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Determinants of Quality Assurance within the Building Construction Industry
(Case Study: Kisii Town, Kenya)

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ABSTRACT: Although a growing body of literature maintains that the construction industry plays a significant role in the economic development world-over, the extent of its regulation may, however, undermine the objectives of sustainable urban development. This study, as a result, investigates the factors influencing quality assurance within the building construction industry in Kenya, a case study of Kisii town. The target population comprised of 7430 residential developments from seven neighbourhoods that were spatially segregated using a high-resolution satellite image. Proportional stratified random sampling was thereafter adopted to select 364 developers through questionnaires. Results indicated that the key factors that undermine the extent of quality assurance within the building construction industry in the study area included failure to obtain a development permit, non-engagement of registered professionals in building design, an inadequate inspection of buildings during construction phases and unauthorized occupation of buildings by developers. The study concludes that despite the existing legal framework, these challenges continue owing to inadequate development control by the County Government of Kisii. This study contributes to the literature on the built environment by demonstrating how factors limiting quality assurance within the construction industry may be statistically analyzed.

Keywords: *Construction industry, Quality assurance, Kisii Town, Kenya.*

INTRODUCTION

The building construction industry is a crucial contributor to any nation's economy. As such, its accomplishments are essential as a trajectory towards the socio-economic transformation agenda that includes the provision of employment, associated infrastructure and shelter (Aghimien et al., 2018; Saidu & Shakantu, 2016; Rahman et al., 2012). It has further been argued that the construction industry presents people with an opportunity of fulfilling their basic needs for shelter. In so doing, it transforms their way of life through an improved living standard, thus making a community feel modernized (Zakaria et al., 2013). When the industry is examined from a world-wide perspective, its socioeconomic implication becomes more apparent. Without a doubt, the sector remains as one of the world's largest industrial employers.

For instance, in several countries, it is responsible for more than 50% of capital investment in addition to 10% of the Gross National Product (GNP) (Du Plessis, 2002). Consequently, in most developing and developed countries, the construction industry is singled out as a leading multiplier for economic growth and employment generation. Some of the notable contributions of the industry towards these initiatives include enhancing of earnings per capita and
providing a basis of livelihood for many people (Saidu et al., 2017; Ng'ang'a et al., 2017). The construction industry has, therefore, a significant direct and indirect links with the various aspects of sustainable development as envisioned by the United Nations (Saidu et al., 2017). Kenya is currently experiencing a construction boom, a pace that has been hastened by the Government through extensive investment on projects with an aim of improving the national economic stature (Competition Authority of Kenya, 2017). Some of these projects include the Standard Gauge Railway (SGR), the largest infrastructure project since independence, and the Lamu Port-South Sudan-Ethiopia-Transport (LAPSET), which upon completion,

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will herald the county's second transport corridor (Olotch, 2017). To fast track these projects, the Government in 2008 launched "Vision 2030", an initiative of transforming Kenya to an industrialized middle-income country. The goal for the construction sector according to the Vision is to increase the contribution to Gross Domestic Product (GDP) by at least 10% per annum and propel Kenya in becoming Africa's industrial hub (The Republic of Kenya, 2008). Noticeably, in 2015, the industry accounted for 7% of GDP (The Republic of Kenya, 2018).

Nonetheless, notwithstanding the importance of the industry, its regulation has in the recent past come under sharp criticism owing to inadequate quality assurance. For instance, on 11th March 2019, six people narrowly escaped unhurt after a two-storey building collapsed in Kisumu City, Kenya. Preliminary investigations showed that the building caved in due to substandard materials and poor construction methods (Ojwang, 2019). In an attempt to stem the unfortunate manifestations, President Uhuru Kenyatta of Kenya commissioned an audit of all buildings within Nairobi City County in 2015. The audit found that a paltry 42% of the buildings were fit for habitation (Thuita, 2017). The objective of this study was, therefore, to examine the determinants of quality assurance within the building construction industry in Kenya using Kisii Town as a case study. Its findings could provide policy formulating bodies and international readers with information crucial for setting development goals in regulating the construction industry.

Literature Review

This section undertakes a literature review in an attempt to broadly contextualise the current international debate on the key determinants of quality assurance within the building construction industry. As a starting point, a recent study by Grill et al. (2019) in Denmark and Sweden examined the nature of leadership practices with a particular reference to the construction site managers and their impact on occupational safety. This study targeted to expansively explicate the extent to which transformational and passive leadership styles impact on day-to-day interactions between construction site managers and their employees, consequently a key determinant of quality assurance. The results suggested that transformational leadership was a predictor of high construction site safety. On the contrary, passive leadership was found to generally predict low construction site safety. The study concluded that the adoption of less passive leadership and more transformational leadership was a more effective way that construction site managers could embrace as a strategy for promoting quality assurance in the industry.

Mohd-Rahim et al.(2016) appear to advance the arguments of Grill et al. (2019) in a study that delved on the determinants of the sustainable construction industry in Malaysia. According to their view, the sustainability of quality assurance within the construction industry is largely influenced by the availability of skilled and competent labour on the account that by its very nature, the industry is labour-intensive since it relies heavily on human capital. Owing to its significance, the industry needs to guarantee the availability of adequate and competent labour in every project. As a way forward, Grill et al. (2019) advocated that the most feasible way of addressing the shortage of skilled and competent labour is for countries to invest in technical and vocational training since if this is not accomplished, the other variables that also impact on sustainable construction are bound to become immaterial. These findings relate to that of Zaki et al. (2012) that argued that the Malaysian construction industry had challenges in sourcing and retaining skilled labour leading to a dependency on the foreign workers, a strategy towards meeting the high demand attributable to rapid development and inadequate participation from local people.

