EFFECT OF PROJECT PLANNING ON COLLAPSE OF STOREY BUILDINGS IN KIAMBU COUNTY, KENYA

Kingori, Monicah Nyambura.
Masters of Science in Disaster Preparedness and Engineering Management,
Masinde Muliro University of Science and Technology.
Dr Samuel Waweru.
Masinde Muliro University of Science and Technology, Kenya
Dr Edward Masibayi.
Masinde Muliro University of Science and Technology, Kenya

ABSTRACT

Building construction is a crucial and complex industry that plays a significant role in the economy of the country. Building policies are always set up in a relevant legislation authority in order to govern various training institutions, skilled construction workers, site supervisors and registration of the contractors. Building collapse has been a major concern to many governments both globally and locally. The causes of building collapse can range from bad design, faulty construction, foundation failure, extra ordinary load, unexpected failure mode and a combination of causes. The actual causes of storey building collapse have not been fully identified. The purpose of the study was to establish the effect of project planning on collapse of storey buildings in Kiambu County, Kenya. Descriptive survey research design was chosen. From a target population of 596, a sample of 181 respondents were chosen from National Environment Management Authority NEMA (1), Board of registration of Architects and Quantity Surveyors (BORAQS) (1), licensed Civil engineers (28) and Quantity surveyors (19), National Construction Authority (NCA) (1) and Building contractors (131). Data was collected using questionnaires; the questionnaire designed in line with the objectives of the study. The data was entered in Statistical Package for Social Sciences (SPSS) which was used to analyze the data. The data was tabulated and analyzed by calculating various percentages as possible and presented through tables and text. The study found that project strategic plans were developed for the buildings, that there was involvement of currently practicing engineers' professionals in project detailed design and that project ideas into alternative concepts were examined. Moreover, the study found that there was project classification and that project past experience information was accessed and applied. The study concluded that project planning significantly contributes to collapse of storey buildings in Kiambu County. The study therefore recommends that it is good for the construction companies to emphasize the need for use of qualified personnel in all construction activities as a step towards restoring sanity in the industry.

Key words: **Building collapse, project planning, detailed design, project classification, building construction.**

INTRODUCTION

Buildings, like all structures, are designed to support certain loads without deforming excessively. The loads are the weights of people and objects, categorized as live loads or imposed loads which includes; people, furniture, vehicles, the weight of rain and the pressure of wind and the dead loads which includes; the weight of a building's structural elements such as beams, walls, roof and structural flooring components.

A building is, according to Umeora (2013), a roofed and walled structure made for lasting use for the living, working, and storage of man. Buildings are buildings that shield man and his property and actions. They should be meticulously planned, designed and built to achieve the desired environmental quality. Development failure can be described as the incapacity of the construction components to meet the regular demands of those components. The malfunction of one or more of its elements may result into the building's inability to carry out its safety and stability functions totally or partly (Charagu, 2013).

Buildings contribute greatly to every nation's growth. Consequently, when a building collapses, it does not fulfill its roles to the government and the people. It is also necessary to protect human lives, which may be threatened by a collapse of a structure (Balu-Tabaaro, 2011). Building problems in developing countries can be due to one or more variables, including the building owners and the failure of developers to adhere with building rules, or the negligence of architects and engineers, contractors, government agencies or officials to fulfill their duties in accordance with existing building codes (Gichuhi, 2011).

Building all over the globe is one of humanity's most prized possessions. Therefore, while these structures provide a wide range of accommodation for mankind in the form of homes, temples, mosques, workplaces, classrooms, hospitals, etc., they also provide work for the skilled and unskilled citizen (Oke, 2011). Corbett (2015) confirmed an 8-story commercial building collapsed in Savar, a sub-district near Bangladesh's capital, Dhaka, on 24 April 2013. At least 547 people have died, and around 2,500 have been injured, many others missing. It is considered to be the worst accident in the clothing factory in memory. It was reported that the elected mayor of the municipality was fired for alleged negligence in approving the design and construction of the project, including addition of a three-story building to the Rana Plaza (Ellingwood & Bruce, 2006).

The shortage of land and a propensity for flooding in Bangladesh has prompted many factory owners to build up, rather than out. Additional floors often are hastily added without reference to building codes and approvals. Most factory owners who couldn't afford to build new buildings because of high land costs and limited access to utilities converted hundreds of residential and other buildings into renovated garment factories to meet the demands of Western retailers (Simbiye, 2013). Two elevated walkways tumbled on July 17, 1981, killing 114 people and wounding 200 others through the Hyatt Regency Hotel lobby in Kansas City, Missouri, United States. The incident was due to late improvements in the architecture, modifying the mechanism by which they were connected to the rods linking the walkways, and accidentally through the binding forces. The accident highlighted the need for good communication between the design engineers and suppliers, including limitations on product changes. The accident is a common case study on engineering courses worldwide and is used to teach engineering the value of ethics (Githui, 2012).

