Examination of Non-Value Adding Activities in Public Building Construction Projects in Niger State, Nigeria

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Abstract

The Nigerian construction industry is suffering from low productivity and poor performance in terms of time, cost and quality of works which is as a result of many factors; prominent among is the presence of waste otherwise known as non-value adding activities in construction works. This study examines non-value adding activities in public building construction projects in Niger state, Nigeria. Towards this end, 150 structured questionnaires were distributed to construction professionals and contractors selected within Niger state, Nigeria. Data collected were analyzed using frequency analysis in the form of percentages, mean item score and Likerts 5 scale ranking - statistical packages for social sciences (SPSS). The findings revealed that inappropriate materials handling, poor decision-making ability, poor planning of construction activities, unethical practices amongst the construction teams and other factors resulted to non-value adding activities (waste) in public building construction projects. The presence of NVAAs in building construction projects as revealed by the findings above, has a detrimental effect on the overall construction projects output and if left unchecked; it will have severe consequences on the productivity of the industry in terms of time, cost and quality. Therefore, there is the need for effective management and monitoring of the different waste streams on a construction project which requires a detailed waste minimization strategy. The study was limited to public building construction projects in Niger state of Nigeria.

Keywords: *Construction Industry, Construction Projects, Mitigating Measures, Niger State, Non-Value Adding Activities, Waste*

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Background to the Study

A project is said to be successful if only the project remained within budgetary costs, maintained its schedule and accomplishes its technical performance (Olawale and Sun, 2010). The Nigerian construction industry is however, facing chronic problems of low productivity, poor performance of time and cost, poor safety, inferior working conditions and insufficient quality which is considered as a very critical issue by many. That is why Alwi*et al* (2002) argues that activities such as repairs, reworks and time delays etc. Which do not add value (waste) to construction work contribute to the reduction of construction work productivity. Hamzah*et al.* (2012) opined that activities that do not add values are simply a waste and should be eliminated.

Non-value adding activity (NVAA) is a term that is used to differentiate between other wastes which occurs during the construction process and physical construction waste found on-site. Non-value adding activities (NVAAs) simply mean activities that does not add value to the customer but absorb resources (Saukkorippi, 2005). According to Buzby et al.. (2002), Non-value adding activity in construction terms is synonymous to waste. This waste according to Tersine (2004), is resource and/ or money consuming, time consuming, add no value to the product and therefore undesirable. Waste also includes anything that does not add value from the perspective of the customers and should be completely eliminated. Generally, the use of resources that do not add value to the final product is directly associated with the concept of waste.

But waste goes beyond the loss of productivity due to inefficient use of labour and material. That is why; Lam et al. (2001) in Burke (2003) argue that the construction industry is associated with collective efforts spent on producing unusable or impractical project information which collectively create waste. This waste (a misleading scope definition) which according to Burke (2003) resulted from the failure to accurately interpret the clients' needs and problems. For a very long time, construction managers in the Nigerian construction industry have focused their attention on conversion processes, with little attention given to flow activities, leading to uncertain flow processes, expansion of non-value adding activities (NVAAs) and reduction of output value.

Statement of Research Problem

The present problem of non-value adding activities (NVAAs) in the Nigerian construction industry is that though NVAAs occurs in construction projects in other parts of the world and there seems to be commonality with NVAAs in other countries, the frequency of occurrence and their impacts and effects on public construction projects performance in Nigeria may differ.

Non-value adding activities (NVAAs) are considered to be problematic in the management of projects (Hamzah et al 2012). They consume resources without necessarily adding value to completed projects and can impact project performance negatively in the form of cost and time overruns.

Since construction performance affects productivity across all other sectors of the economy (Hampson, 1997), the identification of non-value adding activities (NVAAs), their causes, and a measurement of their level of importance would provide useful information that would allow management to actively reduce their negative effects in advance.