Ruya et al. (2017) while examining the effectiveness of building development control in Nigeria demonstrated a significant correlation between construction standards and established regulations. In this case, the construction standards, aided in improving the quality within the established building construction regulations. Consequently, construction regulations were positively considered to be among the key drivers of an effective standard for quality assurance within the Nigerian building construction industry. The study suggested that the government should consistently undertake strict enforcement to ensure total adherence to the set regulations as a strategy for promoting quality assurance. In an attempt to further explore the factors determining quality assurance within the construction industry in China Liu et al. (2016) maintained that the overarching variable was the contractors' unethical behaviour. To substantiate their line of argument, the study sought to, among others, find out the drivers of individuals' unethical behaviour within the Chinese building construction industry that negatively impacted on quality assurance. The results indicated that cost-cutting pressures, insufficient sanctions by the government, and lack of a common code of conduct were the leading drivers of unethical behaviour. According to Shirur & Torgal (2014), socio-economic variables may influence the quality assurance within the construction industry. For example, advocacy stemming from contiguous property owners and the public in general, together with prevailing businesses adjacent to the facility under construction may raise objections if they feel that the sustainability of their environment is likely to be compromised. In such a scenario, civic groups through legislation may demand to have more input into the design of construction projects through citizen advisory boards that are convened during project initiation, design and construction phases.

In Kenya, studies have also been undertaken to try and understand the determinants to the regulation of building construction industry. For example, Gacheru & Diang'a (2015) established that key variables included corruption, inadequate sensitization, insufficient organization by the National Construction Authority (NCA) as the regulator, inadequate training of contractors, and lack of clear cut roles of the NCA leading to overlapping responsibilities with other government agencies. The Republic of Kenya (2018) further

identified factors influencing quality assurance within the country's construction industry to include, but not limited to inadequate harmony in policies, laws and regulations, use of inappropriate construction materials, poor quality of works as a result of poor workmanship and use of substandard materials, unethical conduct and unfair business practises; inadequate skilled and competent workforce, lack of a standard monitoring and evaluation framework; and inadequate capacity for enforcement of standards and regulations. A recent study by Otido & Omwenga (2019) confirmed that the key determinants of quality assurance within the building construction industry in Kenya included the question on contractors' competency along with lack of clear construction policies. The study recommended for stringent enforcement by NCA with respect to the regulation of building development and that further research need be undertaken with an objective of investigating the emerging relationship between contractors' proficiency and quality of building constructions that are undertaken by them.

To this end, although a growing body of literature has attempted to account for some of the variables that are perceived to determine quality assurance within the construction industry, there is still a scarcity in knowledge on how other variables such as obtaining a development permit, engagement of professionals, and authorization of the building occupation, may also impact on quality assurance. Further, this study contributes to the international debate on the built environment by demonstrating how factors limiting quality assurance within the construction industry may be statistically analyzed.

Theoretical Orientation

This study was based on the underpinning of the Public Interest Theory of Regulation (PITR). The theory, as observed by Christensen (2010), elucidates that all economic markets have an inclination of operating inefficiently by favouring the individuals' interest at the expense of generally addressing the wider society's concerns. Due to this lapse, governments always intervene by imposing regulations with an objective of monitoring and directing economic markets. As such, the government as a supreme authority tend to protect the interest of the wider society rather than targeting to benefit itself or a few individuals. Land as one of the factors of production is, therefore, an integral component of the economic market that warrants regulation. When applied to the current study, PITR justifies why the building construction industry in Kisii Town as a case study needs regulation towards promoting quality assurance. Through this initiative, both the NCA and the County Government of Kisii (CGK) should undertake enforcement by controlling privileges to development and improvements, consequently, development control intercedes within the processes of development and occupancy. As such, failure by developers to comply usually attracts stiffer penalties as may be prescribed in the applicable legislation.

In support of PITR, Fainstein & Campbell (2012) argue that planning has the advantage of addressing the uncertainty that occasions within the market in reference to the approved development plan thereby producing a more rational spatial organisation. Regulations, moreover, gives the state the authority of adjudicating conflicts on land use, in consequence controlling individual actions which may possibly result in unsustainable land use activities leading to the indiscriminate allocation of finite resources.

MATERIALS AND METHODS

Background to the Study Area

Kisii Town is located 305 km North-West of Nairobi, the capital city of the Republic of Kenya. The town serves as the headquarters of Kisii County, one of the 47 counties of the Republic of Kenya. Geographically, the town is spatially referenced within latitude 0° 40' 54.26" North and longitude 34° 45' 59.98" East. Its topography predominantly consists of several valleys located on the confluence of numerous rivers characterised by steep to gentle hills, a situation that makes building construction to be quite an expensive undertaking The projected population in 2018 was 93,959, which is further projected to 140,118 by 2032 (Omollo, 2018). This increase is anticipated to create more demand for housing developments. If the trend continues in the absence of effective development control, challenges related to quality assurance within the construction industry are expected to escalate, thus significantly undermining the objectives of sustainable urban development.

The choice of Kisii Town as a case study was motivated by two competing factors. First, as per the Republic of Kenya (2009), the population density of Kisii town (2,862 per km2) remains the highest within the Western region of Kenya, in fact, much higher than Kisumu, the third-largest city in Kenya. Second, Kisii town has also one of the highest annual population growth rates in Kenya as corroborated by 2.7% that is higher than Kenya's average of 2.6%. Consequently, a combination of these factors in the absence of an operational land-use planning model has continued to present challenges in the regulation of building construction industry in Kisii town.

Population, Sample and Sampling Design

In an attempt to examine the determinants of quality assurance within the building construction industry in Kisii town, the target population comprised 7,430 residential developments from the seven sublocation neighbourhoods. A determination of the sample size was guided by the Sample Size Determination Table which is provided by Krejcie & Morgan (1970). According to this table, if the population (N) is between 7,000 and 7,999, the sample size (n) should be 364. Proportional stratified random sampling through the application of a random number table was consequently used to select developments from each sublocation neighbourhood (Table 1).