Mark Bediako reported in Daily Graphic Newspapers that Accra, the capital city of Ghana, had officially listed four major building accidents between 2012 and 2014 that claimed 19 lives in all. The collapse of the Melcom building near Achimota in 2012 claimed 14 lives

while 4 deaths were recorded for the collapse of the Grand View Hotel building in Nii–Boi City in 2014. Two other buildings fell in 2014; the building near Akai House in Cantonments took one life while the central university hostel building in Dawhenya crumbled exacerbating no casualties. The collapse of a multi-storey building recently happened in Cantonments and confirmed three deaths. A critical review of these structures has shown that almost all of the buildings that failed during this time were private property. The crash of the Dar es Salaam building in March 2013, which resulted in the deaths of 36 persons, was correlated with multiple collapse factors; including bad structural construction, violating the layout cap of 10 floors and not 16 floors, substandard strengthening of concrete and steel bars (Simbeye, 2013). On Saturday, January 28, 2012, the demolition of the Naval structure, a two-story building in Gwarimpa, Abuja, happened. Fifteen people were confirmed to be working at the site when the building collapsed; two died, one was seriously injured and the others survived with minor injuries (Faniran et al, 2000). The building under review was listed as unsafe by the Federal Capital Development Authority (FCDA), and was listed for destruction before it eventually collapsed. This, however, causes the structure to be defective, hence the need to explore the determinants responsible for this (Nnabugwu, 2012). A pertinent glance at the debris exposes the structural weakness of the materials used for the construction. Poor quality materials were used in building construction, including the reinforcement bars, concrete mixture ratio etc. The concrete material was not evenly distributed; thus, the craftsmanship during the development of the collapsed building could be identified as bad. This as a matter of fact must also have contributed to the weak structural members such as columns, beams and slabs which led to the unsafe nature of the building.

A 2009 report by the Architecture Association of Kenya (AAK) indicated that 2/3 of Kenya's buildings failed to meet the mandatory safety standards. The most vivid are the collapse of a building in Nairobi Ronald Ngala in 2006, at pipeline, Embakasi in June 2011 collapse of a building in Kiambu town in 2009, another building in Kiambu in the year 2010.

Statement of the Problem

Kenya has experienced several cases of building collapse in the last few years. The major causes have been attributed by substandard building materials; which have been done without tangible evidence. Kenya has been using the British standard for building materials which is an assumption that the materials are of same quality. Over the last decade, more than ten cases of buildings collapse in Kiambu County have been reported; in 2009 a five storey building which was under construction collapsed due to unequal settlement of the ground leading to death of 17 people while 10 people sustained serious injuries. In 2014, a four storey building collapsed leading to death of 3 people while 4 others sustained injuries. In 2010, heavy rains led to the collapse of a five storey building although no casualties were reported. In 2015, a four storey building collapsed due to poor foundation while in 2016, a five storey building collapsed due to unknown reasons; another 5 storey building under construction near Ndenderu market collapsed injuring 1 person, the cause of collapse was due to the use of substandard building materials. Kiambu County has had many cases of building collapse, yet no investigations have been done to determine the cause; thus, it is against this

background that the researcher wished to investigate the contribution of project planning to collapse of storey buildings in Kiambu County.

Research Objectives

The overall objective of this study was to investigate the contribution of project planning to collapse of storey buildings in Kiambu County.

LITERATURE REVIEW

Project planning is one of the most important project management functions. Hore et al (1997) describes project planning as the optimal systematic arrangement of project resources to achieve project objectives. Project planning requires that project objectives are defined first; thereafter, the strategies to achieve them are formulated. Project planning can be described as the process of defining project objectives, determining the framework, methods, strategies, tactics, targets and deadlines to achieve the objectives and communicating them to project stakeholders. The process of project planning requires that the client's expectations or requirements and the available resources be defined first, then matched to set project objectives, available options identified and evaluated and the most appropriate frameworks, strategies and tactics to achieve the objectives selected (Gigado, 2004). Project planning also involves communicating the objectives and the frameworks, methods, strategies, targets and deadlines to achieve them to the persons, parties and organizations concerned with their implementation, monitoring and control. The process involves preparing numerous project plans, each representing defined strategies to achieve defined project objective. Faniran et al (1998) describes project planning as the process of determining the appropriate strategies for the achievement of predefined project objectives. The above studies indicate that a project plan is a document that specifies one or more project objectives and how to achieve them. Several plans are required for the effective delivery of a project. While a plan may comprise two or more objectives, two or more plans may target the same objective.