Sources of Non Value Adding Activities (NVAAS) in Building Construction Projects
Priyadarshi and Sameersinh (2012) opined that sources of wastes i.e. non value-adding activities (NVAAs) can be found in faulty design, planning, procurement, material handling operations and other processes. They further opined that major stakeholders such as architects, designers, developers, owners, and vendors influence generation of waste in their capacities. In addition, not only construction activities but also external factors such as theft and vandalism; causes waste.

However, Alwi*et al.*(2002) suggested that the sources of NVAAs can be categorized in terms of people, professional management, design and documentation, material, site operations, and physical factors. In the Nigerian construction industry; sources of NVAAs associated with people which includes inadequate trade skills, poor distribution of labour, and late supervision of work, shortage of skilled supervisors / foremen, inadequate subcontractor skills, and inexperienced inspectors is observed to be a common problem. That is why Skoyles and Skoyles (1987) observed that construction companies are not concerned about physical material wastages because they believe that waste is natural, insignificant in quantity and unavoidable. Sources of NVAAs linked to professional management include poor planning and scheduling, poor information management, poor coordination within the construction supply chain and a slow decision making process. Sources of NVAAs relative to design and documentation include poor quality site documentation, unclear specification, unclear site drawings, slow response to requests for information (RIF), design changes, and poor design. Sources of NVAAs relative to material include non-conformance to quality standards, delay of material delivery, poor material handling and inappropriate use of material. The sources of NVAAs linked to site operation includes poor site layout, outdated equipment, shortage of equipment, inappropriate construction methods, and excessive reliance on overtime in order to execute work timely. In addition, other writers such as Polat& Ballard (2004), Gul & Glenn (2004) suggested that origins of NVAAs in construction in terms of material or time can be categorized with respect to design, procurement, material handling, site operation and other construction related activities.

Causes of Non Value-Adding Activities (NVAAS) in Building Construction Projects
Han *et al.* (2007) opined that the major reason behind schedule delays and cost overruns in design and construction projects were caused by construction process waste (non-value adding activities or necessary non-value adding activities). Thus, after waste had been identified, construction practitioners need to evaluate the problem to find out the root causes of the problem (Hamzah*et al.*, 2012). The danger of not identifying the root cause is that a superficial symptom of the underlying problem may be viewed as the core problem to be solved (Fidelis and John, 2011).

Han *et al.* (2007) contend that errors and changes generally trigger NVAAs in the construction production system in the forms of interruption, productivity loss, and rework, which requires additional time and efforts (additional resources that were not originally planned for) in order to compensate for the lost time and efforts. Han *et al.* (2007) further suggest that though through a simulated model NVAAs can be identified and quantified, they can nonetheless be easily propagated into other related activities. therefore, rework in the form of 'the rework cycle' that can occur either at the design stage or on construction sites seems to pervade the construction process regardless of the project activities, types and / or location (Cooper *et al.*, 2002).

Further, Hwang *et al.* (2009) discovered that on both owner and contractor related projects on the database of the Construction Industry Institute (CII) in the USA, design error / omission appeared to be the root causes of rework among other sources that included owner change, design change, constructor error / omission, constructor change, vendor error / omission, vendor change, and transportation error. Another study that focused on the construction industry in Australia and Indonesia discovered that design changes, lack of trade's skill, slow decision making, poor coordination between project partners, poor planning and scheduling, delay in material delivery to site, inappropriate construction method, poor design, poor quality of site documentation, slow drawing revisions and distributions, unclear site drawing, unclear specification , and weather conditions individually and collectively result in NVAAs in varying degrees (Alwi *et al.*, 2002).

In his study, Nazech (2008) divided the causes of non-value adding activities (waste) into the following categories. These are: changes in design and documentation, professional management, shortages in skilled manpower, poor and improper material handling, improper work and execution, other external factors, site planning / layout, procurement: ordering and non-delivery, poor contract practices.

Objectives of the Study
The objective of this research work is to examine non-value adding activities (NVAAs) in public building construction projects in Niger State, Nigeria. The objective pursued is to identify the causes of non-value adding activities (NVAAs) in public building construction projects in Niger State, Nigeria.

