Factors Influencing the Adoption of Sustainable Construction Practices in Building Development Projects in Ruiru Municipality, Kenya

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Construction industry significantly shapes the built environment by providing essential infrastructure, housing and commercial spaces for the growing population. However, its expansion brings detrimental environmental and social impacts. This paper examines factors influencing the adoption of sustainable construction practices in building development projects in Ruiru Municipality, Kenya. Data was collected using questionnaires which were administered to contractors, site supervisors and project managers in 95 building development projects. Stratified random sampling technique was used to sample the building development projects. Data was analysed using descriptive statistics such as frequencies, percentages, mean, and relative importance index, alongside inferential statistics that include Kruskal-Wallis H test and Pearson Correlation test. The findings reveal that contractors, site supervisors and project managers are aware and knowledgeable about sustainable construction practices, but affordability greatly influence their adoption in building development projects. Other factors included market demand, commitment and cooperation, emerging technologies and regulations. This study therefore recommends that frequent awareness creation, enforcement mechanism and fiscal incentives are imperative in order to promote the adoption of sustainable construction practices.

Key words: Adoption, construction, sustainable practices, building development projects, Kenya

Introduction

The construction industry is a cornerstone of national development since it contributes to economic prosperity and societal well-being (Abdillahi *et al*., 2024). Sustainable construction practices emphasize how building projects can protect the environment and impact the social and economic well-being of the community (Willar *et al*., 2021). Sustainable construction ensures that construction operations are conducted in a manner that promotes the economy, supports society, and conserves the environment (Ismail *et al*., 2017). Sustainable practices utilize eco-friendly materials and technologies, consume less water, improve energy efficiency, conserve resources, reduce waste, and create safe and healthier environments (Rajabi *et al*., 2022; Njeri *et al*., 2023). Over time, there has been a growing awareness of how construction affects the environment, therefore, implementing sustainable practices during construction lessen the adverse consequences (Djokoto *et al*., 2014; Rajabi *et al*., 2022). Sustainable practices are associated with benefits such as risk minimization, enhanced competitiveness (Liu *et al*., 2020), reduced operation expenses, lower maintenance costs, and increased effectiveness and performance (Mukalula *et al*., 2024). Despite these benefits, sustainable practices in building development projects are still inconsistent and varied in developing nations, like Kenya (Tanui & Tembo, 2023).

Adoption of sustainable construction is influenced by factors that are linked to operations, stakeholders and techniques used in construction (Wang *et al.*, 2018). Several factors can impede or enhance the rate at which sustainable construction is adopted depending on the priorities of the stakeholders (Malik *et al*., 2024). The proficiency of the project team in executing sustainable practices on sites is enhanced by knowledge and awareness acquired via consistent practice and training (Shen *et al.*, 2017; Jimoh *et al*., 2022; Abidin, 2010). Awareness on sustainable techniques including recycling, energy efficiency, utilization of renewable resources and benefits of sustainable construction is crucial (Ametepey *et al*., 2015; Kipkoech *et al*., 2024; Okoye, 2021). The awareness level of stakeholders is dependent on the availability of documented information regarding sustainable approaches, material and technologies (Sherwood & Pollard, 2018). Economic considerations are critical in determining what to perform during construction (Richard, 2024). Some stakeholders believe that using sustainable practices will result in higher cost and capital expenses (Athapaththu & Karunasena, 2018). Inability to secure funding impedes the rate of sustainable construction adoption (Nasereddin & Price, 2021). Access to green financing through loans and grants encourages developers to invest in sustainable practices (Chan *et al*., 2018). Market demand of sustainable buildings

determines the preferences of the stakeholders to incorporate sustainable practices (Chan *et al*., 2018).