Before a determination of the target population was made, an immediate challenge encountered was lack of records maintained by the CGK in the form of a sampling frame depicting residential developments in Kisii town. To overcome

Table 1: Sampling for Residential Developers (Source: Field survey data, 2018)

Name of Sublocation	Name of Neighbourhood	No. of Residential Buildings	Sample size
Mwamosioma sublocation	Jogoo Estate	1,551	76
	Nyamataro Estate	808	40
	Egesa Estate	821	40
	Daraja Mbili Eestate	1,301	64
Nyaura sublocation	Mwembe Estate	1,105	54
Bobaracho sublocation	Nyamage Estate	1,171	57
Nyanchwa	Nyanchwa Estate	673	33
Total		7,430	364

this limitation, the study used a high-resolution satellite image of Kisii town (WorldView 2, a spatial resolution of 0.46 metres) procured from the Regional Centre for Mapping of Resources for Development, Nairobi. This was used in generating an attribute table through digitisation of all developments from the seven neighbourhoods. To ensure that there was no overlap in data collection, each neighbourhood boundary was delineated through a deliberate participatory mapping exercise that incorporated Assistant Chiefs drawn from each sublocation. Further, to ensure that all mapped developments were residential, a three-week ground truthing exercise was undertaken. In the end, 7,430 were successfully mapped. Finally, as a strategy for eliminating any chance of biases during sampling, the study employed a random number table that has been recommended by Saunders et al. (2003). Questionnaires were used to collect primary data from the sampled developers. To certify that collected data accurately depicted the variables under study, the research adopted content validity. To ensure the reliability of data collection instrument, a pilot study was conducted in Nyamira Town which is about 35 km from Kisii Town and results tested using Cronbach alpha. Data were analyzed using descriptive and inferential statistics.

RESULTS AND DISCUSSION

Overview

This study critically examines the key determinants of quality assurance within the building construction industry with a case study of residential building development in Kisii Town, Kenya. This section, therefore, systematically presents and discusses the research findings. It broadly begins by presenting the results of the response rate and that of the pilot study. These are subsequently followed by a detailed account of the underlying key determinants of quality assurance within the building construction in Kisii Town. These determinants are conceptualized to include obtaining a development permit, engagement of registered professionals, and authorization of the building occupation by the planning authority, in this case, the CGK.

Response Rate and Results of the Pilot Study

In order to investigate the determinants of quality assurance within the construction industry in Kisii Town, questionnaires were administered to the owners of residential building developments. Out of the 364 questionnaires that were administered, 290 were successfully returned indicating a response rate of 80%, which is above the minimum of 50% as recommended by Mugenda & Mugenda (2003). A high response rate was attained owing to the fact that the researcher was guided by the ethical consideration where all respondents were assured of their confidentiality and anonymity. During data collection, when sampled developments were occupied by tenants, the details of the landlords were obtained from them and the landlords contacted for data collection at a convenient date. As stated under the research methodology, the study undertook a pilot study to pre-test questionnaires with the aim of determining their robustness in data collection. According to Kothari (2004), the outcome of such studies should be reported in research. To conform to this requisite, the reliability of the questionnaires that were tested using Cronbach's Alpha (α) yielded a value of 0.834 which Goforth (2003) grades as very high levels of internal consistency. This gave credence for data analysis and reporting.

Obtaining of Development Permit

Developers' participation in the preliminary application for a development permit was conceptualised as the first key determinant of quality assurance within the construction industry in Kisii town. The term "preliminary application" was operationalized to connote the initial phase in the application for a development permit as required under Section 31 of the Physical Planning Act of 1996 that conditions any person requiring development permit to make a formal application through Form PPA1 to the planning authority. According to Section 33 of the Act, the CGK upon receipt of such an application may, (a) grant the applicant development permit through Form PPA2, with or without conditions, or, (b) decline to grant the applicant development permit with a justification. These requirements reinforce why Section 30 (1) of the Act prohibits carrying out of development without a permit granted by the relevant planning authority, in this case, the CGK (The Republic of Kenya, 1996). The study, therefore, sought to establish the extent to which developers participated at the cited preliminary stages in the application for a development permit that included possession of building plans, having development permit, awareness of approval procedure, the

source of approval, evidence of approval, and approval conditions granted. It was hence argued that developers who did not comply with the preliminary requirements within these processes were likely to contribute to uncontrolled land-use change, as a result undermining the initiatives towards promotion of quality assurance.

The study commenced by determining if developers had building plans. At large, 86% had plans compared to 14% who did not. The study further established that 65% of developers knew the process of building plan approval compared to 35% who did not. Concerning obtaining a development permit, while 72% had approval, 28% did not. It is, therefore, evident that those who lacked permit occupied houses developed without the statutory quality assurance audits.

This inquiry was further corroborated by the revelation that among developers who knew the process of approval, 84.3% obtained development permit contrasted with 15.7% who did not. Likewise, from those who were unaware of the process, a majority (87.1%) failed to obtain a development permit. The 15.7% who claimed to have obtained permits, despite not knowing the procedure was, however, questionable as they had no basis for obtaining such permits. In view of these findings, the study investigated if there was a relationship between developers' knowledge of building plan approval process and obtaining a development permit. The consequent interrogation was:

"What were the odds that developers who were not conversant with building plan approval process were less likely to obtain development permits than those who knew the process?"

