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# Evaluating the Critical Success Factors of Industrialised Building System Implementation in Nigeria: The Stakeholders' Perception

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## ABSTRACT

Globally, the adoption of Industrialised building system (IBS) has been acknowledged as a panacea for housing delivery performance. However, in most developing nations, especially Nigeria, its successful adoption is confronted with myriad of factors that are differently perceived by stakeholders resulting in poor performance and low uptake. The focus of this study is, therefore, to identify and evaluate those inhibiting factors as perceived by key construction stakeholders in the Nigerian construction industry. Initially, sixty-four (64) factors were identified through literature and structured interview. After which, a panel of experts, through Delphi method, considered forty-seven (47) of the factors contextual to IBS performance in Nigeria. 210 (70%) multidisciplinary construction professionals responded to the 300 administered questionnaires anchored on a Likert scale of I-5, (1-least significant to 5-Most Significant). Mean score approach was employed for data analysis. All the success factors were perceived to be critical. However, while forty (40) factors were perceived to excise high influence, seven (7) factors were found to moderately influence IBS performance. The five (5) critical success factors (CSFs) based on mean score (MS) are; Clear and precise goals (3.986), knowledge & skills (3.976), planning & control (3.948), top management support (3.938), and transportation (3.924). Having the knowledge of factors critical to IBS performance will assist key stakeholders' in their decision-making towards achieving effective project delivery.

## 1. Introduction

A nation's construction industry is pivotal to its socio-economic development. Innumerable studies especially in the developed countries (DCs) such as the United Kingdom, United States of America and Australia attested to the construction industry's contribution to their GDP; predominantly due to successful project performance (UN-Habitat, 2006). Furthermore, the industry's significance is engrained in its congruent relationship with other sectors of the economy such as the manufacturing, agriculture, services etc. However, the construction projects in the less developed countries (LDCs) for decades continue to record unsatisfactory performances manifesting in project delays, cost overruns, inferior quality, disputes and conflicts, lack of sustainability, unprecedented abandonment and incessant building collapse. For instance, in Nigeria, this myriad of failure is reflected in the 17milion housing deficit (Federal Ministry Lands, Housing and Urban development, FMLHUD, 2013) and the minuscule contribution of the industry to employment generation and the nation's GDP in the last three decades (Oluwakiyesi, 2011).

In the building industry, these project failure attributes are mostly associated with the conventional method which typically involves massive on-site activity and unskilled labour (Rahman and Omar, 2006'; Aladeloba et al., 2015). The same method is also criticized for exposing stakeholders to high health and safety risks, low productivity and causing considerable damage to the environment (Jaillon and Poon, 2008). Unfortunately, since independence in 1960, the conventional method accounts for over 90% of buildings in Nigeria landscape (Jiboye, 2011). According to the Construction Industry Developing Board (CIDB, 2003), adopting IBS and its innovative tendencies in any construction process stimulates growth and output, thus positioning the building industry of any nation to becoming a prime contributor to the Gross Domestic Product (GDP). Various stakeholders attested that IBS contributes significantly to project performance and by extension, fulfils the demands of the construction industry (Egan et al., 1998; Pour Fahiniam et al., 2017).

The Nigerian Government in 2011 embraced a paradigm shift from the conventional method of construction to Alternative Building Technologies (ABT), also known as Industrialized Building System (IBS). The adopted four (4) IBS types are; i). America Light Gauge Steel ii). Plassmolite/Plasswall iii) Interlocking Masonry blocks and iv). Burnt bricks for a Pilot Housing Project in Kuje, FCT, Abuja (FMLHUD, 2013). However, despite the recorded favourable performances in other nations like UK, USA, Sweden and Singapore (Khafan and Maqsood, 2015) and lately in some LDCs, like China and Malaysia (Blismass and Wakefield, 2009), studies and empirical observation revealed a low IBS take up in the Nigerian construction industry (FMLHUD, 2013; Kolo et al., 2014; Aladeloba et al; 2015). A plethora of factors have been adduced which include institutional instability, cumbersome and slow foreclosure procedures, non-availability and high cost of construction materials, capacity gaps, inappropriate technology, dearth of technological innovations, strategy of housing delivery at the expense of mass housing development (FMLHUD, 2013; Aladeloba et al; 2015).

