

## DETERMINANTS OF HOUSE CONSTRUCTION COST IN KENYA: A CASE OF NAIROBI COUNTY

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### Abstract

*The provision of decent houses in Nairobi to majority of the population is facing serious challenges of affordability and accessibility. This has resulted to high prices and shortages of houses to the majority of the population. These twin challenges have been attributed to the cost of building the houses. The purpose of this study was to establish the determinants of house construction cost in Nairobi County. To achieve this, specific objectives were to determine the influence of finance, building materials, labour, land and infrastructure cost on construction cost of the houses. In addition, to establish possible strategies and initiatives that can be implemented to make construction cost of house affordable. In order to achieve these objectives the researcher used theories of finance and adapted the Fisher-Di Pasquale-Wheaton model as a constructive tool to explain the basic concepts and interactions between the real estate-market and the financial market. The study evaluated how significant the relationship each of these determinants has with the house cost. The study adopted a descriptive research survey where seventy structured questionnaires were distributed among three categories of professionals in the housing sector. The target population of this study was one hundred and sixty (160) professionals firms in the housing industry and registered with their respective associations as at 31<sup>st</sup> December 2013. A sample of 70 professionals was randomly selected in proportion to what each professional group had with the study population. This study utilized a self-administered questionnaire as a tool of collecting data. The data was analyzed using mean and standard deviations and Pearson correlation analysis. The study found out that land, building materials and infrastructure determinants have the most influence on the housing cost in Nairobi Kenya. Each of these determinants registered the highest average mean score and had a strong positive relationship with house cost with an equally high level of consensus among the respondents. The study also found out that there are possible strategies and initiatives that can be implemented to reduce the cost of constructing houses which includes Private-Public-Partnership, Government facilitation and use of alternative building technology. Based on these findings, this study concluded that the most influential determinants of cost of constructing a house in Nairobi, Kenya are land, building material and infrastructure costs. The study also concludes that there is need for the government to create an enabling environment for private sector to supply houses in Nairobi. The study therefore recommended implementation of a number of strategies and initiatives to make the houses accessible and affordable to most of the population in Nairobi, Kenya namely; encouraging Public-Private-Partnership, Government offering incentives and enabling regulatory and business environment to private sector participation and adoption of new alternatives building technologies by the professionals in the housing sector.*

**Key Words:** Construction Cost, House Price, House Cost, Infrastructure Cost, Materials Cost, Labour Cost, Land Cost, Capital Cost

## 1. INTRODUCTION

### *1.1 Background of the Study*

Housing sector is important and strategic to government and policy makers due to its impact on country's output fluctuations and inflation. The housing industry impacts on the well-being of the people in various ways such as, the size and composition of household wealth, accessibility to credit, labour productivity and employment. Africa is experiencing an explosive demographic growth combined with a rapid urbanization and in most African countries; the delivery of urban housing cannot be met by the supply, AfDB (2011). Currently, 62% of the population living in Africa cities lives in informal housing, where basic services are poor or non-existent, CAHF (2012). In Kenya, 60% of the urban population resides in what is considered inadequate housing, World Bank (2011). This rapid and uncontrollable urbanization have turned the housing industry into one of the critical developmental issues facing policymakers in Africa according to Central bank of Ghana report on The Housing Market in Ghana (2007). Aliyu (2011) noted that the major symptoms of urban housing problems include: an absolute shortage of housing units, emergence and proliferation of slums and squatters settlement, rising house rents and growing inability of citizens to buy or build their own houses. According to Memon (2010) developer's capacity to execute projects as well as to bring well-built units at reasonable cost into the market is a key determinant of housing affordability and availability. Kenya's rapid urbanization, demographics, and the under-supply of housing point to a consistent need for middle and low cost housing, where demand is highest and supply least according to the World Bank (2011).

In Integrated Urban Development Master Plan for the County of Nairobi 2014-2030, captures clearly challenges facing the county as, uncontrolled urban development, insufficient infrastructure, poor living conditions, inadequate social facilities, transport problems, inadequate coordination between relevant organizations, influx of population and high demand for mid-low income housings. The same plan noted that population of Nairobi County is projected to be 5 million people by 2030 and it is growing at 4.3% pa. Based on this background there is clearly need to seek solution to these housing challenges and this study seeks to identify and establish which factors are driving or pushing up the cost of constructing houses in Nairobi, Kenya.