Methodology of Study
This study employed the use of a well-structured closed ended questionnaire administered on selected construction participants in Niger State by the researcher. The questionnaire was aimed at assessing the perception and understanding from knowledgeable respondents that are experts in construction project administration and conversant with the issue of non-value adding activities (NVAAs) in building construction projects with the following steps:
1. Planning
2. Preparing the questionnaire
3. Choosing the respondents

4. Hand distribution and collection of questionnaire forms
5. Analyzing the data gotten from the questionnaire
6. Conclusion

After scope and objectives of this research has been determined from the literature review, a set of close ended questionnaire was developed based on what has been discussed by previous authors before. This questionnaire contains three sections A, B and C. Section A captured the background information of the respondent such as type of organization; organization structure; profession; years of experience; educational qualification and professional membership. Section B dealt with the type of procurement methods used for the project such as traditional method/open tendering system; design, bid, and build method; management contracting method; direct labour method and project management method whilst Section C assessed causes of non-value adding activities. Section C was measured on five (5) points likert type scale in ascending order. Where 1 represents very low, 2 low, 3 average, 4 high and 5 very high or 1 strongly disagreed, 2 disagreed, 3 neutral, 4 agreed and 5 strongly agreed respectively. The questionnaire forms were distributed by hand to 150 respondents. Only 117sets were returned and after careful scrutiny all were considered usable. Analysis of the data was done using frequency analysis in the form of percentage.

Results and Discussion
Data collection for the study was carried out in Niger State, Nigeria through self-administration of the study questionnaire to construction professionals working in Government ministries / parastatals, construction firms and contractors' offices by the researcher. One hundred (150) and Fifty copies of questionnaires were distributed to construction industry workers (Architects, Quantify Surveyors, Civil Engineers, Builders and Services Engineers) in building construction industries. The above respondents were randomly selected and the study survey instruments were delivered to their offices by hand delivery. The total number of one hundred and seventeen (117) questionnaires out of the distributed one hundred (150) and Fifty copies were returned. This represents 78% of the total number of questionnaires distributed which shows the effectiveness of self-administration and hand delivery.

Analysis of Respondents' Demographic Information
In this study, the questionnaire survey respondents were mostly drawn from selected employees of the Department of Public Works or Housing from various ministries, parastatals and institutions in Niger State, the few private consulting firms operating in Niger state and the general building contractors. Primarily, this section provides simple information regarding the details of respondent in relation to the type and structure of the organization, profession, and years of experience, educational qualification and professional membership of various building and civil engineering institutions that abounds in Niger State as presented in the frequency analysis result in table 1 below.

Type of Organization

The retrieved data of analysis from the survey questionnaire as shown in table 1 shows that approximately 64.1% of the respondents were from the public sector working in Government ministries, parastatals, organization and institutions in Niger state while approximately 35.9% of the respondents were from the private sector.

Organization Structure

The results from table 1 also shows that approximately 64.1% of the respondents were from client organizations; 28.2% were from contracting organizations and 7.7% were from consultancy organization in terms of the organization structure of the sampled respondents. There were no respondents from organizations that formed others.

Profession

On information regarding the profession of the sampled respondents, the result in table 1 shows that approximately 41.9% were Quantity Surveyors followed by the architects with a frequency of 21.4%, approximately 18.0% were Civil Engineers, 10.2% were Services Engineers and 8.5% of the sampled respondents were Builders.

Years of Experience

On information regarding the years of working experience of respondents in the construction industry; the result of analysis revealed that 7.7% had less than 5 years working experience, 37.6% had 6-10 years working experience, 35.0% had 11-15 years working experience and 19.7% had above 15 years working experience.

Educational Qualification

Table 1 indicates that 16.2% had National diploma, 43.6% had HND / BSc. / B. Tech, 17.9% had Post Graduate Diploma, 21.4% had MSc / M. Tech and 0.9% had Ph. D while others had 0.0%.

Professional Membership

On information regarding the professional membership of the sampled respondents, the results indicate that 41.8% were not members of any professional institutions, 55.6% were members of various professional institutions in the construction industry while 2.6% were fellows.