Although, there were few pioneer studies on the factors critical to IBS performance in Nigeria construction projects (Kolo et al., 2014; Aladeloba, 2015 and Pour-Fahimian et al., 2017), but a lot of the studies only suggested broad frameworks. The studies by Kolo et al (2014) and Aladeloba et al., (2015), only presented a generic list of IBS CSFs from anecdotal sources. The absence of context-specific approach in the studies makes their recommendations unlikely to be the appropriate solutions to Nigeria housing challenges. Although, Pour Fahimian et al., (2017) outlined IBS CSFs based on experts' opinion, however, the study did not reveal the severity of each factor on building performance. In addition, it is based on the general construction industry. The aim of this study, therefore is to bridge this research gap by identifying factors that are critically constraining IBS performance in Nigerian Mass Housing projects (MHPs) and evaluating and ranking the degree of CSFs significance to IBS performance in MHPs.

It is expected that the ranking of the CSFs based on key stakeholders' perception will strengthen the decision-making aptitude of stakeholders and by extension enhance IBS performance in MHPs.

## 2. IBS and Mass Housing Projects: A Background

IBS, a term adopted from the manufacturing industry, is variously defined by construction stakeholders. It designates a method of mass production of components/buildings. IBS is also variously perceived as a system and/or a process. Junid, (1986) defines IBS as an industrialized process by which components of a building are conceived, planned, fabricated, transported and erected on site. Trikha (1999) describes IBS as "a system in which concrete components prefabricated at sites of factories are assembled to form structures under strict quality control and minimum in situ construction activity." IBS is described by Lessing et al., (2006) as an integration of manufacturing and construction processes with a well-planned organisation to efficiently manage, prepare and control needed resources, activities and results using highly developed components. Thanoon et al (2003) presented IBS as a system of mass producing building components either in a factory or at the site according to the stipulated specifications with standard shapes and dimensions and transported to the construction site to be re-arranged according to a certain standard to form a complete building.

Blismas and Wakefield (2009) emphasise that IBS concept is premised essentially on organizational continuity of the production process that implies a steady flow of demand; standardization; integration of the various stages of the whole production process; a high degree of organization of work; mechanization to replace human labour wherever possible; and where research and organized experimentation are integrated with production. According to Kamar et. al., (2009) IBS concerns an innovative process of building construction using the concept of mass-production of industrialized systems, with components produced at the factory or on-site within controlled environments, it includes the logistics and assembly aspect of it, done in proper coordination with thorough planning and integration. This is in line with CIDB (2003) that perceives building industrialization as a process of social and economic change whereby a society is transformed from pre-industrial to an industrial state. As such, it is part of a wider modernization process through the gainful utilization of relevant and viable technologies. This study accepts that as development concept, IBS success is dependent on a balanced combination of the hardware and software components

In this study, mass housing is viewed as residential buildings, proposed and developed in standard multiple units on a substantial scale entirely by a government or in synergy with private concerns for citizens to rent, own-occupy or outright purchase (Ahadzie, 2007). It is recognized as one of the most all-encompassing projects to meet the shelter needs of a society most vulnerable (low-income earners); especially in most of the LDCs. However, for decades, its successful realization has been constrained by varied factors even where IBS is engaged. Given the current global trends towards competitiveness and future health of the industry, we are of the opinion that, the Nigeria building industry requires to identify and evaluate all CSF hindering the full realisation of IBS potentials with a view to successfully and adequately delivery mass housing; thus achieving stakeholders' objectives.

## 3. Critical success factors (CSFs) and IBS Performance

An increasing number of studies have revealed the benefits of IBS adoption for housing development. However, evidence of low performance of IBS projects is on ascendance (Kolo et al., 2014; Aladeloba et al., 2015). The factors responsible are not only generic and contextual but are as well multifaceted. More so, the rate is higher in the LDCs than in DCs (Lim and Mohammed, 1999). The first step in improving the performance of IBS projects lies in identifying the success factors.

