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Builders' Supervisory Competencies and Productive Performance of Artisans: The Significance of Experiencein Nigeria Construction Industry

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Abstract: The study provided insight into how Builders' supervisory competencies influence the productive capabilities of construction artisans with a view to enhancing construction projects outcome in Nigeria, by evaluating the application of builders' supervisory functions, productive knowledge utilisation of artisans supervised by Builders and the relationship between Builders supervisory functions and productive knowledge of artisans. The survey utilized data from 84 copies of structured questionnaire received from 140 project managers. Data were analyzed using descriptive and inferential statistics. It was found that Builders' supervisory functions vary among levels of experience, while productive knowledge of artisans varies among the various experiences of the supervisors. Significant correlations exist among some artisanal productive knowledge and supervisory functions of builders. It was concluded that the competencies of builders increase with increased job experience, while the productive knowledge utilized by artisans increased with increase in the supervisory competencies of supervisors, therefore if the experience of a builder is not considered before assigning complex jobs and if project managers ignore the level of the productive competence of artisans before assigning supervisors, the optimum project outcome may not be realized. It is recommended that developers and project managers should adequately assess the experience of a builder before assigning supervisory functions on complex jobs. They should take the artisans' productive competence into consideration before assigning supervisors, so as to achieve desired project outcome. Professional bodies should provide enabling environment for retraining and increasing the experience and supervisory competence of builders.

Keywords: Artisans; Builders; Construction Industry; Experience; Productive knowledge; Performance; Supervisory functions.

1.0 Introduction

The construction industry has always been given important recognition both in developed and developing nations because of its role in providing safe accommodation for man and his activities. The industry in Nigeria impacts nearly every facet of the economy and is responsible for about 16% of Gross Domestic Product (GDP) and employment of approximately 25% of labour force in Nigeria (Bilau, Ajagbe, Kigbu & Sholanke, 2015). The industry utilizes the input of numerous resources managedby various stakeholders who are either professionals or non-professionals (Anyanwu, 2013; Owolabi & Olatunji, 2014). Owolabi and Olatunji (2014) noted that "the professionals involved in the cycle of a building which span from inception through design, construction, completion, maintenance and to terminal demolition includes but not limited to; Architects, Builders, Estate Surveyors and valuers, Land Surveyors, Quantity Surveyors, Town Planners, Civil, Electrical, Mechanical and Structural Engineers".

The Builder is the professional at the hub of the physical construction of buildings. He carries out his building production role by superintending over the undertakings on a building construction site to realize a physical structure through transformation of designs, working drawings, and other building production documents (Anyanwu, 2013). In Nigeria, The National Building Code (NBC) (2006)stated that "the management of the execution of the building works together with the supervision of artisans and tradesmen shall be carried out by a registered Builder". The labour intensive construction operations in Nigeria requires artisans and tradesmen who use their skills and dexterity directly in the technical aspect of the production process thereby contributing to the speedy delivery of construction projects (Bilau et al., 2015). Nevertheless, literature has shown that most of the craftsmen and tradesmen employed during construction do not have adequate skill and knowledge of construction operations (Alwi, Keith & Sherif, 2001; Shinde, Gupta & Magdum, 2014). In corroboration, Chukwuji (2012) observed that every construction operation especially in complex building projects usually have large number of craftsmen, artisans and labourers who must be properly supervised to ensure that they carry out their various jobs according to production drawings and specifications. Shinde, Gupta and Magdum (2014) opined that the quality of supervision is determined by the skill and competencies of the supervisor. In most cases , adequate accountability, authority and responsibility are usually given to the supervisor for planning, leading, coordinating and directing the work of others in order to achieve the overall objective of the group. However, incidences of building failures associated with poor construction

supervision have become an issue of foremost concern in Nigeria's major cities (Agwu, 2013). The study noted the frequent collapse of residential and commercial buildings under construction while, many others crumble while being occupied, resulting in the loss of many lives and destruction of properties worth billions of naira. Moreover, some of the poor construction supervision were attributed to poor incompetent personnel (Agwu, 2013). Hence, consultants and contractors must have competent persons on site to monitor work as it progresses during construction. The aim of this study therefore, is to provide an insight into the significance of experience in the assessment of Builders' supervisory competencies , which affects the capabilities of construction artisans in projects they have supervised in Nigeria.

1.1 Objectives and Research Hypotheses of the Study

The objectives of this study were to; (i) evaluate the extent of application of builders' supervisory functions during building production management; (ii) assess the level of productive knowledge utilisation of artisans supervised by Builders', and (iii) evaluate the relationship between implementation of supervisory functions based on Builders experience and productive knowledge utilisation of artisans in Nigeria.

The hypothesis of this study, states that there is no significant correlation between the Builders' application of supervisory functions and the level of productive performance of artisans in the study area. The results of this hypothesis will provide an insight into the importance of experience and influence of Builder's supervisory functions on the productive performance of artisans in the study area. The results will also enlighten the stakeholders in the construction industry on the supervisory functions that can enhance the productivity of artisans in Nigeria.

2.0 Review of Related Literature

The literature review focuses on construction supervision, required competencies of construction supervisors and productive knowledge requirements of artisans.

