**Influence of Construction Crafts’ Skills Acquisition and Critical Knowledge Development on Project Performance in Nigeria**

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**Abstract**

This study evaluated the nature and influence of construction skill acquisition practices on workers productive knowledge and construction projects performance, with a view to aiding the development of the skills foundation for increased quantity quality of artisans in Nigeria. The objectives are to evaluate: the use of skill acquisition practices among artisans, influence of skill acquisition practices on productive knowledge development and relationship between the artisanal productive knowledge level and performance of construction projects. A stratified purposive survey of 510 artisans with structured questionnaire resulted in 423 valid responses. This consists of Masons (87), Carpenters (79), Iron-bender/welders (73), Painters (58), Plumbers (66), and Electricians (60). Data were analysed using descriptive, severity index, Kruskal Wallis and spearman correlation tests. It was concluded that only 33% of the identified skill acquisition practices have significant level of use with all the artisans having the similar opinions about the use of the skill acquisition practices. The levels of use of majority of the skill acquisition methods do not result in adequate attainment of the required artisanal productive knowledge, which do not significantly contribute to the performance of construction projects in Nigeria. The study therefore recommends that stakeholders should evolve skill acquisition policies which involve public- private partnership, and Government should develop national schemes for the recognition of skills through the assessment and certification of skills with appropriate knowledge, and encourage young women to enter apprenticeships to check occupational segregation and provide equitable and high-quality training for both young men and women.

**Keywords:** Artisans;Construction craft; Critical knowledge; skill acquisition; Skill shortage; Project performance

**INTRODUCTION**

The construction industry in Nigeria has been noted to contribute significantly to its overall development. Building and construction sector is one of the top five sectors used in measuring the National Gross Capital Formation (NGCF) and the Gross Domestic Product (GDP) of any country and its effect on every other sectors, makes it a significant front for sustainable development (Isa, Jimoh and Achuenu, 2013). More significantly, human resources have been observed to be central to the performance of the construction industry of most nations (Lerman, 2013). Odediran and Babalola (2013) similarly, observed that availability of manpower in both qualitative and quantitative terms is very crucial and constitutes the second largest single component of resource input required by the construction industry. The study also opined that manpower required for construction varies professionals like Architects, Builders, Engineers, Quantity Surveyors, Urban and Regional Planners, Estate Managers to construction craftsmen like bricklayers/masons, carpenters, welders/iron-benders, house painters, plumbers, electricians and others with their helpers or labours. Bamisile (2004) observed that in spite of advancement in technology, plant and equipment and in particular robotics, the construction industry is one of the few that still relies on the skills of artisans. Okuntade (2014) observed that despite the importance of construction technicians to the industry, a large number of them still remain untrained, even though the construction industry, all over the world, have been implementing skills acquisition programme to meet with the demand of sporadic change in technologies.

Studies have equally opined that the human resources in many developing countries are of insufficient quantity and quality to promote or even accommodate high rates of economic and infrastructural development necessitated by high population growth and sustainable national development. Odediran and Babalola (2013) observed that, the types of manpower mostly needed in large quantity for housing construction in Nigeria and globally are artisans and labours. The craftsmen in the construction industry play a crucial role in the practical realisation of any construction project, they are mostly engaged in the technical aspect of construction and at the management level serve as frontline managers (supervisor); giving the role of interpreting the company policies into practical realization of the organizational goal of employer (Abiola, 2004). Iro, Inuwa and Dantong (2013) also noted that construction craftsmen are operatives who contribute skillfully with their hands in the practical realization of a project in the construction industry. Hence the need for enhanced skill development has been advocated to contain unpredictable workloads in the construction industry and reduce high costs involved in keeping idle labour.

International Labour Organisation, ILO (2008) has also established skills developments to be central to maintaining both productivity and employment growth in developing as well as in developed economies. It is important in combating poverty and maintaining competitiveness and employability in the construction industry. Uwaifo (2009) similarly opined that vocation and technical skills enhance the relevance of individuals in the society, promote their economic survival and vibrancy thereby playing vital role in the development of the society. Okuntade (2014) also recently observed that employers crave for workers with many skills who can handle a wide range of responsibilities, as thriving in the current dynamic and constantly changing technological world demands radical restructuring with the responsibility of imparting skills and knowledge to trainees.

 National Heritage Training Group (NHTG)(2005) has established among developed countries that traditional building crafts skills are some of most prized asset of the construction industry in the past handed down from generation to generation, but now threatened by decline. It was further observed that the shortage of skilled craftspeople has highlighted the need for strong action to prevent further erosion of construction skills base. A study by Eneh (2010) in south east Nigeria revealed a palpable decrease in technical apprenticeship practice and artisanal product and services. The study observed that artisans are aging and younger ones are not taking over from them, generating the fear and concern that, in the next two decades artisans may completely disappear from the development landscape of the country. Ogbeifun (2011) in a study in South Africa noted that the dearth of skilled artisans in the construction industry is because the public sectors are not too active in training artisans, while the informal sectors’ approach is not coordinated.

For the construction industry in Nigeria to be able to service the economy, it has to parade competent hands in its operations, which includes credible, qualified and competent craftsmen.

Hence, the need to train operatives has become imperative so as to meet its responsibility in the economy.