In the UK, the study of Pan et al. (2007) revealed some benefits of IBS which they claimed were difficult to attain. Stakeholders' responses however identified initial high capital cost and complex interfacing of offsite and onsite components and systems as the leading factors limiting IBS performance. Other factors with considerable influence include the manufacturing capacity; the risk-averse culture; the nature of design development process; fragmented nature of industry; the local government planning system and concerns of mortgage lenders; and insurers with nonconventional buildings. In a related scoping study of IBS adoption in Australia, Blismas and Wakefield (2009) signposted IBS constraints that are although similar to those in UK and USA but differently rated by stakeholders. The leading factors include difficulties in adjusting to processing change, high initial capital outlay, supply chain restrictions, lack of skills and requisite knowledge. The study, with further commitment, demonstrated that IBS derivable benefits should be enough stimuli to overcoming the identified constraints.

In Hong Kong, Jaillon and Poon (2008) and Arif and Egbu (2010) are in consensus that conflict with design and construction processes and practices, lack of skilled labour and motivation, and lack of client support are the foremost factors influencing IBS project performance. In the same line of reasoning, Ojoko et al., (2016) opined that the foremost challenges border on cultural change within the construction industry, especially due to the preference for the conventional method. According to Khalfan and Maqood, (2014) overcoming such barrier requires education and motivation that only strong leadership and government can afford. Among several identified factors in the Indian construction industry, Arif et al (2012) highlighted ten prime constraints to IBS adoption to be: high initial capital cost, few codes/ standard, lack of guidance and information, low access to finance, skills shortage, industry fragmented nature, planning system, manufacturing low capacity, inexperience, legal issues and restrictive regulations. In a study that inclined to the soft issues of IBS, Lou and Kamar, (2012) observed 12 factors constraining IBS implementation in Malaysia. A close inspection reveals that, except for the factors of IT and procurement, differences with aforementioned constraints in other nations exist only in wordings.

Kolo et al. (2014), based on literature review and empirical observations, disclose that although IBS is still in its embryonic stage in Nigeria, reluctance to innovate, lack of codes and standards, supply chain integrations, and skill requirements are the leading constraints. Aladeloba et al (2015) adopting a qualitative research approach, itemized factors of costs, skills and requisite knowledge, supply chain, perception, motivation communication and integration as core constraints to an effective embrace of IBS in the Nigerian construction industry. Furthermore, Pour Fahimian et al. (2017) attributed stakeholders' negative perception as the overriding factor to IBS poor performance and low uptake in the Nigeria building industry. Other resilient factors besides the findings are those of lack of supporting infrastructure, wild fluctuation in housing demand, and low manufacturing capacity (Kamar et al., 2009).

It can be inferred from the above that not only are causative factors to IBS poor performance numerous, their severity differs between locations and project types. Such variability holds true even within the Nigerian construction industry as evident in the findings of earlier scholars (Ogwueleka, 2011). Therefore, to address these IBS constraints, this study combines multiple approaches in CSFs identification and evaluation.

Firstly, a compressive literature review was undertaken to identify the factors that generally inhibit IBS performance. This is complemented with structured interview to observe contextual factors. Since the study covers different building types located in different geo-political zones, the relevance of the factors was subjected to the confirmation of a panel of experts from different disciplines and organisations. Thereafter, questionnaire based on five-point Likert scale was administered on key construction stakeholders to rank their perception of the IBS success factors influence on housing project delivery.

## 4. Research Methodology

### 4.1 Expert opinion

The main purpose of this section is to provide a structured approach to collecting data in anecdotal situations for consensus to be attained in the decision-making process; since this study is premised on stakeholders' perception. There are various approaches (Delphi method, nominal groups, brain-storming, focus groups, analytic hierarchy process, and working groups) to achieve such. Except for the Delphi method, the others only take account of the perceptions of the most opinionated members of the group. Hence, the Delphi method is used in this study.

A preliminary list of sixty-four (64) causative factors influencing IBS performance identified through literature and a structured interview was presented to a panel of 30 experts. Their selection was premised on evidenced involvement in varied IBS projects. Twenty-seven (27) i.e. 90% responded in a two-phase Delphi technique. The experts are of diverse disciplines, consisting of six (6) Academia, seven (7) Contracting firms, ten (10) Consulting firms, and four (4) from client organization. While those in academics were approached individually, those in the industries were sourced from the directory of relevant professional bodies Nigerian Institute of Building, (NIOB), Nigerian Institute of Architects (NIA), Nigerian Society of Engineers (NSE), and Nigerian Institute of Quantity Surveyors (NIQS) etc. Table 1 shows the distribution of the experts in terms of organisations, positions, and numbers and average years of experience.

