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Influence of buildability assessment at design phase in real estate investment in Port Harcourt, Nigeria

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Abstract

Buildability assessment is an important aspect of real estate investment, as occasioned by the high cost of land and building materials. This study examined the influence of buildability assessment at design phase in real estate investment in Port Harcourt, Nigeria; to determine and minimize wasted effort before real estate investment commencement. This study adopted descriptive survey with a total number of 340 well-structured questionnaires distributed to clients, contractors and professionals; out of which 221 were retrieved representing 65% response rate. Data collected was analysed using descriptive and inferential statistical tools to determine the effect of buildability assessment on real estate investment. The major factors responsible for failure of buildability assessment are resistance of client to buildability programme, incorrect and inadequate design detailing, errors, omission, under/over design, incorrect specification of materials, construction difficulties, non-optimum materials usage, simple installation, nature of soil etc. as shown in the findings. Unstable economic environment, width of the investment, finance for real property investment, land tenure legislation and land administration, socio-political issues, real property data banking, provision of physical infrastructure and inflation rate were identified as the reasons for the buildability assessment on real property investment. Furthermore, consequences of absence of buildability assessment on real property investment include: delay in property delivery, reduced investment life-span, wastage of invested capital and loss of capital, conflict among lease and lessor, real property investment on long void period, increase in maintenance and repair, loss of investment income, discouragement of prospective investors, difficulty in real property investment and unhealthy investment procedures. Therefore, it thus reaffirmed the relationship between buildability assessment and real property investment as statistically significant with $F(0.659) = 12.74$; $P < 0.0020$, $R^2 = .736$ at $P < .05$. The study recommended that buildability assessment be carried out by the professionals before commencement of any real property development as to determine and minimize or remove waste and wasted efforts, and impediments to real property investment.

Keywords: Assessment, buildability, investment, professionals, real estate

1. Introduction

The demands on the real estate investment sector are substantial; at a time when the urban areas are facing shortage of technological skills. This has increased the workloads and aspirations of real estate investors to deliver ambitious infrastructure that targets alongside other modernization goals of increasing productivity in the sector. A key issue is at play which is beyond real estate investment planning, but the capacity of the industry. The sector has been struggling however to meet growing demand for its services in real property investment, with issues such as demand and supply imbalances which contribute to unaffordability. Real estate investment involves huge capital and there are development stages in the construction of real estate which involves different professional teams such as estate surveyors and valuers architects, builders, engineers, quantity surveyors and so on. In addition, the weakening of the naira has increased the cost of imported building materials thus affecting real estate investment. Analysis of the real estate investment process is commonly expressed in terms of establishing equilibrium among the three primary concerns of time, cost and quality (Nkpitem, Ewin and Ohochuku, 2021) ^[13]. Any investor would want to invest in a facility of highest quality and returns on investment, as it is the goal of the development team to maximize cost and time. Modern property investments are complex edifices and the design, construction and commissioning of a new property is a long complicated process that involves input from a numbers of parties (Odeyinka, 2003). The concept of property performance shows that satisfactory performance, site organization and

methods must be carried out to the highest level of integrity and competence so as to ensure the concept of buildability (Ewin, Nkpite and Kianen, 2021) ^[1]. Buildability, as defined by the “optimum integration of construction knowledge and experience in planning, engineering, procurements and field operations to achieve overall project objectives”.