2.1 Construction Supervision and Supervisory Competencies

Studies have described construction supervision as planning, leading, coordinating and directing the work of others so as to ensure that the final product is in agreement with the conceived design (Ojo, Olabintan, Ojo & Salami, 2013; Shinde, Gupta & Magdum, 2014). For supervision to be effective, Ojo, Olabintan, Ojo and Salami (2013) posited that it must embrace all "inspections, observations and actions taking on site to ensure that an erected building conforms to design and specification at various sub-stages of construction process, involving numerous and complex activities that only well trained professionals can handle". Quality supervision ensures that resources are effectively and efficiently utilised, because the efficient way each phase of the construction process is managed, and the value of the end product or services produced determines the effectiveness of supervisors' efforts (Alwiet al., 2001).

According to Kadushin and Harkness (2002) supervisors can provide guidance which can aid workers efficiency and consequently lead to delivery of quality service. The functions of a supervisor are well documented in studies which includes; The Institute of Cost Accountants of India (ICAI) (2014), Hardison, Behm, Hallowell & Fonooni (2014), Shinde, Gupta & Magdum (2014) and, Ujene & Akpanamasi (2017).

2.2 Construction Artisans'Critical Productive Knowledge Requirements

The processes of adequate skill attainment give rise to honing of certain productive knowledge required for efficiency of a worker based on dexterity, practical knowledge, theoretical knowledge and social ability (Winch & Clarke, 2003; Vokes & Brennan, 2013). These critical knowledge forms also known as the fundamentals of competence, ability and behaviour defines the way a worker can effectively execute a given task. Ujene and Umoh (2015) in corroboration with Scottish Further Education Unit (2005) and Vokes and Brennan (2013) identified some of the critical knowledge as "accuracy and precision, timeliness/time allocation competence, continuity/sustainability awareness, speed and efficiency competence, foundational competence, practical competence, creative competence, situational awareness, integration/reflexive competence, cross-discipline awareness, work development & promotion ability, teaching competence, communication competence, resource allocation competence, collaboration and team working ability, waste avoidance and minimization ability, leadership/control competence, safety consciousness, negotiation competence, flexibility and adaptability competence". Wachira, Root, Bowen and Olima (2008) referred to some of productive knowledge as generic skills whichtake on different meanings in different work contexts and are broadly transferable from one individual to another. The common types of generic skills acquired by craftsmen include; estimation, supervision of work, preparation of quotations, interpretation of documents, job management, determination of work method and material specification (Wachira, Root, Bowen & Olima, 2008).These previous studies served as sources of the critical knowledge used in this study.

2.3 Some Previous Studies on Construction Supervision

The importance of supervision on construction projects have been investigated in literature internationally and locally. Alwi, Keith, and Sherif (2001) evaluated the effects of quality supervision on rework in the Indonesian Context based on questionnaire administered on large contracting organisations in Jakarta and interviews held with ten project managers and supervisors from ten building construction sites. It was found that the quality of site supervision in Indonesia is directly related to the supervisor's level of experience gained through formal training. Hence, the study explored the relationship between the quality of site supervision, expressed as training cost, and the rework cost borne by

contractors in high-rise building construction, to suggest that the quality of site supervision, represented by the supervisors' level of experience gained from formal training, has a strong negative relationship with the rework cost on a construction project.

Hardison (2012) assessed the knowledge-based competencies necessary for the front-line construction supervisor, using survey based research that is administered through subsequent rounds of data collection that included controlled and anonymous feedback (Delphi-technique). The study used a panel of fourteen construction safety experts from American Society of Safety Engineers Construction Practice Specialty list served on LinkedIn.com to establish fifteen key knowledge-based competencies suggested to be most important to the construction supervisor with respect to improving construction site safety performance out of the thirty two identified knowledge-based competencies. Ojo, Olabintan, Ojo, and Salami (2013) investigated design and construction supervision as structurally sustainable tools for building failure/collapse in Nigeria. The records of some reported building failures/collapses, structural defects in some selected roofs and the extent of professional involvement in their design and construction in Nigeria were examined. The factors responsible for the failure of building design and construction supervision process were also identified. The paper concluded that structural sustainability can be greatly improved upon through design and construction supervision by depending on highly skilled professionals.

Hardison et al. (2014) carried out a study to prioritize the most important knowledge-based competencies for front-line construction supervisors for effective site safety in the United States using the Delphi technique. The study provided insight on additional competencies that should be included among the 30-hour Occupational Safety and Health Administration (OSHA) training topics for the construction site supervisor. The study concluded that for effective management of construction site safety by supervisors, they must possess both the baseline 30-hour training and other competencies relating to pre job planning, organizing of work flow, establishing effective communication, and a knowledge of routine and non-routine work tasks. Shinde, Gupta and Magdum (2014) investigated the impact of quality supervision on rework in the Indian construction industry based on a survey targeted on large contracting organizations in Pune and nearby area. The Study utilised questionnaire administered on contractors, designers, clients and interviews held with eight project managers and supervisors in order to supplement the findings of the questionnaire survey. The study found that unskilled site supervision is the principal cause of rework during construction, and concluded that supervision is more likely to be dependent on the experience, instead of the number of supervisors involved in a project. Agwu (2014) examined the relationship between poor

construction supervision and unsustainable building construction practices with regard to incessant building failures in six major cities in Nigeria between September 2012 and August 2013. The paper adopted descriptive research design using questionnaire administered on 397stratified randomly and area clustered selected registered members of Nigerian Institute of Building (NIOB) from six major cities in Nigeria. Results of the study indicated that significant relationship exists between poor construction supervision and unsustainable building construction practices (use of substandard designs, materials, manpower & procedures)/building failures in Nigeria.