Previous studies in Nigeria had been directed to the challenge of productivity in the Nigerian Construction industry. For instance, Olateju (1992) studied the effect which training had on the productivity of construction artisans in south-western Nigeria; Olatunji *et al* (2000) studied the effects of training on the performance of construction craftsmen in south-western Nigeria. Lawal and Kolawole (2004) investigated the productivity of the Nigerian public service construction artisans, Eneh (2010) examined the implication of declining technical apprenticeship and artisan service on Nigeria’s future development, Usman *et al.* (2012) evaluated the training of contractors craftsmen for productivity improvement in Nigeria, Odediran and Babalola (2013) investigated the employment structure of informal construction workers/artisans in Nigeria, Iro *et al*. (2013) investigated into contractors craftsmen training in the Nigerian construction industry while, Okuntade (2014) investigated the relevance of building construction technician training to modern construction industry in Nigeria. Much emphasis has not been directed on the extent of use and effectiveness of the skill acquisition practices, as well as the influence of the current extent of skill acquisition on workers critical knowledge and performance of construction projects. This study therefore aims at broadening and deepening the understanding of the nature, and influence of construction crafts skill acquisition practices on workers productive knowledge and construction projects performance with a view to aiding the development of the skills foundation so as to increase both the quantity and the productivity of labour employed in the Nigerian construction industry.

**Objectives of the study**

The objectives of the study are to:

1. Evaluate the extent of use of skill acquisition practices among construction artisans,
2. Assess the influence of skill acquisition practices on the productive knowledge requirements of construction artisans, and
3. Evaluate the relationship between the productive knowledge level of construction artisans and the performance of construction projects in Nigeria

**Development of the Hypotheses**

Three hypotheses were postulated for testing in this study. The first states the there is no significant variation in the perception of extent of use of skill acquisition practices among artisans, the second states that there is no significant correlation between the level of use of skill acquisition practices and level of productive knowledge acquired, while the third hypothesis states that there is no significant correlation between the level of productive skills acquired and the performance of the construction projects.

**SKILL AND SKILL ACQUSITION PRACTICES**

Skill is defined as the necessary competencies that can be expertly applied by a worker based on dexterity, practical knowledge, theoretical knowledge and social ability (Wachira, Root, Bowen and Olima, 2008). Grugulis (2007) observed that skill which is possessed through qualification, experience and expertise enables a worker to fulfill the tasks associated with his respective occupation. Eneh (2010) also opined that the acquisition of vocational and technical skills enhance the relevance and functionality of an individual, promote their economic survival and vibrancy thereby playing a crucial role in the development of a society. Skills according to Usman *et al.* (2012) can be acquired through different forms of training- defining training as giving teaching and practice to a person or persons in order to bring him or her to a desired standard of behavior, efficiency or physical condition. Several skill acquisition practices have been identified by researchers as follows: trade group training, apprenticeship programme (e.g. NDE), development training, on-the-job training, self keeping approaches, sponsor system, time release training, action research, in-house training, vestibule schools, special courses, written materials and lecture method. Others are conference/workshop method, remedial training, role playing, job rotation, apprenticeship and coaching, sensitivity training, transactional analysis and sink or swim training (Eneh, 2010; Usman *et al*., 2012; Ikediashi *et al*., 2012; Iro *et al*., 2013). The definitions of these practices have been provided in these studies which served as sources of the practices adopted in this study.

**Critical Productive Knowledge Requirements of Construction Artisans**

According to Vokes and Brennan (2013) the skill acquisition processes lead to the development of some productive knowledge necessary for certain skill behaviour of workers. These critical kinds of knowledge also referred to as the elements of competence, ability and behaviour determines how effective a worker can carry out a task assigned to him. Some of the critical knowledge identified by previous studies are: 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 (Scottish Further Education Unit, 2005; Vokes and Brennan, 2013). These therefore served as sources of the critical knowledge used as a basis of the questionnaire formulation in this study.

**METHODOLOGY**

This study is based on modern epistemological and ontological assumptions adopting an objective stand point, which focuses on discovering factual findings in the subject area by emphasizing causality and generalization. The research method is qualitative and quantitative in nature, and is appropriately in line with the positivist tradition. It conforms to the construction management field that appears to be firmly rooted within the positivist tradition that facilitates the application of either pure/or applied research in the built environment (Dainty, 2008). This study uses the exploratory and causal survey design approaches. The former approach was designed to generate basic knowledge, clarify relevant issues and uncover variables associated with the identified research problem (Babbie and Mouton, 2001). The later approach was designed to provide information on potential cause-and-effect, especially the associations or impact of one variable on another (Freedman, 2004). The process involves the use of structured questionnaires and focused group discussions. The population of the study consists of selected artisans in the building industry. The theoretical population of the study could not be defined because of lack of reliable statistics; hence, a purposive sampling technique was adopted to select artisans operating in different geopolitical zones. From the 510 samples of questionnaire administered on the study population, 423 were completed accordingly. This comprises Masons (87), Carpenters (79), Iron-bender/welders (73), Painters (58), Plumbers (66), and Electricians (60) selected by stratified purposive sampling to form the study sample. The sampling technique ensured that the sample covered some artisans operating in four of the six geopolitical zones of the country. The variables used for the study were categorised into three groups, namely: types of skill acquisition practices, productive knowledge of artisans and project performance indicator.