Planning is a fundamental tool in project management used in meeting project scope, time and cost (Morledge & Smith, 2013). Planning defines the activities and actions, time and cost targets, and performance milestones which will result in successful project objectives in the developed countries, according to Onyemachi and Uji (2005), contractors have embraced planning because the results of a well-planned, carefully monitored and controlled contract directly impact on performance and profitability of the contract and the company. Planning is a continuous process that commences as soon as the decision on the investment is taken and does not end until the project is delivered. Accordingly, Emiran et al (2000) identified three levels of project planning:

1) The end-user level, where the planning focuses mainly on the functional characteristics of the project end product;
2) The technical level, which focuses on the technical specifications of the project deliverables that are needed to support the functional requirements.

3) The project management level, which focuses on planning the activities and processes that need to be performed to ensure that the technical work proceeds effectively.

These three levels of planning can otherwise be regarded as project conception planning, project design planning and construction planning. These levels (conception, design and construction) are the project delivery stages.

A number of researches have been done for a long time on the causes of projects closure/ failure, the effects felt as a result of these projects failing to meet the deadlines and the advantages achieved when the projects are implemented within the stipulated time frames. According to Makana (2016) for example, Project closure involves handing over the final product to the customer, handing over the built drawings, giving the operation and maintenance plan, terminating the contracts and informing all stakeholders that the project is closed. If project completion date has been frozen without arranging inputs and proper planning, this can lead to hasty and unsystematic work towards the end of the project. Failure to clearly comprehend the project, all its aspects can lead to works being executed erroneously and the attendant correctional steps to remedy the errors will cause project delay. The consequences are actually grave, ranging from litigation to claims and disputes, to outright abandonment of the project (Olatunji, 2010).

Planning stage is therefore very key to success of construction project. Delivery of materials on site will quite affect the project progress. If that supply does not ensure that quality materials are delivered on site then it will cause delay of project completion (Wambugu, 2013). This is because material not meeting the quality of design will most likely be rejected and the process of getting the right material will be taking more project implementation time. When materials are lacking on site it means that the employees will not have work to do. This is quite demoralizing and will affect the project delivery negatively. This is largely a product of poor planning in the construction project. Indeed, material availability is the most frequent problem that leads to delay in majority of the countries as identified by Olatunji (2010).

Slderbeg (2011) identifies contractors' improper planning as one of the causes of project delay. If a contractor fails to come up with a workable work program at the initial stages, this will affect project timely completion. A similar observation is made by Jagboro and Aibinu, (2002) in Nigeria. Equally emphasizing on the need for proper planning of construction project is Pakir et al (2012) in a study carried out in Sudan. Mc Minimee et al (2009) stated that it was clear that investments in advance planning and project development paid off. Mojahed (2005) states that proper planning in all phases and components of construction project are necessary to avoid re work which in turn leads to delay in project completion.

Wambugu (2013) observes that planning affected the timely completion of rural electrification projects in Kenya, the roads links between Mahi-Mahiu and Nairobi, Narok-Bomet road, the notorious Taita-Taveta –Arusha road 16 among others and that the quality

and importance of project planning had been considered a major cornerstone of every successful project. Tabishl and Jha, (2011) in a study carried out in Singapore conclude that comprehensive site investigation helps in sound planning which in turn helps in clarifying the scope and developing a thorough understanding. This also helps minimize change of scope during construction. Pakir et al (2012) state that accurate construction planning is a key determinant in ensuring the delivery of the project on schedule and within budget. In his writing about the role played by planning in determining the future of the developing countries, Kaming et al (2009) argue that, just like it is difficult to properly plan for finances, labour, risks, monitoring and evaluation, materials providence and many more in the manufacturing industry, the infrastructure implementation sector in developing states has been hit with the same problem for long. The state of infrastructure in Kenya is hindered by planning as a major element whereby the people involved in developing plans do quality planning on paper that considers the project implementation and evaluation only but it is limited in terms of actualization. This has left up to 49.89% of the Kenyan projects taking longer than planned or others dying on the way.

Conceptual Framework

The conceptual framework shows the relationship of the variables to be measured. The independent variables become the parameters that will be measured and their effect on the dependent variable determined. In this study, the researcher views the project planning as subject to the factor that affect the Performance of Building Construction Projects. The moderating variable of the study is direct government involvement.