Collaboration and commitment of project stakeholders is vital in ensuring that sustainable practices are applied (Onubi, 2019). Collaboration and commitment by construction stakeholders highlights the importance of teamwork, uniting various key players with varied expertise to share knowledge and drive collective action toward sustainability goals (Gomezga *et al*., 2021). Construction stakeholders are accountable for implementing sustainable practices during construction (Shen *et al*., 2008; Davies *et al*., 2015). Sustainable rating systems, certification and recognition also impact how sustainable practices is embraced (Abidin *et al*., 2013). The rating systems considers numerous requirements such as material consumption, pollution, energy (Takase *et al*., 2023), water use, onsite environment, land use and waste (Marchi *et al.,* 2021). Despite the availability of sustainability rating systems such as Leadership in Energy and Environmental Design, Green Star rating system, Environmental Design for Greater Efficiencies and safari green building index tool, majority of construction projects in Kenya are reluctant in acquiring certification (Apanavičienė *et al*., 2020; Takase *et al*., 2023). Another crucial factor is the availability of emerging technologies and professionals that have the required understanding of sustainable building practices (Ametepey *et al.,* 2015).

In Kenya, the economic and social progress is significantly influenced by the construction industry since it generates employment, contributes to the Gross Domestic Products (NCA, 2020), addresses housing shortages and foster community development (AAK, 2023). The real estate drives demand for construction activities, which offer attractive investment opportunities, contributing to overall economic stability and growth (Kinuthia *et al*., 2021). In 2023, Kenya's construction sector registered a 3% growth, driven by government expenditure on the affordable housing programme, which mainly focused on the construction of residential apartments (KNBS, 2024). In 2023 also, public and private sector employment in the construction industry increased by 2.1% and 1.8% respectively (KNBS, 2024), which shows that construction is a crucial part of Kenya's economic development (Mbusi, 2020). Although building development have a beneficial influence on the economic growth, it also has a detrimental long-term impact on the environment since it accounts for 50% of landfill trash, 33% of natural resource consumption, and a third of greenhouse gas emissions (NCA, 2020). To lessen the environmental impact of construction activities, sustainable practices should be implemented (Onubi, 2019).

Sustainable practices during construction in Kenya have not been prioritized and exposure to integration of technologies is lacking (Sangori *et al.*, 2020). Issues facing the construction sector such as low environmental performance, safety and low productivity is linked to low incorporation and implementation of technologies such as building information modelling (Adan, 2021), green building materials (Patil & Patil, 2017), prefabrication (Nyambura & Yusuf, 2021), smart building technologies and internet of things (Kariuki *et al*., 2021). In order to lessen the adverse impacts associated with building developments, new technologies are needed to complement construction practices (Patil & Patil, 2017; Chen *et al*., 2022).

Kenya has made strides in promoting sustainable construction through policy and regulatory measures that specifies who enforces and what can be done to ensure that it is implemented (Joseph *et al*., 2023). Key hindrance in adopting sustainable practices in Kenya have been identified to consist of inadequate government support, fear of increased project cost, limited knowledge, inadequate capacity among the construction professionals (Kamau, 2019) and weak enforcement and implementation of policies (Muthoga & Githaiga, 2022). Adherence to regulations on sustainable construction is perceived to be low in building projects and this is a result of inadequate punitive measures, inadequate support from national and county governments and corruption by officials in the government bodies (Koigi, 2019).

The attention given to sustainable practices during construction is minimal and there is limited evidence to illustrate how it is adopted in building development projects in Ruiru Municipality. The inadequacy of such information and experience hinders the mainstreaming of strategies and interventions that enhance construction practices that are sustainable. Ruiru Sub-County being formerly a predominantly rural agricultural centre has over the years urbanized and the trend is changing to residential and commercial land use development (Gathoni & Ngugi, 2016; Kinuthia *et al*., 2021). The increase in population in the area coupled with a high number of people within a working group from Nairobi city is creating a huge demand for dwelling units hence an increase in construction of building development projects so as to manage the soaring demands associated with an upsurge in population (County Government of Kiambu, 2020). As such, the building development projects in Ruiru Municipality is particularly preferred so as to determine factors influencing adoption of sustainable construction practices.