### *1.2 Purpose of the Study*

The purpose of this study was to establish the determinants of house construction cost in Nairobi County, Kenya.

### *1.3 Problem Statement*

The cost of constructing a house has a direct relationship to the final selling price, Glaeser (2004) and World Bank (2011). According to World Bank (2011) report "there is a crucial missing piece of the puzzle towards improving access to housing as the current levels of production are too low and too expensive. Lessons could be learned from other countries which have successfully lowered the cost of housing by looking at size, materials, construction techniques, zoning, land acquisition and provision of infrastructure. Increasing the scale of developments will be a crucial factor in lowering cost of housing." Mariano (2011) concurs by noting that while prices have risen significantly over an extended period and population growth has been quite strong, there has been no pick-up in the supply of new housing in Malaysia, these finding reflect the state of Nairobi County. In Nairobi County the demand for houses has increased tremendously in the last 10 years but the supply has been inadequate, Leah (2012). Marakia

(2012) support this and notes that this has resulted in a supply gap or shortage of houses and the few that are supplied to the market are out of reach by the majority of Kenyans. Nairobi County has a huge housing deficit between the actual demand and supply for the low-income group according to World Bank report (2011). This has made accessibility and affordability of houses in Nairobi County a major challenge. This study seeks to establish the determinants of cost of constructing houses from the supply side of the housing market. Such determinants include; capital, land, material, labour, and infrastructure which will help to answer the questions why supply of houses is low and costly to build.

#### *1.4 Objective of the Study*

##### *1.4.1 General Objective*

The general objective of this study was to establish the determinants of house construction cost in Nairobi County.

##### *1.4.2 Specific Objectives*

The specific objectives of this study were:

- i. To determine the influences of cost of finance on construction cost of houses.
- ii. To establish the influences of cost of building materials on construction cost of houses.
- iii. To assess the influences of cost of labour on construction cost of houses.
- iv. To establish the influences of cost of land on construction cost of houses.
- v. To establish the influences of cost of infrastructure services on construction cost of houses.
- vi. To establish possible strategies and initiatives that can be implemented to make house construction cost affordable.

#### *1.5 Research Questions*

The study was guided by the following questions

- i. What relationship does the financing cost has on house construction cost?
- ii. What relationship does the building materials cost has on house construction cost?
- iii. What level of influence does the labour cost has on house construction cost?
- iv. What relationship does the land cost has on house construction cost?
- v. What relationship does the infrastructure services cost has on house construction cost?
- vi. What are the strategies and initiatives that can be implemented to make houses affordable?

#### *1.6 Justification of the Study*

In Kenya the demand for houses has increased tremendously in the last 10 years but the supply has been inadequate and most of the houses being supplied to the market can only be afforded by the few high income earners despite the fact that the greatest need is in the low income earners, World Bank (2011). Unless the causes of high house construction cost are identified and addressed the house prices and the growth of slums will continue rising.

#### *1.7 Limitation of the Study*

This study focused on professionals in housing construction sector and did not cover other stakeholders, such as developers.

## 2. LITERATURE REVIEW

### 2.1 Introduction

Kenya's National Housing Policy (2004) was aimed at addressing the deficit in housing supply and in arresting the deteriorating housing conditions countrywide and to bridge the shortfall in housing stock arising from demand that far surpasses supply, particularly in urban areas. This situation has been exacerbated by population explosion, rapid urbanization, widespread poverty, and escalating costs of providing housing as noted by United Nation report (2012). Nabutola (2004) concurred and stated that the shortage in housing is manifested in overcrowding, increase in slums and proliferation of informal settlements especially in urban areas. The cost of developing houses in Nairobi has been on the rise which has major implications on the final house prices the consumer pays Leah (2012).

The Kenyan market, as with many other countries in Africa is characterized by a large demand and a chronic undersupply of formal housing. Demand for housing in Nairobi has risen to 80,000 units annually by 2014 according to Panning and Housing Executive Committee of Nairobi County. This situation has a great impact on the house price the consumer finally pays according to World Bank (2011) report, as the higher the demand, the higher the price. Branz (2008) defined the primary drivers of housing prices are long term structural factors such as constrained land supply, increased regulation, population growth, and taxes advantages rather than speculation by investors. In this study the researcher adopts Fleming (2007) definition which distinguished and defined building prices and building costs by referring to the building prices as the market price for the building payable by a client and the building costs as the costs incurred by the developer in constructing the building.