Logistic regression was preferred as the analytical tool since it expresses the multiple linear regression equation in logarithmic terms, thereby overcoming the problem of violating the linearity assumption. Both independent variable (knowing building plan approval process, 1 = yes, 2= no) and the dependent variable (obtaining of a development permit, 1 = yes, 2 = no) were binary. The Nagelkerke's R^2 in the model was 0.531, implying that 53.1% of the variation in the dependent variable was explained by the independent variable. The contribution of the independent variable to the model and its statistical significance was eventually undertaken (Table 2)

The Wald test determines statistical significance for the independent variable. As demonstrated (Table 2), knowledge of building plan approval process was a significant predictor of obtaining a development permit, Exp (β) = 0.03. The

model was, therefore, statistically and significantly fit for analysis. Exp (β) column indicates the extent to which raising the corresponding measure by one unit (one developer) influences the odds ratio, thus interpreted in terms of the change in odds. Odds ratios greater than one indicate that the event is more likely to occur as the predictor increases, while ratios less than one (1) indicate that the event is less likely to occur as the predictor increases. Since Exp (β) = 0.03, developers who did not know the process of approval were 97% less likely to obtain development permits. This applied when an option, "no", within the binary dependent variable (obtaining of development permits, 1 = yes, 2 = no) was used as a reference. The study additionally found out from developers who had approved building plans the key approving document they received from the authorities they claimed to have granted them development permit. A majority, 80%, was given stamped building plans as a sole indicator of approval. Other documents included letters (9%), Form PPA2 (5%), receipts (4%), Environmental Impact Assessment (EIA) license, and the NCA certificate (1% respectively). It is noted that apart from the National Environment Management Authority (NEMA) which independently issues EIA licenses, the final approval document that should be issued by the CGK according to section 33 (1) of the Physical Planning Act (The Republic of Kenya, 1996) is Form PPA2 (notification of approval/refusal/deferment of development permits). The form contains, among other entries, approval conditions. However, it was noted that the CGK mainly issued final approvals through letters or stamped building plans with approval conditions hardly indicated. As such, the office infrequently made use of its statutory form (PPA2). This may explain why 74% who were granted a development permit indicated that the approvals they received had no attached conditions. It may further draw attention on why most residential developments failed to comply with the stipulated quality assurance standards.

Above results prompted the study to examine the approval conditions communicated to developers through letters by inspecting 130 building plans approved between 2013 and 2017. It was found out that conditions were limited to, conformity with building lines and obtaining of Certificate of Compliance (each 27%), provision of parking (18%), certification of structural drawings by a registered engineer for multi-family dwelling units and undertaking EIA (14% and 13%, respectively), change of use (1%), non-encroachment of road reserve (0.4%) and non-encroachment of public land (0.1%). Noted limitations of these conditions were as follows:

Table 2: Test between awareness of approval process and obtaining of development permit (Source: Field survey data, 2018)

Binary Question	B	S.E.	Wald	df	Sig.	Exp(β)
Do you know building plan approval process?	-3.60	0.41	76.80	1.00	0.00	0.03
Constant	0.74	0.23	10.87	1.00	0.00	2.10

a) The minimum building line should be 6 m and not 1.5 m. Setbacks, that is, spaces around domestic buildings should also be 4.5 m for the rear space, 3 m for the side space, and 6 m for the front space, and not 3 m as inferred.
b) No developer was advised on the minimum number of car parking space.
c) Other standards, such as building coverage ratio was not imposed.

Such inconsistencies by the CGK with no reference to recommended planning standards clearly mislead developers. This may suggest why such developers hardly comply with such standards, thus a drawback for quality assurance. These research findings are in consonance with that of Tasantab (2016) that examined the application of building permit as a tool for promoting development control in Sekondi-Takoradi, Ghana. Research findings established that only 25% of residential buildings had development permits, a problem instigated by inadequate enforcement of standards by the Sekondi-Takoradi Metropolitan Assembly.

Engagement of Registered Professionals

Engagement of registered professionals is also a key determinant of quality assurance within the construction industry in Kisii Town. The study, therefore, sought to determine if the initial design of building developments were undertaken by registered professionals (the architects) as provided for under the Architects and Quantity Surveyors Act (The Republic of Kenya, 1978). This aspect was considered important since the non-involvement of registered professionals at the building design phase may account for why most developers did not comply with recommended planning standards. In this case, if unprofessionally designed building which disregards quality assurance standards in construction is ultimately implemented, it is bound to compromise the principles of development control such as safety, conformity and aesthetics. The study established that 90% of the developers knew the requirement of involving professionals at the initial stage of building design. At the same time, 80% reported having engaged "some" registered professionals in the initial building design. Results consequently indicated that most developers (99.5%) who engaged registered professionals represented those (90%) who were aware that building plans should be designed by registered professionals. Conversely, 45.3% of developers who never engaged registered professionals represented 10% of those who did not know that the proposed designs needed to be undertaken by such professionals. Based on these findings, those who reported having engaged professionals in building design were requested to indicate the category of the contracted professional. Most developers (42%) consulted architects followed by engineers (29%), contractors (24%), physical planners (4%) and quantity surveyors (1%). Developers were further requested to indicate documentation availed to them by consulting professionals to ascertain their registration status. 40% cited practising certificates, 1% referral of friends, and 3.1% stamped building plans, 4% personal acquaintance, and 3.1% NCA registration certificate. Nevertheless, a majority (49%) reported not to have requested for such confirmation raising a question as to whether their projects were designed by registered professionals. These findings suggest that most professionals (58%), although not registered as architects, still offered consultancy services for building design, thus compromising planning quality assurance standards. In view of the foregoing, the study explored the relationship between obtaining a development permit and engagement of registered professionals. The aim was to establish if developers who had development permits were likely to engage registered professionals than those who did not. Logistic regression was used as an analytical tool. The Nagelkerke's R^2 was .270, indicating that 27% of the variation in the dependent variable was accounted for by the independent variable. Test for the significance of the relationship was subsequently undertaken (Table 3.)