Ling and Tan (2015) investigated the association between a site supervisor's attributes and project outcomes. The study identified the attributes of site supervisors that are significantly correlated with project outcomes (cost, time, quality and client satisfaction), and examined if site supervisors with different educational levels and job experience have different attributes. The study utilised questionnaire designed based on the attributes identified from the literature review and distributed among Singapore-based construction site supervisors. The results showed that site supervisors with IT skills are likely to have projects with good time, quality and satisfaction outcomes, while the projects of supervisors with longer work experience show significantly better time performance and higher client satisfaction. Ujene and Akpanamasi (2017) provided insight into the required supervisory competencies of selected professionals and factors influencing quality of supervision, with a view to enhancing productivity and construction projects delivery in Uyo, Nigeria. The study on the relationship between site supervisors' attributes and the productive performance of artisans is therefore scarce in the study area, hence this study.

3.0 Methodology

This study adopted a qualitative research design. It utilised the exploratory and deductive cross-sectional survey approach which quickly helped to expose, frequency and relationships (and non-relationships) among variables at a specific time without accentuating on processes or changes over time (Mann, 2003; Saunders, Lewis and Thornhill, 2009). After content validity and distribution through research assistants, the collected instrument was tested for reliability and found to be of high level with Cronbach α of 0.79 and 0.81 for the Builders' supervisory and artisans' productive knowledge questions respectively. These values were considered satisfactory, because the alpha values are greater than 0.6 (Gliem and Gliem, 2003).The population of the study comprised Construction project managers who have utilised Builders and artisans in the execution of building projects in Nigeria. The sample frame comprised eighty four project managers obtained from the questionnaire returned from mailed questionnaire sent to a total of 140 project managers in different construction firms in Nigeria. The

choice of project managers as respondents is due to the view that the main role of the project manager is in the administration of the project. The project manager manages the clients' resources and co-ordinates all other stakeholders which requires adequate understanding of all the manpower related issues (Shibani & Sukumar, 2015). This study identified eighteen Builders' supervisory functions from Hardison (2012), The Institute of Cost Accountants of India (ICAI)(2014), Hardison, Behm, Hallowell and Fonooni (2014), Shinde, Gupta and Magdum (2014), Hardison et al. (2014) and Ling and Tan (2015), while twenty two critical knowledge requirements of artisans were identified from Winch and Clarke (2003), Scottish Further Education Unit (2005), Wachira, Root, Bowen and Olima (2008), Vokes and Brennan (2013) and Ujene and Umoh (2015). The project managers were requested to evaluate the extent of application of the identified supervisory functions by Builders' who have worked under them as well as the level of productive performance attained by artisans supervised by the Builders during production. The measurements were on a five point Likert-scale namely: poor=1, low=2, moderate=3, high=4 and very high=5. The total weight value (TWV) was arrived at from the summation of the products of the number of responses for the rating of each variable and the respective weight value for each rating. The relative importance index (RII) method was used in line with the formula used by Ugwu and Haupt (2007) and Enshassi, Mohamed and Abushaban (2009) as shown in equation 1

$RII = \sum W / A \times N$…… (1)

W is defined as weight ascribed to each variable by the respondents, with values of 1 to 5; A represents maximum weight = 5; N represents the overall respondents.

A cut-off score of RII computed was determined by summing the weights and dividing by the total number of weighting items and highest weight respectively: (1+2+3+4+5)/5/5 = 0.60. Thus, events that have RII that are higher than 0.60 are defined as important, those with RII equal to 0.60 are moderate, while those less than 0.60 are less important. This study adopted a threshold of 0.60 representing above average, since there is no specific threshold of a RII available in the literature as authors use threshold of 0.6 or 0.7, while others select the top 5 or top 10 variables for explanation (Alashwal & Al-Sabahi, 2018). The correlations between the Builders supervisory functions among levels of experience and demonstration of productive knowledge of artisans were tested with spearman rank correlation.

4.0 Results, Analyses and Discussions

The result and discussion are presented in this section.

4.1 Characteristics of Respondents used for the Study

For an understanding of the characteristics of the respondents, their sex, age, zone of operation, qualification and experience were evaluated. The results are presented in table 1.

Table 1: Descriptive results of Project managers Features

Features	Sub features	N	%
Sex	Male	78	90.7
	Female	6	9.3
	Total	84	100
Age	1-17yrs	0	0
	18-60yrs	65	77.4
	>60yrs	19	22.6
	Total	84	100
Zone of Operation	North central	15	17.9
	North west	13	15.5
	South west	19	22.6
	South east	16	19.0
	South south	21	25.0
	Total	84	100
Qualification	OND	2	2.4
	HND	6	7.1
	B.Sc	42	50.0
	M.Sc	22	26.2
	P.hD	12	14.3
	Total	84	100
Experience	1-5yrs	10	11.9
	6-10yrs	16	19.0
	11-15yrs	19	22.6
	16-20yrs	24	28.6
	>20yrs	15	17.9
	Total	84	100

The result in Table 1 shows that majority of the project managers were male (90.7%,) who are adults (100% more than 18years) fairly spread across five out of the six geopolitical zones in Nigeria (over 15% in each zone). Majority of the respondents equally have the basic qualification (B.Sc-50%, M.Sc-26.2%), while those with more that eleven years' experience are over 69%. Hence, the results generally imply that the selected respondents have the required features to provide reliable information for this study.