Majority of building collapses occurs due to structural failure. Every building is designed to carry a specified load, but when this is altered with; collapse of buildings will definitely occur. Project planning is a vital aspect which must be followed to the later and conceptual planning, design and construction stages to be adhered with (Ellingwood & Bruce, 2006). This has been presented in Figure 1.
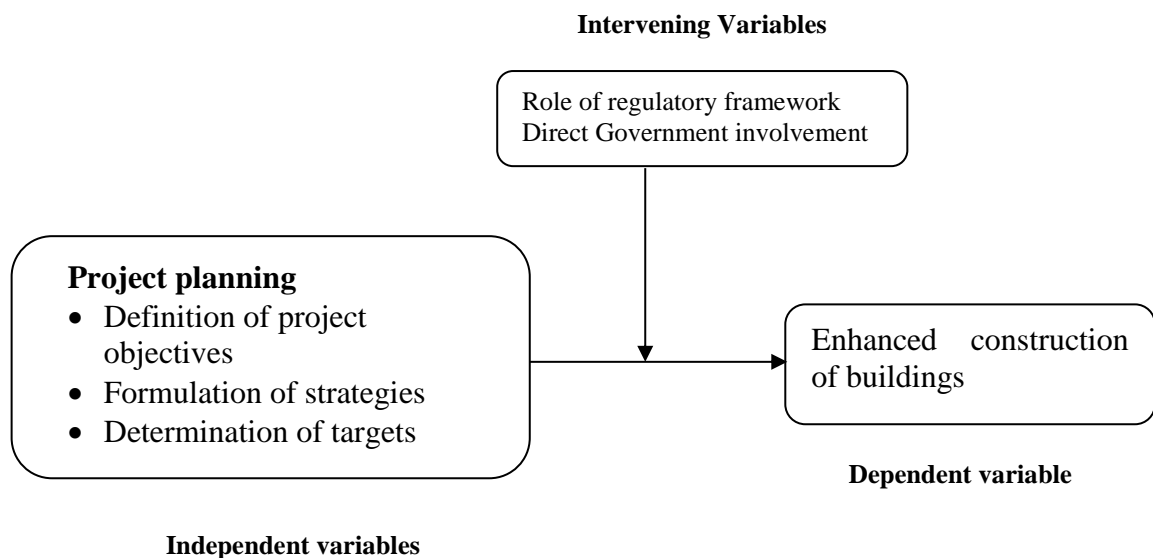
Intervening Variables

```
┌─────────────────────────────┐
│ Role of regulatory framework │
│ Direct Government involvement │
└─────────────────────────────┘
```

```
┌──────────────────────────┐            ┌──────────────────────────┐
│ Project planning          │            │ Enhanced    construction │
│  • Definition of project  │ ─────────▶ │ of buildings              │
│    objectives             │            │                          │
│  • Formulation of strategies │          └──────────────────────────┘
│  • Determination of targets │                   **Dependent variable**
└──────────────────────────┘
```

Independent variables

Figure 1: Conceptual Framework

Materials and Methods

Study area

Kiambu County is one of the 47 counties in the Republic of Kenya. It is located in the central region of Kenya and covers a total area of 2,543.5 Km2 with 476.3 Km2 under forest cover according to the 2009 Kenya Population and Housing Census. Kiambu County borders Nairobi and Kajiado Counties to the South, Machakos to the East, Murang'a to the North and North East, Nyandarua to the North West, and Nakuru to the West as indicated in Map. The county lies between latitudes 00 25'and 10 20'South of the Equator and Longitude 360 31'and 370 It is one of the rapidly urbanising counties after Nairobi and Mombasa, whereby 60 per cent of the county is urbanised (KPHC, 2019).

