SUCCESS FACTORS INFORMING THE CHOICE OF A BUILDER FOR OWNER-BUILD INCREMENTAL HOUSING IN THE GLOBAL SOUTH: A GHANA STUDY

Abstract

Whereas the factors informing the choice of a builder in public sector procurement are known, there is a lack of country-specific studies that investigated the factors informing the choice of a builder for owner-build incremental housing although it had been the dominant means of homeownership in the Global South. This current study determined the underlying success factors informing the choice of a builder for owner-build incremental housing in Ghana and, established the relative influence of each of the underlying factors. A structured questionnaire and structured interview helped in data collection. Data were analysed using percentage, mean, standard deviation, and the Relative Importance Index (RII). Thirty-five (35) underlying factors, organized under six main factors, informed the choice of a builder for owner-build incremental housing in Ghana. Each recorded a significant RII value from 0.80 to 0.94. *Adequacy factors, Cost-based factors, Time-based factors, and Quality-based factors* were consistent with the theoretical framework that underpinned the study. *Client-builder relationships and Ghana-specific factors* were unique to this Ghana study. In terms of civil and construction engineering practices, this study has offered an understanding of how owner-builders choose builders for owner-build incremental housing.

Keywords: Construction, Ghana, incremental housing, and owner build

INTRODUCTION

Across the globe, adequate housing has become a critical challenge to development. Under article 25 of the Universal Declaration of Human Rights, housing is recognized as a basic human right [1]. Moreso, Sustainable Development Goal 11 (Sustainable Cities and Communities), among others, targets access to adequate, safe, and affordable housing for all by 2030 against the backdrop that housing is a basic human right [2]. Some nations across the globe, including Ghana, have enshrined the right to housing within their national laws. However, since governments or states alone have not been able to meet this right of humanity, individuals have adopted several means to meet their housing needs. An example of such means is owner-build incremental housing. The wide acceptance of owner-build incremental housing dates back five (5) decades, and it has been an important means of individual home ownership, renovation, and expansion [3] in private sector procurement, and Ghana is no exception. It has been a means to address global housing shortages, especially in the Global South [3]. This is largely attributable to successive governments' unsuccessful social and affordable housing interventions, high interest on mortgages, high cost of buying estates from the few estate developers, high cost of housing rent, and protracting housing-unit deficits in the Global South, among others [4].

In Ghana, owner-build incremental housing has been the dominant approach to homeownership due to the difficulties in accessing housing finance by individuals from banks, microfinance institutions, NGOs, and other formally established entities with the mandate of providing financing for housing [4]. This approach to housing has varying self-financing sources including individual savings and remittances [4] [5]. Characteristics of owner-build incremental housing in Ghana are that on average, it takes 15 years to complete, owners often occupy their

houses when partially completed [5], and the houses are improved when resources are available [5].

Owner-build incremental housing describes a gradual and piecemeal approach to housing development by which individuals (owner-builders) put up or improve their buildings as and when funding, time, or materials are available [3]. It is also known as self-build or self-help incremental housing [3]. Owner-build incremental housing is designed such that it is completed at the pace of the owner-builder, and the builder is also chosen by the owner-builder [3]. However, there is a lack of empirical studies that unravel the underlying factors informing the choice of a builder for owner-build incremental housing. Hence, the relevance of this current study in filling this gap in the literature. Owner-builder is a person who funds the construction of a building, owns the building and acts as a general contractor during the construction [4] [5]. The owner-builder either builds by him/herself or engages tradesmen (most often the case) to execute the project.

Whereas studies in the past have focused on the choice of a builder for public sector procurement, and have come out with a plethora of factors informing the choice of a builder for public sector procurement, which includes housing projects [6], [7], [8]; there is a lack of study that has explored the factors informing the choice of a builder for owner-build incremental housing which falls within the domain of private sector procurement. Moreso, a critical review of previous studies revealed the wide acceptance and adoption of a case study approach to research, and the use of the Relative Importance Index (RII) in data analysis in builder selection studies [8], [9],[10],[11]. This is attributable to the strength and usefulness of the methodology. Likewise, this study deemed the case study approach to research and the use of RII appropriate. Though it does not seek to generalize its findings to represent what is prevailing in the Global South, it offers fruitful lessons to Global South countries such as Nigeria, Angola, and Sierra Leone, whose mortgage market shares close resemblances with that of Ghana and owner-build incremental housing approach is the dominant means to home ownership.

