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Challenges Faced by Construction Firms in Sustainability of Skilled Workforce, a Survey of Construction Firms in Nairobi County, Kenya

Qs. Rosemary Mukami Macharia
Department of Construction and Property Studies,
The Technical University of Kenya

Dr. Absalom H.V. Lamka
Department of Construction and Property Studies
The Technical University of Kenya

Dr. Sarah W. Gitau
Department of Construction and Property Studies
The Technical University of Kenya

Qs David G. Choka
Department of Construction and Property Studies
The Technical University of Kenya

***Abstract*— Construction firms in Kenya are highly dependent on human resources that is the skilled, semi – skilled and unskilled workforce. Skilled workforce is deemed to be the engine of construction firms turning materials into useful items and bringing the architects and engineers concepts to life through the technical skills possessed, practical knowledge and hands on experience.**
The inability to sustain skilled workforce is one of the major issues facing Kenyan construction firms. This study aimed at identification of the current challenges faced by construction firms in sustainability of skilled workforce that required intervention.
The study employed a mixed method research methodology focusing on 245 construction firms with active construction sites within Nairobi County under NCA 1 to NCA 4 class of registration out of which only 170 firms responded. Data was collected from supervisory/managerial staff and skilled workers through questionnaires and interviews, analyzed through Microsoft Excel and Statistic Package for Social Sciences (SPSS) Version 27 and presented in tables, bar graphs and pie charts. The study applied descriptive statistics. Economic changes, increased demand for skilled workforce, lack of job security and poor construction image had a significant influence on sustainability of skilled workforce.

***Keywords*— Challenges, construction firms, sustainability, skilled workforce**

I. INTRODUCTION

A. Background

The construction industry in Kenya has grown in leaps and bounds over the past decade due to increased investments by both the local and foreign investors owing to a conducive business environment created by the government as well as increased budgetary allocation towards infrastructure (KNBS, 2024).

This growth has been evidenced by the increased number of cumulative registered projects, increased annual consumption of materials such as steel and increased number of employees engaged in the industry. The number of registered construction firms has also increased and it is indeed the latter two that are of great significance to this research.

The construction industry comprises of enterprises such as contractors, sub-contractors and consultants, and the workforce force which consists of skilled, semi-skilled and unskilled labour. It is the contractors and sub-contractors who own construction firms. In Kenya, these firms are categorized under different National Construction Authority (NCA) categories dependent on the value of works they can handle as well as the types of work they undertake as indicated in Table 1.1 below.

Table 1.1: NCA categories of construction firms

Category	Project Value
NCA 1	Unlimited
NCA 2	Upto Kshs 500,000,000
NCA 3	Upto Kshs 300,000,000
NCA 4	Upto Kshs 200,000,000
NCA 5	Upto Kshs 100,000,000
NCA 6	Upto Kshs 50,000,000
NCA 7	Upto Kshs 20,000,000
NCA 8	Upto Kshs 10,000,000

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Source: NCA, (2025)

The performance of these construction firms and the construction industry at large is highly dependent on human resources, that is, skilled, semi - skilled and unskilled workforce to achieve sustainable development. Depending on the nature of the project, these human resources account for 30 – 50% of the total cost (Alshahrani et al., 2023). Furthermore, labour is the most valuable asset since it combines all other factors of production namely; materials, equipment and capital.

A skilled workforce exerts the most significant influence on construction operations through the high-quality and efficient execution of tasks. Their proficiency contributes substantially to the success of construction projects, particularly in today's increasingly sophisticated and technology-driven construction delivery environments(Hussain et al.,2020).

It is very instrumental in turning materials into useful items. Without the skilled workforce the architect's concepts and engineer's designs would not become a reality. They possess technical skills, practical knowledge and hands on experience that enables them to carry out their duties with precision and efficiency. The effectiveness of workers during the construction phase is a key determinant of a project's overall success.

Skilled workforce involves different trades such as; paintworks and decorations, electrical installations, tile works, steel bending and fixing, plumbing, glazing, masonry, roofing, landscaping, carpentry, Heating Ventilation and Air Conditioning (HVAC) installations and pipe fittings (Akomah et al., 2020).

Shortage of skilled workforce has become an international phenomenon threatening the future of construction firms, the construction industry as well as economic growth of countries. This has been linked to several factors, including an ageing workforce, high staff turnover, low motivation, inadequate remuneration, the poor public perception of the construction industry, limited interest among young people, and low levels of job satisfaction (Akomah et al., 2020).

B. Research Problem

Sustainability of skilled workforce has been termed as a global challenge facing firms worldwide with a high turn-over being largely experienced.

A survey conducted by Allianz (2022), placed the shortage of skilled workforce at the entry of their top 10 risks in the Allianz Risk Barometer. It indicated that attraction and retention of skilled workers had become a global challenge with 69% of firms reporting talent shortages in various fields amongst them, construction.

African countries are experiencing increased infrastructure projects worth billions of moneys whilst on the other hand having a great challenge in sustaining skilled workforce within the construction industry, particularly Kenya and South Africa. South Africa is projected to face critical shortages of skilled workers such as carpenters, electricians, bricklayers, plumbers, and painters in the coming years (Shikweni et al., 2019). Similarly, in Nigeria, construction firms are incurring higher labor costs and experiencing frequent project delays due to a scarcity of skilled personnel. In Kenya, the Institute of Quantity Surveyors of Kenya (IQSK) reported that the labor-to-building cost ratio increased from 20% in 2020 to 25% in 2022, with the costs of hiring plumbers, masons, and painters rising steadily due to limited availability. These trends across East Africa highlight the growing challenge of sustaining a skilled construction workforce, underscoring the need for targeted training, retention strategies, and policies to maintain labor supply and support industry growth.