***Table 1*** *Expert Profile*

| Expert | Role in IBS Usage | Position | Number | Av. Years' of Experience |
|---|---|---|---|---|
| 1 | Academia | Senior Lecturer-Professor | 6 | 21 |
| 2 | Contracting | Managing Director | 7 | 15 |
| 3 | Consulting | Project Manager | 10 | 18 |
| 4 | Client | Project Coordinators | 4 | 13 |

The first phase required the experts to rate the success factors on a five -point Likert scale from 1-highly insignificant, 2- insignificant, 3-moderate, 4- significant and 5-highly significant. A total of forty-seven (47) success variables were selected based on a mean score of three (3). For the second phase, based on the same scale, the average score of the first exercise was provided to the experts and thereafter asked to further rate the factors indicating agreement or otherwise. The reassessed scores were used to calculate a final average score for all the CSFs. Any factor with a mean score of three and above ($\geq$3) is

***Table 2*** *List of Accepted Success Factors Based on Expert Delphi Exercise*

| Code | Factor | Code | Factor | Code | Factor |
|---|---|---|---|---|---|
| F1 | Level of Automation | F17 | Technology Transfer | F32 | Motivation |
| F2 | Team Integration | F18 | Communication | F33 | Personnel Commitment |
| F3 | Training of Personnel | F19 | Warrant /Insurance Coverage | F34 | Authority/ Responsibility |
| F4 | Clear and Precise Goals | F20 | Innovation | F35 | Permit/ Regulations |
| F5 | Supply chain collaboration | F21 | Standardisation | F36 | Product & Service Cert |
| F6 | Monitoring & Feedback | F22 | Stakeholder Management | F37 | Locations |
| F7 | Knowledge & Skills | F23 | Modularisation | F38 | Strategic Value Chain |
| F8 | Component Reuse. | F24 | Code & Standard | F39 | Conflict Resolution |
| F9 | Buildability/Constructability | F25 | Project size &Value | F40 | Water |
| F10 | Planning & Control | F26 | Socio-Cultural | F41 | Budget Update |
| F11 | Transportation | F27 | Weather/Act of God | F42 | Procurement management |
| F12 | Top Management Support | F28 | Economics | F43 | Vested Interest |
| F13 | Component repeatability | F29 | Waste Disposal | F44 | Schedule Updates |
| F14 | Components interfacing | F30 | Risk management | F45 | Storage |
| F15 | Equipment | F31 | Power (electricity) | F46 | Manufacturing capability |
| F16 | Raw Material | | | F47 | Sewage |