The cost of constructing the house consist both the physical and financial resources. Geltner and Miller (2001) defined building costs as direct costs of the physical components of the construction project such as land cost, labour, material and equipment, developer fees, construction management and overhead costs plus the soft costs of design, legal and financing. Meikle (2001) and Jagren (2003) defined construction cost as the total charges related to contractors and those related to developers. The contractor's charges are such as costs of materials, labour and equipment to undertake the work and the contractor's finance, management and various site and office overheads. The contractor then charges these costs plus a margin profit of the developer. Alaghbari (2010) and Alaghbari et al. (2008) on the other hand defined and grouped the factors influencing housing cost into five groups namely; factors related to land, materials used, construction methods used, finishing works and other external factors influencing housing cost.

This study adopted Alaghbari (2012) definition and grouping of construction costs factors as cost of land, cost of material, and cost of finishing works, cost of financing, cost of providing infrastructure services, cost of labor and cost of complying with government regulations.

### 2.2 Theoretical Review

Theory helps make sense of complex situations by directing attention to key issues and by guiding methods of analysis. Theories address three aspect of science namely, explanation, prediction and direction according to Koskela (2000). This study is grounded on the theories of finance and their application to real estate development and their implications to both house prices and costs. The theory of production as applied in construction being referred to as the transformation-flow-value theory of production will also be highlighted.

The finance theories have shaped the way in which academics and practitioners analyze investment performance, Myers (2001). Most of the theories are based on the notion that investors act rationally and consider all available information in the decision-making process, and investment markets are efficient, reflecting all available information in the investment prices, Myers (2001). Investing in house construction is no exceptional and developers are expected to consider current market prices for the houses before and after engaging in construction.

This study focuses on development sector of the asset market. In this study the researcher used analytic framework whose foundation is finance theory of efficient market theory to show that to make houses affordable to the final buyers and available through supply of new houses into the market, we need to address the bottlenecks that limit supply and push up cost of constructing new houses in Nairobi. The theoretical framework used divides the real estate market into two; real estate space and real estate assets markets. In this theoretical framework the important connections between the space and asset markets is demonstrated.

### 2.2.1 Application of Finance Theories

The researcher applied two theories of finance; Trade off theory of capital structure and Q theory of investment as a framework and foundation of this study on factors that influence the construction cost of houses in Nairobi County, Kenya. The challenge being the rate at which the houses are being developed is low and slow due to what is attributable to determinants of house cost.

#### *Trade-off Theory*

The tradeoff theory of capital structure refers to the theory that a company chooses how much debt and equity finance to use by balancing the costs and benefits there off, Cortez (2001). The theory state that there are advantages and disadvantages in financing with debt as well as equity for a firm or project. The theory is therefore based on the financing option or mix applied in the specific investment project or a firm.

Esty and Sesia (2007) used the following definition in their study; project finance involves the creation of a legally independent project company financed with nonrecourse debt for the purpose of financing investment in a single-purpose capital asset, usually with a limited life. The capital structure theory applies to project financing the same way it applies to a firm, by addresses how the project is funded and it is one of the financial issues that have been extensively researched on and referred to as project finance, Cortez (2001). Capital structure theory when applied in single investments projects take the project as a separate and distinct entity and some studies have reported some relevant of the theory on real estate projects Gau (2000) and Mayer (2004). The theory is relevant to this study as it addresses one of the determinants of housing cost namely capital cost or real estate financing cost. According to this theory, there is an optimal debt to equity ratio which maximizes the value of an investment project and it is usually viewed as a trade-off of the costs and benefits of borrowing.

The cost of financing influences the value or final cost of the project according to this theory and therefore this theory is relevant to this study. One of the determinants of housing cost being evaluated is financing cost.

#### The Q Theory of Investment

James Tobin (1969) put up the idea under “A General Equilibrium Approach to Monetary Theory” that the rate of investment should be related to Q, where q refers to the value of capital or asset

relative to its replacement cost. The Q theory of investment is defined as the ratio of the market value of installed capital to its replacement cost. The market value of a house is set in the asset market in terms of selling price of the house and the replacement cost is set in the construction sector which is also part of asset market. It therefore mean that by the time the developer of the house is engaging in the construction, they will have considered the market value of the houses and the replacement cost. The construction cost of the house need to be lower than the market value of the house for the project to be a viable investment. The Q theory state that the rate of investment should be related to the ratio between the marginal value of capital and marginal replacement cost. The Q theory argues that investment in any asset is a function of the Q ratio; the ratio of the market valuation of the asset to its replacement cost Jud D G and Winkler T D (2003).