In Ghana, the factors accounting for the use of owner-build incremental housing, housing conditions of owner-build incremental houses, owner-build incremental housing financing, and tenure of owner-build incremental housing projects are known [3], [5], [12]. However, little is known, if any, of studies that determine the success factors informing the choice of a builder for owner-build incremental housing. It is against this backdrop that this current study seeks to determine the underlying success factors informing the choice of a builder for owner-build incremental housing in Ghana and, establishes the relative influence of each of the underlying factors. The specific objectives that governed the study were:

- to identify the underlying success factors informing the choice of a builder for owner-build incremental housing in Ghana;
- to determine the relative significance of each of the underlying success factors informing the choice of a builder for owner-build incremental housing in Ghana.

The remaining sections of the study have been structured under literature review**,** methodology, results and discussions, conclusions and references.

LITERATURE REVIEW:

General overview of factors informing the choice of a builder for housing projects in previous studies

According to [13] four (4) main factors inform the choice of a builder, especially sub-contractors. They are factors relating to quality, cost, adequacy, and time. In a study in the

United Arab Emirates (UAE), five main factors were found to inform the choice of a builder namely, energy management, bid price, water management, technical bid, and proposed time [11]. However, the study focused on green buildings and not on owner-build incremental housing. Thus, its findings are UAE-specific. In a related study in Palestine with the Gaza Strip as a case study, factors such as commitment to quality, adherence to contract terms, commitment to prices, adherence to time schedule, good reputation, expertise in certain types of works, and the required equipment and machinery of the builder inform the choice of a builder [10].

In a study in Nigeria by [9], key factors clients consider in selecting builders for housing projects include past experience in terms of size and type of projects completed, nature of the contract, the time of the year (weather), builder's past relationships with the client, builder's past performance on a project, and project facilitation in terms of labour/plant resources. The study employed the Relative Significance Index for data analysis. However, the study suffers sample size adequacy (100 per targeted group) and lumped the views of clients, main contractors, and subcontractors. Thus, it did not give a true account of the factors clients will consider in selecting builders. Also, the study focused on the selection of sub-contractors by clients or contractors within the public sector. The study lacked a theoretical basis and findings from the research respondents were not validated. This current study, therefore, addressed these weaknesses by using the principles of sampling by [14] to determine the sample size from the research population as well as theoretically underpinning the study with the sub-contractor selection model [13].

In a Ghana study by [15], the author argued that the choice of a builder for a housing project is influenced mainly by managerial factors, location factors, resource availability factors, quality and standards factors, duration, and cost factors [15]. Some of the specific variables under the five main components were human relations, communication skills, ability to maintain a programme, capacity of the builder, familiarity with the location of the project, labour charges, and projects completed successfully in the past. The study focused on public-sector procurement. The study lacked a theoretical basis and findings from the research respondents were not validated. Similarly, the focus of the study was not on owner-builders and incremental housing.

In another housing study in Ghana by [8], the study was limited to 82 developers of private hostels within Kwame Nkrumah University of Science and Technology (KNUST) and its catchment areas and construction practitioners. The study identified tender sum, past performance on similar projects, financial abilities of the builder, technical capacity of the builder, relationship with clients, previous dispute records, equipment holdings, and current workload of the builder. The Relative Importance Index (RII) was used in analysing data [8]. The study lacked a theoretical basis and responses from the research respondents were not validated. Moreso, the focus of the study was not on owner-builders and incremental housing in Ghana.

According to [6], payment flexibilities, workforce competencies, cost of the project, quality of workmanship, site cleanliness, workers' conduct at the job site, the reputation of the builder, scale of projects completed in the past, the proximity of builder to the project site, and relationship with client influence the choice of a builder for a housing project [6]. However, in a study in Malaysia about how Real Estate Developers in Malaysia select builders. The study revealed that price quotation and builder-client relation have a small effect on selecting a builder whereas parameters such as builders' financial standing, past experience, and expertise of the workforce have a significant effect on the choice of builders [16]. Availability of equipment,

history of delays, workload, availability of qualified staff, capital assets, internal safety regulations, safety record, and reputation influence the choice of a builder [7].