Buildability is increasingly becoming a major requirement in the real estate investment practice. The industry, investors are continuously demanding the best value for money, in terms of the efficiency with which the property is developed. The integration of good buildability into good overall design is the responsibility of the design team. Researches in part of the country have shown that good buildability leads to major cost benefits for clients, designers, and investors (Bamidele and Olamoju, 2017) ^[4]. Secondly, the achievement of good buildability depends upon both designers and investors being able to see the whole property investment process through each other’s eyes (Akindoyeni, and Bamisile, 2003) ^[5, 1]. This is the biggest problem because it requires expertise in the two aspects by both role and moreover, the procurement practices do not favour this. Involving an expert appraiser with investment knowledge and experience at the very beginning (design stage) of the investment result in maximizing benefits (Bassioni, Price and Hassan, 2005) ^[6]. It has been shown that the integration of investment knowledge during the planning, design and procurement phase of a project brings extraordinary benefits into the delivery of the real estate investment (Obiegbo, 2004) ^[15]. To review the design after completion is not a buildability programme. It has to start from the beginning, because it is very difficult to make substantial changes in the design once you are through with it. Buildability consideration saves to be started at the same time as the initial investment planning and should continue during the entire life of the real estate investment (Kuye, 2018) ^[12]. There are lots of challenges facing real estate investment arising from high cost of land acquisition and building materials as result of an unfavourable inflation trend for which buildability concept should be considered in Nigeria, and it would be seen that only buildability can be an applied assessment on real estate investment. In short, buildability optimizes the following real estate investment elements from start to finish: overall project planning, planning and designing, construction to delivery schedule, cost and estimate, construction method. This paper explores the potential issues and opportunities that buildability assessment offers real estate investment. By examining the influence of buildability assessment on real estate investment and the substantial role in solving the problems faced at the property market in Port Harcourt, Nigeria.

2. Literature review

2.1 Buildability in Real Estate Investment

Buildability is the ability to construct a building effectively, economically and to an agreed or specified quality standard from its constituent materials, components and sub-assemblies (Bamisile 2004) ^[5]. According to Lam and Wong (2008) defined buildability as the extent to which the design of a building facilitates ease of construction, subject to the overall requirements for the completed building. Jergas and Van der Put (2001) ^[10] defined buildability as the optimum use of construction knowledge, expertise and experience gained in planning, design, and procurement and field

operation to achieved maximum project objective. Mourgues (2008), stated that buildability is lack of design empathy for “construction,” it is the functional and economical assessment of design alternative and should be the first stage of builder’s professional input in the building process.

Buildability can as well be defined as the ability of putting parts together especially building components as a means of transferring what is in the working drawing to the ground without problems that arise during and after assemblies (Motsa, Oladapo and Othman, 2008). Recognizing some of these difficulties; Arditi, Elhassan and Toklu (2002) ^[3] opine that buildability booms with all the principles of real estate investment in supporting the industry’s change. According to Bustani and Oyemogum (2014), “the basic function of buildability is to determine and minimize or remove waste and wasted efforts prior to commencement of work on site. This function is not meant for the property investor to find faults in the designer’s work, but to study the real property investment information and suggest ways in which the design could be improved upon. And the most important work of the developer is to complement the efforts of the designer and add more value to the client’s investment”. As a consequence of using manufacturing production methods, the workflow is significantly different from traditional property performance. Asserts that performance will be much closely monitored and scrutinized through buildability; as performance can be tracked throughout the property’s life: meaning there is a continuous cycle from design, production, development, management and feedback into design.

Real estate sector is one of the highest unit output costs in terms of labour and materials. While the cogency of these claims cannot be verified of the industry’s performance difficulties, there can be no doubt that major real estate investors are demanding improved value from their investments (Ewin, Nkpite and Kianen, 2021) ^[11]. As stated by Nkpite, Ewin and Ohochuku, (2021) ^[13] that this conflict encourages a major though largely judicious study into approaches to improving a vaguely defined term “buildability” in property performance. “Buildability is the extent to which the design of a building facilitates ease of construction, subject to the overall requirements for the completed investment” (Building and Construction Authority (BCA, 2005a) ^[7]. Properties developed with the least variation to design are known to give satisfaction to all the major parties of the real estate investment sector: client, investor, design team and development team (Nkpite, Kianen and Ohochuku. 2021) ^[13].

In the property development process, it is used to drive out waste and enhance cost and program certainty, through properly planning the works and construction logistics and using modern construction techniques (Ballard, 2000). Moreover, for real estate investment, buildability provides investors with wider options. By having different profile and properties, Moreover, for real estate investment, buildability provides investors with wider options. By having different profile and properties, Motsa, Oladapo and Othman (2008) states that buildability supplements existing capabilities where investors will have more options to choose from when considering options for a real estate investment. Bustani and Oyemogum (2014) opined that this introduces a new dynamic into a traditionally rigid operating environment, particularly around labour and resources

factors, planning and engineering constraints, and sustainability and environmental performance. As much more of the investment value comes from when buildability efficiency gains are achieved.