Kiambu County has 12 administrative Sub- Counties that are also referred as constituencies, as shown in fig 2.
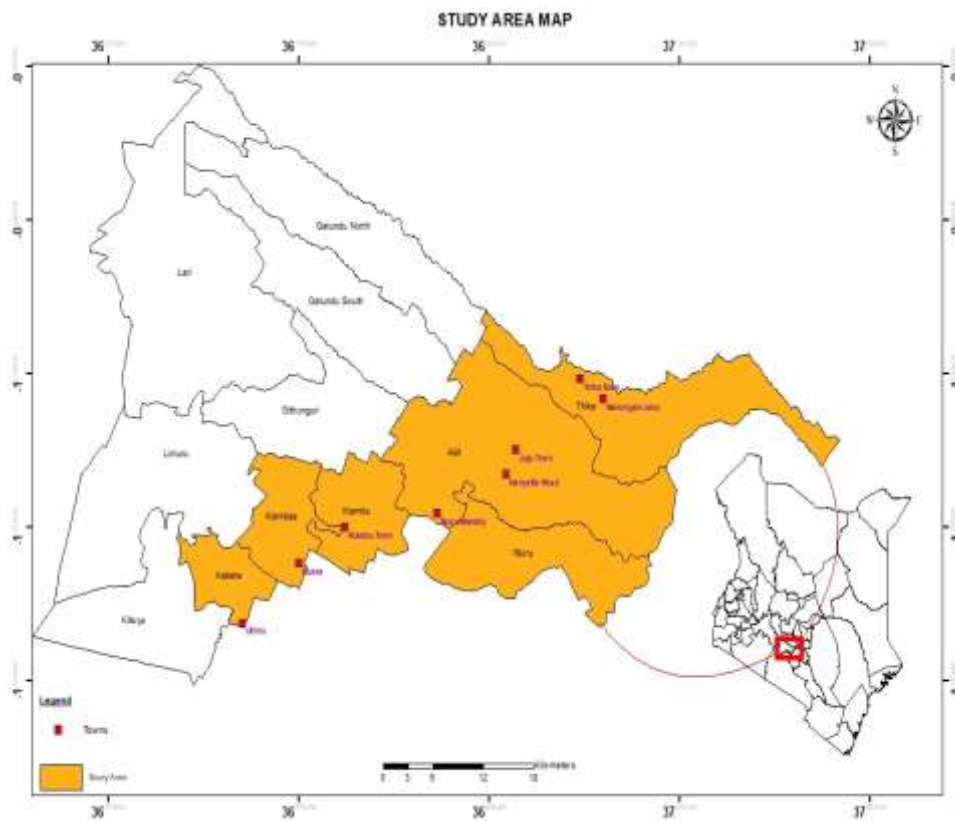
Scale: 1:50000

Coordinate (1.0314° S, 36.8681° E)

Figure 2: Map of Kiambu County showing the twelve sub counties

Modified by: The Researcher Date: April 2019

Research design

Descriptive survey research design was chosen to enable the researcher to generalize the findings to a larger population.

Target population

This study targeted all the licensed architectural and quantity surveyor firms and building contractors operating in Kiambu County, as well as officers from the Board of Registration of Architects & Quantity Surveyors (BORAQS), National Construction Authority (NCA) and National Environment Management Authority(NEMA) building inspection unit. The statistics from the Institute of Quantity Surveyors of Kenya (IQSK) indicates that there are 63 registered quantity surveyors firms operating in Nairobi region. The total population therefore totals to 596.

Sampling Procedure and Sample Size

Purposive sampling method was used to select Kiambu County due to familiarity of the researcher and the rise in cases of building collapse in the area. The Sub counties were selected with the highest number of building plans submitted in the department of planning for approvals as at 2013- June, 2015.

The study used simple random sampling to select 19 licensed quantity surveyors, 28 licensed civil engineers and 131 licensed building contractors. The study also randomly selected 1 officer in management position each from the BORAQS, NCA and NEMA in charge of building licensing and inspection. This gave a sample size of 181.

Data Collection

The researcher used self-administered questionnaires as the main tool for data collection. The selection of these tools was guided by the nature of data that was collected, time available as well as the objectives of the study. The questionnaire comprises both closed and open-ended questions drawn in accordance with the set objectives of the study. The questionnaire is organized in subsections.

The study collected primary data and secondary data from reports. The primary data was collected using a questionnaire. The questionnaire is designed in line with the objectives of the study. Structured questions were used in an effort to conserve time and money as well as to facilitate easier analysis as they are in immediate usable form; while the unstructured questions were so as to encourage the respondent to give an in-depth and felt response without feeling held back in revealing of any information (Mugenda & Mugenda, 2003).

Data Analysis Procedures

Data was analyzed using Statistical Package for Social Sciences (SPSS Version 25.0). All the questionnaires received were referenced and items in the questionnaire were coded to facilitate data entry. After data cleaning which entailed checking for errors in entry, descriptive statistics such as frequencies, percentages, mean score and standard deviation was estimated for all the quantitative variables and information presented inform of tables. The qualitative data from the open-ended questions was analyzed using conceptual content analysis and presented in prose. Inferential data analysis was done using regression analysis. In this study the regression model generally assumed the following equation;

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

Where: - β_0=constant ; β_1 = Regression coefficients; Y= collapse of storey buildings; X_1= Project planning; ε=Error Term

Research Findings and Discussions

The study sought to examine the contribution of project planning to collapse of storey buildings in Kiambu County. Therefore, the respondents were asked to indicate the level to which they agree with the various statements on contribution of project planning to collapse of storey buildings in Kiambu County. Their responses were as shown in Table 1.