The determinants of house cost are therefore critical in the investment decision for they influence the replacement cost. This study focuses on the determinants of the house cost in order to evaluate which among them are the most critical in influencing construction cost of houses in Nairobi. Such factors includes high land and infrastructure costs which makes replacement cost high compared to the market value of the property hence reducing the expected profit margins or low Q ratio. Grimes (2007) stated that new house supply reacts to price of existing houses relative to the cost of developing new houses and therefore the cost of constructing a new house influences investment decision.

#### 2.2.2 Fisher-Di Pasquale-Wheaton (FDW) Model

To depict the interaction between the asset market and the space market of the housing industry, this study adopted the Fisher-Di Pasquale-Wheaton model which clearly shows how these two markets interact and relate whenever there is none equilibrium between supply and demand of houses.

Real estate is a durable capital good whose production and price are determined in an asset market, MacDonald (2011). The price of the house depends on the demand and supply for the space in the market. In turn the supply of new real estate assets depends on the price of those assets in the market relative to the cost of replacing or constructing the asset.

In the long run, the asset market should equate market prices with replacement costs, MacDonald (2011). However in the short run, there are lags and delays that are inherent in the construction process which forms the focus of this study as they push construction cost up and limit supply which eventually impact on house prices, making houses unavailable and unaffordable. Based on this model, it is expected that with high prices well above construction costs, new construction will be produced eventually reducing house price. Theoretically it is expected that as new space arrives on the market, demand is satisfied and the rent for space begin to fall reducing the price of the house in the market towards the cost of replacement, Hull (2011).

Rent is determined in the property market for space and not in the asset market for ownership, Meyers (2001). In the property market, the supply of space comes from the asset market through construction and supply of new houses. The tasks of property market is to determine a rent level at which the demand for space equals the supply of space, Toil (2003). Holding other factors constant when the number of household increases and firms expand production, the demand for space usage rises pushing rent up in the short run as supply of space is fixed Hua (2001).

Therefore there is a link between the assets and property markets where the rent levels determined in the property market are central in determining the demand for real assets, Di Pasquale

(2001). In acquiring the asset the investor is purchasing the present and future streams of income and therefore changes in rent occurring in the property market will immediately affect the demand for assets in the capital Market, Toil (2003). The second link between the two markets occurs through the construction sector, where when the construction increases and the supply of assets grows, the rents will decline in the property markets, Di Pasquale (2001). Then the decrease in rent in the property market leads to decrease in streams of present and projected future income causing the prices of assets to decline in the asset market.

### Theory of Construction

The theory of construction is an application of the generic theory of production to the characteristic context of construction such as one-of-a-kind production, site production and temporary project organization, Koskela (2000). In this view, production is conceptualized as a transformation of inputs to outputs. This study takes this view on the application of theory of production to construction by viewing construction of houses as a process of transforming input into output. Where inputs consist of both the financial and physical resources and output the newly built house.

### 2.3 Empirical Studies

There are various studies and reports carried out in Kenya and outside Kenya that have identified a number of applicable determinants that usually influence the cost of building houses.

#### 2.3.1 Financing

Leah (2012) cites funding as one of the major cost driver for the developers of houses who in turn has to recoup the same from the final buyers of the houses by charging high prices. Memon (2010) support this finding and stated that in house development availability and cost of long term funding has a major influence on the final cost of the house. AfDB (2013) research findings support this position in Kenyan context by confirming that there are only a handful of private developers in Kenya that can afford to finance medium to large scale developments of 200 units and above for middle to low income segments. Financing cost is therefore one of the key obstacles for the development of large scale real estate developments and forms part of the final cost of the house.