Research Methodology

Ruiru Municipality covers an area of 201.36 km^2 and lies between latitudes 1° 5'34.64"S and 1°15'40.84"S and between longitude 36°52'12.23"E and 37° 9'19.78"E (Figure 1). It has a population of 490,120 persons (KNBS, 2019) and is strategically located within

Nairobi metropolitan region. Due to the rapid urbanization, the area has experienced significant population growth, leading to increased demand for housing and infrastructure (UN-Habitat, 2018), especially student accommodation and affordable residential units for low and middle income earners, while the high-income market continues to seek homes in gated communities (Carole, 2023).

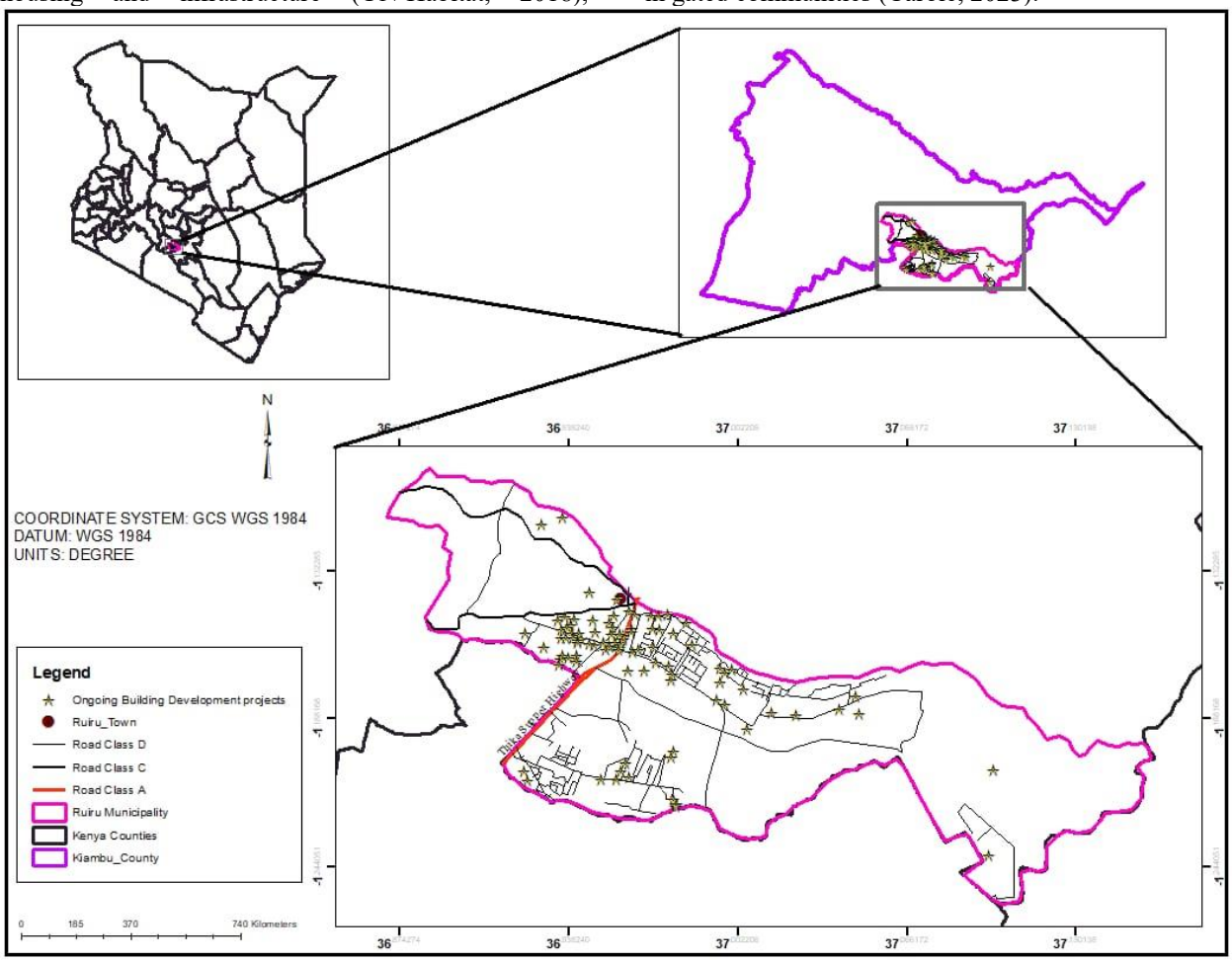

Figure 1: Location of ongoing building development projects within Ruiru municipality