Thus, from previous studies there exist a plethora of factors that inform the choice of a builder. However, the study by [13] came close in containing all the factors informing the choice of a builder. Hence, it provided the theoretical basis for this current study. However, the sub-variables defining the main variables were reconceptualized and the four main factors have been restated as Adequacy factors, Cost-based factors, Time-based factors, and Quality-based factors.

The theoretical basis for the study

In explaining the factors informing the choice of a builder for owner-build incremental housing, the sub-contractor selection model by [13] was employed. The model had 4 main factors informing the choice of a builder namely: quality, cost, adequacy, and time-related factors. Cost consisted of timely payment to labourers, and financial capacity, among others. Adequacy was defined by nine specific sub-factors namely adequacy of labour resources, adequacy of experienced site supervisory staff, proposal accuracy, adequacy of material resources, adequacy of equipment, care of work and workers, compliance with site safety requirements, compliance with the contract, and compliance with company image. Time comprised accessibility to the firm, time accuracy in submitting bids, completion of the job within time, and adherence to the programme. Quality entailed the quality of production, the standard of workmanship, team efficiency, quality of material used, experience in similar works, experience in the construction industry, job safety, personnel training, and the number of qualified personnel [13]. However, the model did not include the client-builder relationship as the main factor informing the choice of a builder. Accordingly, [13] argued that selecting builders based on relationships leads to inefficiencies and affects the performance of the builder on a project. This assumption was consistent with the assertion by [16] that relationships with clients do not significantly inform the choice of a builder. In contrast, [6] and [19] strongly asserted that the relationship with the client informs the choice of a builder. But that notwithstanding, this current study included the client-builder relationships as one of the main factors informing the choice of a builder for owner-build incremental housing to ascertain its veracity and level of influence.

Client-builder relationships

This measures the extent that the relationship between the client and the builder informs the choice of a builder for owner-build incremental housing. A cordial relationship between the client and builder gives the builder a competitive advantage in the selection of a builder for a housing project and eventually leads to client retention [8], [6], [17]. In explaining client-builder relationships, the interpersonal relationship theory was employed. Interpersonal relationship refers to a strong association among persons with analogous interests, aspirations, and/or tastes in life. It includes political relationships, marriage relationships, family relationships, religious relationships, neighbourhoods, social groups, and friendships [18]. Furthermore, builders' reputation [7], [19], loyalty, and commitment are essential ingredients in building interpersonal relationships [17]. Internal safety regulations of builders [7]; accessibility of a builder to the client [16], [17], and referral by a third party [17] also contribute to client-builder relationships.

Quality-based factors

This describes the quality of workmanship and materials informing the choice of a builder for owner-build incremental housing. These factors include the safety of the workforce, experiences of the builder and workforce, and material-related matters which are of concern to

the owner-builder. According to [13] and [19], quality-based factors include quality of production, the standard of workmanship, team efficiency, quality of material used, experience in similar works, experience in the construction industry, job safety, personnel training, capital assets of the builder, equipment base of the builder, and the number of qualified personnel [13],[19]. The safety performance of the builder [7]. Risk avoidance, cleanliness at the site, and pollution prevention and control, according to [6], also relate to quality and as such do influence the choice of a builder.

Adequacy factors

Adequacy is a measure of the capacity of the builder to perform. This factor includes adequacy of labour resources, adequacy of experienced site supervisory staff, proposal accuracy, adequacy of material resources, adequacy of equipment, care of work and workers, compliance with site safety requirements, compliance with the contract, compliance with company image according to [10], [13] and [19]. It is also influenced by physical resources and current work commitments [6]. Builder's welfare plan for workers and adequacy of material resources [6], [9]; experience of workers [16]; and the experience of the project supervisory team [7] also influence the choice of a builder.

Time-based factors

Time-related factors measure the level of compliance to meeting project deliverables by the builder. These factors include access to the firm [6]; time accuracy in submitting bids, completion of the job within time, and adherence to the program [13], [19]. The proximity of the builder to the project site, promptness in completing project deliverables and promptness in submitting project quotations to the client [6].

Cost-based factors

This is a measure of the affordability of the quotation of the builder by the owner-builder and the application of funds by the builder. It comprised timely payment to labourers, and financial capacity [13], [19]. Affordability of builder's estimate for the project [16]; and payment flexibilities [6].