#### 2.3.2 Land

According to Nabutola (2004) land is a major constraining factor in the County of Nairobi because most of the slum dwellers do not own the land which is owned by the central and county government making land inaccessible to the majority who need it most but cannot afford its premium price. Lock (2003) acknowledges the importance of land and stated that Land regulation and property titles are at the cornerstone of housing. In Kenya, land and property regulations have been inherited from colonial times and involve a rather complex tenure mechanism framed in many difference laws Gichunge (2001) observes. World Bank (2011) notes that lack of affordable constructions combined with difficulties in accessing land makes it difficult to expand access to homeownership. In particular the multiple land titling and registration mechanisms are grossly inefficient and overly complex.

#### 2.3.3 Provision of Infrastructure Services

The basic housing infrastructure include; roads, water, power, and sewerage system. According to UN-HABITAT (2012) report, a part from property registration and tenure, the other most important aspects for property development is infrastructure provision. The development of such infrastructure is

highly linked to price since as developers buy land and service it with infrastructure, land prices rise immensely and the increment is passed on to the buyers, otherwise the government should take up the infrastructure services provision to make houses affordable, Shelter Afrique (2013) argues.

### 2.3.4 Building Material

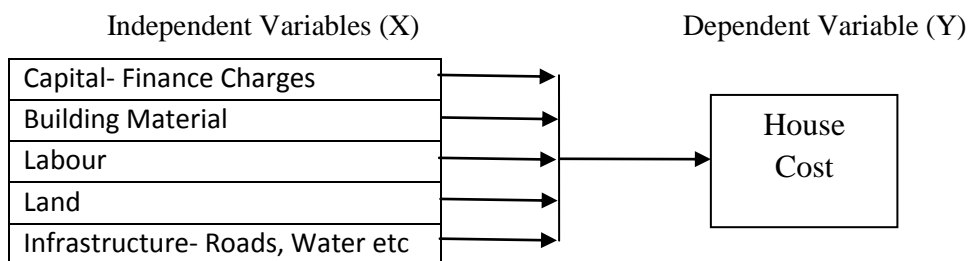
Building materials refers to the physical resources that are used to construct a house. Alaghbari (2012) found out with regards to construction materials that some of the basic hard supplies such as steel and most of the finishing materials like tiles, have to be imported making them susceptible to foreign exchange fluctuation cost and influence of external factors which are finally passed on to the final consumer. Although majority of the materials like cement and sand are produced locally the supply does not always meet local demand and pushing up prices, Memon (2010).

### 2.3.5 Labour

A study done by Alaghbari (2010) found that labour cost is one of the most contentious factor among all the factors that affect construction costs and the debate revolves around the role of labour changes, their level of skill and productivity, unionized or non-unionized labour and employment laws. Warsame (2006) supports this position by comparing labour cost among different regions and argues that buildings are produced and consumed locally, and that the proportion of cost input mainly labour and building materials costs forms the largest component of the final cost of the house. AfDB (2013) Africa Economic Brief Survey of developers reported that material costs followed by Labour costs are the most influential determinants of house cost.

## 2.4 The Conceptual Framework

Orodho (2008) stated that a conceptual framework is a model representation where a researcher represents the relationships between variables in the study and shows the relationship graphically and diagrammatically. The conceptual framework in this study is based on factors influencing the cost of construction of houses in Nairobi County. The most cited factors that influence the cost of constructing houses includes, labour, materials, land, infrastructure, professional fees, financing charges and other contingencies, Shelter Afrique (2013).



Source: Author 2014

Figure 1: The Conceptual Framework



### 2.5 Research Gap

The price of a house is a factor of demand and supply AfDB (2013). On the supply side the most influencing factor is the cost of constructing houses which has a direct relationship with the house prices World Bank (2011). However there is no known study that has comprehensively looked at the factors influencing the cost of developing houses in Nairobi County. This study seeks to fill this gap by looking at the factors that are influencing the cost of building houses which finally impact on the house prices making them unaffordable and unavailable.

## 3. RESEARCH METHODOLOGY

### 3.1 Research Design

A research design is the framework or plan for a study used as a guide in collecting and analyzing data, Sekeran (2003). This study adopted a descriptive research design. The main aim of descriptive research was to provide an accurate and valid representation of the factors or variables that pertain or relevant to the research question. The primary data was generated through a survey. Orodho (2008) observes that surveys are suitable in gathering data whose intention is to describe the nature of the existing conditions. This is a cross-sectional study that involves drawing a sample of elements from the population of interest. And because a great deal of emphasis is placed on selecting sample members, preferably with a probability sampling plan, the technique is often called sample survey Mugenda (2003). Mugenda (2003) further attributes the design to a method of collecting information by interviewing or administering a questionnaire to a sample of individuals.