2.2 Buildability Attributes of Design Phase in Real Estate Investment

According to Ezeokonkwo, Ezemerihe, Obiegbu and Akabogu (2002), "the characteristics and generally the term "buildability attribute" has been selected to describe those characteristics which directly or indirectly optimize integration of real estate investment knowledge in the property investment process and balancing the various developmental and environment constraints to maximize project goals and property performance". Even though different terms have been used to describe buildability, as well as buildability concepts in design phase. Extensive reviews have been carried out on previous researches on buildability concepts, attributes, principles and other areas related to, and contributing to buildability mainly in the design phase (Anderson, Fisher and Raham, 2000; Ardit, Elhassan and Toklu, 2002; Rosli, 2004; Bamisile, 2004) [2]. Bamisile (2004) [3, 5, 16] states that understanding the design and requirements of a property to be developed are important for successful quality of real estate investment. Where there are changes in the original design and/ specification, it should not be compromise quality of work the real property investment would achieve (Kuye, 2018) [12].

However, there is a major problem with regards to design and property investment in the real estate sector. A high level of defects rate has greatly affected the support for real estate investors and buildability has made it necessary to reduce defects in property investment (Obiegbu, 2003) [14]. Buildability with regards to real estate investment play a large role in determining whether cities become centres of sustainable, resistant to climate change and inclusive growth of the future (Nkpote, Ewin and Ohochuku, 2021) [13]. Buildability is a tool to systematically consider the development influence of real estate investments; both in terms of their positive impacts, as well as their potential for creating negative impacts (Uche, (2003) [18]. From the definitions of buildability information management is the key which brings to light the new paradigm known as building information modelling (BIM). Succar 2009 [17] defined BIM as a set of interacting policies and processes being enabled by technologies in generating a methodology to procure building works from inception to completion down to the entire lifecycle of a building in a digital format (Hamma-Adama *et al.*, 2018) [9]. Based on the reviewed evidence, this study presents insights of intelligible understanding of the influence of buildability on real estate investment, and how to apply it to real estate investment decisions during the design process.

This study discusses the influence of buildability assessment design phase of real estate investment which has been discussed in other studies and that is where the gap in knowledge exists on buildability concepts. The studies previously carried out by researchers were based on buildability concepts, attributes, principles and other areas related to, and contributing to buildability mainly in the design phase (Anderson, Fisher and Raham, 2000; Ardit, Elhassan and Toklu, 2002; Rosli, 2004; Bamisile, 2004) [2, 3, 5, 16]. Even though different terms have been used to describe buildability; studies have not actually been conducted on the

concept buildability assessment design phase as it relates to real estate investment.

3. Research Methodology

The research design used for this study was that of descriptive survey which relied on questionnaire and interview to generate data for the analysis. The study focused on the influence of buildability assessment at design phase in real estate investment in Port Harcourt, Nigeria. A pilot study was conducted by the researchers to identify 340 professionals involved in buildability assessment buildability of construction project and estate properties investment. The population of the study therefore consists of 340 professionals from public and private sectors of the real estate sector that are made up of estate surveyors and valuers, architects, quantity surveyors, project managers, builders, engineers, construction supervisors, etc. using questionnaires. A total number of 340 well-structured questionnaires were distributed to respondents; out of which 221 were retrieved representing 65% response rate. A sample of 221 respondents was selected using random sampling technique for the various construction professionals such as the client, consultant, contractors, estate surveyors and valuers, architects, engineers, builders, project managers. In order to weigh the influence of buildability assessment at design phase in real estate investment, variables were identified on 5-point likert scale ranging from 1=Very unimportant/insignificant to 5=Very important/significant. The data collected was analysed by the using descriptive (mean, relative importance index (RII) and simple frequency table) and inferential statistical tools (regression analysis). The analyses of data include determining the effect of buildability assessment at design phase in real estate investment.