METHODOLOGY

This study employed a mixed methodology and adopted a three-stage approach to research. Firstly, relevant literature was reviewed which aided in identifying the factors informing the choice of a builder for owner-build incremental housing.

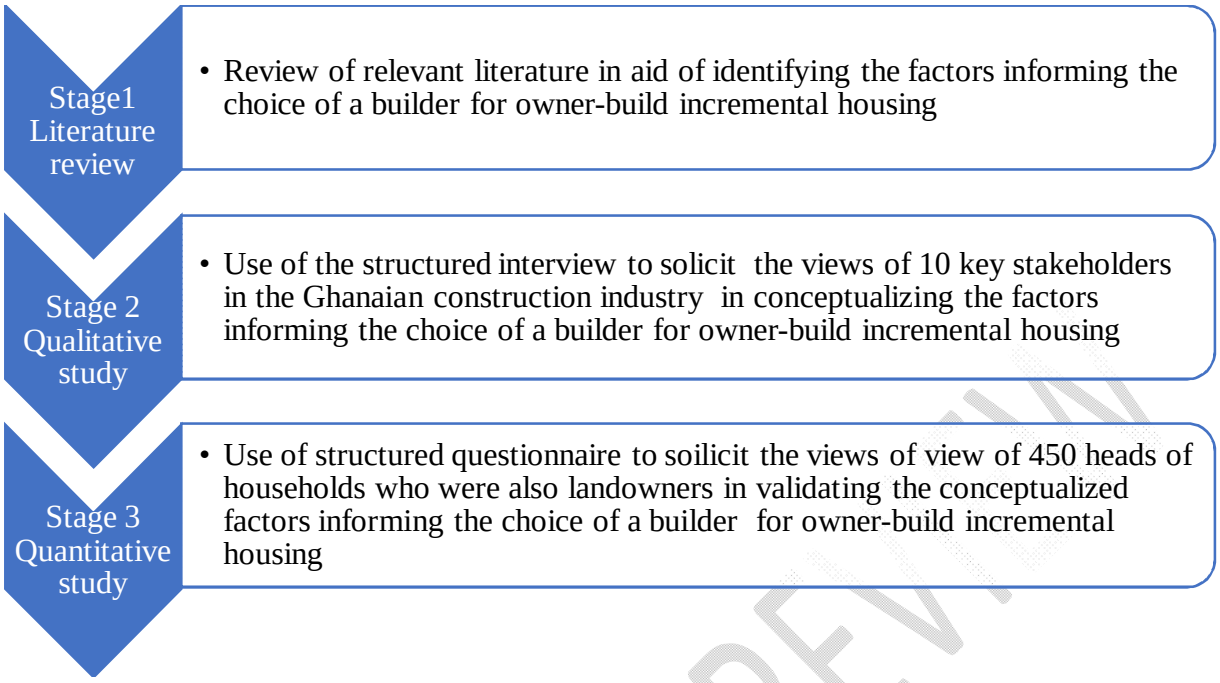

Figure1: Processes flow chart for the study

The second stage was the qualitative study. It involved the use of the structured interview to purposively seek the views of 10 key stakeholders in the Ghanaian construction industry about the factors informing the choice of a builder for owner-build incremental housing. This helped in the conceptualization of the factors informing the choice of a builder for owner-build incremental housing for this Ghana study. The stakeholders were chosen based on their rich knowledge and/or experience on the issue being investigated for over two decades. The stakeholders comprised three owner-builders (residential), three builders, and one lead member from professional and association affiliates in the Ghanaian construction industry. The professional associations were the Institution of Engineering and Technology (IET), Ghana, the Ghana Institution of Surveyors (GhIS), the Ghana Institute of Architects (GIA), and the Association of Building and Civil Engineering Contractors of Ghana (ABCECG). In line with research ethics, the names of the respondents were kept confidential. The key stakeholders were asked to rate the factors informing the choice of a builder for an owner-build incremental housing project using a 5-point scale, where (1) represents highly insignificant, (2) is insignificant, (3) is neither, (4) is significant, and (5) denotes highly significant. Blank spaces were provided for the respondents to further suggest factors that were not captured in the structured interview. Suggestions received were captured under Ghana-specific factors (see Appendix A).