*Table 3 Ranking of Success Factors influencing IBS performance*

| S/N | CODE | FACTOR | MS | SD | RANK |
|---|---|---|---|---|---|
| 1 | F4 | Clear and Precise Goals | 3.986 | 0.904 | 1 |
| 2 | F7 | Knowledge & Skills | 3.976 | 0.935 | 2 |
| 3 | F10 | Planning & Control | 3.948 | 0.919 | 3 |
| 4 | F12 | Top Management Support | 3.938 | 0.479 | 4 |
| 5 | F11 | Transportation | 3.924 | 0.909 | 5 |
| 6 | F3 | Training of Personnel | 3.914 | 0.903 | 6 |
| 7 | F40 | Water | 3.905 | 0.913 | 7 |
| 8 | F18 | Communication | 3.905 | 0.954 | 8 |
| 9 | F8 | Component Reuse. | 3.904 | 0.954 | 9 |
| 10 | F2 | Team Integration | 3.891 | 0.871 | 10 |
| 11 | F22 | Stakeholder Management | 3.890 | 0.893 | 11 |
| 12 | F24 | Code & Standard | 3.895 | 0.869 | 12 |
| 13 | F16 | Raw Material | 3.895 | 0.906 | 13 |
| 14 | F36 | Product & Service Certification | 3.886 | 0.856 | 14 |
| 15 | F5 | Supply chain collaboration | 3.886 | 0.873 | 15 |
| 16 | F23 | Modularisation | 3.886 | 0.921 | 16 |
| 17 | F21 | Standardisation | 3.886 | 0.895 | 17 |
| 18 | F13 | Component repeatability | 3.885 | 0.976 | 18 |
| 19 | F46 | Manufacturing capability | 3.881 | 0.912 | 19 |
| 20 | F9 | Buildability/Constructability | 3.876 | 0.904 | 20 |
| 21 | F31 | Power (electricity) | 3.867 | 0.865 | 21 |
| 22 | F14 | Components interfacing | 3.867 | 0.913 | 22 |
| 23 | F33 | Personnel Commitment | 3.862 | 0.910 | 23 |
| 24 | F2 | Motivation | 3.857 | 0.968 | 24 |
| 25 | F1 | Level of Automation | 3.843 | 0.933 | 25 |
| 26 | F35 | Permit/ Regulations | 3.838 | 0.950 | 26 |
| 27 | F41 | Budget Update | 3.819 | 0.912 | 27 |
| 28 | F25 | Project size &Value | 3.819 | 0.966 | 28 |
| 29 | F43 | Vested Interest | 3.819 | 0.988 | 29 |
| 30 | F15 | Equipment | 3.810 | 0.908 | 30 |
| 31 | F39 | Conflict Resolution | 3.808 | 0.960 | 31 |
| 32 | F17 | Technology Transfer | 3.786 | 0.940 | 32 |
| 33 | F42 | Procurement management | 3.786 | 0.942 | 33 |
| 34 | F6 | Monitoring & Feedback | 3.776 | 1.000 | 34 |
| 35 | F19 | Warrant /Insurance Coverage | 3.767 | 0.932 | 35 |
| 36 | F44 | Schedule Updates | 3.767 | 0.972 | 36 |
| 37 | F28 | Economics | 3.748 | 0.967 | 37 |
| 38 | F38 | Strategic Value Chain | 3.733 | 0.991 | 38 |
| 39 | F34 | Authority/ Responsibility | 3.729 | 1.000 | 39 |
| 40 | F26 | Socio-Cultural | 3.681 | 0.927 | 40 |
| 41 | F37 | Locations | 3.557 | 0.933 | 41 |
| 42 | F30 | Risk management | 3.529 | 0.707 | 42 |
| 43 | F20 | Innovation | 3.529 | 0.771 | 43 |
| 44 | F29 | Waste Disposal | 3.510 | 0.766 | 44 |
| 45 | F45 | Storage | 3.448 | 0.812 | 45 |
| 46 | F47 | Sewage | 3.314 | 0.810 | 46 |
| 47 | F27 | Weather/Act of God | 3.252 | 0.829 | 47 |

**NOTES**

**Number of Respondents = 210; Kendall's coefficient of concordance = 0.115; Level of significance: 0.00.**

considered to have a reasonable influence on project performance and thus accepted, while those with values below 3 are rejected (Chan et al., 2004). Table 2 shows the 47 factors ranked above the threshold of 3 and thus, met the acceptance criteria based on the Delphi Exercise.

### *4.2 Design and Administration of the Questionnaire*

In comparison to other instruments for descriptive and analytical surveys in construction management research, questionnaire studies provide less biased results (Enshassi et al., 2010). As such it is the method selected. A two-segment pilot questionnaire was developed for the data instrument. The first segment was to elucidate information on the respondents' background, while the second part investigated the influence of each factor on project performance. The exercise was conducted within only FCT, Abuja. The target of this study were professionals of managerial cadre working in the client, consulting, contracting, and project management, manufacturing and supply organisations. Except for the client organisation, where stratified sampling approach was employed, for a wider reach snowballing method was employed in the rest. Developers were not included because of the observed multiple roles they assume in the Nigeria construction industry.

To eliminate ambiguity from the result, ensure easy interpretation, with appropriate measurement of data on the ordinal scale, the Likert five-point scale was employed (Ekanayake and Ofori, 2004). The Likert scale of 1-5 point was adopted, where 1-represents-least significant, 2- less significant, 3- significant, 4- more significant and 5-most significant. Based on snowballing technique, 300 questionnaires were administered on the various stakeholders working in various organisations (Client, Consultant, and Contractors, project manager, manufacturing and supply). 210 (70%) stakeholders made up of various professionals responded within the last three weeks of October 2015. This response rate in construction management field meets the threshold of subjects to an item of 20-30 % acceptable range (Akintoye, 2000). Consulting organisation constitutes the overall highest respondents (29.7%), followed by the contractor (26.5%), project manager (20.3%), the client (15%), and manufacturing and supply (9%).