4.2 Evaluation of Supervisory Competencies Application of Builders

For the purpose of evaluating the extent of application of builders' supervisory functions during building production, eighteen supervisory functions identified were presented to project managers to evaluate among Builders of varying experiences. The result in Table 2 indicates that 41.12% of the supervisory functions attained more than the cut-off level among builders with 1-5 years of experience, 50% for builders with 6-10 years of experience, 55.55% for builders with 11-15 years of experience, 66.67% for builders with 16-20 years of experience and, 83.33% for builders with more than 20 years of experience. The result is an indication that there is variation in the level of application of supervisory functions among the various categories of builders investigated. The result shows that

builders with 1-5 years' experience were better at selecting workers, knowing & enforcing quality and safety, builders with 6-10 years' experience were better at selecting the workers, having good knowledge of work routine and quality assurance; builders with 11-15 years' experience were better at interpretation of drawings, as well as safety and quality assurance. The result also shows that builders with 16-20 years' experience were better at directing worker tasks and responsibilities, knowing & enforcing quality and selection of workers, while builders with more than 20 years' experience were better at job planning & work flow organization, adequate knowledge of work routine and directing worker tasks and responsibilities.

Table 2: Project managers' evaluation of supervisory competencies application of Builders

Experience of Builders (years)	**1-5**		**6-10**		**11-15**		**16-20**		**Above 20**	
No of respondents evaluated	**N= 10**		**N= 16**		**N=19**		**N=24**		**N=15**	
Supervisory functions of Builders	**RII**	**Rank**	**RII**	**Rank**	**RII**	**Rank**	**RII**	**Rank**	**RII**	**Rank**
Job planning & work flow organization	0.56	9	0.63	6	0.63	8	0.68	9	0.83	1
Good knowledge of work routine	0.60	6	0.65	2	0.64	7	0.70	6	0.80	2
Directing worker tasks and responsibilities,	0.50	15	0.61	8	0.66	4	0.77	1	0.80	2
Knowing & enforcing safety	0.64	3	0.63	6	0.71	2	0.68	9	0.77	4
Reading & understanding the drawings	0.62	4	0.64	4	0.73	1	0.72	5	0.77	4
Effective communication of orders	0.52	11	0.45	16	0.44	17	0.68	9	0.77	4
Knowing & enforcing quality	0.66	1	0.65	2	0.68	3	0.74	2	0.77	4
Making the work interesting	0.58	8	0.55	13	0.53	11	0.53	15	0.72	8
Reading and writing reports for work	0.60	6	0.64	4	0.63	8	0.69	8	0.72	8
Selecting the workers,	0.66	1	0.66	1	0.66	4	0.73	3	0.71	10
Introduction of new work methods	0.52	11	0.58	12	0.49	15	0.54	13	0.69	11
Induction of new employees,	0.40	18	0.44	17	0.40	18	0.41	18	0.68	12
Training the employees	0.52	11	0.59	10	0.51	13	0.54	13	0.67	13
Enforcing discipline	0.62	4	0.61	8	0.61	10	0.70	6	0.63	14
Establishing positive team work	0.54	10	0.59	10	0.52	12	0.66	12	0.61	15
Assessing workers stress levels	0.52	11	0.53	15	0.51	13	0.47	16	0.56	16
Co-ordination between workers & managers	0.44	17	0.44	17	0.65	6	0.73	3	0.49	17
Handling grievances	0.50	15	0.55	13	0.47	16	0.45	17	0.45	18

The results generally indicate that builders are generally proficient in work planning and organization, directing of workers task and ensuring quality and safety at work. The possible explanation for this finding is that in most institution of learning where building is offered in Nigeria, significant concern is placed on construction programme, construction methodology, and quality and safety management knowledge. However, it can be seen that the competencies of the builders increase with increase in job experience, and the implication of this is that if the job experience of a builder is not properly considered before assigning complex jobs (with many artisans and activities) not so much will be achieved in terms of project outcomes, this is in line with the observation by Ling and Tan (2015) that experience of a supervisor has significant influence on project outcomes.

4.3 Evaluation of Productive Knowledge Utilization of Artisans Supervised by Builders

The second objective assessed the level of productive knowledge utilization of artisans supervised by Builders' during production, For this purpose twenty two productive knowledge of artisans identified were presented to project managers to evaluate among artisans supervised by Builders of varying experiences. The result is presented on Table 3

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Table 3: Project managers' evaluation of productive knowledge utilisation of artisans supervised by Builders