Descriptive research design was utilized since it gathers, describes and analyse the characteristics of the population (Siedlecki, 2020). The research adopted the Cochran (1977) formula in determining the representative sample size. The Cochran (1977) formula used was;

$n_{\circ}=\frac{z^2pq}{e^2}$ equation 1

where: $n_{\circ}$ is the sample size; z is the selected critical value of desired confidence (1.96); p is the estimated population (0.5); q is 1-p; and e is the desired level of precision (0.05).

Therefore; $n_{\circ}=\frac{1.96^2*0.5*0.5}{0.05^2}$ =384.16≃ 384

The population was small, so the sample size was reduced using the Cochran (1977) correction formula in order to obtain the final sample size. The formula was;

$n=\frac{n_{\circ}}{1+\frac{n_{\circ}-1}{N}}$ equation 2

Where: n is the final sample size; $n_{\circ}$ is the sample size derived from equation 1 and N is the population size. In Ruiru Municipality, there are 171 number of ongoing building development projects.

Therefore; $n=\frac{384}{1+\frac{384-1}{171}}$=118.75≃ 119

One hundred and nineteen (119) ongoing building development projects were sampled based on Cochran (1977) formula followed by stratified random sampling technique. The size of the building development project, as informed by the project value, was used as the strata. Projects valued below KES 10,000,000 was considered as small, 10,000,001-20,000,000 as medium while 20,000,001 and above were large. Data was collected using questionnaires whereby one respondent in each building construction site was selected by purposive sampling amongst industry experts, contractors, site supervisors and project managers. The questionnaires were administered at 95 construction sites out of 119

construction sites resulting in 80% response rate. A total of 10 factors were identified from previous studies (Table 1). Pilot study was conducted with six seasoned project managers, site supervisors, and contractors, each boasting over a decade of hands-on experience in the daily operations of construction projects. The comments were reviewed and amendments that include deleting and modifying was done. This aimed at aligning with the specific characteristics of construction projects and the issues prevalent in the area. As a result, 6 statements that include awareness and knowledge, affordability, market demand, policy and regulation, emerging technologies and cooperation and commitment by project stakeholders were selected.

Table 1: Factors influencing adoption of sustainable practices

Factors	Reference
Knowledge and awareness	(Abidin, 2010; Ametepey *et al*., 2015; Shen *et al*., 2017; Sherwood & Pollard, 2018; Okoye, 2021)
Market demand	(Chan *et al*., 2018)
Cost of implementation	(Athapaththu & Karunasena, 2018)
Access to funding and green financing	(Chan *et al*., 2018)
Compliance and enforcement of policies and regulations	(Djokoto *et al*., 2014; Gan *et al*., 2015; Muthoga & Githaiga, 2022; Joseph *et al*., 2023)
Construction technologies	(Patil & Patil, 2017; Sangori *et al.*, 2020; Chen *et al*., 2022)
Cooperation and commitment by project stakeholders	(Onubi, 2019; Gomezga *et al*., 2021)
Application of sustainable rating systems	(Abidin *et al*., 2013; Marchi *et al.,* 2021)
Expertise and technical capacity	(Kamau, 2019)
Government support	(Kamau, 2019)

The socioeconomic data and the characteristics of the building project were analysed using frequency and percentage while the data on factors were analysed using mean, relative importance index (RII), Kruskal-Wallis H test and Pearson Correlation test. The reliability and internal consistency of the data were measured using Cronbach Alpha calculated as:

$$\alpha = \frac{n}{n-1}\left(1 - \frac{\sum S^2(Xi)}{S^2(y)}\right) \quad \text{equation 3}$$

where; n= number of items s^2 (X_i)=variance of item and $s^2(y)$=Variance of the observed total scores. If the result is closer to 1 it implies the reliability of the instrument is greater but if close to 0 it is weaker. The Cronbach Alpha value obtained was 0.893, which shows that instrument was reliable.