Data on the extent of use of skill acquisition practices, influence of skill acquisition practices on the critical knowledge of artisans, relationship between the critical knowledge level of construction artisans and project performance were collected from the construction artisans using structured questionnaires. The variables were measured on a five point Likert-scale scored as follows: nil=1, low=2, moderate=3, high=4, and very high=5.

From the severity index (SI) calculated from the above, a cut-off of 0.6 was adapted, such that SI < 0.6 is insignificant while SI ≥ 0.6 is significant (Ujene, 2014). The agreement in the perceptions of the extent of use of skill acquisition practices was analysed with Krukal Wallis tests, while the correlation between the influence of skill acquisition practices on the critical knowledge of artisans and relationship between the critical knowledge level of construction artisans and project performance were analysed using spearman rank correlation.

**PRESENTATION AND DISCUSSION OF RESULTS**

# **Features of the respondents**

The features of the artisans used for the study were investigated as a background to the understanding and discussion of the respondents used. For this purpose, five features namely: sex, age, zone of operation, highest educational qualification and years of experience were used to investigate the characteristics of the artisans. The result as presented on Table 1. shows that the percentage of the artisans who are males range between 96.6 and 100% among the zones investigated, while the females ranged between 0 and 3.4 %. The artisans with 18 years and above were about 98% of the artisans investigated, while the sampled artisans were uniformly spread across the zones investigated.

Table 1: Features of Artisans

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Sub features |  Masons | Carpenters | Iron-benders | Painters | Plumbers | Electricians | Total |
| N | % | N | % | N | % | N | % | N | % | N | % | N | % |
| Sex | Male | 85 | 97.7 | 78 | 100 | 73 | 100 | 56 | 96.6 | 67 | 100 | 59 | 98.3 | 418 | 98.8 |
| Female | 2 | 2.3 | 0 | 0 | 0 | 0 | 2 | 3.4 | 0 | 0 | 1 | 1.7 | 5 | 1.2 |
| Total | 87 | 100 | 78 | 100 | 73 | 100 | 58 | 100 | 67 | 100 | 60 | 100 | 423 | 100 |
| Age | 1-17yrs | 3 | 3.5 | 2 | 2.6 | 1 | 1.4 | 2 | 3.4 | 0 | 0 | 0 | 0 | 8 | 2.1 |
| 18-60yrs | 61 | 70.1 | 49 | 62.8 | 54 | 73.9 | 44 | 75.9 | 48 | 71.6 | 46 | 76.7 | 302 | 71.4 |
| >60yrs | 23 | 26.4 | 27 | 34.6 | 18 | 24.7 | 12 | 20.7 | 17 | 28.4 | 14 | 23.3 | 112 | 26.5 |
| Total | 87 | 100 | 78 | 100 | 73 | 100 | 58 | 100 | 67 | 100 | 60 | 100 | 423 | 100 |
| Zone of Operation | SS | 23 | 26.5 | 21 | 26.9 | 20 | 27.3 | 16 | 27.6 | 18 | 26.8 | 16 | 26.7 | 114 | 27.0 |
| SW | 21 | 24.1 | 19 | 24.4 | 18 | 24.7 | 14 | 24.1 | 16 | 23.9 | 15 | 25.0 | 103 | 24.3 |
| SE | 21 | 24.1 | 18 | 23.1 | 17 | 23.3 | 13 | 22.4 | 16 | 23.9 | 14 | 23.3 | 99 | 23.4 |
| NC | 22 | 25.3 | 20 | 25.6 | 18 | 24.7 | 15 | 25.9 | 17 | 25.4 | 15 | 25.0 | 107 | 25.3 |
| Total | 87 | 100 | 78 | 100 | 73 | 100 | 58 | 100 | 67 | 100 | 60 | 100 | 423 | 100 |
|  | FSLC | 26 | 29.9 | 19 | 24.4 | 18 | 24.7 | 15 | 25.9 | 10 | 14.9 | 9 | 15.0 | 97 | 22.9 |
| Qualification | City&Guild | 11 | 12.6 | 10 | 12.8 | 9 | 12.3 | 6 | 10.3 | 14 | 20.9 | 11 | 18.3 | 61 | 14.4 |
| O/L | 28 | 32.2 | 30 | 38.5 | 29 | 39.7 | 20 | 34.5 | 26 | 38.8 | 23 | 38.3 | 156 | 36.9 |
| OND/HND | 16 | 18.4 | 16 | 20.5 | 15 | 20.5 | 15 | 25.9 | 17 | 25.4 | 14 | 23.3 | 93 | 22.0 |
| B.Sc | 6 | 6.9 | 3 | 3.8 | 2 | 2.8 | 2 | 3.4 | 0 | 0.0 | 3 | 5.0 | 16 | 3.8 |
| Total | 87 | 100 | 78 | 100 | 73 | 100 | 58 | 100 | 67 | 100 | 60 | 100 | 423 | 100 |
| Experience | 1-5yrs | 12 | 13.8 | 11 | 14.1 | 8 | 11.0 | 7 | 12.1 | 9 | 13.4 | 8 | 13.3 | 55 | 13.0 |
| 6-10yrs | 25 | 28.7 | 19 | 24.4 | 19 | 26.0 | 14 | 24.1 | 15 | 22.4 | 12 | 20.0 | 104 | 24.6 |
| 11-15yrs | 27 | 31.0 | 29 | 37.2 | 28 | 38.4 | 20 | 34.5 | 25 | 37.3 | 24 | 40.0 | 153 | 36.2 |
| 16-20yrs | 16 | 18.4 | 15 | 19.2 | 14 | 19.2 | 14 | 24.1 | 16 | 23.9 | 13 | 21.7 | 88 | 20.8 |
| >20yrs | 7 | 8.0 | 4 | 5.1 | 4 | 5.4 | 3 | 5.2 | 2 | 3.0 | 3 | 5.0 | 23 | 5.4 |
| Total | 87 | 100 | 78 | 100 | 73 | 100 | 58 | 100 | 67 | 100 | 60 | 100 | 423 | 100 |