Experience of Builders	**1-5**		**6-10**		**11-15**		**16-20**		**Above 20**	
No of respondents evaluated	**N= 10**		**N= 16**		**N=19**		**N=24**		**N=15**	
Critical knowledge of artisans	**RII**	**Rank**	**RII**	**Rank**	**RII**	**Rank**	**RII**	**Rank**	**RII**	**Rank**
practical competence	0.70	2	0.68	3	0.65	1	0.65	4	0.72	1
leadership/control competence	0.50	10	0.59	12	0.64	3	0.63	5	0.69	2
speed and efficiency competence	0.44	18	0.71	1	0.51	21	0.61	11	0.68	3
resource allocation competence	0.70	2	0.59	12	0.60	10	0.52	22	0.68	3
safety consciousness	0.66	5	0.64	8	0.60	10	0.68	1	0.68	3
continuity/sustainability awareness	0.46	12	0.56	17	0.47	22	0.53	18	0.65	6
waste avoidance &minimization ability	0.44	18	0.66	4	0.61	7	0.63	5	0.65	6
Document interpretation	0.52	20	0.52	19	0.58	13	0.53	18	0.65	6
communication competence	0.46	12	0.58	15	0.58	13	0.63	5	0.64	9
Planning /organising competence	0.44	18	0.56	17	0.54	19	0.60	13	0.63	10
teaching competence	0.44	18	0.59	12	0.61	7	0.58	15	0.63	10
accuracy and precision	0.46	12	0.56	17	0.62	6	0.61	11	0.61	12
creative competence	0.62	8	0.63	9	0.63	4	0.66	3	0.61	12
work development & promotion ability	0.70	2	0.60	10	0.60	10	0.55	17	0.61	12
collaboration and team working ability	0.72	1	0.66	4	0.65	1	0.68	1	0.61	12
negotiation competence	0.64	6	0.56	17	0.61	7	0.62	8	0.61	12
foundational competence	0.46	12	0.58	15	0.55	17	0.58	15	0.60	17
situational awareness	0.46	12	0.56	17	0.58	13	0.53	18	0.57	18
cross-discipline awareness	0.64	6	0.65	6	0.63	4	0.62	8	0.57	18
Estimation competence	0.48	11	0.56	17	0.54	19	0.62	8	0.57	18
flexibility and adaptability competence	0.42	22	0.65	6	0.56	16	0.60	13	0.56	21
integration/reflexive competence	0.46	12	0.69	2	0.55	17	0.53	18	0.53	22

Table 3 shows that the artisans supervised by builders with 1-5 years' experience utilized 36.36% of the productive knowledge identified, the artisans supervised by builders with 6-10 years' experience utilized 45.45% of the productive knowledge identified, while the artisans supervised by builders with 11-15 years' experience utilized 54.55% of the productive knowledge. The result also shows that the artisans supervised by builders with 16-20 years' experience utilized 63.64% of the productive knowledge, while the artisans supervised by builders with more than 20 years' experience utilized 77.27% of the productive knowledge identified. The artisans supervised by the least experience

builders showed better performance in collaboration and team work, work development & promotion and practical ability. Those supervised by builders with 6-10 experience performed better in speed and efficiency competence, integration/reflexive competence and practical competence. Artisans supervised by builders with 11-15 years' experience performed better in practical competence, collaboration and team working ability and leadership/control competence. The builders with 16-20 years' experience encourage artisans more on safety consciousness, collaboration and team working ability and creative competence, while the builder with more than 20 years' experience encourage artisans more on practical competence, leadership/control competence and speed and efficiency competence. The result showed increase in productive knowledge of artisans with increase in the job experience of the supervisors. This may be attributable to the variation in the supervisory attributes of the builders, an indication that the experience acquired on the job has influence on how productive knowledge is imparted on artisans. The implication of this is that if project managers do not take the level of productive competence of artisans into consideration before assigning supervisors, then the expected optimum project outcome may not be realized.

4.4 Association between Builders' supervisory competence and artisans' productive knowledge

To evaluate the association between builders' supervisory competencies and productive performance of artisans, the four most important builders' supervision functions which attained the cut of score of 0.60 were correlated with the five most important productive knowledge of artisans supervised by the different level of experience, in view of the significant variation observed among the level of experience. The four most important supervisory competencies represent about 20% of the identified competencies in line with Pareto rule that 20% of the causes are responsible for 80% effect (Callaghan, 2014). The hypothesis proposed for this study was tested with the spearman rank correlation, with similar decision rule that thehypothesis is accepted if p-value greater than 0.05, and the hypothesis is rejected, but if p-value is less than or equal to 0.05.The results in Table 4 show that among builder with 1-5 years' experience 'selecting the workers' correlated significantly with "collaboration and team working ability", "work development & promotion ability' and "safety consciousness" of artisans. 'Knowing & enforcing quality' correlated with 'practical competence' and 'resource allocation competence', while 'knowing & enforcing safety' correlated with 'collaboration and team working ability', 'work development & promotion ability' and 'safety consciousness'.