The questions on factors were based on Likert scale rating ranging from 1 to 5 scale where 1 and 5 are not at all and to a great extent, respectively. The mean score (MS) of each variable was computed using equation 4.

$$MS = \frac{\Sigma(f)\ X\ S}{N} \quad \text{equation 4}$$

Where f = frequency of reply to each rating (5 to 1), s = score assigned to each item by the respondents (5 to 1) and N = total number of responses relating to the item.

Ranking was computed based on relative importance using relative importance index with a weight of 0 to 1 (equation 5).

$$RII = \frac{\Sigma W}{A \times N} \quad \text{equation 5}$$

Where W = weight the respondent allotted to each item (5 to 1), A = highest weight (5) and N = total number of respondents.

The RII values obtained were then converted into various significance level. Based on Akadiri (2011) the five significant levels are: low (L) ($0 \leq RII < 0.2$), medium-low (M-L) ($0.2 \leq RII < 0.4$), medium (M) ($0.4 \leq RII < 0.6$), high-medium (H-M) ($0.6 \leq RII < 0.8$) and high (H) ($0.8 \leq RII \leq 1$).

The Shapiro-Wilk test with alpha value of 0.05 was conducted in order to determine the data normalcy. From the analysis, the p-values (0.000) obtained by the Shapiro-Wilk test were lower than 0.05 showing that the data collected was not normally distributed. This led to the use of Kruskal-Wallis H test and Pearson correlation analysis. Kruskal-Wallis H Test was performed in order to determine any essential variation in the various occupations that include contractors, site supervisors and project managers. With a confidence level of 95%, the Kruskal-Wallis H test result was significant at the level of 0.05 (p-value < .05). Where p value was less than 0.05 the null hypothesis (there is no significant difference) was rejected and the alternative accepted. Pearson Correlation test was utilized to determine the association among the factors (affordability, market demand, policies and regulations, emerging technologies and cooperation and commitment by project stakeholders). Pearson Correlation test was significant at the level of 0.01 (p-value < .01). Where p value was less than 0.01 the null hypothesis (there is no relationship) was rejected and the alternative accepted.

Results and Discussion

Socioeconomic characteristics of respondents

The study revealed that 51% of the respondents were site supervisor, 28% were project managers while 21% were contractors (Table 2). This indicated that the perspective of each key player offered unique insights into the different aspects of construction projects. The significant proportion of the site supervisors is because they are engaged more frequently in the day-to-day operations and hands-on management of the construction site. Seventeen percent (17%) of the respondents had a post graduate degree, 41% had a bachelor's degree, and 1% had higher diploma, and 41% had a diploma. This imply that respondents had the necessary educational level to comprehend the survey and provide suitable answers. The respondents were engineers (47%), quantity surveyors (23%), architects (12%), 10% building technicians, 4% environmentalist, 3% interior designer and 1% construction manager. This demonstrates that diverse viewpoints were received from a broad spectrum of experts in the built environment. The work experience of the respondents were over 10 years (5%), 6-10 years (26%), 1-5 years (54%), and less than 1 year (15%). From the results we can depict that majority of the respondents were professionals who had adequate experience regarding construction operations.

Characteristics of building development projects

Majority (83%) of the building development projects under construction in Ruiru Municipality were residential projects and it consisted of private dwelling, apartment and townhouse. 11% of the projects were commercial buildings and it consisted of shopping malls, offices and retail stores. 6% consisted of religious projects specifically churches (Table 2). The high rate of residential developments is because the demand for housing is high. The findings affirms to that of Wambugu *et al*. (2017) who noted that in order to accommodate the population influx in Ruiru Municipality, the locals were building rental apartments. Additionally, the presence of infrastructure development such as the Eastern Bypass and Thika Superhighway makes it easy to access important business hubs such as Tatu city industrial park, Ruiru Business centre, Spur mall and Unicity Mall. The municipality also hosts master planned projects like Northlands City and Tatu City, making the area an appropriate satellite area for one to settle. About 98% of the ongoing building development projects were privately owned while 2% were owned by the government. The public projects consisted of residential project being constructed by the Government of Kenya under the Affordable Housing Program. The Government aims at facilitating the delivery of 250,000 homes annually all over the country in order to close the housing shortfall (RoK, 2024). The dominance of privately-owned projects in the area is because there is available land for development and private developers are able to have high returns from building residential or commercial projects in the area. This is consistent with Cytonn Real Estate (2021) market review report, which regarded municipality as one of the top most areas for development due to its tranquil setting and high value returns for investors.