Table 1: Agreement with the Various Statements on Contribution of Project Planning to Collapse of Storey Buildings

	Mean	Std. Dev.
There was identification of the project ideas.	3.616	0.578
Project feasibility studies were done.	4.075	0.839
Project evaluation was done.	4.199	0.776
There was project classification.	3.815	0.788
There was project preliminary selection.	2.473	0.578
Project ideas into alternative concepts were examined.	3.925	0.734
Project strategic plan was developed.	4.075	0.806
Project past experience information was accessed and applied.	3.370	0.954
Development of systems with repositories database that contain project details were established and applied.	4.171	0.782
Project ideas generation were examined.	4.021	0.859
There was project assessment of market, technology and competition.	4.212	0.798
There was involvement of currently practicing engineers' professionals in the definition of the product.	2.329	0.888

There was involvement of currently practicing engineers' professionals in project detailed design.	3.945	0.608
There was involvement of currently practicing professionals in the project technical specifications.	3.034	0.783

From the findings, the respondents agreed that there was project assessment of market, technology and competition as shown by a mean of 4.212, that project evaluation was done as illustrated by a mean of 4.199, that development of systems with repositories database that contain project details were established and applied as shown by a mean of 4.171 and that project feasibility studies were done as illustrated by a mean of 4.075. This concurs with Gigado (2004) who argues that project planning also involves communicating the objectives and the frameworks, methods, strategies, targets and deadlines to achieve them to the persons, parties and organizations concerned with their implementation, monitoring and control. The process involves preparing numerous project plans, each representing defined strategies to achieve defined project objective.

The respondents also agreed that project strategic plan was developed as illustrated by a mean of 4.075, that project ideas generation were examined as illustrated by a mean of 4.021, that there was involvement of currently practicing engineers' professionals in project detailed design as shown by a mean of 3.945 and that project ideas into alternative concepts were examined as illustrated by a mean of 3.925. Additionally, the respondents agreed that there was project classification as shown by a mean of 3.815 and that there was identification of the project ideas as shown by a mean of 3.616. However, the respondents were neutral that project past experience information was accessed and applied as shown by a mean of 3.370 and that there was involvement of currently practicing professionals in the project technical specifications as shown by a mean of 3.034 but disagreed that there was project preliminary selection as shown by a mean of 2.473 and that there was involvement of currently practicing engineers' professionals in the definition of the product as shown by a mean of 2.329. These findings correlate with Oluwoye and Lenard (1998) who describe project planning as the process of determining the appropriate strategies for the achievement of predefined project objectives. The above studies indicate that a project plan is a document that specifies one or more project objectives and how to achieve them. Several plans are required for the effective delivery of a project. While a plan may comprise two or more objectives, two or more plans may concern the same objective. Planning is a continuous process that commences as soon as the decision on the investment is taken and does not end until the project is delivered.

Collapse of Storey Buildings in Kiambu County

The respondents were further asked to indicate their level of agreement with various statements on collapse of storey buildings in Kiambu County. Their replies were as shown in Table 2.

Table 2: Statements on Collapse of Storey Buildings in Kiambu County

	Mean	Std. Dev.
There are visible cracks on the buildings	3.619	0.962
Buildings are always inspected for possible weaknesses	3.833	1.034
There has been frequent collapse of storey buildings in our area.	3.071	0.712
The chief engineer inspects concrete mixing to ensure that it is properly done.	4.167	0.794
Soil strength test is done to ascertain how hard the ground is to support the storey building	3.925	0.734
Modifications are always made to correct the excess weight faults by considering adding additional columns for backing up so as to support the excess weight	4.075	0.806

From the findings, the respondents agreed that the chief engineer inspects concrete mixing to ensure that the it is properly done as shown by a mean of 4.167, that modifications are always made to correct the excess weight faults by considering adding additional columns for backing up so as to support the excess weight as illustrated by a mean of 4.075, that soil strength test is done to ascertain how hard the ground is to support the storey building as indicated by a mean of 3.925, that buildings are always inspected for possible weaknesses as shown by a mean of 3.833 and that there are visible cracks on the buildings as illustrated by a mean of 3.619. The respondents were neutral that there has been frequent collapse of storey buildings in our area as illustrated by a mean of 3.071. These findings conform to Environmental Management and Coordination Act (1999) that NEMA has the primary responsibility of implementing environmental safeguards, although many actors have responsibilities including civil society, private consulting firms, development banks which finance infrastructure and other government actors including local government and the court system. Currently, the system suffers from inadequate funding, corruption, a lack of engagement with important community stakeholders, gaps or duplications of regulations, and a misunderstanding by society at-large of the benefits of a sustainable project.