### *4.3 Data Analysis and Results*

The Statistical Package for Social Sciences (SPSS Version 20) software aided the analysis of the survey data. In determining the internal consistency test of the data, the Cronbach coefficient alpha an accepted relevant criterion was employed (Zhai t al., 2014). The analysis of the 47 factors signposts an internal consistency with a Cronbach's alpha value of 0.843 which exceeds the minimum threshold of 0.7. This study made use of three types of analysis as obtainable in other in similar studies (Chan et al. 2004; Yang et al., 2012). Civil engineers constitute the highest (33.5%) professionals of all respondents and are present in all the Organisations. Almost 70% of the respondents are within the 31 -50years age bracket; an active age bracket for optimum performance in the construction industry. More than 65% of the respondents have over 11years experience in the construction industry with not less than 5years in IBS. Over 50% of the respondents work in the consulting and project management firms. These firms were the domain of experts in project performance evaluation and management, which further adds validity to this study. Interestingly, the usage of IBS in mass housing will be enhanced by the continuous participation of such professionals. This can be achieved by using tools and strategies which may well be usefully integrated into the process of implementing IBS.

Using the statistical package for social sciences (SPSS version 20), mean scores and standard deviations for the variables were derived. Based on the response, the 47 factors influencing IBS project performance were determined. A similar approach has been observed to be acceptable in previous studies (Chan et al., 2004; Yang et al., 2012). In order to determine if the 47 CSFs (Table 3) were similarly perceived by the respondents, Kendall's concordance coefficient was employed. Yeung et al. (2007) opine that, if Kendall's coefficient is equal to one (1), it implies that the CSFs were identically ranked by all the respondents. However, if Kendall's coefficient is equal to zero (0), it then signifies that the CSFs were differently ranked by the respondents. For the ranked 47 CSFs, the value of Kendall's coefficient is 0.115 which is statistically significant at 1% level. This suggests a general consensus among the 210 respondents. Thereafter, Spearman's rank correlation test was employed to establish the general similarity of the respondents' rankings of between the respondents; client, consultant, contractor,

*Table 4 Conversion of Table of five-point Likert scale to three scale points (Adapted)*

| Likert Scale (five points) | | | | | Researcher Scale (three points) | | | Differential Calculation |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | L | M | H | 5 -1/3=1.333 |
| SD | D | N | A | SA | | | | |

**L**-Low, **M**-Moderate, **H**- High

project manager, and manufacturer and supply organisations. Correlation coefficient (r) is employed for this purpose and it indicates the strength of the correlation between two factors. At 5% level, the least correlation coefficient (r) for the different pairs is 0.621 (Client-Contractor). Therefore, statistically, there is a general consensus among the stakeholders.

### *4.4 Ranking of Success Factors*

In the ranking of factors, where more than one factors have same mean score (MS), the one with lower standard deviation (SD) takes supremacy since a low standard deviation (SD) implies that most of the responses are close to the mean (Table 3).

In addition, Dawes, (2007) opines that the strength of factors in any study is partially influenced by the choice of the scale format. On attitudinal response to public opinion, like in this study, Matell and Jacoby (1971) in support of Likert (1932) assertion argues for the conversion of any ubiquitous scale to three scale point in order to enhance decision-making. Based on this submission, the five-point Likert scale used in this study to derive the factors mean score was converted to three (Table 4).

Since the Likert scale used for this study ranges from 1-5, then based on Table 4, the three levels of causative factors influence on project performance are as shown in Table 5.

*Table 5 The Level of mean Value distribution*

| Mean Value | Level |
|---|---|
| 1.00 - 2.33 | Low |
| 2.34 - 3.67 | Moderate |
| 3.68 - 5.00 | High |

## 5. Finding and Discussion

From the survey responses ranked in Table 3, the mean scores for the 47 CSFs range from 3.986 to 3.252. According to Table 5, the influence of all the factors are above the low mean value of 2.33. This implies that each of the 47 factors can noticeably influence the performance of IBS in housing project delivery. Forty (40) factors however have high influence on project performance, while the remaining seven (7) are perceived by stakeholders to moderately influence IBS project outcome. The Ten factors with the highest influence on project performance are shown in Table 6.