4. Results and Discussion of Findings

4.1 Factors Responsible for Failure of Buildability Assessment on Real Property Investment

Table 1 shows the factors responsible for failure of buildability assessment on real property investment. Table 1 revealed that more than half of the respondents with mean score of >3.00 indicates checking for errors, omissions, under design/ over design, resistance to buildability program by client, incorrect and inadequate design detailing, optimize material usage, nature of soil, finance, construction difficulties and construction safety as the factors to be considered when carrying out buildability assessment on a design at the designing stage on real property investment. Without it, a negative impact would experience on the real property investment; which reasonable experienced clients, contractors and consultant will consider in the real property investment decision process. From the above analysis the factors to be considered when carrying buildability assessment on a design at the design stage includes checking for errors, omissions, under design/ over design, resistance to buildability program by client, incorrect and inadequate design detailing, optimize material usage, nature of soil, finance, construction difficulties and construction safety. The analysis has shown that majority of the respondent have experienced design errors in some of the project they have executed, indicating that design error is commonly experienced in the real estate investment sector which also indicate that proper buildability assessment on most real property investment is not been carried out.

Table 1: Factors Responsible for Failure of Buildability Assessment on Real Property Investment

Factors Responsible for Failure	Weigh: N=221					Σfx	Σfx/Σf	RII	Rank
	5	4	3	2	1				
Resistance to buildability program by client	70	64	44	23	20	804	3.64	0.74	1 st
Incorrect and inadequate design detailing	70	56	44	30	21	786	3.56	0.73	2 nd
Errors in design	70	50	40	35	26	766	3.47	0.71	4 th
Omission in design	70	49	40	34	28	762	3.45	0.69	6 th
Under/or over design	68	55	45	36	17	784	3.55	0.72	3 rd
Incorrect specification of materials	68	53	42	40	18	776	3.51	0.70	5 th
Construction difficulties	70	50	40	35	26	766	3.47	0.71	4 th
Non-optimum material usage	70	56	44	30	21	786	3.56	0.73	2 nd
Simple installation	68	55	45	36	17	784	3.55	0.72	3 rd
Nature of soil	70	49	40	34	28	762	3.45	0.69	6 th
Finance	68	53	42	40	18	776	3.51	0.70	5 th

Source: Author’s Field Investigation, 2021.

4.2 Consequences for Failure of Buildability Assessment on Real Property Investment

Table 2 shows the consequences of consequences for failure of buildability assessment on real property investment. From the Table 2, the results reveal that the consequences are delay in real property time delivery with mean score of 3.62, reduces investment life-span with mean score of 3.51, wastage of invested capital and loose form of benefits with mean score of 3.48 respectively, conflict among lease and lessor, and real property investment on long void period with mean score of 3.38 respectively, increase in maintenance and repairs with mean score of 3.30, loose of investment income with mean score of 3.22, discourages prospective investors and difficulty in real property investment with mean score of 3.18 respectively and

unhealthy investment procedures with mean score of 3.12. It implies that the consequences include: delay in property delivery, reduces investment life-span, wastage of invested capital and loose of capitals, conflict among lease and lessor, real property investment on long void period, increase in maintenance and repair, loose of investment income, discourages prospective investors, difficulty in real property investment and unhealthy investment procedures. From the above analysis, it indicates that absence of buildability assessment at the design stage of any project will have will affect real property investment delivery. if construction safety and construction difficulties are not put in to consideration will there be an impact on real property investment; construction safety and difficulties will lead to delay in real property investment time delivery.