Table 4: correlation of artisanal productive knowledge and supervisory functions of builders with 1-5 years' experience

Variable correlated	TWV	Mean	SD	R	P-value	Decision
Selecting the workers,	**33**	**3.300**	**1.160**			
collaboration and team working ability	36	3.600	0.966	0.947	0.001	Reject
work development & promotion ability	35	3.500	0.850	0.980	0.001	Reject
practical competence	35	3.500	1.179	0.468	0.172	Accept
resource allocation competence	35	3.500	0.972	0.330	0.352	Accept
safety consciousness	33	3.300	1.160	0.838	0.001	Reject
Knowing & enforcing quality	**33**	**3.300**	**1.160**			
collaboration and team working ability	36	3.600	0.966	0.407	0.244	Accept
work development & promotion ability	35	3.500	0.850	0.470	0.170	Accept
practical competence	35	3.500	1.179	0.951	0.001	Reject
resource allocation competence	35	3.500	0.972	0.866	0.001	Reject
safety consciousness	33	3.300	1.160	0.301	0.399	Accept
Knowing & enforcing safety	**32**	**3.200**	**1.317**			
collaboration and team working ability	36	3.600	0.966	0.653	0.041	Reject
work development & promotion ability	35	3.500	0.850	0.776	0.008	Reject
practical competence	35	3.500	1.179	0.243	0.498	Accept
resource allocation competence	35	3.500	0.972	0.044	0.903	Accept
safety consciousness	33	3.300	1.160	0.997	0.001	Reject
Reading & understanding the drawings	**31**	**3.100**	**1.287**			
collaboration and team working ability	36	3.600	0.966	0.273	0.445	Accept
work development & promotion ability	35	3.500	0.850	0.399	0.253	Accept
practical competence	35	3.500	1.179	0.772	0.009	Reject
resource allocation competence	35	3.500	0.972	0.650	0.042	Reject
safety consciousness	33	3.300	1.160	0.422	0.225	Accept

'Reading & understanding the drawings' correlated with 'practical competence' and 'resource allocation competence'. These suggests that when builders with 1-5 years' experience are able to select good workers, enforce quality and safety, the artisans supervised would be more productive in terms of collaboration and team work, work development and promotion, safety at work, practical skill and resource allocation. The p-values less than the significant value of 0.05 indicated that the resulting associations were not by chance.

Table 5 shows that among builder with 6-10 years' experience 'selecting the workers' and 'reading and understanding the drawings' correlated significantly with 'integration/reflexive competence' and

'collaboration and team working ability' of artisans. 'Good knowledge of work routine' and' knowing and enforcing quality' correlated with 'speed and efficiency competence', 'practical competence', and 'waste avoidance & minimization ability'.

Table 5: correlation of artisanal productive knowledge and supervisory functions of builders with 6-10 years' experience

Variable correlated	TWV	Mean	SD	R	P-value	Decision
Selecting the workers,	**53**	**3.313**	**1.195**			
speed and efficiency competence	57	3.563	0.892	-0.189	0.482	Accept
integration/reflexive competence	55	3.438	1.031	0.987	0.001	Reject
practical competence	54	3.375	0.885	0.003	0.990	Accept
waste avoidance and minimization ability	53	3.313	0.793	0.081	0.765	Accept
collaboration and team working ability	53	3.313	1.014	0.975	0.001	Reject
Good knowledge of work routine	**52**	**3.250**	**0.842**			
speed and efficiency competence	57	3.563	0.892	0.876	0.001	Reject
integration/reflexive competence	55	3.438	1.031	0.091	0.737	Accept
practical competence	54	3.375	0.885	0.953	0.001	Reject
waste avoidance and minimization ability	53	3.313	0.793	0.976	0.001	Reject
collaboration and team working ability	53	3.313	1.014	-0.007	0.980	Accept
Knowing & enforcing quality	**52**	**3.250**	**0.775**			
speed and efficiency competence	57	3.563	0.892	0.793	0.001	Reject
integration/reflexive competence	55	3.438	1.031	0.209	0.438	Accept
practical competence	54	3.375	0.885	0.861	0.001	Reject
waste avoidance and minimization ability	53	3.313	0.793	0.870	0.001	Reject
collaboration and team working ability	53	3.313	1.014	0.099	0.714	Accept
Reading & understanding the drawings	**51**	**3.188**	**1.047**			
speed and efficiency competence	57	3.563	0.892	0.068	0.802	Accept
integration/reflexive competence	55	3.438	1.031	0.619	0.011	Reject
practical competence	54	3.375	0.885	0.273	0.305	Accept
waste avoidance and minimization ability	53	3.313	0.793	0.303	0.253	Accept
collaboration and team working ability	53	3.313	1.014	0.537	0.032	Reject

This suggests that when builders with 6-10 years' experience are able to select workers, interpret drawings with good knowledge of work routine and quality, the artisans supervised would be more productive in terms of adaptation to situations, collaboration and team work, speed and efficiency at work, practical capability and waste control. The p-values less than the

significant value of 0.05 indicated that the resulting associations were not by chance.

Table 6 shows that among builder with 11-15 years' experience 'reading and understanding the drawings' ,'knowing and enforcing safety' and 'knowing and enforcing quality' all correlated with 'practical competence', 'collaboration and team working ability' and 'creative competence', while 'directing worker tasks and responsibilities' correlated with 'practical competence' and 'collaboration and team working ability'.