A study conducted by NCA in 2022 to assess the training needs of construction workers in Kenya identified the existence of skills and knowledge gap in Kenya's construction industry. The skills gap between the present boom seen in the industry and the availability of qualified skilled personnel was also concurred with by William Mwanza, Director of National Industrial Training Authority (NITA) during the Dual Apprenticeship Launch Event held in Kenya (Swiss contact, 2021). The gap was identified after a feasibility study was conducted and majority of the construction firms attested to facing a shortage of skilled workers.

The Federation of Kenya Employees (FKE), the most representative employers' organization in Kenya, whose members account for 67% of formal private sector wage employees in Kenya, conducted a survey dubbed 'Skills Demand' in the month of March to April 2023 to understand the changes in demand for skills for the current and future work environment.

The findings of the survey placed the building and construction sector in third place of high demand for Technical and Vocational Education and Training (TVET) skills at a percentage rate of 18.2% out of the 521 participating enterprises distributed across the country. The survey constituting further indicated that 20% of the enterprises found it hard to fill in the needed workforce thus resulting in the accommodation of a workforce with much lower qualifications.

The above citations clearly indicated that there was a problem facing construction firms and the industry at large in as far as skilled workforce is concerned. With Kenya's Vision 2030 overall goal for the construction sector being to increase its contribution to GDP to at least 10% as well as propel the country to be Africa's industrial hub, sustainability of skilled workforce

C. Research Objective

The main objective of this study was to identify the current challenges faced by construction firms in Nairobi County in the sustainability of skilled workforce.

D. Study Significance

By identifying and analyzing the key challenges affecting the sustainability of the skilled construction workforce, the study offers a foundation for evidence-based decision-making and policy development. For construction firms, the findings inform strategic workforce planning, such as implementing more stable employment structures, improving working conditions, and investing in employee sustainability initiatives.

For policymakers and government bodies, the study guides on the formulation of targeted labor policies and provide incentives for workforce development and sustainability in the construction sector. The findings of the study contribute to the development of a more resilient, attractive, and sustainable construction workforce. Addressing these workforce challenges not only benefits individual firms but also supports the broader economic and infrastructural goals of society by ensuring that the industry can meet current and future construction demands efficiently and effectively.

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II. LITERATURE REVIEW

A. Theoretical Framework

The study examined Herzberg's Two-Factor Theory, Job Embeddedness Theory, and Human Capital Theory, but was primarily grounded in Herzberg's model due to its broad social perspective on workforce sustainability.

The theory offers a structured framework by highlighting motivation and hygiene factors such as responsibility, recognition, achievement, interpersonal relationships, salary, organizational policies, administration, and working conditions.

Originally developed in 1959 by Herzberg, Mausner, and Snyderman, the motivation-hygiene theory was influenced by Maslow's hierarchy of needs (Alshmemri et al., 2017). At a time when monetary rewards were widely viewed as the main driver of motivation, Herzberg challenged this notion, asserting that job satisfaction stemmed more from the nature of the work itself rather than its external conditions (Kurt, 2022).

The theory maintains that workplace factors fall into two distinct categories; those that promote satisfaction and those that cause dissatisfaction, which cannot be assessed along the same continuum (Nickerson, 2023). Intrinsic motivators, tied directly to the content of the job, foster satisfaction, whereas extrinsic hygiene factors, when absent, lead to dissatisfaction (Nickerson, 2023; Bundtzen, 2021)

Figure 2.1: Motivation and Hygiene Factors
Source: Adopted from Nickerson, (2023)

1) Motivation factors

Motivators are elements that generate job satisfaction and encourage employees when they exist in the workplace. They are tied to the nature of the work itself and opportunities for personal development, appealing to an individual's inner drive for purpose, challenge, and accomplishment. Such factors include career advancement, the intrinsic value of the job, opportunities for growth, a sense of responsibility, recognition, and achievement.

a. Advancement

This refers to the upward and favorable progression or position an individual attains within the workplace. Conversely, a stagnant or declining position is regarded as negative advancement (Alshmemri et al., 2017).

b. The work itself

The nature of job tasks and responsibilities directly influences employees' experiences; when work is engaging and appropriately challenging, it fosters satisfaction, while tasks that are overly simple, overly difficult, or monotonous may result in dissatisfaction (Nickerson, 2023).

c. Possibilities for growth

These represent the avenues through which an individual can achieve personal and professional development within the workplace, including opportunities for promotion, acquiring new skills, training in advanced methods, and expanding professional knowledge (Alshmemri et al., 2017).

d. Responsibility

Employees derive satisfaction when they are entrusted with responsibility, autonomy, and decision-making authority. However, when the level of responsibility is not matched with adequate authority, it tends to reduce job satisfaction (Nickerson, 2023).

e. Recognition

Acknowledging employees with praise or rewards for achieving targets or delivering quality work enhances job satisfaction, whereas criticism or blame for poor performance reflects negative recognition (Nickerson, 2023).

f. Achievement

Positive achievement refers to successfully accomplishing goals, such as completing challenging tasks on schedule, resolving work-related issues, or witnessing favorable outcomes from one's efforts. In contrast, negative achievement arises from lack of progress or making poor decisions at work (Alshmemri et al., 2017).