The result also shows that majority of the artisans are holders of ordinary level and first school leaving certificate, while majority of them have experience range between 6 and 15 years. The result indicates that majority of the artisans sampled have the required knowledge and experience for the information provided in this study.

**Evaluation of extent of use of skill acquisition practices**

In order to evaluate the extent of use of skill acquisition practices among construction artisans, twenty skill acquisition practices were identified from literature. Respondents were then requested to indicate their assessment of the level of use of the skill acquisition practices. The results are presented on Table 2.

The result in Table 2 shows that about 33% of the identified skill acquisition practices have significant level of use with SI equal or greater than 0.6, while about 67% are not significantly practiced by the artisans. The result also shows that practices mostly used by the artisans are apprenticeship and coaching, On-the-job training, in-house training, apprenticeship program( NDE), special courses, development training and role playing.

Table 2: Result of extent of use of skill acquisition practices

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  MasonsN=87 | CarpentersN=78 | Iron-bendersN=73 | PaintersN=58 | PlumbersN=67 | ElectriciansN=60 | TotalN=423 |
| Skill acquisition practices | SI | Rank | SI | Rank | SI | Rank | SI | Rank | SI | Rank | SI | Rank | SI | Rank |
| Apprenticeship and coaching | 0.90 | 1 | 0.86 | 1 | 0.79 | 2 | 0.80 | 1 | 0.84 | 1 | 0.84 | 1 | 0.84 | 1 |
| On-the-job training | 0.86 | 2 | 0.84 | 2 | 0.82 | 1 | 0.80 | 1 | 0.80 | 2 | 0.80 | 2 | 0.82 | 2 |
| In-house training | 0.73 | 3 | 0.66 | 3 | 0.69 | 3 | 0.68 | 3 | 0.63 | 5 | 0.68 | 4 | 0.68 | 3 |
| Apprenticeship program( NDE) | 0.68 | 4 | 0.62 | 4 | 0.65 | 4 | 0.65 | 4 | 0.68 | 3 | 0.69 | 3 | 0.66 | 4 |
| Special courses | 0.62 | 5 | 0.62 | 4 | 0.59 | 7 | 0.61 | 6 | 0.61 | 6 | 0.67 | 5 | 0.62 | 5 |
| Development training | 0.58 | 9 | 0.58 | 8 | 0.58 | 8 | 0.62 | 5 | 0.64 | 4 | 0.62 | 8 | 0.60 | 6 |
| Role playing | 0.60 | 8 | 0.60 | 6 | 0.60 | 6 | 0.56 | 9 | 0.57 | 9 | 0.64 | 6 | 0.60 | 6 |
| Trade group training | 0.58 | 9 | 0.57 | 9 | 0.58 | 8 | 0.57 | 7 | 0.58 | 8 | 0.64 | 6 | 0.59 | 8 |
| Sponsor system | 0.61 | 7 | 0.60 | 6 | 0.57 | 10 | 0.54 | 10 | 0.61 | 6 | 0.58 | 9 | 0.59 | 8 |
| Conference/workshop method | 0.57 | 11 | 0.55 | 11 | 0.61 | 5 | 0.57 | 7 | 0.56 | 10 | 0.58 | 9 | 0.57 | 10 |
| Remedial training | 0.62 | 5 | 0.57 | 9 | 0.55 | 12 | 0.54 | 10 | 0.55 | 11 | 0.56 | 12 | 0.57 | 10 |
| Self keeping approaches | 0.54 | 13 | 0.53 | 12 | 0.57 | 10 | 0.54 | 10 | 0.50 | 14 | 0.52 | 14 | 0.54 | 12 |
| Job rotation | 0.57 | 11 | 0.53 | 12 | 0.50 | 15 | 0.50 | 17 | 0.53 | 12 | 0.57 | 11 | 0.54 | 12 |
| Sensitivity training | 0.54 | 13 | 0.53 | 12 | 0.50 | 15 | 0.51 | 13 | 0.52 | 13 | 0.56 | 12 | 0.53 | 14 |
| Time Release training | 0.50 | 16 | 0.51 | 15 | 0.48 | 17 | 0.51 | 13 | 0.50 | 14 | 0.49 | 16 | 0.50 | 15 |
| Lecture method | 0.52 | 15 | 0.48 | 18 | 0.51 | 14 | 0.51 | 13 | 0.47 | 17 | 0.49 | 16 | 0.50 | 15 |
| Action research | 0.49 | 17 | 0.50 | 16 | 0.47 | 18 | 0.51 | 13 | 0.46 | 18 | 0.49 | 16 | 0.49 | 17 |
| Vestibule schools | 0.48 | 18 | 0.49 | 17 | 0.47 | 18 | 0.46 | 20 | 0.48 | 16 | 0.52 | 14 | 0.48 | 18 |
| Sink or swim training | 0.48 | 18 | 0.47 | 19 | 0.53 | 13 | 0.50 | 17 | 0.46 | 18 | 0.46 | 20 | 0.48 | 18 |
| Transactional analysis | 0.42 | 21 | 0.46 | 20 | 0.46 | 20 | 0.49 | 19 | 0.44 | 20 | 0.46 | 20 | 0.45 | 20 |
| Written materials | 0.43 | 20 | 0.40 | 21 | 0.40 | 21 | 0.43 | 21 | 0.41 | 21 | 0.47 | 19 | 0.42 | 21 |