### 3.2 Study Population

Sekeran (2003) define population as the entire set of people, events or things of interest that the researcher wishes to investigate. He further defines population elements as individual's members of the population whose characteristics are to be measured. The population of this study was 160 professionals firms namely architects, civil engineers and quantity surveyors registered with their respective professional bodies and practicing in Nairobi County as at December 2013 and therefore the study excludes non registered members, as given by the table 1

**Table 1: Target Population of the Study**

Institutes	Population No	Percentage
Institute of Quantity Surveyors	55	28%
Institute of Engineers of Kenya	45	34%
Architectural Association of Kenya	60	38%
<b>Total</b>	<b>160</b>	<b>100</b>

### 3.3 Sample Size

The study used stratified random sampling that grouped the population into three mutually exclusive categorizes of professional respondents. Deming (1990) argues that if well chosen, samples of about 10% of the population can often give good reliability and can be considered representative. However this study used a sample size of 70 respondents out of the target population of 160 respondents which gives a 44% ratio which is ideal as indicated by Mugenda and Mugenda (2003).

### 3.4 Sampling Frame

Stratified random sampling techniques was used to pick the respondents from the various strata giving each subject of the study a chance to be picked in the sample. From the target population of 160, a sample of 70 was randomly selected covering the entire professional group in proportions that each group bears to the study population, as given by the table 2.

**Table 2: Sampling Framework**

<b>Institutes</b>	<b>Pop No</b>	<b>Sample No</b>	<b>Percentage</b>
Institute of Quantity Surveyors	55	24	34%
Institute of Engineers of Kenya	45	20	28%
Architectural Association of Kenya	60	26	34%
<b>Total</b>	<b>160</b>	<b>70</b>	<b>100</b>

### 3.5 Data Collection

The study used qualitative data in order to gain a better understanding and a more insightful interpretation of the results. Primary data was collected from the respondents sampled from the professionals themselves. The data was collected using questionnaires with a set of selected open and closed ended questions presented in a likert scale. Each questionnaire was coded with a technique used for classifying data into meaningful categories. Each item of the questionnaire was developed to address a specific research objective or research question of the study. Kothari (1990) pointed out that this instrument is popular, as it was free from bias and respondents have adequate time as well as to facilitate an easier analysis while unstructured questions were used so as to encourage the respondent to give an in-depth response.

### 3.6 Pilot Testing

A pilot study was done to pre-test the research instruments in the field of randomly selected professional firms to determine the validity and reliability of the research instruments. This was carried out in three randomly selected professional firms which were not picked for the final study.

### 3.7 Data Analysis

Data collected was analyzed and edited for accuracy, consistency and completeness. The data collected was coded and classified into the five factors and analyzed to generate quantitative reports through measures of central tendency and further summarized into frequency distribution tables for ease of understanding, analysis and comparison. The data was analyzed using mean score, standard deviation and Pearson Ranking correlation. The level of significance was tested 95% level. The ranking of effects of each determinant was calculated based on the mean score.

### 3.8 Correlation

Test of relationship between each determinant with cost of the house was calculated using Pearson Correlation. The data collected in this study was non-parametric statistic and ordinal variables and therefore Pearson Correlation Ranking method was considered suitable for analysis and examining

the relationship between the variables. This test has the obvious advantage of not requiring the assumptions of normality or homogeneity of variance.

### 3.9 Data Presentation

The data was presented by use of tables to illustrate the general relationship of variables being measured. These approaches were used because they are easy to understand and would therefore be reader friendly.

## 4. FINDINGS

### 4.1 General Information

The analysis of the general information sort from the respondents revealed that majority of them were quantity surveyors whom the researcher consider to be well conversant with cost of construction, had handled over six projects each in the last five years which was consider enough exposure. The respondents were currently involved in a project or had handled at least one project in the last one year and majority of them had over six years working experience. This exposure and experience was consider adequate and appropriate to give an informed and professional view.