Appendix A presents the outcome of the qualitative study using the structured interview as an instrument of data collection. Data were analysed using the standard deviation and the mean. The mean responses for the factors ranged from 3.0 to 5.0. Compared with the hypothesized mean which was set at 3 based on the five-point scale employed, it was an indication of (neither to highly significant). Moreso, the standard deviation values ranged from 0.0 to 1.0, an indication of consensus in the views of the key stakeholders regarding the factors informing the choice of a builder for owner-build incremental housing. Thus, thirty-five (35) factors were conceptualized and it became the basis for the quantitative study in stage three of

this study. Among the thirty-five (35) factors, it was observed that thirty (30) factors were consistent with the literature findings, whilst five (5) factors namely, a builder who was spotted on the job doing quality work, a builder who does not waste materials, a builder who safely keeps client's materials, builder's ability to implement working drawings, and builder's knowledge in construction were inconsistent with literature findings, suggesting that they were peculiar to this current study in Ghana.

The third stage was the quantitative study. A structured questionnaire was used to collect data from 450 heads of households who were also landowners in validating the qualitative findings in stage two. The views of 450 heads of households who were also landowners were sought on the factors informing the choice of a builder for owner-build incremental housing in Ghana. The common criteria for selecting the respondents were that: a respondent should be the head of a household who was also a landowner and has built a house using the owner-build incremental housing approach. This aided in ensuring that the respondents had experience and/or knowledge regarding the issue under investigation and that the quality of responses could be vouched for. Since there is no database available which gives the population of heads of households who were also landowners in Ghana, the 2020 population and housing census figure (population of heads of households) became the population size for the quantitative study. The population for the quantitative study was made up of 8.3 million heads of households in Ghana according to [20] as affirmed by [21]. In determining the sample size of the study, the principle by [14] was followed which suggested that for a population of about 5 000 units or more, a sample size of 400 should be adequate [14], [22]. Thus, 450 heads of households who were also landowners were sampled. The targeted respondents were asked to rate the thirty-five (35) factors informing the choice of a builder for owner-build incremental housing using a 5-point scale, where (1) represents highly insignificant, (2) is insignificant, (3) is neither, (4) is significant, and (5) denotes highly significant based on their experience and/or knowledge.

The two fundamental objectives that governed the design of the questionnaire for the study were: to maximize the response rate and , to obtain accurate relevant information for and from the survey [22]. A 100% response rate was recorded because the questionnaire was self-administered. The questionnaire was self-administered with the help of twenty (20) field workers from March to May 2021. Respondents spent at most 8 minutes on the survey, and further clarification was given when requested. Informed by the assertion that the way a questionnaire is worded has an enormous influence on the nature of information elicited [22], the questionnaire for this current study was carefully worded using clear and simple sentences. Using a ranking scale, clear instructions were set out as to how the questions were to be answered. Owing to the kind of data analysis, that this study employed, together with the extent of accuracy the sample had to be for the researchers' purposes, and the population characteristics, a sample size of 450 targeted respondents was considered adequate [14], [22]. Thus, the sample size for this study was found adequate for analysis. Data were analysed using the Relative Importance Index (RII) using the formula:

$$\mathrm{RII} = \frac{\sum W}{A * N}$$

where, W—the weight that was given to the statement by the research respondents. It ranged from 1 – 5 based on a five-point scale. A in the formula represented the highest integer and, in this study, (5). N was the total number of research respondents [23], [24]. The RII scores ranged from 0.00 to 1.00 [24]. The closer the score to 1.00 the more significant the variable or factor.

Thus, RII scores of 0.50 and above were considered to be of significant influence in this study, whereas scores below 0.50 were considered not significant [23], [24].

RESULTS AND DISCUSSIONS

The initial section of the survey included some items for collecting the project and respondents' characteristics. The characteristics included financing sources, project duration, and project status. These characteristics were identified to be associated with owner-build incremental housing during the literature review. The demographic characteristics were collected with the aid of the questionnaire. The respondents were the 450 heads of households who were also landowners.