2. Hygiene factors

Hygiene factors constitute the essential conditions of employment that, although not drivers of job satisfaction, are necessary to prevent dissatisfaction. They encompass salary, supervision, organizational policies, working conditions, and interpersonal relationships.

a. Interpersonal relationships

Interpersonal relationships encompass the connections and interactions an employee maintains with supervisors, colleagues, and subordinates. These include both formal work-related communications and informal social exchanges within the workplace. Strong, positive interpersonal relationships contribute to a supportive work environment, fostering collaboration, engagement, and overall job satisfaction (Alshmemri et al., 2017).

b. Salary

Compensation encompasses all forms of financial remuneration provided in the workplace, including salary or wage increases, as well as the absence or reduction of expected pay adjustments. Adequate and timely compensation is critical for employee

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satisfaction and retention, as it reinforces a sense of fairness and recognition, while insufficient or delayed pay can lead to dissatisfaction and increased turnover (Nickerson, 2023).

c. Company policies and administration:
Company policies and administration refer to the clarity and effectiveness of organizational rules, management guidelines, and administrative procedures. When policies are vague, authority is poorly delegated, procedures are unclear, or communication is inadequate, employees are likely to experience dissatisfaction. Conversely, well-defined policies and transparent administration foster a structured and supportive work environment, which can enhance employee retention, motivation, and the overall sustainability of the skilled workforce (Nickerson, 2023).

d. Supervision
Supervision refers to the quality, competence, and fairness of managerial oversight. It includes a supervisor's ability to delegate responsibilities, provide guidance, demonstrate fairness, and possess sufficient job knowledge. Effective supervision not only enhances employee job satisfaction but also fosters professional development, engagement, and loyalty, which are critical for retaining skilled workers. Conversely, inadequate leadership or poor managerial support can undermine satisfaction, leading to higher turnover and threatening the sustainability of the skilled workforce (Alshmemri et al., 2017).

e. Working conditions:
Working conditions refer to the physical and environmental aspects of the workplace, including factors such as workload, available space, ventilation, tools and equipment, temperature, and safety. Favorable working conditions enhance employee satisfaction, pride, and overall well-being, while poor conditions can lead to dissatisfaction, reduced motivation, and higher turnover. Ensuring a safe and supportive work environment is therefore essential for maintaining a sustainable skilled workforce (Alshmemri et al., 2017).

B. Global Perspective on Sustainability of Skilled Workforce by Construction Firms

The sustainability of a skilled workforce is recognized as a complex and global challenge. With the rapid expansion of the construction industry worldwide, it has emerged as a critical concern for construction firms. Contrary to common expectations, the issue impacts both developed and developing construction industries alike, as highlighted in the examples below.

1) USA
The issue of sustaining a skilled workforce in the United States construction industry has become increasingly critical, particularly within residential projects (Abdulhafedh, 2023). According to the Associated Builders and Contractors (ABC), the sector required 430,000 additional skilled workers in 2021, a figure that rose to 650,000 in 2022. Projections indicated that firms would need to attract around 546,000 workers in 2023 and a further 342,000 in 2024 to meet labor demands (ABC, 2023).

Despite employing approximately 7.7 million people, the construction industry continues to face significant shortages. A 2023 report by the Associated General Contractors of America (AGC) revealed that 89% of construction firms struggled to recruit skilled workers (AGC, 2023). Contributing factors include the long-term effects of the 2008 recession, which pushed many skilled workers into alternative careers, the COVID-19 pandemic, an ageing workforce, declining interest in construction jobs among younger generations, and the growing preference for flexible employment opportunities (Abdulhafedh, 2023; Alsharef et al., 2021).
These shortages have had major cost and schedule implications. In 2023, project expenses increased by 81%, while project durations rose by 71%. Shortages were particularly acute among carpenters (42%), electricians (28%), plumbers (27%), framers (25%), masons (22%), painters (21%), concrete finishers (18%), roofers (16%), and HVAC specialists (16%). Labor costs surged to 119.37 index points in 2023, nearly doubling the long-term average of 59.54 recorded between 1950 and 2023. Meanwhile, labor force participation fell to 62.7% in 2023, down from 63.3% in February 2020 and 67.2% in 2001 (Abdulhafedh, 2023).

2) European Union
The European Union (EU), with a population of about 450 million, employs roughly 3 million individuals in the construction sector (Brucker et al., 2021). In many developed economies of northern and western Europe, construction firms address labor shortages by relying on migrant workers from southern and eastern EU member states. However, this intra-EU migration creates challenges for less developed countries within the bloc, as their own firms struggle to retain skilled workers and are often compelled to recruit from non-EU countries.
The sustainability of the construction workforce in the EU faces mounting pressures due to demographic trends such as population decline and an ageing workforce. Projections from the European Centre for the Development of Vocational Training suggest that by 2025, around one million additional workers will be required, forcing firms to increasingly depend on foreign labor (Bossavie et al., 2022). To mitigate these challenges, Brucker et al. (2021) recommend attracting migrants with the necessary skills while also reducing bureaucratic hurdles and accelerating procedures for admitting skilled construction workers from abroad.

3) Malysia
The Malaysian construction sector plays a central role in the country's economic growth and is recognized as a major productive industry. It provides substantial employment opportunities, ranking as the fourth-largest employer with approximately 1.2 million workers, equivalent to about 9% of the national labor force (Sulaiman et al., 2021).
However, sustaining a skilled workforce remains a serious challenge. A global survey by Grant Thornton International (2020) revealed an average shortage of 39% in skilled construction labor across construction firms, with the gap rising above 60% in both Singapore and Malaysia. This shortage has forced Malaysian construction firms to increasingly depend on foreign workers at construction sites.