**Table 3: General Information Summary**

Category	Frequency	Percentage
Professional Background – Quantity Surveyors	29	48
Project Handled in the last 5 years – Over 6 Projects	45	75
Handling at least one project- 2013/14	54	87
Work Experience – Over 6 Years	40	66

**Source: Survey 2014**

These findings were in line with those of Patience (2008) where responses were 74% compared to this study 85%. On professional background the respondents were Quantity Surveyors 46% compared to 48% in this study, Architects 27% compared to 33% in this study and Engineers 37% compared to 18% in this study. However the findings differs in terms of experience exposure, Patience (2008) respondents were between 5-10 years 53% and those between 10-20 years 47%, and for this study 33% of the respondents were below 5 years and those above 5 years 63%. These finding differs with those of Memon (2010) where 81% of the respondents had over 10 year work experience and those between 6-10 years were 19%. Meaning none of these respondents had less than 6 year work experience unlike this study where 44% of the respondents have less than 6 years. The low work experience among respondents was attributed to the tendency by the senior professionals to delegate completion of questionnaire to their junior members of their professional in their firm.

### 4.2 Factors Influencing Cost of Housing

The respondents' views on the determinants of house cost and strategies of making house construction affordable were analyzed based on average mean score, standard deviation and Pearson correlation. The results of Pearson correlation analysis lead to rejection of the null hypothesis and conclusion that all the five determinants have a positive influence on the house cost. However land,

building materials and infrastructure had a strong positive relationship with house cost compared to finance charges and labour costs.

**Table 4: Determinants of house construction cost ranking**

Factors	Mean	S.D	R	Ranking
Land	4.65	.777	.885	1
Building materials	4.50	.864	.828	2
Infrastructure services	4.15	.831	.695	3
Capital – Finance Charges	3.82	1.112	.154	4
Labour inclusive of professional fees	2.23	1.351	.209	5

**Source: Survey 2014**

The researcher found out that the most influential determinants of house construction cost in Nairobi County were; land, building materials and infrastructure costs. These results are in line with those of Alaghbari (2010) who found out that the cost of land and materials were the most influential factors affecting cost of housing in Sana'a, Yemen as most of the land was in the hands of the private sector. Aliyu (2011) also found similar results that the level of bureaucracy associated with land acquisition and use of imported materials had the most influence in the construction cost in Makana Jahun, Nigeria. Bank of Ghana survey report of 2007 on the housing market in Ghana found out that the cost of inputs and cost of land acquisition were the main driving force behind the persistent increases in house prices which were very close to the findings of this study.

These results are slightly different from those reported in World Bank (2011) report on Kigali Rwanda which indicated that housing finance cost was the most significant factors influencing cost of building houses in Kigali Rwanda. The findings of this study also differs with those of AfDB (2013) Africa Economic Brief Survey of developers which reported that material costs followed by Labour cost make up 70% and 30% of the total cost of the house respectively. Similarly the Hull (2011) found out that the cost of funding and availability of long term funds are the main influencing factor of cost of housing in Landon, UK. This to some extend may be explained by the land ownership system and housing development level in UK compared to developing counties like Yemen, Kenya, Rwanda and Nigeria where land ownership system is less developed, bureaucratic and housing sector still at rudimentary stage.

#### *4.3 Strategies for Making House Construction Cost Affordable Ranking*

In terms of possible strategies for reducing construction cost, the respondents had a high level of consensus that public-private-partnership, government incentives and use of alternative building technology are the most appropriate strategies for reducing house cost in Nairobi County.

**Table 5: Strategies and initiatives for making cost of constructing houses affordable**

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Factors	Mean	S.D	Ranking
Public-private-partnership (PPP)	4.18	0.965	1
Government Incentives	4.10	0.584	2
Use of new construction technology	4.00	0.651	3
Land reforms	3.05	1.096	4
National housing policy of 2004	2.78	1.290	5
Use of foreign contractors	1.95	1.419	6

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**Source: Survey 2014**

The study found out that the most influential strategies and initiatives for reducing cost of constructing houses in Nairobi County, Kenya to make them affordable and accessible were Public-private-partnership, Government incentives and use of alternative building technology. These initiatives are in line with World Bank (2011) recommendations for Kigali Rwanda which recommended similar approaches which included; putting up houses be community based using cheaper available local materials, Public-Private-Partnerships be encouraged and serviced plots be availed to the general public.

The findings of this study were incorporated and similar to those of Noppen (2012) findings on ABC of making houses affordable in Kenya which recommended ten strategies namely; making land affordable, use of alternative technologies, subsidy, creative financing, appropriate design, incremental construction, self construction, community supported labor, avoiding speculation and develop contracts with suppliers. However some of these strategies are considered more general and some may not apply to Nairobi County, like community supported labor which would apply better in rural areas.