Regarding the value of the project, majority (79%) of the ongoing building development projects were valued above KES 20,000,001, 17% were between KES 10,000,000 and 20,000,000 while 4% were valued below KES 10,000,000. The high value of the ongoing building development projects in the area is attributed to the high cost of construction inputs and the nature of the projects, which consumes large quantity of inputs. Over time, the cost of construction inputs like labour, materials, transportation, fuel and equipment has been steadily rising (KNBS, 2023).

Table 2: Characteristics of respondents and the building development project

Category	Profile	Frequency	Percentage (%)
Education level	Postgraduate	16	17
	Undergraduate	39	41
	Diploma	39	41
	Higher diploma	1	1
Professional background	Engineer	45	47
	Quantity surveyor	22	23
	Architect	11	12
	Others	17	18
Occupational role in construction project	Contractor	20	21
	Project manager	27	28
	Site supervisors	48	51
Work experience	Less than 1 year	14	15
	1-5 years	51	54
	6-10 years	25	26
	Over 10 years	5	5

Nature of the project	Commercial	10	11
	Private residential	44	46
	Apartment residential	34	36
	Townhouse	1	1
	Religious	6	6
Type of the project	Public	2	2
	Private	93	98
Value of the project (KES)	<10,000,000	4	4
	10,000,001-20,000,000	16	17
	>20,000,001	75	79

Factors influencing adoption of sustainable construction practices

Recycling and reuse of materials has the highest RII value (0.821), indicating that most professionals are highly knowledgeable and aware of the practice compared to other sustainable practices. (Table 3). In a similar study by Isang (2016), it was established that construction stakeholders in Akwa Ibom state, Nigeria are highly aware of practices such as selection of the appropriate construction technique. Water conservation is the second most with RII of 0.797, energy efficiency is third with RII value of 0.779, use of renewable materials is fourth with RII value of 0.774, waste reduction is fifth with RII value of 0.771, social practices is sixth with RII value of 0.750 and reducing air and noise pollution is seventh with RII value of 0.721. Based on the transformation matrix used to compare RII with the relevant importance level (Akadiri, 2011) the results indicated that recycling and reuse of materials had a high importance level since the RII was above 0.8. The RII for water conservation, energy efficiency, use of renewable materials and waste reduction, social practices, reduction of air and noise pollution ranged between 0.721 to 0.779 indicating that the importance level was high to medium. The results show that the level of knowledge and awareness on sustainable construction among construction stakeholders is generally high. The results are similar to that of Simwero *et al*. (2024) who noted that the level of awareness on sustainable practices in construction is high among construction stakeholders in Kenya.

Table 3: Knowledge and awareness of sustainable construction practices

	Std. Deviation	RII	Rank	Shapiro-Wilk Test		
				Statistic	df	Sig.
Recycling and reuse of materials	0.944	0.821	1	.666	95	.000
Water conservation	0.911	0.797	2	.719	95	.000
Energy efficiency	1.29	0.779	3	.709	95	.000
Use of renewable materials	0.875	0.774	4	.740	95	.000
Waste reduction	0.881	0.771	5	.719	95	.000
Social practices	1.245	0.750	6	.774	95	.000
Reducing air and noise pollution	0.861	0.721	7	.708	95	.000

Given that the respondents were from a variety of occupations (contractors, project managers and site supervisors) it was crucial to perform an inter-group comparison in order to identify any essential variation among their responses. Kruskal-Wallis H Test was performed, and the results obtained showed that all the p values (sig) of the variables were greater than the significance level of 0.05 implying that the null hypothesis was accepted (Table 4). This indicates that there is no significant difference in the knowledge and awareness level of the sustainable practices among contractors, site supervisors and project managers. The results vary with Isang (2016) who established that knowledge on practices such as control of dust to reduce pollution and waste management varied among the construction professionals.