Table 1: Demographic characteristics

Demographic variables	Assessing parameters	Score	Cumulative score
Financing sources	Personal savings	85%	85%
	Remittances	15%	100%
Project duration	0-5 years	40%	40%
	6-10 years	30%	70%
	11-15 years	20%	90%
	Above 15 years	10%	100%
Project status	Completed and occupied	73%	73%
	Partially completed but occupied	27%	100%
Age	Average	40 years	

The demographics indicated that personal savings (85%) and remittances (15%) were the financing sources for owner-build incremental housing in Ghana. This affirmed the study by [5] that remittances and savings were the predominant source of finance for owner-build incremental housing in Ghana. Furthermore, the completed and occupied (73%) and partially completed but occupied (27%) suggested that only a few owner-build incremental houses were occupied before they were completed. This was close to the 25% volume of uncompleted houses in Ghana [5], with 2 percentage point variance. Also, the demographics suggested that cumulatively 90% of owner-build incremental housing was completed within 15 years. This supported the national data in Ghana that, on average, it takes 15 years for owner-builders to complete owner-build incremental housing [5]. The average response age for this study was 40, an indication that the respondents were within the youth bracket.

Table 2: Factors informing the choice of a builder for owner-build incremental housing by household heads

Sn	Informed factors	RII	RII Ranking	Group RII	Group RII Ranking
	Quality-based factors			**0.80**	**6th**
1	Capital assets of builder	0.80	4th		
2	Builder's equipment base	0.80	4th		
3	The safety performance of the builder	0.80	4th		
4	Cleanliness at the project site	0.81	1st		
5	Pollution prevention	0.80	4th		
6	Pollution control	0.81	1st		
7	Builder's performance on past project	0.81	1st		
	Adequacy factors			**0.84**	**5th**
8	Current workload of builder	0.81	4th		
9	Adequacy of labour resources	0.80	7th		
10	Builder's welfare plan for workers	0.81	4th		
11	Adequacy of material resources	0.87	2nd		
12	Experience of workers	0.96	1st		
13	Builder's compliance with terms of the contract	0.81	4th		
14	The experience of the project supervisory team	0.84	3rd		
	Cost-based factors			**0.93**	2nd
15	Affordability of Builder's estimate for the project	0.89	2nd		
16	Payment flexibilities	0.96	1st		
	Time-based factors			**0.86**	**4th**
17	The proximity of the builder to the project site	0.96	1st		
18	Prompt in submitting project quotations to client	0.80	3rd		
19	Prompt in completing project deliverables	0.81	2nd		
	Client-builder relationship			**0.94**	**1st**
20	Internal safety regulations of builders	0.82	11th		
21	Reputation of builder	0.96	5th		
22	Accessibility of builder to client	0.89	10th		
23	Referral by a third party	0.95	7th		
24	The loyalty of the builder to the client	0.99	1st		
25	Builder-client relationship by marriage	0.92	8th		
26	Builder-client relationship by family ties	0.97	4th		
27	Neighbourhood relationship	0.98	3rd		
28	Religious relationship	0.96	5th		
29	Relationship by friendship	0.99	1st		
30	Political relationship	0.92	8th		
	Ghana specific factors			**0.91**	**3rd**
31	A builder who was spotted on the job doing quality work	0.97	2nd		
32	A builder who does not waste materials	0.93	3rd		
33	A builder who safely keeps client's materials	0.98	1st		

34	Builder's ability to implement working drawings	0.80	5th		
35	Builder's knowledge in construction	0.86	4th		

Empirically, this study revealed thirty-five (35) factors to have informed the choice of a builder for owner-build incremental housing. These were further organized under six main factors. Each of the six main factors recorded a significant RII value ranging from **0.80 to 0.94**. Thus, six main factors significantly influence the choice of a builder for owner-build incremental housing in Ghana. The factors were: *Client-builder relationships, Ghana-specific factors, Adequacy factors, Cost-based factors, Time-based factors, and Quality-based factors.* In comparison with the sub-contractor selection model by [13], which theoretically underpinned this study, *client-builder relationships* and *Ghana-specific factors* contrasted with the theoretical model whereas *adequacy factors, cost-based factors, time-based factors, and quality-based factors* were consistent with the model. The integration of *client-builder relationships* and *Ghana-specific factors* as main factors in explaining the factors informing the choice of a builder for owner-build incremental housing has redefined the frontiers of existing knowledge. Relatively, *client-builder relationships* obtained an RII score of 0.94 and ranked 1st. This supported the study by [6] and [9], which earlier identified builders' relationship with the client to be an important factor in selecting a builder for a project. However, it contrasted with the position of [13] that client-builder relationships did not significantly inform the choice of a builder. Eleven sub-factors defined client-builder relationships. Relationship by friendship with an RII score of 0.99 ranked 1st among the client-builder relationships factors. This supported the study by [18] which found relationships through friendship to be influential in making a choice or taking a decision. The authors further argued that relationships through marriage, family ties, neighbourhood relationships, religious relationships, and political relationships also inform one's choice. These variables were equally significant in this Ghana study as they recorded RII values of 0.92, 0.97, 0.98, 0.96, and 0.92 respectively. The 11th-ranked sub-factor under client-builder relationships was internal safety regulations of builders with an RII score of 0.82. This lends support to the assertion by [7] that internal safety regulations of builders inform the choice of a builder.