Regression Analysis

The researcher conducted a multiple regression analysis to test the relationship between the variables. This showed how the dependent variable is influenced by the independent variables.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error
1	0.819	0.670	0.668	0.868

From the findings, the independent variable was statistically significant predicting the dependent variable since adjusted R square was 0.68. This implied that 68% variations in collapse of storey buildings in Kiambu County are explained by project planning. Other

factors leading to collapse of storey buildings in Kiambu County that were not covered in this study accounted for 32% which form the basis for further studies.

Table 4: ANOVA Test

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	199.121	1	199.121	264.094	0.000
	Residual	98.017	130	0.754		
	Total	**297.138**	**131**			

From the ANOVA Table, p-value was 0.000 and F-calculated was 264.094. Since p-value was less than 0.05 and the F-calculated was greater than F-critical (2.4408), then the regression relationship was significant in determining how project planning contributes to collapse of storey buildings in Kiambu County.

Table 5: Coefficients of Determination

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	**Std. Error**	**Beta**		
(Constant)	1.267	0.182		6.962	0.000
Project Planning	0.712	0.208	0.611	3.423	0.001

The established model for the study was:

$$Y = 1.267 + 0.712X_1$$

Where: - Y= Collapse of Storey Buildings in Kiambu County

X_2= Project Planning

The regression equation above has established that taking (quality of building materials, project planning, pre-construction practices and role of institutional bodies), collapse of storey buildings in Kiambu County will be 1.267. Further it was found that if project planning increases, there is a 0.712 increase in Collapse of Storey Buildings in Kiambu County. These findings correlate with Kakitahi et al (2013) who showed that poor quality materials are partly responsible for cases of low-quality construction works registered in Uganda.

Conclusions

The study also concludes that project planning significantly contributes to collapse of storey buildings in Kiambu County. The study deduced that project strategic plan was developed, that there was involvement of currently practicing engineers' professionals in project detailed design and that project ideas into alternative concepts were examined. Moreover, the study found that there was project classification and that project past experience information was accessed and applied. The study also found that there was involvement of currently practicing professionals in the project technical specifications and that there was no involvement of currently practicing engineers' professionals in the definition of the product.

Recommendations

The study recommends that it is good for the construction companies to emphasize the need for use of qualified personnel in all construction activities as a step towards restoring sanity in the industry. The tragedies are likely to keep occurring if left unchecked as construction activities increase. The inability of Kenyan construction industry of having its own code of practice is another factor that should be put into consideration. This would have considered the quality of the local materials used in construction.

In order to reduce the incidences of building collapse in any country, the Institution of Engineers of Kenya (IEK), Architectural Association of Kenya (AAK) and other government agencies should work on availing a code of practice which will match on the local materials used in a particular region. They should also make sure that the client employs a qualified engineer to supervise the project. The government should be keen in ensuring that all projects meet the required standards before they are laid on site. Any sort of corruption, poor governance or poor construction materials that do not meet the required standards of construction will always lead to loss of lives and properties.

REFERENCES

Balu-Tabaaro, W. (2011). Use of pozzolans as a binder in the building materials industry in Uganda, In Proceedings of the Workshop on Cement and Concrete for Africa, organized by Spearhead Network for Innovative, Clean and Safe Concrete Technologies (SPIN), 17th August 2011, *BAM Federal Institute for Materials Research and Testing*, Berlin, Germany, pp. 23-31.

Charagu, S.N. (2013) MSc. Thesis on collapsing building structures in Kenya, JKUAT.

Corbett, K.O. (2015). Incessant Incidents of Building Collapse in Nigeria: A Challenge to Stakeholders. *Global Journal of Researches in Engineering*, 10, 75-84.

Ellingwood & Bruce R. (2006). Mitigating risk from abnormal loads and progressive collapse. *Journal of Performance of Constructed Facilities* 20, no. 4: 315-323.

Faniran, O.O., Love, P.E.D. & Smith, J. (1998). Effective front-end project management: A keyelement in achieving project success in developing countries. Proceedings: The Construction Development Conference. Botswana, 2–16 June.

Gichuhi, F. (2011). Why buildings collapse in Kenya. *A4architect* (2011), (available athttp://www.a4architect.com/2011/09/why-buildings-collapse-in-kenya/).*Journal of Emerging Trends in Engineering and Applied Sciences* (JETEAS) 2 (3), 462-469 (ISSN: 2141-7016

Gigado, D. M. (2014). Ethical issues in the construction industry in Kenya: A critical analysis of the professional conduct in engineering technology management.*Industrial Engineering Letters www.iiste.org*2224-6096, 2 (7).