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Several factors contribute to this situation, including difficulties in attracting new talent amid rising labor demand, negative perceptions of construction work among youth who view it as low-status, the shift of workers to the manufacturing sector offering better conditions, high labor turnover, increased access to higher education, declining birth rates, and the migration of workers to higher-paying countries (Kerai et al., 2023).
The Real Estate and Housing Developers' Association (REHDA) in Malaysia further notes that the inability to sustain a skilled workforce has contributed to rising property prices and reinforced the sector's reliance on foreign labor, particularly from Indonesia and Bangladesh.

4) Rwanda
In Rwanda, construction is recognized as one of the key drivers of economic growth. The sector is largely informal, a situation influenced by the rapid migration of people from rural to urban areas, which has fueled the expansion of construction activities. It represents the largest share of Rwanda's industrial economy and is growing at a pace that surpasses the country's already strong overall economic performance.
A closer assessment reveals that the industry relies heavily on an informal workforce, with 98.5% of workers employed under informal arrangements. Most of these workers have limited skills and low educational attainment, with 85% having completed only primary school or less. The workforce also faces significant challenges such as low wages, delayed or irregular payments, poor occupational safety and health conditions, lack of proper contracts, and restricted access to training opportunities (Rwanda Development Board [RDB], 2021).

5) Kenya
One of the major challenges limiting the growth and profitability of construction firms in Kenya is the persistent skills gap within the workforce and the need for more advanced, industry-specific training (Deutsche Gesellschaft für Internationale Zusammenarbeit [GIZ], 2024). The sector's labor force consists of skilled, semi-skilled, and unskilled workers, but the lack of a sustainable pool of skilled personnel has forced many firms to rely on expatriates, thereby driving up recruitment and labor costs. This shortage of skills has also reduced the competitiveness of local firms. Women remain significantly underrepresented in the industry, accounting for less than 3% of the workforce, far below the global average. At the same time, the workforce is aging, and limited training and apprenticeship opportunities have worsened the sustainability problem (Osolo, 2021).
According to GIZ (2024), many skilled construction workers in Kenya are employed under precarious, temporary conditions without formal contracts, leaving them vulnerable to exploitation. These workers often lack job security, protection against dismissal, or access to social benefits such as healthcare, pension, or disability support. Skilled workers make up 30.3% of the total workforce, compared to 67.6% who are semi-skilled or unskilled. Only 2.1% have received formal technical training to become site supervisors, while most skilled workers—81.3%—gained their expertise through practical experience, with just 18.7% having undergone formal training (NCA, 2022).
Shifts in employment practices and the adoption of new technologies have introduced new skill requirements, creating further demand for specialized labor. Construction firms are currently experiencing increased workforce demand driven by government initiatives such as affordable housing projects, Special Economic Zones (SEZs), industrial parks, and major infrastructure developments. Surveys show rising demand for trades such as masonry, welding, and carpentry (Lagat et al., 2023).
The sector remains a key driver of employment, with data showing a 95% increase in job opportunities between 2012 and 2021 (KNBS, 2024). However, there has been a shift from public to private sector-led projects, bringing changes in workforce needs. Informal, labor-intensive construction practices remain common, fueling demand for workers in non-formalized roles (GIZ, 2024). Additionally, rapid urbanization, industrial construction, and the implementation of Vision 2030 continue to accelerate the demand not only for skilled workers but also for a highly competent workforce able to adapt to evolving industry dynamics during this crucial economic transition.

C. Factors Influencing Sustainability of Skilled Workforce

1) Economic Changes
Construction firms are highly vulnerable to economic cycles, often facing significant fluctuations in employment levels and workforce composition (Sokas, 2019). During periods of recession or downturns in the construction industry, job opportunities decline sharply, leaving many skilled workers unemployed. To cope, these workers seek alternative income sources or shift into different trades (Akomah et al., 2020). Consequently, when the economy improves, many are hesitant to return to the construction sector (Alshahrani et al., 2023).

2) Lack of Job Security
Skilled workers in the construction industry often have minimal or no social protection. During economic booms, the sector experiences increased investment, creating a builder's market with plenty of job opportunities. However, during recessions, many skilled workers are laid off, and once the economy improves, these workers are often hesitant to rejoin the construction workforce (Alshahrani et al., 2023).
Construction firms also undertake mobilization and demobilization of skilled workforce at different stages of construction projects to meet the works demand (Shikweni et al., 2019). The business dictionary defines mobilization as the activation of resources for a specific project, and demobilization as deactivation of resources at the construction site. The act of mobilization and demobilization enhances lack of job security among the skilled workforce.

3) Higher Educational Levels
Attitudes toward education have shifted considerably, with many young people favoring higher education over vocational training, motivated by the expectation of securing less strenuous and more prestigious jobs than those in construction. At the same time, construction work is often perceived as dirty and hazardous (Akomah et al., 2020). Furthermore, reforms in national education systems have produced a generation of highly skilled youth who, because of their qualifications, are

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more inclined to migrate to higher-paying countries or pursue careers in sectors that offer better working conditions (Yusoff et al., 2021).