Table 2: Consequences of Buildability Assessment Failure on Real Property Investment

Consequences of Buildability Assessment Failure	Weigh: N=221					Σfx	Σfx/Σf	RII	Rank
	5	4	3	2	1				
Delay in real property time delivery	70	64	44	23	20	804	3.64	0.74	1 st
Reduces investment life-span	70	56	44	30	21	786	3.56	0.73	2 nd
Increase in real property investment cost	68	53	42	40	18	776	3.51	0.70	5 th
Wastage of invested capital	70	50	40	35	26	766	3.47	0.71	4 th
Conflict among lease and lessor	68	55	45	36	17	784	3.55	0.72	3 rd
Real property investment on long void period	70	49	40	34	28	762	3.45	0.69	6 th
Difficulties in real property investment	70	64	44	23	20	804	3.64	0.74	1 st
Unhealthy investment procedures	70	50	40	35	26	766	3.47	0.71	4 th
Increases maintenance and repair works	70	56	44	30	21	786	3.56	0.73	2 nd
Discourages prospective investor	68	55	45	36	17	784	3.55	0.72	3 rd
Loose of investment income	68	53	42	40	18	776	3.51	0.70	5 th
Leads to shape practices	70	49	40	34	28	762	3.45	0.69	6 th

Source: Author’s Field Investigation, 2021.

4.3 Needs for Buildability Assessment on Real Property Investment

Table 3 shows the machismos that influenced the needs for buildability assessment on real property investment. And these are the constraints stifling real property investment that prompt utilization of buildability assessment would addressed. Table 4.6 reveals that unstable economic environment, width of the investment, finance for real property investment and land tenure legislation and land administration have weighted sums of 3.26 and 3.21 respectively; while socio-political issues, real property data banking, provision of physical infrastructure and inflation rate have weighted sums of 3.14 and 3.12 respectively. From the table, all the variables perceived being the mechanisms influencing the needs for buildability assessment on real estate investment under study have mean

values greater than three (>3). This implies that unstable economic environment, width of the investment, finance for real property investment, land tenure legislation and land administration, socio-political issues, real property data banking, provision of physical infrastructure and inflation rate are the considerable factors for the buildability assessment on real property investment.

Despite the general vibrancy of real property investment sectors, a number of constraints are observable in the study. The real property investment markets have continued to stifle and should be addressed to substantially increase the already vibrant opportunity offered by real property investment as to reduced associated risks. As shown in the study, unstable economic environment is inextricably linked with performance of the investment, while width of the investment and finance for real property investment are

linked with high lending rate and access to loans. All these constraints; buildability assessment provided a mechanism that demonstrated the issues important to real property

investors. The needs for buildability assessment abreast issues that concerns such investor and be able to provide pertinent advice on all of them.

Table 3: Needs for Buildability Assessment on Real Property Investment

Needs for Buildability on Real Property Investment	Weigh: N= 221					Σfx	Σfx/Σf	RII	Rank
	5	4	3	2	1				
Unstable economic environment	70	64	44	23	20	804	3.64	0.74	1 st
Width of the investment vehicles	70	56	44	30	21	786	3.56	0.73	2 nd
Finance for real property investment	68	55	45	36	17	784	3.55	0.72	3 rd
Land tenure legislation and land administration	70	50	40	35	26	766	3.47	0.71	4 th
Socio-political issues	68	53	42	40	18	776	3.51	0.70	5 th
Real property data banking	70	49	40	34	28	762	3.45	0.69	6 th
Provision of physical infrastructure	70	64	44	23	20	804	3.64	0.74	1 st
Inflation rate	70	56	44	30	21	786	3.56	0.73	2 nd

Source: Author’s Field Investigation, 2021.

The significant relationship between the influence of buildability assessment and real property investment are presented and discussed below. Table 4 simple regression model summaries show the model summary as obtained from SPSS. The R² in this case is 0.740, while adjusted R² was 0.736. This means that the model explains 74% of the variation in the influence of buildability on real property

investment is in real life. This number suggests that the model is significant drives of change in real property investment implementing buildability assessment moderately fit, therefore it may not be able to accurately predict the influence of buildability for any currently real property investment processes from known independent variables.

Table 4: Model Summary on the Influence of Buildability Assessment

Model	R ^a	R ²	Adjusted R ²	Std. Error of Estimate
1	0.489	0.740	0.736	635786.538

Source: Author’s Field Investigation, 2021.

a. Predictors: (constant): Real Property Investment

The analysis of variance (ANOVA) in Table 5 shows simple regression ANOVA, where a significant regression analysis equation was found (f (0.659) =12.74, P < 0.0020, with an R² of 0.740. with a P-value < 0.002,0, the regression equation’s results are significant, only the independent

variables that was not a significant predictor. Because the P-value was less than 0.005, the influence of buildability on real property investment was significant predictor as other independent variables were eliminated.