Having clear and precise goals was ranked the highest CSFs by all stakeholders. It attracted a mean score value of 3.986. This finding agrees with that of Ogwueleka (2011). For project success, all decisions must emanate from the premise of definite needs and demand, subjected to rigorous trade-offs. However, due to vested interest and political exigencies, that most government decisions are hardly accorded this consideration. Having the requisite knowledge and skills (3.976) was perceived to have the second highest influence on IBS performance. This rating is in consonance with the observations of Hamid (2009). A major reason is that from conception to installation, the whole process of IBS is knowledge-driven, making precision of utmost requirement in its usage, since remedying any defect is always at a higher cost. In addition, the level of mechanization is high thus necessitating sufficiently qualified personnel. Need for sufficient planning and control was rated third, and it attracts a mean score value of (3.948). Being an asset of huge life time investment, the importance of careful planning of resource requirement and necessary control to attain the set objectives cannot be overemphasized. One major difficulty lies in the fact that each experience differs, as such it requires professionals with a range of experience.

The support of management was considered an extremely influential factor with a mean score value of (3.938). As against the findings of Hamid (2009) and Ogwueleka (2011), which considered it prime, stakeholders in this study perceived it to be the fourth ranked factor. For the success of any physical project, resources must be moved between locations. As such, the availability of appropriate and adequate means of transporting components remains vital. Transportation means was rated fifth (3.924). The availability of water (3.905), contrary to the dry construction IBS is grouped occupies the sixth significant leading position. This could be to the fact that the two predominant IBS currently the in Nigeria building industry are the interlocking masonry blocks and burnt bricks; and both require a good measure of wet trade. The remaining leading factors are training of personnel, effective communication, component reuse and team integration but they are however rated higher in other literature (Thanoon et al. 2003; Blismas and Wakefield, 2009; Lou and Kamar, 2014).

*Table 6 Ten Success Factors with High Influence on IBS Project Performance*

| CODE | FACTOR | MS | SD | RANK |
|---|---|---|---|---|
| F4 | Clear and Precise Goals | 3.986 | 0.904 | 1 |
| F7 | Knowledge & Skills | 3.976 | 0.935 | 2 |
| F10 | Planning & Control | 3.948 | 0.919 | 3 |
| F12 | Top Management Support | 3.938 | 0.479 | 4 |
| F11 | Transportation | 3.924 | 0.909 | 5 |
| F3 | Training of Personnel | 3.914 | 0.903 | 6 |
| F40 | Water | 3.905 | 0.913 | 7 |
| F18 | Communication | 3.905 | 0.954 | 8 |
| F8 | Component Reuse. | 3.904 | 0.954 | 9 |
| F2 | Team Integration | 3.891 | 0.871 | 10 |

## 6. Conclusion

This study has demonstrated that adopting IBS for housing delivery reduces its construction duration and overall cost, enhances its quality and safety, and contributes significantly to it sustainability. However, in spite of these well-documented attributes, its performance and uptake in Nigeria is still low even well over after six years it was embrace. From the sixty-four (64) identified success factors, experts and stakeholders (client, consultants, contractors, project managers, manufacturers and suppliers) perceived forty-seven (47) as critical success factors (CSFs) for IBS poor performance in the Nigerian building Industry. Analysis shows that the factors have varying significant influence on IBS performance in the housing project delivery process. While forty (40) factors exercise high influence on performance, only seven of the CSFs were considered to moderately influence IBS performance.

In addition to identifying the CSFs from literature and semi-structured interviews, the other main contribution of this study lies in the rank ordering of the factors by key stakeholders based on their experience. Although, IBS is akin to dry construction, we observed during the site visits that most of the ongoing projects are predominantly of burnt bricks and interlocking blocks. Hence, the high rating accorded water by the stakeholders in this study may probably be due to the embryonic phase of IBS implementation in the country or the dominance of wet trade of IBS buildings in the area of study. A further study is required for clarification in this regard. In addition, there is also the need to establish the degree of interrelationships between the CSFs. Factor analysis method would be employed in future studies to investigate these underlying relationships among the identified CSFs.

Also, the influence of these factors on identified IBS benefits shall be explored in order to maximize project objectives. Hopefully, the awareness created by this study will strengthen the stakeholders' decision-making skills on IBS CSFs influence on housing performance. It is envisaged that the findings of this study will assist the policy makers in establishing a more reliable reference in their drive towards effectively repositioning the Nigerian building industry on employment generation and wealth creation in Nigeria.

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