4) Increased Demand for Skilled Workers

Construction firms face significant challenges in attracting the skilled workforce needed for their many projects because of the high demand for such workers. The situation is further worsened by the fact that much of the available workforce possesses only limited proficiency in their respective trades (Akomah et al., 2020).

5) Poor Construction Industry Image

The construction industry is often viewed by the public as having a negative and unattractive image (Yusoff et al., 2021). Contributing factors to this perception include limited career advancement opportunities, unattractive job characteristics, low wages, unsafe and harsh working conditions, as well as profit-driven practices and broader economic pressures. Much of this unfavorable image stems from the very nature of construction work, which is commonly associated with being dirty, dangerous, and difficult—the so-called "3D" environment (Yusoff et al., 2021).

6) Ageing Workforce

The shortage of skilled workforce in construction has encouraged the retention of older workers. Firms particularly value experienced employees when projects are technically complex, have tight deadlines, or demand strict adherence to safety standards. However, age brings additional risks and injury severity tends to increase as workers grow older. Ageing skilled workers often face challenges such as reduced functional capacity, higher disability rates, and premature mortality, largely due to cumulative work-related injuries. Sokas (2019) notes that the fatal injury rate among workers aged 55 and above is double that of workers aged 35 and younger. Demographic trends indicate an aging workforce. The median age of U.S. construction workers was 42 in 2021 one year above that of the overall labor force and the share of workers aged 55 and over rose from under 19.3% in 2015 to 22.3% in 2021 (Zhao, 2023). Retaining older skilled workers may, therefore, raise firms' compensation and operational costs, especially since modified duty options are less viable in construction contexts.

III. METHODOLOGY

A. Study Site

This research focused on Nairobi City County as its study site due to its urbanized nature with cultural, educational and technological diversity thus best representing all other counties in the country. The diversity and number of projects was high in comparison to other counties and all classes of construction firms are best represented. Lastly, the county served as the most accessible location for the researcher due to the limitation of time and funding.

B. Research Design

This study adopted a mixed methods research design, integrating both quantitative and qualitative approaches to effectively address the research questions. On the quantitative side, descriptive research was employed to provide an accurate and systematic account of the population, situation, or phenomenon. Descriptive research focuses on explaining the "what," "where," "when," and "how" aspects, while not addressing the "why" and is useful in identifying characteristics, frequencies, patterns, and classifications (McCombes, 2023). The qualitative component, on the other hand, was applied to analyze open-ended questionnaire items and data obtained from interviews.

C. Population of the Study

According to Bhandari (2023), a population refers to the complete group from which a researcher intends to make conclusions. Similarly, Thomas (2023) describes a research population as the entire set of individuals, objects, or events that share particular characteristics and are relevant to the study.

In line with these definitions, this study focused on construction firms having active construction sites in Nairobi County and registered with NCA under categories NCA 1 to NCA 4 as indicated in Table 3.1. The research included project managers, site supervisors, skilled workforce and human resource personnel to ensure reliable data.

Table 3.1: Total Population distribution of construction firms under different NCA categories with active construction sites in Nairobi City County.

CATEGORY	PROJECT VALUE (Kshs.)	POPULATION (N)
NCA 1	Unlimited	40
NCA 2	Upto 500,000,000	55
NCA 3	Upto 300,000,000	125
NCA 4	Upto 200,000,000	250
TOTALS		**470**

Source: NCA, (2025).

D. Sampling Procedure and Sample Size

Mugenda and Mugenda (2013) suggest that when the accessible population is below 10,000, a sample size of 10–30% is sufficient for representation. This study utilized 30% of the population for its sample size for construction firms in NCA 3 and NCA 4. 10% was increased to the sample size to compensate for respondents that the researcher was unable to contact.

Populations in NCA 1 and NCA 2 categories were less than 100 and therefore the study aimed to survey the entire population adopting it as its sample size. The sample size for each category was as indicated in Table 3.2.

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Table 3.2: Distribution of calculated sample size of active construction sites in the various categories of NCA registration

CATEGORY	POPULATION (N)	SAMPLE SIZE
NCA 1	40	40
NCA 2	55	55
NCA 3	125	50
NCA 4	250	100
TOTALS	**470**	**245**

Source: Author's Construct, (2025).

E. Sampling Technique

The study used random sampling technique whereby construction firms were selected randomly within the various categories. Probability or random sampling ensures that every individual or element in the population has an equal chance of selection, thereby producing a representative sample and minimizing bias.

F. Data Collection

This study used a survey for data collection as it was quick, flexible and helps in collection data from many participants. Survey simply refers to collection of information through asking questions (McCombes, 2019). Surveys can be administered using questionnaires distributed in person, online, or by mail or through interviews, where the researcher poses a series of questions either face-to-face or by phone and records the responses (Mc Combes, 2019). In this study, data was collected using questionnaires that contained both open-ended and closed-ended items. The closed-ended questions provided respondents with predetermined options, such as binary choices, Likert scales, single-answer lists, and multiple-answer lists. In contrast, the open-ended questions allowed participants to respond freely in their own words, offering richer explanations that complemented the closed-ended responses. Most importantly, the questions were worded in an unbiased way capturing relevant insights.

G. Data Analysis

The collected data was statistically analyzed using Microsoft Excel 2019 and the Statistical Package for Social Sciences (SPSS) Version 27. Quantitative data analysis was conducted through descriptive statistics, which help to summarize and organize key features of a dataset. Descriptive statistics generally include frequency distributions that present data in numbers or percentages, measures of central tendency such as the mean, and measures of variability including standard deviation and variance (Bhandari, 2023).