Table 3 shows that the attainment of development permit predicted the extent to which developers engaged registered professionals, p =. 000. Hence, developers who obtained a development permit were 9.991 times more likely to consult registered professionals in building design than those who had not obtained a development permit. These results ensued when the classification category "yes" (having a building plan) was used as the reference point. Conversely, when the dichotomous category "no" was referenced, it was found out that developers who did not obtain development permits were 90% less likely to consult registered professionals than those who had obtained a development permit. These developers, in the absence of effective development control, are likely to compromise building quality assurance standards such as floor area ratio. These research findings relate to that of Chigozie & Jide (2015) that established that the menace of quacks and quackery had

Table 3: Test between having development permission and engagement of professionals (Source: Field survey data, 2018)

	B	S.E.	Wald	df	Sig.	Exp(B)
Did you obtain a development permit?	2.30	.351	43.12	1	.00	9.991
Constant	-2.27	.255	79.61	1	.00	.103

negatively contributed to the sustainable development of the building construction industry in Nigeria. They additionally established that more than 50% of building collapse in the country alongside other failures were occasioned by non-professionals. As a way forward, the study recommended that professional bodies whose scope covers the built environment alongside their relevant regulatory bodies should constantly ensure that their members conform with the standards regarding the provision of service within the building construction industry in addition to enforcing stringent consequences on any defaulting member.

Authorization of Building Occupation

Section 16 (3) of the Building Code (The Republic of Kenya, 1968) explicitly requires a person who has constructed a building to give the CGK a notice of its completion to enable a final quality assurance inspection to be made and a Certificate of Completion subsequently issued. Subsection four hence prohibits the use of any building before the certificate has been issued (The Republic of Kenya, 1968). This subsection, therefore, examines two components in the authorization of building occupation. These include (a) inspection of completed buildings by the CGK and (b), obtaining a certificate of completion by developers from the CCK.

Inspection of Completed Buildings

The study sought to interrogate if the owners of completed developments were aware of the requirement of issuing completion notices to the CGK to facilitate final inspection. A majority, as corroborated by 63% were aware compared to 37% who were not. A follow-up question was put to developers to determine how many had issued such notices to the CGK. It emerged that a majority (64%) never issued the notices. In the end, a majority (66%), revealed that their completed buildings were not inspected. These findings raised the following interrogations that guided successive analyses:

a) If there was a relationship between developers' awareness that completed buildings must be inspected before occupation and whether they issued the required completion notices to the CGK.

b) If a relationship ensued between issuance of completion notices and if an actual final inspection was undertaken by the CGK.

c) If there was a relationship between approved developments, on one hand, and whether they were finally inspected, on the other hand.

Regarding the first issue, preliminary results revealed that among developers who were aware of the requirement and had completed their building developments, 55%, issued notices of completion compared to 45% who did not, meaning that they occupied unapproved buildings. On the other hand, among those who were not aware of the requirement, 99% never issued completion notices to the CGK. The significance of the observed relationship was tested using logistic regression since the two variables were binary. Nagelkerke R2 was used to determine variations in the dependent variable (issuance of completion notice) that was accounted for by the independent variable (awareness of requirement on building inspection before occupation). The reported value of .443 suggested that 44.3% of the variation was explained by the independent variable (Table 4).

Awareness of the requirement of issuing completion notices to permit final inspection, audit before building occupation significantly predicted if such notices were issued by developers, $p = .000$ (Table 4). Since $\beta < 0$ and $\text{Exp}(\beta) < 1$, developers who were unaware of the requirement were 99.1% less likely to issue completion notices than those who were aware of the requirement. The second issue probed if there was a relationship between issuance of completion notices and if a final inspection by the CGK occurred. Results showed that amongst developers who issued completion notices, 92% were inspected for conformity, while 8% were not since the CGK was not responsive.

Conversely, out of those who never issued notices, 99% of their buildings were not inspected. This prompted the study to determine why such developers never issued final completion notices. Findings revealed that in the first place, a majority (95%) did not obtain a development permit. At the same time, 99% disregarded the requirement of issuing notices to the CGK when they were starting the construction process. As such, they had no basis to request for final inspection because their developments were not inspected during the construction process. Moreover, 28% never engaged registered professionals in the building development, design. The foregoing results were further subjected to statistical analysis to determine if a significant relationship ensued between issuance of completion notice and final inspection by the CGK. As the case of previous

Table 4: Test between awareness of final inspection and Issuing of final Inspection Notice (Source: Field survey data, 2018)

Binary Question	B	S.E.	Wald	df	Sig.	Exp(β)
Awareness of building inspection before occupation	-4.75	1.01	21.8	1	.00	.009
Constant	4.53	1.00	20.3	1	.00	93.000

analyses, the relationship was tested using logistic regression. A model was generated to explain the proportion of the dependent variable (whether the inspection was done) that was accounted for by the independent variable (whether notice of completion was issued by the developer). Nagelkerke R2 reported a very high variation of 87.6% in the dependent variable. In addition, 96.5% of all prediction cases were correctly classified. In the interest of prediction and significance testing, the category "no" (did not issue an inspection notice to the planning authority) was used as the point of reference (Table 5).