Table 6: correlation of artisanal productive knowledge and supervisory functions of builders with 11-15 years' experience

Variable correlated	TW	Mean	SD	R	P-value	Decision
Reading & understanding the drawings	**69**	**3.632**	**1.165**			
practical competence	62	3.263	1.368	0.920	0.001	Reject
collaboration and team working ability	62	3.263	1.284	0.885	0.001	Reject
leadership/control competence	61	3.211	0.855	-0.018	0.942	Accept
creative competence	60	3.158	1.344	0.917	0.001	Reject
cross-discipline awareness	60	3.158	0.834	-0.064	0.795	Accept
Knowing & enforcing safety	**67**	**3.526**	**1.124**			
practical competence	62	3.263	1.368	0.959	0.001	Reject
collaboration and team working ability	62	3.263	1.284	0.925	0.001	Reject
leadership/control competence	61	3.211	0.855	-0.070	0.776	Accept
creative competence	60	3.158	1.344	0.933	0.001	Reject
cross-discipline awareness	60	3.158	0.834	-0.133	0.587	Accept
Knowing & enforcing quality	**65**	**3.421**	**1.017**			
practical competence	62	3.263	1.368	0.899	0.001	Reject
collaboration and team working ability	62	3.263	1.284	0.912	0.001	Reject
leadership/control competence	61	3.211	0.855	-0.162	0.508	Accept
creative competence	60	3.158	1.344	0.869	0.001	Reject
cross-discipline awareness	60	3.158	0.834	-0.134	0.583	Accept
Directing worker tasks and	**63**	**3.316**	**1.108**			
practical competence	62	3.263	1.368	0.459	0.048	Reject
collaboration and team working ability	62	3.263	1.284	0.474	0.040	Reject
leadership/control competence	61	3.211	0.855	-0.232	0.339	Accept
creative competence	60	3.158	1.344	0.438	0.060	Accept
cross-discipline awareness	60	3.158	0.834	-0.287	0.233	Accept

These suggest that when builders with 11-15 years' experience are able to interpret the drawings, enforce safety and quality with adequate knowledge of directing worker tasks, the artisans supervised would be more productive in terms of practical capability, collaboration and team work, and

creativity at work. The results show that the resulting associations were not by chance as p-values were less than the significant value of 0.05.

Table 7 shows that among builder with 16-20 years' experience 'directing worker tasks and responsibilities' and 'co-ordination between workers and managers' correlated with, 'safety consciousness', collaboration and team working ability' and 'leadership/control competence'. 'knowing and enforcing quality' correlated with 'creative competence' and 'practical competence, while 'selecting the workers' correlated with 'collaboration and team working ability', 'creative and practical competences'

Table 7: correlation of artisanal productive knowledge and supervisory functions of builders with 16-20 years' experience

Variable correlated	T W	Mean	SD	R	P-value	Decision
Directing worker tasks and responsibilities,	**92**	**3.833**	**1.007**			
safety consciousness	82	3.417	1.100	0898	0.001	Reject
collaboration and team working ability	81	3.375	1.173	0905	0.001	Reject
creative competence	79	3.292	0.999	0.322	0.125	Accept
practical competence	78	3.250	0.989	0.283	0.181	Accept
leadership/control competence	77	3.208	1.285	0.933	0.001	Reject
Knowing & enforcing quality	**89**	**3.708**	**0.859**			
safety consciousness	82	3.417	1.100	0.143	0.506	Accept
collaboration and team working ability	81	3.375	1.173	0.159	0.459	Accept
creative competence	79	3.292	0.999	0.870	0.001	Reject
practical competence	78	3.250	0.989	0.863	0.001	Reject
leadership/control competence	77	3.208	1.285	0.116	0.588	Accept
Selecting the workers,	**88**	**3.667**	**1.167**			
safety consciousness	82	3.417	1.100	0.327	0.118	Accept
collaboration and team working ability	81	3.375	1.173	0.418	0.042	Reject
creative competence	79	3.292	0.999	0.575	0.003	Reject
practical competence	78	3.250	0.989	0.622	0.001	Reject
leadership/control competence	77	3.208	1.285	0.385	0.064	Accept
Co-ordination between workers & managers	**87**	**3.625**	**1.096**			
safety consciousness	82	3.417	1.100	0.775	0.001	Reject
collaboration and team working ability	81	3.375	1.173	0.781	0.001	Reject
creative competence	79	3.292	0.999	0.182	0.394	Accept
practical competence	78	3.250	0.989	0.132	0.539	Accept
leadership/control competence	77	3.208	1.285	0.869	0.001	Reject

These suggest that when builders with 16-20 years' experience are able direct worker tasks and responsibilities, co-ordinate between workers &

managers, enforce quality with adequate knowledge of choice of workers, the artisans supervised would be more productive in terms of safety consciousness, collaboration and team work, leadership/control, creative competence and practical capability. The resulting associations were found not to be by chance as p-values were less than the significant value of 0.05.

Table 8 shows that among builder with more than 20 years' experience 'job planning and organization of work flow', 'good knowledge of work routine' and 'knowing and enforcing safety' all correlated with, 'speed and efficiency competence', 'safety consciousness' and 'resource allocation competence', while ''directing worker tasks and responsibilities' correlated with 'practical competence' and 'leadership/control competence'. These suggest that when builders with more than 20 years' experience are able to plan, organize and direct work with good knowledge of work routine and safety the artisans supervised would be more productive in terms of 'speed and efficiency , 'safety consciousness', 'resource allocation, practical work execution and 'leadership/control ability. The resulting associations were found not to be by chance as p-values were less than the significant value of 0.05.