These findings differ in scope and coverage with those of Bank of Ghana (2007) which strongly recommended; setting up of strong legal and regulatory environment for the housing sector, establishment of land courts to handle and clear the huge backlogs of land-related cases, creation of land banks by the government for estate developers to put up affordable housing units to the populace since the high price of land acquisition affects their products, government should open up cement market to break up monopoly, and finally government should subsidize cost of infrastructure to developing sites which would help reduce the final prices of houses in the long run.

## 5. CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Conclusion

The finding of this study has made a contribution by bringing out clearly the role of government and professionals in housing sector in order to make houses affordable and available in Nairobi County, Kenya. The Ministry of Housing to a large extent has captured the state of affairs in the housing sector in Nairobi County in its strategic plan 2008-13 which read in part “Investment in housing sector has been minimal and sporadic. This is as a result of lack of an enabling environment for private sector participation in housing delivery process particularly for lower middle and low-income groups; low government funding; high cost of finance; lack of serviced land; high cost of building and construction materials; appropriate building and construction technologies; limited research on how low cost building

materials and construction technologies; stringent planning regulation and standards and high cost of infrastructure.”

The findings of this study concluded that there are at least three critical determinants of housing cost in Nairobi County that must be addressed to make housing accessible and affordable to the majority of the population. These are cost and ownership system of land, cost and type of building materials and cost of providing basic infrastructure services such as roads, water, power and sewerage system. In addition there are three strategies and initiative that can be undertaken to avert the pending housing crisis in Nairobi County namely; Public-private-partnership, Government initiatives aimed at creating enabling environment for private sector participation in housing provision and use of alternative building technology. These strategies require public, private and professional participation due to the very nature of housing which has both social and economic dimension.

Failure to address these challenges will results in increased gap between supply and demand for housing that will further fuel growth of slums and escalating prices of houses which middle and low income population cannot affordable. The end implications are that availability and affordability of houses in Nairobi will remain a major challenge as population and urban migration continues to grow.

### *5.2 Recommendation*

In light of the findings of this study the researcher made the following recommendation;

That the Government must be the enabler, partner, facilitator or and catalyst to create a favorable and maintain enabling environment, for both public and private players’ participation that would eventually bring cost of house construction down.

The Ministry of Land, Housing and Urban Development needs to implement land reforms and enact laws and regulations that would ensure equity and equitable distribution of land in Nairobi County.

The professionals and developers in the housing sector need to embrace and adopt alternative building technologies some of which like Polystyrene Panels has been found to cut material cost by 30% and time by 50%.

The National and County Governments need to get involved in providing basic and necessary infrastructure such as water, power, sewerage and roads so that the infrastructure cost is not passed on to the final buyer of the house.

On funding the government and developers need to get involved in mobilizing long term and low interest rate funds to bring cost of financing down through initiatives such as mobilizing county’s saving through national schemes such as National Social Security Fund and international sourcing of funding through issuing international housing bonds.

### *5.3 Areas of Further Research*

The researcher recommends that more research needs to be carried out on appropriate and applicable Public-Private-Partnership approaches that can be implemented to reduce house construction cost.

The researcher also recommends a comparative study on use of alternative building technology and traditional modern technology.

A similar study can be conducted to cover more stakeholders such as house developers, construction sector professionals and ministry of housing as the respondents with a comparative analysis of their views.

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<b>Construction Cost:</b>	This refers to the cost incurred in the process of preparing for and constructing buildings and it includes planning, designs and financing and continues until the structure is ready for occupancy.
<b>House Price:</b>	The amount of money paid by the buyer of the house
<b>House Cost:</b>	The amount of money spent to construct a house.
<b>Infrastructure Cost:</b>	In relation to house construction infrastructure provision it refers to Road, Water, Sewerage and Power
<b>Materials Cost:</b>	Refers to substance used in the construction of houses such as cement, iron sheets, steel and stones
<b>Labour Cost:</b>	Refers to human physical and mental effort used in the process of constructing the house.
<b>Land Cost:</b>	Refers to the value of site or plot upon which the house is being constructed.
<b>Capital Cost:</b>	Refers to the charges incurred for using borrowed funds or opportunity cost incurred for using own funds.