In order to ascertain if significant variation exist among the artisans so as to allow for generalization and confidence of views, the first hypothesis was postulated as earlier stated. The hypothesis was tested with Kruskal Wallis test at p≤0.05. The decision rule is that if p-value > 0.05, the hypothesis is accepted, but if p-value ≤ 0.05 the hypothesis is rejected. The results are presented on Table 3.

The results in Table 3 show that the p-value for the first hypothesis is 0.956 > significance level of 0.05, the null hypotheses is accepted, implying that there is no significant variation in the perception of the artisans concerning the level of use of the skill acquisition practices. The similarity in opinion may be attributable the level of education of majority of them, who mostly use the apprentice and coaching in acquiring artisanal skill.

Table 3: Results of Kruskal-Wallis test for Comparison of respondents’ perception

|  |  |
| --- | --- |
| Items compared among Artisans | Extent of use of skill acquisition practices |
| No of variables (N) | 21 |
| Mean Rank of Masons | 67.55 |
| Mean Rank of Carpenters | 62.24 |
| Mean Rank of Iron Benders | 62.07 |
| Mean Rank of Painters | 61.33 |
| Mean Rank of Plumbers | 59.24 |
| Mean Rank of Electricians | 68.57 |
| Chi-Square | 1.082 |
| P-value | 0.956 |
| Significance level | 0.050 |
| Decision | Accept |

**Influence of skill acquisition practices on the productive knowledge**

For the purpose of evaluating the influence of skill acquisition practices on the productive knowledge of construction artisans, the second hypothesis was postulated and twenty types of productive knowledge were identified from literature. Respondents were then requested to indicate their assessment of the level of attainment of the productive knowledge from the skill acquisition practices (see result in Appendix 1). The seven significant acquisition practices were then correlated with the five significantly attained productive knowledge areas. The second hypothesis was tested using the Spearman rank correlation test at p≤0.05. The decision rule for the hypothesis is that if p ≤ 0.05, the test rejects the hypothesis, but if p > 0.05, the test accepts the hypothesis. The results are presented in Table 4.

The results in Table 4 reveal that the test of correlation between apprenticeship/coaching and the significant productive knowledge have p-value range of 0.184 and 0.836 which are more than 0.05 hence accepting that there is no significant correlation, except with negotiation competence which has p-value of 0.001, implying that apprenticeship and coaching significantly influences the negotiation competence. The correlation of on-the-job training with productive knowledge shows that it significantly influences two productive knowledge (p-value =0.017 and 0.006), but did not influence three productive knowledge (p-values = 0.063 0.977 and 0.403).

Table 4: Correlation of skill acquisition practices and critical productive knowledge