Table 4: Inter-group comparison using Kruskal-Wallis H Test

	Energy efficiency	Waste reduction	Water conservation	Use of renewable materials	Recycling and reuse of materials	Reducing air and noise pollution	Social practices
Chi-Square	3.825	0.233	0.918	0.196	1.105	1.532	0.835
df	2	2	2	2	2	2	2
Asymp. Sig.	0.148	0.89	0.632	0.907	0.576	0.465	0.659

Grouping Variable: Occupational role in this construction project

Affordability of implementing sustainable construction had a relative importance index of 0.884 (1st rank) indicating that it is the highest factor that influence adoption of sustainable construction (Table 5). This finding are inconsistent with previous studies. Isang, (2016) established regulation as the highest factor impacting sustainable construction while Shan *et al*., (2020) established provision of incentives by government and engagement of laborers who are experienced in sustainable practices as the most common factors. The variation in findings suggests that the relative importance of factors influencing the adoption of sustainable construction can be context-specific, varying across different regions.

Increasing market demand for sustainable construction had a relative importance index of 0.846 (2nd rank) indicating that the adoption of sustainable practices is highly dependent on the market demand (Table 5). When the market, which is mostly composed of developers and users show little interest in sustainable practices, the adoption rate falls (Chan *et al.*, 2018).

Enforcement of the policies & regulations related to sustainable construction had a relative importance index of 0.827 (3rd rank) indicating a high importance level (Table 5). Onubi, (2019) observed that government play a crucial part in promoting sustainable construction by developing regulations that attracts the interest of stakeholders in construction. The policies and regulations should offer the primary means of reducing the negative effects of construction operations on the environment and society through effective enforcement (Gan *et al*., 2015).

Availability of emerging construction technologies ranked 4th with a relative importance index of 0.8 indicating a high level of importance (Table 5). The private sector in Kenya has been active in innovating technologies that are eco-friendly and efficient (Simwero *et al*., 2024). Limited technology options deters industry professionals from adopting sustainable practices (Gan *et al*., 2015).

Cooperation and commitment by project stakeholders were the least ranked factor with a relative importance index of 0.798 indicating an importance level of high to medium (Table 5). Previous studies have reported that commitment and cooperation by all stakeholders involved in the execution of building projects is crucial in ensuring the successful adoption of the sustainable practices (Shafii *et al*., 2006; Isang, 2016). Stakeholders can have a clear objective when they work together (Gan *et al.*, 2015). The respondents were from a variety of occupations (contractors, project managers and site supervisors) it was crucial to perform an inter-group comparison in order to identify any essential variation between their responses. Kruskal-Wallis H Test was used to analyse the data.

Table 5: Rankings of factors influencing the adoption of sustainable construction practices

	Mean	Std. Deviation	Influence level	Rank
Affordability of implementing sustainable construction	3.52	0.977	H	1
Increasing market demand for sustainable construction	3.32	1.065	H	2
Enforcement of the policies & regulations related to sustainable construction	3.34	1.117	H	3
Availability of emerging construction technologies	3.17	1.173	H	4
Cooperation and commitment by project stakeholders	3.15	1.194	H-M	5

H: High, H-M: High-Medium

It was crucial to perform an intergroup comparison in order to determine if there is any essential variation of factors influencing the adoption of sustainable construction practices among the various occupation of the respondents. The results obtained showed that all the p values (sig) of the variables were greater than the significance level of 0.05 implying that the null hypothesis was accepted. This indicate that there is no significant difference in the factors that influence the adoption of sustainable construction among contractors, site supervisors and project managers (Table 6). The result underscores the importance of fostering a collaborative and standardized approach to sustainable construction. Wang *et al*., (2018) observed that perceptions of factors impacting sustainable issues are often consistent across different roles due to shared professional experiences and exposure.