IV. DATA ANALYSIS, RESULTS AND DISCUSSION

A. Response Rate and Distribution

According to Sataloff and Vontela (2021), the response rate is calculated by dividing the number of completed surveys by the total number of individuals surveyed. This measure is crucial because a low response rate reduces the sample size and statistical power of a study, thereby heightening the risk of bias. In various fields, acceptable response rates are typically reported to range between 40% and 75%.

Out of the 245 targeted construction firms, response was received from 170 firms accounting for a response rate of 69% as indicated in Table 4.1below.

Table 4.1: Response Rate Among Construction Firms Under the Different Classes of NCA Registration.

Class of NCA Registration	Sample Size	No. of. Responsive Firms	Response Rate
NCA 1	40	30	75%
NCA 2	55	35	64%
NCA 3	50	40	80%
NCA 4	100	65	65%
TOTALS	245	170	**69%**

Source: Field Survey, (2025).

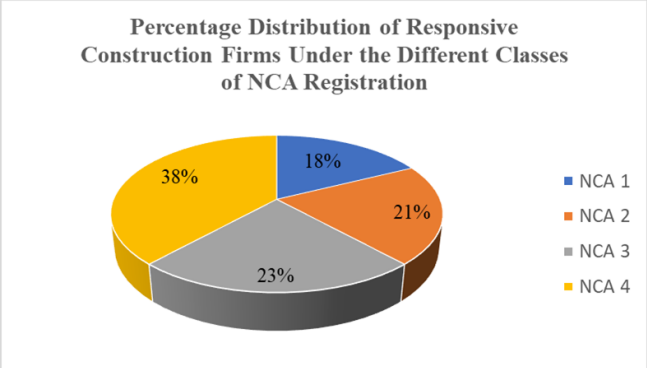

Figure 4.1:Percentage Distribution of Responsive Construction Firms Under the Different Classes of NCA Registration.

Source: Field Survey, (2025)

B. Sustainability of skilled Workforce Among the Various Classes of NCA Registration

85% of NCA 1 construction firms, 55% of NCA 2, 40% of NCA 3 and 20% of NCA 4 construction firms were able to sustain their skilled workforce. This resulted into an overall sustainability of 43% as shown in the figures below.

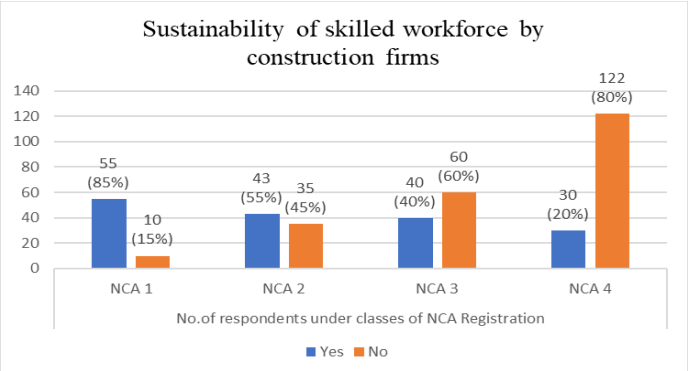

Figure 4.2:Sustainability of skilled Workforce in Firms Under the Various NCA Categories

Source: Field Survey, (2025).

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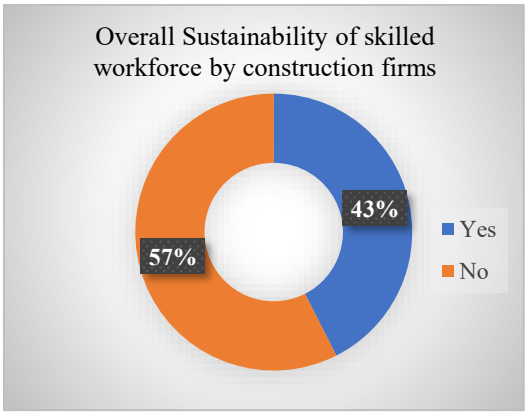

Figure 4.3:Overall Sustainability of skilled Workforce.
Source: Field Survey, (2025).

C. Factors Influencing Sustainability of skilled Workforce Among the Various Classes of NCA Registration.

1) Economic Changes

Economic changes had a 63% influence on sustainability of skilled workforce in construction firms under NCA 1 category, 75% on construction firms under NCA 2, 86% on construction firms under NCA 3 and 87% on construction firms under NCA 4.

25% of the respondents strongly agreed, 54% agreed, 18% remained neutral and 3% disagreed to economic changes influencing sustainability of skilled workforce. Overall, this factor had a mean of 3.882 translating to 78% thus significantly influencing sustainability of skilled workforce.

Table 4.2: The extent to which economic changes influences sustainability of skilled workforce in construction firms.

Class of NCA Registration	Mean	Standard Deviation	Proportion
NCA 1	3.154	0.662	63%
NCA 2	3.731	0.592	75%
NCA 3	4.300	0.640	86%
NCA 4	4.342	0.474	87%
Overall Score	**3.882**	**0.592**	**78%**

Source: Field Survey, (2025).

2) Lack of Job Security

Lack of job security had a high influence on sustainability of skilled workforce on construction firms under NCA 4 at 84% and least influence on NCA 1 firms at 50%. NCA 3 and NCA 2 firms were in second and third place at 78% and 71% respectively.

