed that there was a positive correlation between the views of consultants and contractors. The range of causes of delay in completing road construction projects in Kenya was identified. The most important causes of delay in road construction projects in Kenya were also identified. The differences in perception of contractors and consultants regarding causes of delay in delivering projects by the intended completion date were identified as well. Therefore, the objectives of this study were substantially accomplished.

The Null Hypothesis which states that road construction project delays are not caused by exogenous and endogenous factors is rejected. Hence the Alternative Hypothesis which states that road construction project delays are caused by exogenous and endogenous factors is accepted.

Clients should improve their financial management systems so that they could be able to pay contractors in a timely manner. Kamanga and Steyn (2013) suggest that while it is common practice for contracts to include a performance guarantee clause, there should also be a payment guarantee clause so that if a duly issued payment certificate is not paid by the client within the stipulated period, the contractor may demand his payment from the guarantor. Bureaucracy and red tape should be reduced in client organisations in order to speed up the slow decision making process. Claims should be settled quickly so that they do not become a source of delays. Contractors should prepare adequate plans and schedules during execution of road projects. During the rainy season, contractors should plan to execute activities that are not normally affected by the rain in order to mitigate delays.

The following are recommended areas for further research: Investigation of factors that cause delays in road projects during the design stage; Investigation of the impact of BOOT (Build Own Operate Transfer) method of procurement on construction time performance; Impact of usage of old equipment on road construction projects on construction time performance; and Impact of usage of concrete surfacing in lieu of asphalt on roads on construction time performance.

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