Table 6: Inter-group comparison using Kruskal-Wallis H test

	Chi-Square	df	Asymp. Sig.
Affordability of implementing sustainable construction	0.588	2	0.745
Increasing market demand for sustainable construction	3.18	2	0.204
Enforcement of the policies & regulations related to sustainable construction	4.22	2	0.121
Availability of emerging construction technologies	1.241	2	0.538
Cooperation and commitment by project stakeholders	0.703	2	0.704

a. Kruskal Wallis Test

b. Grouping Variable: Occupational role in this construction project

In order to determine the association and strength among the factors, Pearson correlation analysis was performed. The results in Table 7 shows that all correlations were significant at level 0.01 and the variables had a positive association. The strongest correlation coefficient (r=.848) was between availability of emerging construction technologies and cooperation by stakeholders. This suggests that collaboration among stakeholders is essential for technology integration hence promoting the adoption of sustainable construction. The findings concur with Wang *et al*. (2018) observation that stakeholder cooperation significantly influences the successful implementation of emerging technologies. The strong correlation (r=0.752) between policy enforcement and technology suggests that a regulatory framework promote the use of emerging construction technologies which in turn enhances the adoption of sustainable construction in the industry. Ametepey *et al*. (2015) and Chan *et al*. (2018) emphasized the importance of policy enforcement in driving the adoption of green construction technologies, which is consistent with the strong correlation observed in this study. Affordability of implementing sustainable construction has a strong relationship with increasing market demand for sustainable construction (r=0.680). Increasing market demand and availability of emerging construction technologies (r=0.647) indicates that higher market demand encourages the innovative solutions thereby enhancing the adoption of sustainable construction. Gunatilake (2013) highlighted how market demand acts as a catalyst for affordability and innovation in sustainable construction, supporting the correlations identified in this study.

Table 7: Pearson correlation analysis of factors influencing adoption of sustainable construction

		Affordability of sustainable construction	Increasing market demand for sustainable construction	Enforcement of the policies & regulations for sustainable construction	Availability of emerging construction technologies	Cooperation and commitment by project stakeholders
Affordability of sustainable construction	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	95				
Increasing Market demand for sustainable construction	Pearson Correlation	.680**	1			
	Sig. (2-tailed)	0				
	N	95	95			
Enforcement of the policies & regulations	Pearson Correlation	.570**	.473**	1		
	Sig. (2-tailed)	0	0			

for sustainable construction	N	95	95	95		
Availability of emerging construction technologies	Pearson Correlation	.592**	.647**	.752**	1	
	Sig. (2-tailed)	0	0	0		
	N	95	95	95	95	
Cooperation and commitment by project stakeholders	Pearson Correlation	.518**	.499**	.665**	.848**	1
	Sig. (2-tailed)	0	0	0	0	
	N	95	95	95	95	95

**Correlation is significant at the 0.01 level (2-tailed).

Conclusion

Sustainable construction practices have emerged as a critical strategy to balance development with environmental protection and social well-being. However, its adoption remains inconsistent in building development projects despite the high level of awareness and knowledge of sustainable construction among contractors, site supervisors and project managers since it is significantly influenced by factors such as affordability, market demand, commitment and cooperation by project stakeholders, emerging technologies and existing regulations. Affordability of sustainable construction practices is a significant factor influencing the adoption of sustainable construction practices in building development projects. The challenge of securing affordable financing and the burden of high initial capital costs plays a critical role in the adoption of sustainable construction practices. Stakeholders struggle with the challenge of balancing sustainability goals with financial constraints. If sustainable construction is to be widely adopted, efforts must focus on reducing the financial barriers. Policy interventions should prioritize creating financial incentives such as low-interest loans, and subsidies, to help offset the higher upfront costs of implementing sustainable practices. Regulatory frameworks should be complemented by financial incentives and educational initiatives that empower stakeholders to adopt sustainable practices without compromising on affordability. Furthermore, collaboration between stakeholders, including government bodies, industry associations, and construction firms, is vital in creating a supportive environment for sustainable construction.

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