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable correlated | Mean | SD | R | P-value | Decision |
| **Apprenticeship and coaching** | **4.213** | **0.952** |  |  |  |
| Practical competence | 3.352 | 0.739 | 0.055 | 0.260 | Accept |
| Collaboration and team working ability | 3.158 | 0.682 | 0.065 | 0.184 | Accept |
| Negotiation competence | 3.092 | 0.684 | 0.221 | 0.001 | Reject |
| Leadership/control competence | 3.045 | 0.699 | 0.057 | 0.244 | Accept |
| Creative competence | 2.998 | 0.789 | 0.010 | 0.836 | Accept |
| **On-the-job training** | **4.111** | **1.077** |  |  |  |
| Practical competence | 3.352 | 0.739 | 0.091 | 0.063 | Accept |
| Collaboration and team working ability | 3.158 | 0.682 | -0.001 | 0.977 | Accept |
| Negotiation competence | 3.092 | 0.684 | 0.041 | 0.403 | Accept |
| Leadership/control competence | 3.045 | 0.699 | 0.116 | 0.017 | Reject |
| Creative competence | 2.998 | 0.789 | 0.134 | 0.006 | Reject |
| **In-house training** | **3.395** | **1.054** |  |  |  |
| Practical competence | 3.352 | 0.739 | -0.036 | 0.461 | Accept |
| Collaboration and team working ability | 3.158 | 0.682 | 0.068 | 0.165 | Accept |
| Negotiation competence | 3.092 | 0.684 | 0.051 | 0.293 | Accept |
| Leadership/control competence | 3.045 | 0.699 | 0.236 | 0.001 | Reject |
| Creative competence | 2.998 | 0.789 | 0.069 | 0.154 | Accept |
| **Apprenticeship program( NDE)** | **3.305** | **1.164** |  |  |  |
| Practical competence | 3.352 | 0.739 | 0.109 | 0.025 | Reject |
| Collaboration and team working ability | 3.158 | 0.682 | 0.040 | 0.406 | Accept |
| Negotiation competence | 3.092 | 0.684 | 0.003 | 0.946 | Accept |
| Leadership/control competence | 3.045 | 0.699 | 0.222 | 0.001 | Reject |
| Creative competence | 2.998 | 0.789 | 0.161 | 0.001 | Reject |
| **Special courses** | **3.099** | **1.282** |  |  |  |
| Practical competence | 3.352 | 0.739 | 0.051 | 0.300 | Accept |
| Collaboration and team working ability | 3.158 | 0.682 | 0.052 | 0.282 | Accept |
| Negotiation competence | 3.092 | 0.684 | -0.013 | 0.787 | Accept |
| Leadership/control competence | 3.045 | 0.699 | 0.304 | 0.000 | Reject |
| Creative competence | 2.998 | 0.789 | 0.159 | 0.001 | Reject |
| **Development training** | **3.002** | **0.940** |  |  |  |
| Practical competence | 3.352 | 0.739 | 0.033 | 0.500 | Accept |
| Collaboration and team working ability | 3.158 | 0.682 | -0.052 | 0.283 | Accept |
| Negotiation competence | 3.092 | 0.684 | -0.022 | 0.645 | Accept |
| Leadership/control competence | 3.045 | 0.699 | 0.144 | 0.003 | Reject |
| Creative competence | 2.998 | 0.789 | 0.278 | 0.000 | Reject |
| **Role playing** | **3.000** | **1.211** |  |  |  |
| Practical competence | 3.352 | 0.739 | -0.108 | 0.026 | Reject |
| Collaboration and team working ability | 3.158 | 0.682 | 0.119 | 0.014 | Reject |
| Negotiation competence | 3.092 | 0.684 | 0.045 | 0.353 | Accept |
| Leadership/control competence | 3.045 | 0.699 | 0.231 | 0.000 | Reject |
| Creative competence | 2.998 | 0.789 | 0.119 | 0.014 | Reject |

The correlation of in-house training with productive knowledge shows that it significantly influences only one productive knowledge (p-value =0.001), but did not influence four productive knowledge (p-values range = 0.154 and 0.4461). The correlation of apprenticeship program with productive knowledge shows that it significantly influences three productive knowledge (p-values=0.001), but did not influence two productive knowledge (p-values = 0.406 and 0.946). The result also shows that the use of special courses as a skill acquisition method has significant influence on two productive knowledge (p-value =0.001), but did not influence three productive knowledge (p-values range = 0.282 - 0.787). The correlation of development training with productive knowledge shows that it significantly influences two productive knowledge (p-value =0.003 and 0.001), but did not influence three productive knowledge (p-values = 0.500, 0.283 and 0.645). The result also shows that the use of role playing as a skill acquisition method has significant influence on four productive knowledge (p-values <0.050), but did not influence negotiation competence with a p-value of 0.353). The result generally indicates that the present level of use of majority of the skill acquisition methods do not result in adequate attainment of the required productive knowledge of the artisans. This may be attributable to poor skill transfer and lack of interest due to emphasis on academic qualification.

**Influence of skill productive knowledge on project performance**

In order to evaluate the influence of skill productive knowledge on project performance, five indicators of project performance were selected from literature. Respondents were then requested to indicate their assessment of the level of performance of projects (Appendix 2). The performance indicators were then correlated with the five most important productive knowledge. The third hypothesis was postulated for this purpose, and was also tested with the spearman rank correlation, with same decision rule as former. The result is presented on Table 5.

Table 5 shows that the correlation of practical competence with the performance indicators gave p-values range between 0.066 and 0.517, all greater than 0.05 significant level, hence accepting the hypothesis that there is no significant correlation between this productive knowledge and project performance. This indicates that the present level of practical competence of artisans does not significantly influence the performance of project performance in Nigeria.