28% of the respondents strongly agreed, 37 % agreed, 17 % remained neutral, 16% disagreed and 3% strongly disagreed to lack of job security influencing sustainability of skilled workforce. Overall, this factor had a mean of 3.527 translating to 71% thus significantly influencing sustainability of skilled workforce.

Table 4.3: The extent to which economic changes influences sustainability of skilled workforce in construction firms.

Class of NCA Registration	Mean	Standard Deviation	Proportion
NCA 1	2.477	0.806	50%
NCA 2	3.526	1.129	71%
NCA 3	3.910	0.895	78%
NCA 4	4.197	0.903	84%
Overall Score	**3.527**	**0.934**	**71%**

Source: Field Survey, (2025).

3) Higher Education Levels Among Skilled Workforce

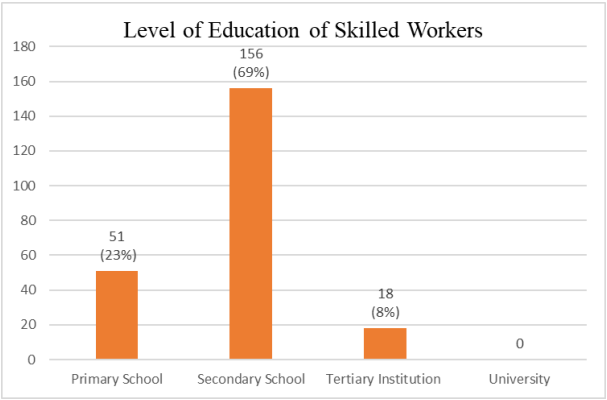

Figure 4.4:Level of Education of skilled Workforce.
Source: Field Survey, (2025).

Table 4.4: The extent to which high education levels among skilled workforce influences sustainability of skilled workforce in construction firms.

Class of NCA Registration	Mean	Standard Deviation	Proportion
NCA 1	1.769	0.576	35%
NCA 2	1.705	0.718	34%
NCA 3	1.700	0.640	34%
NCA 4	1.513	0.500	30%
Overall Score	**1.672**	**0.608**	**33%**

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Source: Field Survey, (2025).

With an overall mean of 1.672 (33%), higher education levels among skilled workforce had no significant influence on sustainability of skilled workers.
50% of the respondents disagreed, 43% strongly disagreed and 7% remained neutral on the factor affecting sustainability of skilled workforce. Overall, NCA 4 construction firms were the least impacted by higher education levels among skilled workers.
69% of the skilled workers respondents had gone up to secondary level, 23% up to primary school level and only 8% had achieved tertiary education supporting the fact that higher education levels were not present among the skilled workers. Majority of them had acquired their skills through apprenticeship and on-site training.

4) Increased Demand for Skilled Workforce

Demand for skilled construction workforce was high across all construction firms in the various NCA categories with an overall mean of 3.820 translating to 76% as shown below.
NCA 4 construction firms had the greatest demand for skilled workforce influencing their sustainability of skilled workforce at a mean of 4.026. Construction firms under NCA 1, 2 and 3 categories faced a significant demand for skilled workforce at means of 3.785, 3.750 and 3.720 respectively.
44% of the respondents agreed, 27% strongly agreed, 19% remained neutral, 8% disagreed and 1% strongly disagreed to increased demand for skilled construction workforce influencing sustainability of skilled workforce in construction firms.

Table 4.5: The extent to which increased demand for skilled workforce influences sustainability of skilled workforce in construction firms.

Class of NCA Registration	Mean	Standard Deviation	Proportion
NCA 1	3.785	0.774	76%
NCA 2	3.750	1.331	75%
NCA 3	3.720	1.001	74%
NCA 4	4.026	0.888	81%
Overall Score	**3.820**	**0.999**	**76%**

Source: Field Survey, (2025).

5) Poor Construction Industry Image

Table 4.6: The extent to which poor construction image influences sustainability of skilled workforce in construction firms.

Class of NCA Registration	Mean	Standard Deviation	Proportion
NCA 1	3.000	1.177	60%
NCA 2	3.487	0.944	70%
NCA 3	3.560	1.013	71%
NCA 4	3.632	0.985	73%
Overall Score	**3.420**	**1.030**	**68%**

Source: Field Survey, (2025).

Poor construction image characterized by poor working conditions, low wages and such like factors had a significant influence on sustainability of skilled workers with an overall mean of 3.420 (68%) as indicated in Tables 4.23 and 4.24 below. In NCA 1 firms, this factor had a 60% influence on sustainability of skilled workforce, NCA 2 firms 70%, NCA 3 firms 71% and lastly NCA 4 firms 73% as shown in Table 4.6.

6) Ageing Workforce

Ageing workforce had minimal influence on sustainability of skilled workers in construction firms with an overall mean of 1.959 (39%). 59% of the respondents disagreed to ageing workforce influencing sustainability of skilled workforce in their construction firms, 22% strongly disagreed and 19% remained neutral. Majority of the skilled workers were between the ages of 31 to 40, followed by 18 to 30 indicating that old age was not a major factor influencing construction firms in Nairobi County.

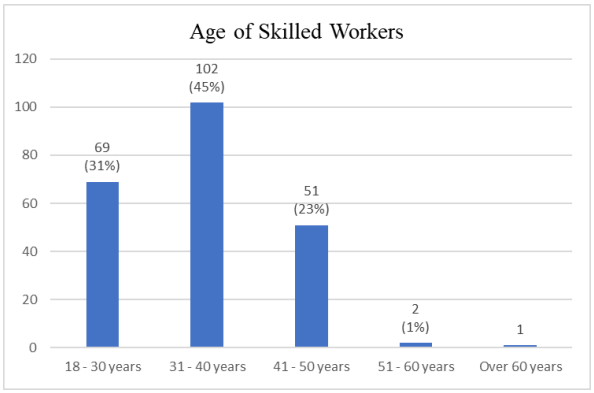

Figure 4.5:Age of skilled Workforce.
Source: Field Survey, (2025).