Cost-based factors with an RII score of 0.93 ranked 2nd. This was defined by two sub-factors. Payment flexibilities with an RII score of 0.96 ranked 1st among the cost-based factors. According to [6] flexible payment significantly influences the choice of a builder. Affordability of builder's estimate for the project with an RII score of 0.89 ranked 2nd. This lends support to the study by [16] which argued that the affordability of a builder's estimate influences the choice of a builder.

Ghana-specific factors with a group RII score of 0.91 ranked 3rd among the six main factors. It consisted of five sub-factors. Both the main and sub-factors were unique factors to this Ghana study as they have never appeared in any previous study. A builder who safely keeps client's materials with an RII score of 0.98 ranked 1st whereas a builder's ability to implement working drawings with an RII value of 0.80 ranked 5th. More so, *adequacy factors* ranked 5th and recorded an RII score of 0.84. This affirms the argument by [13], that choice of a builder should be informed by adequacy factors. Adequacy factors comprised seven (7) sub-factors. Experience of workers emerged 1st with an RII score of 0.96. Clients look out for the experience of the project supervisory team [7], and the builder's compliance with the terms of the contract [19]. Likewise, the experience of the project supervisory team and the builder's compliance with the terms of the contract were found to be of significant influence on the choice of a builder for an owner-build incremental housing project.

According to [6], clients' choice of a builder is informed by the current workload of the builder. Builders with more workload, if not well managed, result in a builder not being loyal [17], and client dissatisfaction.

Time-based factors with an RII score of 0.86 emerged 4th. According to [11] and [13], time-related factors inform the choice of a builder for a project. Time-based factors comprised the proximity of builder to project site with an RII score of 0.96 and ranking 1st. Prompt in completing project deliverables with an RII score of 0.81 ranked 2nd, prompt in submitting project quotations to client obtained an RII score of 0.80 and ranked 3rd. According to [6], the choice of a builder is informed by the proximity of the builder to the project site and promptness in submitting project quotations to the client by builders. These factors were also found to be of significant influence in choosing a builder for owner-build incremental housing in Ghana.

Quality-based factors with an RII score of 0.80 ranked 6th among the six main factors informing the choice of a builder for owner-build incremental housing. It comprised seven sub-factors with each sub-factor recording an RII score of 0.80 or 0.81, an indication of having a significant influence on the choice of a builder for owner-build incremental housing. According to [16], a builder's performance on past projects informs the choice of the builder. This was affirmed in this current study as the builder's performance on past projects obtained an RII significant score of 0.81 and ranked 1st. The safety performance of the builder obtained a significant RII score of 0.80. This supports the study by [7] which found the safety performance of builders to have a significant influence on the choice of a builder for owner-build incremental housing. Cleanliness at the project site, pollution prevention, and pollution control recorded significant RII values of 0.81, 0.80, and 0.81 respectively. These RII scores were significant and thus, supported the study by [6] which argued that cleanliness at the project site, pollution prevention, and pollution control significantly influence the choice of builder.