Table 5: Correlation of productive knowledge and level of project performance

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable correlated | Mean | SD | R | P-value | Decision |
| **Practical competence** | 3.352 | 0.739 |  |  |  |
| Quality | 3.508 | 0.797 | 0.090 | 0.066 | Accept |
| Productivity | 3.473 | 0.691 | 0.054 | 0.271 | Accept |
| Client satisfaction | 3.255 | 0.686 | 0.065 | 0.180 | Accept |
| Cost | 3.128 | 0.746 | 0.034 | 0.482 | Accept |
| Time | 3.111 | 0.766 | -0.032 | 0.517 | Accept |
| **Collaboration and team working ability** | **3.158** | **0.682** |  |  |  |
| Quality | 3.508 | 0.797 | -0.105 | 0.031 | Reject |
| Productivity | 3.473 | 0.691 | 0.137 | 0.005 | Reject |
| Client satisfaction | 3.255 | 0.686 | -0.188 | 0.000 | Reject |
| Cost | 3.128 | 0.746 | 0.081 | 0.095 | Accept |
| Time | 3.111 | 0.766 | 0.089 | 0.069 | Accept |
| **Negotiation competence** | **3.092** | **0.684** |  |  |  |
| Quality | 3.508 | 0.797 | -0.064 | 0.186 | Accept |
| Productivity | 3.473 | 0.691 | 0.083 | 0.088 | Accept |
| Client satisfaction | 3.255 | 0.686 | 0.091 | 0.061 | Accept |
| Cost | 3.128 | 0.746 | -0.028 | 0.569 | Accept |
| Time | 3.111 | 0.766 | 0.089 | 0.068 | Accept |
| **Leadership/control competence** | **3.045** | **0.699** |  |  |  |
| Quality | 3.508 | 0.797 | 0.010 | 0.838 | Accept |
| Productivity | 3.473 | 0.691 | 0.025 | 0.614 | Accept |
| Client satisfaction | 3.255 | 0.686 | -0.029 | 0.553 | Accept |
| Cost | 3.128 | 0.746 | 0.130 | 0.008 | Reject |
| Time | 3.111 | 0.766 | -0.045 | 0.359 | Accept |
| **Creative competence** | **3.000** | **0.789** |  |  |  |
| Quality | 3.508 | 0.797 | -0.055 | 0.262 | Accept |
| Productivity | 3.473 | 0.691 | 0.158 | 0.001 | Reject |
| Client satisfaction | 3.255 | 0.686 | 0.054 | 0.271 | Accept |
| Cost | 3.128 | 0.746 | 0.258 | 0.000 | Reject |
| Time | 3.111 | 0.766 | -0.070 | 0.150 | Accept |

The correlation of collaboration and team working ability with the performance criteria show that quality, productivity and client satisfaction had p-values less that the significance level. Hence, the rejection of hypothesis imply that this productive knowledge have significant influence on quality, productivity and client satisfaction, but has not significantly influenced cost and time performance. The result also shows that the correlation of negotiation competence with all the performance variables gave all the p-values greater than the significance level, hence accepting that there is no significant correlation between the productive knowledge and project performance. The result indicate that the level of negotiation competence attained by the artisans have not significantly influenced the performance of the projects. The correlation of leadership/control competence with the performance indicators shows that four of the indicators have p-values greater than the 0.05 significance level, hence accepting that there is no significant correlation, except the correlation with cost which has a p-value of 0.008 < 0.05 leading to rejection of hypothesis. The results indicate that the present level of leadership/control competence attained by artisans have not significantly influenced the other indicators of performance except for cost. The significant influence of cost may be attributed to the fact that the net effect of non performance of time, quality and productivity add up to that of cost in the long run. The result in Table 5 also shows that the correlation of creative competence with the performance indicators yielded three p-values greater than the significance level hence acceptance of hypothesis, while two were less than the significance level hence rejecting hypothesis. The result indicates that the current level of creative competence attained by the artisans have not significantly influenced quality, clients satisfaction and time performance of project, while productivity and cost have been significantly influenced by the level of creative competence attained by the artisan. The significant influence of this critical knowledge on productivity and cost of projects may be attributed to the fact that the poor creative competence of a worker reduces his ability to evolve alternative solutions to problems thereby reducing his productivity level, which eventually will increase cost. The results generally indicate that about 76% of the cases were accepted indicating no influence of critical knowledge on project performance, while about 24% were rejected indicating significant influence of critical knowledge on project performance.

**CONCLUSION AND RECOMMENDATION**

This study has evaluated the nature and influence of construction crafts skill acquisition practices on workers productive knowledge and construction projects performance with a view to aiding the development of the skills foundation so as to increase both the quantity and the productivity of labour employed in the Nigerian construction industry. It was concluded that about 33% of the identified skill acquisition practices have significant level of use with SI equal or greater than 0.6, while about 67% are not significantly practiced by the artisans. The practices mostly used by the artisans are apprenticeship and coaching, On-the-job training, in-house training, apprenticeship program (NDE), special courses, development training and role playing. It was also concluded the artisans have the same opinions about the extent of use of the skill acquisition practices. The study also concluded that that the present levels of use of majority of the skill acquisition methods do not result in adequate attainment of the required productive knowledge of the artisans. The study also concluded that the present attained levels of the productive knowledge have not significantly contributed to the performance of construction projects in Nigeria. The study therefore recommends that stakeholders should evolve skill acquisition policies which involve public- private partnership in developing relevant skills which promote productive knowledge and high levels of competences and a sufficient quantity of skilled workers to match skills supply with the demand of the construction industry.

Government should develop national schemes for the recognition of skills through the assessment and certification of skills with appropriate knowledge whether or not they were acquired in the informal or formal apprenticeship system. It is also recommended that government should encourage young women to enter apprenticeships to check occupational segregation and provide equitable and high-quality training for both young men and women to reduce male domination.