7) Summary of the factors influencing sustainability of skilled workforce

Economic changes, increased demand for skilled workforce, lack of job security and poor construction industry image had significant influence on sustainability of skilled workforce at 78%, 76%, 71% and 68% respectively. Ageing workforce and higher education levels had minimal influence on sustainability of skilled workers at 39% and 35% with (M=1.959, SD=0.607) and (M=1.760, SD=0.602) respectively as shown below.

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Table 4.7: Summary of the challenges influencing sustainability of skilled workforce in construction firms.

Factors influencing sustainability of skilled workforce in construction firms.	Mean	Standard Deviation	Ranking	Proportion
Economic Changes	3.882	0.592	1	78%
Lack of job security	3.527	0.934	3	71%
Higher Education Levels	1.760	0.602	6	35%
Increased Demand for skilled workforce	3.820	0.999	2	76%
Poor construction industry image	3.420	1.030	4	68%
Ageing Workforce	1.959	0.607	5	39%

Source: Field Survey, (2025).

V. CONCLUSION

Sustainability was highest in NCA 1 construction firms at 85%. This was attributed to higher financial capacity and stability in relation to construction firms in other NCA categories which enabled them to acquire works worth large amounts of money, attracting larger profit amounts and taking longer periods of time. This helped the construction firms have their skilled workers under permanency basis thus promoting sustainability. NCA 2, NCA 3 and NCA 4 construction firms achieved sustainability of skilled workforce at 55%, 40% and 20% respectively. This was as a result of the continuous workflow in some of the construction firms that enabled them retain and sustain skilled workers all through as they rotated in the various sites. Other construction firms were able to retain few skilled workers who were flexible enough to navigate through different roles such as masons who would undertake carpentry and steel fixing roles. Some sustained skilled workers by paying them lesser amounts when there were no works, say salary equivalent to that of semi-skilled workers as backed by feedback from the interviews.

Among the challenges focused on in this study, economic changes, increased demand for skilled workforce, lack of job security and poor construction industry image had a huge impact on sustainability of skilled workforce at 78%, 76%, 71% and 68%. These findings were in tandem with (Sokas,2019; Akomah et al., 2020; Alsharani et al., 2023; Shikweni et al., 2019) and the influence was high in NCA 3 and 4 construction firms.

Ageing workforce and higher education levels among skilled workforce, ranked fifth and sixth respectively and with means of 1.959 (39%) and 1.760 (35%) had minimal influence on sustainability of skilled workforce across firms in all NCA categories represented. This was due to the fact that majority of the skilled workers were in the age brackets of 18 – 30 years and 31 – 40 years with their educational level being secondary school and primary school. They had learnt the various skills and trades through apprenticeship starting off as semi-skilled workers and later graduating into skilled workers passing on the skills to others thereafter.

Respondents gave other challenges influencing sustainability of skilled workforce such as delayed payments from clients which resulted into delayed payments for the skilled workforce and as a result the skilled workforce looked for job opportunities elsewhere where they were paid on a daily or weekly basis. Many construction firms were business oriented with their main aim being making profits and maximising savings out of them thus evading the need of sustainability of skilled workforce.

Low competitive pricing of works especially for construction firms in NCA 4 resulted into minimal profits and made it difficult to sustain workforce. Poor financial management through prioritisation of material purchase in place of payment of workers and lack of the actual skilled qualified workers were cited as challenges too.

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Ms. Rosemary Mukami Macharia
Student - Master of Construction Project Management,Technical University of Kenya (TUK)
Bachelor of Quantity Surveying - The Technical University of Kenya Professional Quantity Surveyor - Institute of Quantity Surveyors of Kenya (IQSK)
Registered Quantity Surveyor - Board of Registration of Architects and Quantity Surveyors (BORAQS)

Dr. Absalom H.V. Lamka
Senior Lecturer - The Technical University of Kenya (TUK)
Doctor of Philosophy (PhD) Construction Project Management- Technical University of Kenya
Masters of Science (MSc) Construction Project Management - Jomo Kenyatta University of Agriculture and Technology (Kenya)
Bachelor of Philosophy (B.Phil) Construction Management - University of Nairobi (Kenya)
Higher Diploma Construction (Building and Civil Engineering) - Mombasa Polytechnic
Diploma Building and Civil Engineering - Mombasa Polytechnic
Memberships - M.A.A.K (CPM - 3889); MIET (M/No 1007)

Dr. Sarah Wairimu Gitau
Senior Lecturer- The Technical University of Kenya. (TUK)
Doctor of Philosophy (PhD) Community Participation in Informal Settlements Development in Kenya - University of Central England in Birmingham (United Kingdom)
Masters of Arts (MA) Housing Administration - University of Nairobi (Kenya)
Memberships - REITS Association of Kenya

Qs. David G. Choka
Senior Lecturer- The Technical University of Kenya. (TUK)
Masters of Arts (MA) Construction Management - University of Nairobi (Kenya)
Bachelor of Arts (BA) Building and Economics - University of Nairobi (Kenya)
Memberships - BORAQS, IQSK, PMI