Table 5: ANOVA of the Influence of Buildability on Real Property Investment

Model 1	Source of Variation	DF	SS	MS	F	Value
	Regression	8	1.43128	0.47709	12.74	
	Residual	100	0.29952	0.03744		
	Total	108	1.73080			

Source: Author’s Field Investigation, 2021.

- a) Dependent variable: Real Property Investment
- b) Predictors: (Constant): Influence of Buildability
- c) * Significant at 0.05 alpha level: df= F 0.659; critical F 12.74; N=221

Table 6 shows simple regression co-efficient with a P-value < 0.001, the regression equations results are significant where the influence of buildability is equal to 4.702 -0.6059 (Real Property Investment). However, the only dependent

variable that was a significant predictor as shown in the “sig” column of Table 6 was the influence of buildability on real property investment; all other independent variables were eliminated.

Table 6: Co-efficient on the influence of Buildability on Real Property Investment

Model	Unstandardized	Co-efficient	Standardized co-efficient		
	B	Std. Error	Beta	T	Sig
1(constant) Impact Ethnic Crisis.	4.702	2.5681	0.19349	24.71	0.0001
	0.6059	1.5389		-3.77	0.0001

Source: Author’s Field Investigation, 2021.

a. Dependent Variable: Influence of Buildability

However, partial comprehension of designers of real property development and implementation requirements, and resistance of client to buildability due to extra visible costs on the invested real property; are the main constraints

in its implementation on real property investment. Generally, buildability results in adding cost to other expenses and may harm the effective buildability program which begins during the planning phase and will continued

conceptually to the end of the real property investment. This issue directly affects real property investment time, quality and cost where the necessity to apply buildability becomes more intangible. It was noticed that many of the problems and issues with buildability on real property investment are due to lack communication among the various stakeholders before starting the investment according to their specific nature of performance. As most of the performance-based features and programs determine the final outcome and its application to real property investment. Lack of communication among the various stakeholders cover overly performance features, and by integrating buildability in the design process in the early stage of the investment decision; the real property investment contradiction will be less, and consequently, the real property investment delivery will be more secure.

5. Conclusion and Recommendations

The study has assessed and evaluates the influence of buildability assessment on a real property investment delivery in Port Harcourt, Rivers State, Nigeria. The research as revealed that most of the real property investment undertaken experienced buildability problem. The result of the analysis revealed that the major factors responsible for failure of buildability assessment are resistance of client to buildability programme, incorrect and inadequate design detailing, errors, omission, under/ over design, incorrect specification of materials, construction difficulties, optimize materials usage, simple installation, nature of soil etc. The study found that unstable economic environment, width of the investment, finance for real property investment, land tenure legislation and land administration, socio-political issues, real property data banking, provision of physical infrastructure and inflation rate are the considerable factors for the buildability assessment on real property investment. In addition, failure to carry out buildability assessment on building projects design at the design stage before delivery is a phenomenon that has brought about buildability problems. To avoid and stop these problems, involvement of professionals in the built environment including builders at the early stage of design and till final completion of the project, implementation of adequate soil investigation, use of high quality material, adequate funding by clients, effective planning and adequate implementation of project teamwork and deployment of Building information modelling (BIM) should be emphasized, while bureaucracy should be eliminated to enhance good quality real property investment delivery. Therefore, it thus reaffirmed the relationship between buildability assessment and real property investment. These variables statistically significantly predicted buildability assessment as the determinant of real property investment in Port Harcourt, $F(0.659) = 12.74$; $P < 0.0020$, $R^2 = .736$; as all three variables added statistically significantly to the prediction at $P < .05$. Based on the findings, an evaluation of buildability assessment should be executed by the professionals before the commencement of any real property development as to determine and minimize or remove waste and wasted efforts, and impediments to real property investment.

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