CONCLUSIONS

This study concludes that there are thirty-five (35) underlying factors that inform the choice of a builder for owner-build incremental housing in Ghana. The factors were organized into six (6) main factors namely: *client-builder relationships, Ghana-specific factors, adequacy factors, cost-based factors, time-based factors, and quality-based factors.* Whereas *adequacy factors, cost-based factors, time-based factors, and quality-based factors* were consistent with the theoretical framework that guided the study, *the client-builder relationships and Ghana-specific factors* were unique to this Ghana study only. Thus, the integration of the *client-builder relationships and Ghana-specific factors* has broadened the frontier of the factors informing the choice of a builder for owner-build incremental housing. Relatively, the *client-builder relationships* obtained an RII score of 0.94 and ranked 1st. *Cost-based factors* with an RII score of 0.93 ranked 2nd. *Ghana-specific factors* with an RII score of 0.91 ranked 3rd. Time-based factors with an RII score of 0.86 emerged 4th. *Adequacy factors* ranked 5th whereas *quality-based factors* with an RII score of 0.80 and ranked 6th among the six main factors. The demographic characteristics associated closely with the literature findings.

The uniqueness of the study also lies in the application of the sub-contractor selection model by [13] in studying the success factors informing the choice of a builder for owner-build incremental housing in Ghana and thus theorizes that *client-builder relationships, cost-based factors, Ghana-specific factors, time-based factors, adequacy factors,* and *quality-based factors* are the success factors informing the choice of a builder for owner-build incremental housing in Ghana. In terms of civil and construction engineering practices, this study has offered an

understanding of how owner-builders choose builders for owner-build incremental housing. It has demonstrated that owner-builders choose builders based on multiple factors and not limited to the traditional cost, time, and quality (iron triangle) or cost, time, quality, and adequacy related factors as earlier informed by the sub-contractor selection model by [13] which underpinned this Ghana study. However, it has reduced the multiplicity of factors into 35 success factors peculiar to Ghana. It also provides the basis for future studies in owner-build incremental housing. Though this study was geographically limited to Ghana, the findings offer great lessons to Global South countries like Nigeria, Angola, and Sierra Leone whose mortgage market shares a close resemblance with Ghana. Practically, the findings of this study will inform builders to strategically position themselves to attract owner-build in Ghana for business. A future study may consider adopting a data reduction technique to group the factors informing the choice of builder for owner-build incremental housing into principal components.

Consent

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

Appendix A: Outcome of the response from stakeholders

	Quality-based factors	Standard Deviation	Mean	Remarks
1	Capital assets of builder	1.0	3	[13],[19]
2	Builder's equipment base	1.0	3	[13],[19]
3	The safety performance of the builder	1.0	3.5	[7]
4	Cleanliness at the project site	1.0	3.5	[6]
5	Pollution prevention	1.0	4	[6]
6	Pollution control	1.0	4	[6]
7	Builder's performance on past project	1.0	4	[9],[16]
	Adequacy factors			
8	Current workload of builder	0.0	5	[6]
9	Adequacy of labour resources	0.0	3	[13]
10	Builder's welfare plan for workers	0.0	5	[8],[9]
11	Adequacy of material resources	1.0	4	[8],[9]
12	Experience of workers	0.0	5	[7],[16]
13	Builder's compliance with terms of the contract	1.0	3	[10],[19]
14	Experience of project supervisory team	1.0	4	[7]
	Cost-based factors			
15	Affordability of builder's estimate for the project	1.0	4	[16]
16	Payment flexibilities	0.0	4	[6]
	Time-based factors			
17	The proximity of the builder to the project site	0.0	5	[6]
18	Prompt in submitting project quotations to client	1.0	4	[6]
19	Prompt in completing project deliverables	0.0	5	[13],[19]
	Client-builder relationship			
20	Internal safety regulations of builders	1.0	4	[7], [13],[19]
21	Reputation of builder	1.0	3.5	[7], [10]
22	Accessibility of builder to client	1.0	3.5	[16],[17]
23	Referral by a third party	1.0	4	[17]
24	The loyalty of the builder to the client	1.0	4	[17]
25	Builder-client relationship by marriage	0.0	4	[18]
26	Builder-client relationship by family ties	1.0	4	[18]
27	Neighbourhood relationship	1.0	4	[18]
28	Religious relationship	0.0	4	[18]
29	Relationship by friendship	1.0	4	[18]
30	Political relationship	1.0	4	[18]
	Ghana specific factors			
31	A builder who was spotted on the job doing	-	-	Unique to Ghana study

	quality work			
32	A builder who does not waste materials	-	-	Unique to Ghana study
33	A builder who safely keeps client's materials	-	-	Unique to Ghana study
34	Builder's ability to implement working drawings	-	-	Unique to Ghana study
35	Builder's knowledge in construction	-	-	Unique to Ghana study

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