Results confirmed that the issuance of notices of completion to warrant final inspection significantly predicted if an inspection by the CGK would occur. In this analysis, because $\beta < 0$ and Exp (B) <1, it was deduced that developers who never issued notices of completion to warrant final inspection were 99% less likely to have their completed buildings inspected than those who issued notices of inspection. This raises further uncertainty that buildings which were never inspected and not accounted for in the records of the CGK could be flouting recommended quality assurance standards, thus contributing towards unplanned land-use change. The third query was whether there was a relationship between approved developments and inspection of completed buildings. Framed differently, what were the odds that buildings which were granted development permits were likely to be inspected more than the ones which had not been approved? Preliminary descriptive analysis indicated that although a majority of developers obtained a development permit (72%), only 45% eventually had their residential buildings inspected by the CGK upon completion, suggesting that 55% who never had inspection occupied buildings without the mandatory quality assurance audits. With such an occurrence, there was no objective evidence to demonstrate that they conformed to the approved building plans, attributable to inadequate surveillance and enforcement by the planning authority. In relation to developments that had no permit (28%), it emerged that 96% were not inspected, subsequently, a high likelihood of flouting the recommended planning standards. In view of this, Logistic regression was used to determine the likelihood that completed and approved developments would be inspected before occupation. The model was not only statistically significant, $p = .000$, but equally explained 23.2% (Nagelkerke R2) of the dependent variable. Because $\beta < 0$ and Exp (B) <1, results showcased that developers who did not obtain development permits were 94.5% less likely to have their completed buildings inspected before occupation than those who had obtained permits, thus encumbering quality assurance, in effect contributing towards the uncontrolled land-use change.

Issuance of Completion/Occupation Certificate

The purpose of inspecting completed buildings by the CGK is to make certain that they conform to approved conditions. It is only after such a quality assurance audit that certificates of completion/occupation may be granted. To examine whether developers had complied, the study first investigated if they were aware of this important requirement. Results showed that 55% were aware compared to 45% who were not. It was nevertheless found out that only a minority, 30%, obtained completion certificates. In contrast, a majority (70%) did not comply. These observations equally raised the following pertinent questions aimed at guiding further data analysis in addition to providing viable options for anticipated development control policy formulation by the CGK:

a) Does the issuance of completion certificates depend on the developers 'awareness that certificates should be issued upon completion of development?

b) Is there a relationship between final inspection of completed buildings and the issuance of certificates of completion?

c) What is the relationship between the approval of development permits and issuance of certificates of completion by the CGK?

Concerning the first question, results showed that out of developers who knew the requirement, 46.1% did not obtain completion certificates. On the other hand, all developers who were not aware of the requirement never obtained certificates, signalling inadequate development control. Chi-square test of association was used to determine the statistical relationship between the two variables. Research findings showed $\chi 2 = 88.158$, $p = .000$, confirming a statistically significant association between obtaining a certificate of completion and awareness that such certificates should be obtained upon completion of building development. Therefore, obtaining the certificates was not independent, but significantly dependent on developers' awareness of the requirement. Phi and Cramer's V (φc) which measures the strength of association between two binary variables was further used to test the strength of established association. The results further validated that the strength of the association was positive and significant, $\varphi c = .587$, $p = .000$.

Regarding the question of whether there was a relationship between final inspections of completed buildings and the

Table 5: Test between issuance of the notice of completion and final inspection by the CGK (Source: Field survey data, 2018)

Binary Question	B	S.E.	Wald	df	Sig.	Exp(β)
Issued a notice of inspection after completing your building?	-6.88	.813	71.74	1	.00	.01
Constant	4.401	.711	38.26	1	.00	81.50

issuance of certificates of completion. Results showed that as regards developments successfully inspected upon completion, 82.6% were issued with completion certificates. On the other hand, out of the residential developments that were not inspected, 97.1% were not issued with the certificates since they were not legible for the same. A Chi-square test of independence between the two variables reported $\chi 2 = 173.425$, $p = .000$, indicating a statistically significant dependence between inspection of completed building and issuance of the completion certificates. This dependency was additionally corroborated using Phi and Cramer's V that also reported a strong positive and significant dependence, $\varphi c = .823$, $p = .000$. It was, therefore, concluded that the relationship between the two variables was not independent, but dependent since obtaining completion certificates depended on final quality assurance and conformity inspections undertaken by the CGK. In view of the dependency between the two variables, logistic regression was used to test the effects of inspection on the odds that developers would be issued with completion certificates. The model was significant, $p = .000$ and explained 73.6% (Nagelkerke R2) of the variance in the dependent variable, in addition to correctly classifying 92.2% of all categories. Results showed that developers whose properties had not been inspected after their construction was completed were 99.4% less likely to obtain completion certificates.

The study finally sought to investigate if there was a relationship between the approval of development permits and obtaining the completion certificates. The intention was to determine if all approved developments were eventually certified upon being completed. Results revealed that even though 72% of proposed developments were in the beginning approved, upon completion, only 40% had obtained certificates of completion. This implies that the remaining (60%) was occupied without quality assurance audits. As such, it was not possible to determine if they complied with the recommended quality assurance standards. This may be explicated by the fact that 26% of such approved developments were never inspected during construction phases, in addition to 31% whose owners were not aware that buildings under construction needed final inspection before issuance of the completion certificate, thus a key setback for effective development control.

Although results revealed that most developers who had obtained a development permit never obtained certificates of completion, an initial logistic regression model that had been derived to explain why most developers never sought for the certificates had an explained variance of 17% (Nagelkerke R2) in the dependent variable which was considered too low for analysis. As such, the forward selection method using Multiple Logistic Regression was used to add other variables which would significantly improve the explained variance (why developers with approved permit never obtained completion certificates) and further predictions. Added variables to the model included if developers had engaged registered professionals, whether their buildings were inspected upon completion and whether they had obtained a development permit.

After the third step, the first two variables were eliminated and the remaining used for further analysis to predict significant factors deterring obtaining completion certificates. The three variables improved variance explained in the dependent variable to 72.9% from the initial 17% with an overall classification accuracy of 90.4%. The significance of the three predictors in the model that influenced obtaining completion certificates by developers in the study area was therefore analyzed (Table 6).