Githui, D. M. (2012). Ethical issues in the construction industry in Kenya: A critical analysis of the professional conduct in engineering technology management. *Industrial Engineering Letters www.iiste.org*2224-6096, 2 (7).

Hore, A.V., Kehoe, J.G., McMullan, J. & Penton, M.R. (1997). Construction 1: Management Finance Mea Hwang,Bon-gang;Ng, Wei Jian.Project management, knowledge and skills for green construction: overcoming challengs. Journal of the international project management association Vol.31,2013,2, p.272-284.

Jagboro, C. and Aibinu, T. (2002). Application of the Weibull Distribution Technique in the Prediction of Construction industry Discussion Document, 2002. *International Journal of Engineering Research and Technology Journal of Construction Management and Economics, 20, 13-19.*

Kakitahi, J. M., Alinaitwe, H. M., Landin, A. & Rodrigues, M. J. (2013). A Comparison of construction related rework in Uganda and Mozambique. *Journal of Construction Project Management and Innovation*, 4(1), 770-781.

Kaming, V., Gibson, G., Kaczmarowski, J., & Lore, H. (2009). Pre-project-Planning Process for Capital Facilities, *Journal of Construction Engineering Management*, 121(3), 312-318.

Kenya Standard KS 2183:2009 (KEBS 2009): General Concrete works – Code of practice

KPHC, (2019). General Concrete works – Code of practice

Makana, F. (2016). *Owners of collapsed Huruma building and county officials remanded.* Retrieved from Standard Digital: http://www.standardmedia.co.ke/article/2000200513/owners-of-collapsed-huruma-building-and-county-officials-remanded.

Mc Minimee, D. B., Laufer, A. & Tucker, R. (2009). Is construction planning really doing its job? A critical examination of focus, role and process, *Construction Management and Economics*, Vol. 5 No. 3, pp. 243-266.

Mojahed, M. (2005). Appraisal of Sandcrete Block as Walling Unit in Nigeria, *Environmental Watch Journal, Federal Polytechnic, Bida*, 1(1), 251 – 257.

Morledge, R. & Smith, A. J. (2013). *Building procurement.*John Wiley & Sons.

Mugenda, O. M&Mugenda. A.G.(2003). *Research Methods, Qualitative and Quantitative Approaches*. Sage Publications

Nnabugwu, F.(2012). One feared dead as building collapse in Abuja. The Vanguard newspaper, January 28th 2012.www.vanguardngr. com Organization for Economic Co-operation and Development (OECD); 2000.*Reducing the Risk of Policy Failure: Challenges for Regulatory Compliance.* Wales:

Oke, O. E. (2011). *Causes and effects of collapsed buildings in Nigeria* (A case study of Lagos stateThesis). Federal University of Technology, Kure.

Oluwoye, T. C. & Lenard, Z. A. (1998). Building Failure and its Implication On Real Estate Investments In Nigeria,*Journal of the Association of Architectural Educators in Nigeria (AARCHES)*, 4(1), 57 – 63.

Onyemachi, C. and Uji, D. (2005). Building Failure and its Implication On Real Estate Investments In Nigeria, *Journal of the Association of Architectural Educators in Nigeria (AARCHES)*, 4(1), 57 – 63.

Pakir, N., Alinaitwe, H. M., Landin, A. & Rodrigues, M. J. (2012). Building Code and Challenges for Builders. NEW Published on Tuesday. 19 Nov., 2013 by Femi Akinola Sustain. Dev. 13, 209-211. Sustainable Construction; Watford, UK. the Times Between Failures (MTBF) of Building Components, Nigeria Journal of the Way Forward". The West Africa Built Environmental Research Conference,

Simbeye, F. W. (2013). Tanzania: Poor Workmanship to Blame as High RiseHigh-Rise.

Slderbeg, T. (2011). Sustainable development (1987-2005): An oxymoron comes of age.

Tabishl, S. and Jha, W. (2011). A Comparison of construction related rework in Uganda and Mozambique. *Journal of Construction Project Management and Innovation*, 4(1), 770-781.

Umeora, C.O. (2013). The Incidence of Building Collapse and Emergency Management in Nigeria.*Journal of Environmental Sciences and Resource Management*, 5(2), 73-79.

Wambugu, P. (2013). Use of concrete in Kenya". Proceedings of Workshop on diverse use of concrete. Department of Civil and Structural Engineering, Moi University, Kenya.