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Appendix 1: Perceptions of level of productive knowledge

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  MasonsN=87 | CarpentersN=78 | Iron-bendersN=73 | PaintersN=58 | PlumbersN=67 | ElectriciansN=60 | TotalN=423 |
| Critical knowledge required | SI | Rank | SI | Rank | SI | Rank | SI | Rank | SI | Rank | SI | Rank | SI | Rank |
| Practical competence | 0.68 | 1 | 0.69 | 1 | 0.65 | 2 | 0.64 | 3 | 0.70 | 1 | 0.64 | 3 | 0.67 | 1 |
| Collaboration and team working ability | 0.60 | 7 | 0.66 | 2 | 0.66 | 1 | 0.56 | 11 | 0.67 | 2 | 0.64 | 3 | 0.63 | 2 |
| Negotiation competence | 0.60 | 7 | 0.65 | 3 | 0.62 | 4 | 0.66 | 2 | 0.61 | 6 | 0.57 | 14 | 0.62 | 3 |
| Leadership/control competence | 0.61 | 4 | 0.54 | 5 | 0.62 | 4 | 0.62 | 5 | 0.64 | 4 | 0.64 | 3 | 0.61 | 4 |
| Creative competence | 0.61 | 4 | 0.49 | 14 | 0.63 | 3 | 0.67 | 1 | 0.63 | 5 | 0.59 | 10 | 0.60 | 5 |
| Work development & Promotion ability | 0.62 | 2 | 0.52 | 10 | 0.60 | 8 | 0.53 | 15 | 0.60 | 9 | 0.64 | 3 | 0.59 | 6 |
| Teaching competence | 0.60 | 7 | 0.61 | 4 | 0.59 | 9 | 0.56 | 11 | 0.57 | 13 | 0.63 | 7 | 0.59 | 6 |
| Communication competence | 0.59 | 10 | 0.53 | 7 | 0.57 | 13 | 0.57 | 10 | 0.61 | 6 | 0.66 | 2 | 0.59 | 6 |
| Accuracy and precision | 0.61 | 4 | 0.50 | 11 | 0.58 | 12 | 0.60 | 6 | 0.59 | 10 | 0.61 | 9 | 0.58 | 9 |
| Waste avoidance and minimization ability | 0.55 | 16 | 0.47 | 19 | 0.61 | 7 | 0.63 | 4 | 0.67 | 2 | 0.56 | 16 | 0.57 | 10 |
| Safety consciousness | 0.55 | 16 | 0.50 | 11 | 0.59 | 9 | 0.60 | 6 | 0.61 | 6 | 0.59 | 10 | 0.57 | 10 |
| Flexibility and adaptability competence | 0.62 | 2 | 0.49 | 14 | 0.56 | 14 | 0.59 | 8 | 0.57 | 13 | 0.59 | 10 | 0.57 | 10 |
| Speed and efficiency competence | 0.55 | 16 | 0.54 | 5 | 0.50 | 19 | 0.58 | 9 | 0.56 | 15 | 0.63 | 7 | 0.56 | 13 |
| Resource allocation competence | 0.55 | 16 | 0.53 | 7 | 0.62 | 4 | 0.50 | 20 | 0.59 | 10 | 0.59 | 10 | 0.56 | 13 |
| Timeliness/time allocation competence | 0.54 | 20 | 0.53 | 7 | 0.53 | 18 | 0.51 | 18 | 0.58 | 12 | 0.57 | 14 | 0.54 | 15 |
| Continuity/sustainability awareness | 0.58 | 13 | 0.49 | 14 | 0.46 | 20 | 0.54 | 13 | 0.54 | 18 | 0.67 | 1 | 0.54 | 15 |
| Foundational competence | 0.59 | 10 | 0.50 | 11 | 0.55 | 15 | 0.51 | 18 | 0.55 | 16 | 0.55 | 17 | 0.54 | 15 |
| Situational awareness | 0.59 | 10 | 0.48 | 18 | 0.59 | 9 | 0.54 | 13 | 0.50 | 20 | 0.54 | 19 | 0.54 | 15 |
| Cross-discipline awareness | 0.58 | 13 | 0.49 | 14 | 0.55 | 15 | 0.52 | 17 | 0.55 | 16 | 0.55 | 17 | 0.54 | 15 |
| Integration/reflexive competence | 0.56 | 15 | 0.45 | 20 | 0.55 | 15 | 0.53 | 15 | 0.51 | 19 | 0.53 | 20 | 0.52 | 20 |

Appendix 2: Perceptions of level of project performance

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  MasonsN=87 | CarpentersN=78 | Iron-bendersN=73 | PaintersN=58 | PlumbersN=67 | ElectriciansN=60 | TotalN=423 |
| Performance indicators | SI | Rank | SI | Rank | SI | Rank | SI | Rank | SI | Rank | SI | Rank | SI | Rank |
| Quality | 0.70 | 2 | 0.73 | 1 | 0.67 | 2 | 0.74 | 1 | 0.66 | 2 | 0.73 | 1 | 0.70 | 1 |
| Productivity | 0.78 | 1 | 0.66 | 2 | 0.67 | 1 | 0.68 | 2 | 0.67 | 1 | 0.67 | 3 | 0.69 | 2 |
| Client satisfaction | 0.70 | 2 | 0.62 | 5 | 0.60 | 4 | 0.67 | 3 | 0.62 | 3 | 0.70 | 2 | 0.65 | 3 |
| Cost | 0.63 | 5 | 0.65 | 3 | 0.66 | 3 | 0.59 | 5 | 0.56 | 5 | 0.66 | 4 | 0.63 | 4 |
| Time | 0.67 | 4 | 0.63 | 4 | 0.55 | 5 | 0.64 | 4 | 0.61 | 4 | 0.62 | 5 | 0.62 | 5 |