Results in Table 6 shows that all the variables were significant predictors of the dependent variable (obtaining of completion certificate). Further, when the variables in the multiple logistic regression models were interpreted individually, the following observations ensued:

a) Developers who never engaged professionals in the design were 92.5 % less likely to obtain completion certificates.

Table 6: Determining factors in obtaining completion certificates (Source: Field survey data, 2018)

		B	S.E.	Wald	df	Sig.	Exp(β)
Step 3[c]	Engagement of duly registered professionals	-2.59	.894	8.40	1	.00	.075
	Building inspection after completion	-4.85	.604	64.49	1	.00	.008
	Obtaining development permission	-2.88	1.37	4.421	1	.04	.056
	Constant	5.66	1.02	30.76	1	.00	287.77

Variable(s) entered on step 1: Building inspection after completion

Variable(s) entered on step 2: Engagement of duly registered professionals

Variable(s) entered on step 3: Obtaining development permission

b) Developers whose buildings were never inspected upon completion were 92% less likely to obtain completion certificates than those whose completed buildings were inspected.

c) Developers who obtained development permits were 94.4% less likely to obtain certificates of completion than those who did not obtain a development permit from the CGK.

However, when the category “no" (not having approved plan) was used for prediction under item ‘c’ above, it emerged that developers who did not obtain development permit were 17.74 times more likely to obtain completion certificates than those who had approved plans. This suggests that although some developers had no approved building plans, they could have irregularly obtained completion certificates from the CGK.

Although previous studies have attempted to broadly examine the determinants of quality assurance within the building construction industry, there is still a scarcity in knowledge on the relationship between key variables that interacts within the building development control process. This gap has been filled in the current study by statistically demonstrating the nexus between the following variables which are considered to be among the key determinants of quality assurance within the industry:

a) Awareness of building plan approval process and obtaining a development permit.

b) Obtaining of development permits and engagement of registered professionals in building design.

c) Engagement of registered professionals by developers and obtaining of the completion certificates.

d) Awareness of inspecting completed buildings before occupation and issuance of inspection notice.

e) Issuance of completion notices by developers and if the inspection was undertaken by planning authority.

f) Obtaining of development permits and actual inspection by planning authority.

g) Final inspection of completed buildings and issuance of certificates of completion.

h) Obtaining of development permits and issuance of the certificate of completio.

CONCLUSION

This study has shown that the factors undermining quality assurance within the construction industry in Kisii Town include the extent to which the CGK enforces the development control function on obtaining of development permits, engagement of registered professionals in building design, an inspection of buildings under construction and authorisation of buildings occupation upon completion. These limitations afford developers with an opportunity of disregarding the standards within the construction industry leading to unsustainable urban development. The challenges continue unabated notwithstanding article 66 (1) of the Constitution of Kenya (The Republic of Kenya, 2010) that gives the State powers of regulating land use and sections 4 and 16 of the Building Code (The Republic of Kenya, 1968) that respectively requires the CGK to inspect all buildings during construction and further ensure that no person occupy any building before a certificate of occupancy has been issued. Inadequate development control is, therefore, hypothesized as the root cause for poor quality assurance within the construction industry in Kisii Town. The following recommendations are made towards the promotion of quality assurance in the study area:

a) The CGK should regularly mount sensitization campaigns to enlighten members of the public on building development control procedures. Additionally, audits should be undertaken in Kisii Town to determine if existing developments comply with quality assurance standards.

b) Approval for development permission should be made through the statutory Form PPA2 to clearly indicate the conditions that each developer should comply with.

c) In order to ensure that only registered professionals undertake consultancy services within the construction industry, CGK should partner with relevant professional associations and regulatory bodies, and thereafter, implement rigorous mechanisms for detection of frauds within the construction industry.

d) Regular training workshops should be organized for practitioners in the building construction industry to deepen their understanding of the benefits rather than the punitive nature of development control.

e) The CGK should ensure that all approved building developments are inspected at all stages of construction to ensure compliance with quality assurance standards.

The scope of this study was limited to residential building development. To further contribute to the growing body of knowledge within the construction industry, a recommendation is made that future research needs to focus the extent to which other categories of developments such as commercial, residential, and industrial are also conforming to recommended quality assurance standards.

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REFERENCES

Aghimien, D.O., Adegbembo, T.F., Fadeke, T., Aghimien, E.I., Imuetinyan, E., & Awodele., O.A. (2018). Challenges of sustainable construction: A Study of educational buildings in Nigeria. *International Journal of Built Environment and Sustainability,* 5 (1), 33-46.

Christensen, J. G. (2010). Public interest regulation reconsidered: From capture to credible commitment. *A paper presented at the 3rd Biennial Conference, University College, Dublin*, 17th-19th June 2010. Retrieved January 1, 2019, from http://www.regulation. -papers/1J1. pdf

Competition Authority of Kenya (2017). *The construction industry analysis of the state of competition.* Retrieved February 6, 2019, from https://www.cak.go.ke/sites/ default/files/Construction%20 Industry%20in%20Kenya.pdf.

Chigozie, A.C., & Jide, A.K. (2015). The contemporary roles of an architect and other building professionals panacea to the menace of quacks and quackery. *Civil and Environmental Research,* 7 (10), 68-75.

Du Plessis, C. (2002). Agenda 21 for Sustainable Construction in Developing Countries. A Discussion Document. *Report for the CIB and UNEP-IETC, CSIR Building Construction and Technology,* Pretoria. Retrieved August 12, 2018, from http://www.irbnet.de/daten/ iconda/CIB4162.pdf.

Fainstein, S, S., & Campbell, S. (2012). *The structure and debate of planning theory.* In S. S. Fainstein & S. Campbell (Eds), Readings in Planning Theory (3rd edition) (Pp.1-18). West Sussex: Blackwell Publishing Limited.