Table 8: correlation of artisanal productive knowledge and supervisory functions of builders with more than 20 years' experience

Variable correlated	TWV	Mean	SD	R	P-value	Decision
Job planning & organization of work flow.	**62**	**4.133**	**0.915**			
practical competence	54	3.600	1.298	0.195	0.485	Accept
leadership/control competence	52	3.467	1.407	0.226	0.419	Accept
speed and efficiency competence	51	3.400	1.056	0.896	0.001	Reject
safety consciousness	51	3.400	0.910	0.875	0.001	Reject
resource allocation competence	51	3.400	1.056	0.896	0.001	Reject
Good knowledge of work routine	**60**	**4.000**	**0.926**			
practical competence	54	3.600	1.298	0.195	0.480	Accept
leadership/control competence	52	3.467	1.407	0.239	0.392	Accept
speed and efficiency competence	51	3.400	1.056	0.783	0.001	Reject
safety consciousness	51	3.400	0.910	0.752	0.001	Reject
resource allocation competence	51	3.400	1.056	0.783	0.001	Reject
Directing worker tasks and responsibilities,	**60**	**4.000**	**1.254**			
practical competence	54	3.600	1.298	0.927	0.001	Reject
leadership/control competence	52	3.467	1.407	0.950	0.001	Reject
speed and efficiency competence	51	3.400	1.056	0.447	0.095	Accept
safety consciousness	51	3.400	0.910	0.404	0.135	Accept
resource allocation competence	51	3.400	1.056	0.447	0.095	Accept
Knowing & enforcing safety	**58**	**3.867**	**0.990**			

practical competence	54	3.600	1.298	-0.134	0.635	Accept
leadership/control competence	52	3.467	1.407	-0.113	0.689	Accept
speed and efficiency competence	51	3.400	1.056	0.567	0.027	Reject
safety consciousness	51	3.400	0.910	0.582	0.023	Reject
resource allocation competence	51	3.400	1.056	0.567	0.027	Reject

5.0 Conclusion and Recommendation

The study provided insight into how well Builders can use their supervisory competencies to affect the productive capability of construction artisans for the purpose of improving construction projects outcome in Nigeria.

The study evaluated eighteen Builders' supervisory functions and twenty two critical knowledge requirements of artisans through the perception of project managers. It was found that the levels of supervisory functions which attained the cut-off level among builders vary increasingly in accordance with the years spent on the job. The result is an indication that the competencies of the builders increase with increase in job experience, and the implication of this is that if the job experience of a builder is not properly considered before assigning complex jobs (with many artisans and activities) not so much may be achieved in terms of project outcomes.

It was also found that the utilisation of productive knowledge identified by artisans supervised by builders vary somehow in accordance with the experience of the Builders who supervise them. The result is an indication that the experience acquired on the job has influence on how productive knowledge is imparted on artisans. The implication of this finding is that if project managers do not take the level of the productive competence of artisans into consideration before assigning supervisors, the expected optimum project outcome may not be realized.

It was found that significant correlations exist among some artisanal productive knowledge and supervisory functions of builders, which suggest that when builders with very few years of experience are able to select good workers, enforce quality and safety, the artisans supervised would be more productive in terms collaboration and team work, work development & promotion, safety at work, practical skill and resource allocation, when builders have acquired moderate years of experience are able to select workers, interpret drawings with good knowledge of work routine and quality, the artisans supervised would be more productive in terms of adaptation to situations, collaboration and team work, speed and efficiency at work, practical capability and waste control. When builders with many years of experience are able to interpret the drawings, enforce safety and quality with adequate knowledge of directing worker tasks, the artisans supervised would be more productive in terms of practical capability, collaboration and team work, and creativity at work. When builders with very many years

of experience are able direct worker tasks and responsibilities, co-ordinate between workers & managers, enforce quality with adequate knowledge of choice of workers, the artisans supervised would be more productive in terms of safety consciousness, collaboration and team work, leadership/control, creative competence and practical capability. When builders with more than very many years of experience are able to plan & organization and direct work with good knowledge of work routine and safety, the artisans supervised would be more productive in terms of 'speed and efficiency, 'safety consciousness', 'resource allocation, practical work execution and 'leadership/control ability. Consequent upon the findings of this study it is concluded that the competencies of builders increase with increase in job experience, while the productive knowledge utilized by artisans increased with increase in the supervisory competencies of the supervisors, therefore if the job experience of a builder is not properly considered before assigning complex jobs or if project managers do not take the level of the productive competence of artisans into consideration before assigning supervisors, the expected optimum project outcome may not be realized.

It is therefore recommended that developers and project managers should adequately assess thejob experience of a builder before assigning supervisory functions on complex jobs. They should also take the level of the productive competence of artisans into consideration before assigning appropriate supervisors, so as to achieve the expected optimum project outcome. It is also recommended that the professional bodies should provide enabling environment for retraining and increasing the experience and supervisory competence of builders.

6.0 Limitations of the Study

This study is limited to the eighteen Builders' supervisory functions and twenty two critical knowledge requirements of artisans selected from literature and the views of 84 project managers or their representatives who were considered as chief project administrators who returned their questionnaire. The result from this study can be improved upon by studying other construction stakeholders and more Builders' competencies not covered in this study. In spite of these limitations the result could provide reasonable insight into how Builders supervisory competencies can affect the productive capability of construction artisans for enhanced construction projects performance in Nigeria. It can also serve as guide for further studies.

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