Gacheru, E.N., & Diang'a S.O. (2015). Regulating building contractors in Kenya and challenges of enforcing the National Construction Authority mandate. *International Journal of Soft Computing and Engineering*, 5 (1), 127-133.

Grill, M., Nielsen, K., Grytnes, R., Pousette, A., & Torner, R. (2019). The leadership practices of construction site managers and their influence on occupational safety: An observational study of transformational and passive/avoidant leadership. *Construction Management and Economics,* 37 (5), 278-293.

Goforth, N. (2003). *Using and interpreting Cronbach's Alpha.* Retrieved March 18, 2019 from http://data.library.virginia.edu/using-and-interpreting-cronbachs-alpha/

Kothari, G.R. (2004). *Research methodology, methods and techniques* (second revised edition). New Age International (P) Limited Publishers: New Delhi.

Krejcie, R.V. & Morgan, D.W. (1970). Determining sample size for research activities. *Education and Psychological Measurement,* 30, 607-610

Liu, J., Zhao, X., & Li, Y. (2016). Exploring the factors inducing contractors' unethical behavior: Case of China. *Journal of Professional Issues in Engineering Education and Practice*, 14 (3). Retrieved, October, 11, 2018, from https://doi.org/10.1061/(ASCE)EI.1943-5541.0000316

Mohd-Rahim, N.S.M., Wang C. V., Nurshuhada, Z., Sumiani, Y., & Rafikullah, D. (2016). The challenge of labour shortage for sustainable construction. *Journal of the Malaysian Institute of Planners,* 77-88.

Mugenda, A., & Mugenda, O. (2003). Research methods: Quantitative and qualitative approaches. Acts Press: Nairobi.

Ng'ang'a, K.K., Ngigi, P., Siboe, I., Ongundo, D., & Wanyona, G. (2017). *Health and safety conditions at construction sites in Nairobi County,* Kenya. Retrieved January 11, from http:// journals.jkuat.ac.ke /index.php/jscp/article/download/1060/865.

Ojwang, J. (2019, April 14). 6 narrowly escape as two-storey Kisumu building collapses. *Capital news.* https://www.capitalfm.co.ke/ news/2019/03/6-narrowly-escape-as-two-storey-kisumu-building-collapses/

Olotch, C. (2017). *Kenya's new railway and the emergence of the government-to-government procurement method.* Retrieved February 6, 2019, from https ://blogs.worldbank.org/ppps/kenya-s-new-railway-and-emergence-government-government-procurement-method.

Omollo, W.O. (2018). *Development control as tool for plan implementation.* Unpublished PhD thesis, Jaramogi Oginga Odinga University of Science and Technology.

Otido, J., & Omwenga, J. Q. (2019). Factors affecting National Construction Authority on regulating building construction projects in Nairobi City County, Kenya. *The Strategic Journal of Business & Change Management*, 6 (2), 2354 – 2368.

Rahman, I.A., Memon, A.H., & Ade, A.A. (2012). Time and cost performance in construction projects in Southern and Central Regions of Penisular Malaysia. *International Journal of Advances in Applied Sciences (IJAAS)* 1(1), 45-52.

Ruya, D., Chitumu, D., & Jatau, C.A. (2017). *Construction standard and regulation in Nigeria*. Retrieved December 14, 2018 from https :// www. fig.net/resources/proceedings/fig_proceedings/fig2017/papers/ ts07d/TS07D_fadason_danladi_et_ al_ 8746.pdf.

Saidu, I., & Shakantu, W. (2016). The contributions of construction material waste to project cost overruns in Abuja, Nigeria. *Acta Structilia,* 23(1), 99-113.

Saidu, I., Shakantu, W. M., Adamu, A. D., & Anugwo, I.C. (2017). A bespoke approach for relating material waste to cost overrun in the construction *industry Journal of Construction Business and Management*, (1), 39-52

Saunders, M., Lewis, P., & Thornhill, A. (2003). *Research methods for business students.* Edinburgh: Prentice Hall.

Shirur, E., & Torgal, S. (2014). Indian Construction Industry: Challenges for the Construction Managers. *Journal of Business and Management (IOSR-JBM)*, 16 (4), 65-69.

The Republic of Kenya (2018). *Construction industry policy*. Retrieved April, 7, 2019, from http://nca.go.ke/wp-content/uploads/2018/06/ CIP-DRAFT_1.pdf

The Republic of Kenya (2010). Constitution. Nairobi: Government Printer.

The Republic of Kenya (2009). *Kenya Population and Housing Census Survey* Vol 1. Nairobi: Government Printer.

The Republic of Kenya (2008). Vision 2030: The Popular Version.

The Republic of Kenya (1996). *Physical Planning Act.* Nairobi: Government Printer.

The Republic of Kenya (1978). *The Architects and Quantity Surveyors Act.* Nairobi: Government Printer.

The Republic of Kenya (1968). Building Code. Nairobi: Government Printer.

Thuita, P. (2017). *Death traps: Why buildings collapse so frequently in Kenya.* Retrieved November 12, 2019, from https://www. constructionkenya.com/2236/buildings-collapse-kenya/

Tasantab, J.C. (2016). Building Permit as a Tool for Development Control: Evidence from Sekondi-Takoradi. *Journal of Environment and Earth Science*, 6 (11), 2224-3216.

Zakaria, Z., Ismail, S., Yusof, A.M. (2013). Toward Sustainability in construction industry: The important of final account closing satisfaction. *Journal of Southeast Asian Research*, 20 (2), 118-124.

Zaki., S.B.A., Mohamed, S.F., & Yosof, Z.M. (2012). Construction skilled labour shortage –the challenges in Malaysian construction sector. *OIDA International Journal of Sustainable Development*, 4 (5), 99-108.