Table 1: Demographic Information of the Respondents

S/N	Respondents information	Frequency	Percentage
1	**Type of Organization**		
A	Public	75	64.1%
B	Private	42	35.9%
2	**Organization Structure**		
A	Client	75	64.1%
B	Consultancy	9	7.7%
C	Contracting	33	28.2%
D	Others	-	0.0%
3	**Profession**		
A	Architect	25	21.4%
B	Quantity Surveyor	49	41.9%
C	Civil Engineer	21	18.0%
D	Builder	10	8.5%
E	Services Engineer	12	10.2%
4	**Years of Experience**		
A	Less than 5 years	9	7.7%
B	6 – 10 years	44	37.6%
C	11 – 15 years	41	35.0%
D	Above 15 years	23	19.7%
5	**Educational Qualification**		
A	OND	19	16.2%
B	HND / BSc. / B. Tech	51	43.6%
C	PGD	21	17.9%
D	MSc / M. Tech	25	21.4%
E	Ph. D	1	0.9%
F	Others	-	
6	**Professional Membership**		
A	Non-member	49	41.8%
B	Associate	65	55.6%
C	Fellow	3	2.6%

Source: Field survey (2018).

Analysis of the Procurement Method Used for the Project

Information was sought from respondents on the procurement methods used for the projects; the responses of the respondents are presented in Table 2. The result reveals that only three (3) procurement methods were mostly used for the projects. 70.9% of the projects were procured through the traditional method, 7.7% of the projects were procured through design, bid and build method, no project was procured through management contracting

method, 21.4% of the projects were procured through direct labour method while no project were procured through project management method and others.

Table 2: Procurement Methods Used

S/N	Respondents information	Frequency	Percentage
A	Traditional methods/open tendering	83	70.9%
B	Design, bid and build method	9	7.7%
C	Management contracting method	0	0.0%
D	Direct labour method	25	21.4%
E	Project management method	0	0.0%
F	Others	0	0.0%

Source: Field survey (2018).

Analysis on the Causes of NVAAS on Building Projects
Table 3 present the analysis on the causes of NVAAs on building projects. The causes of NVAAs on building projects was sub divided into five sections namely: Information and documentation; Site setup; Materials and material specifications; Competency of site management personneland Contract practices.

The result from the analysis on information and documentation shows that inconsistent client requirements was ranked first with MIS of 3.932 followed by incomplete drawings/design at the time of tender and inadequate design details which was ranked second with MIS of 3.402. Contradiction in design documents was ranked third with MIS of 2.291 while Omission of item(s) from the contract documentation was ranked fourth with a MIS of 2.231 and poor dissemination of information was ranked fifth with a MIS of 2.026. This implies that the respondents agreed that Inconsistent client requirements, incomplete drawings/design at the time of tender and inadequate design details as a NVAAs in building projects in Niger are high since their MIS is between 3.10 to 4.0 while the results also show that contradiction in design documents and Omission of item(s) from the contract documentation were averagely present since their MIS is between 2.1 to 3.0 and Poor dissemination of information is low since the value is between 1.1 to 2.0.

On site setup, movement of men was ranked first with a MIS of 3.496 followed by plant and equipment wrongly located which was ranked second with a MIS of 3.153 and lack of proper site layout with MIS of 2.932 was ranked third. Poor working space with a MIS 2.897 was ranked fourth whilst dumping and storage of materials with a MIS of 2.837 was ranked fifth and last. This result also implies that the respondents agree that movement of men and plant and equipment wrongly located as a NVAA sin building projects in Niger state are high since their MIS is between 3.10 to 4.0 while lack of proper site layout, poor working space and dumping / storage of materials were at average level since their MIS is between 2.1 to 3.0.

On Materials and material specifications; the respondents ranked damages resulting from Poor storage of materials with MIS of 3.744 as first, this was followed closely by damages as a result of inappropriate material handling during construction with MIS of 3.718which was ranked second, under supply of materials required at a given time leading to delays with MIS of 3.633 was ranked third while errors in materials specifications with MIS of 2.786 came fourth and delays in materials procurement/transportation with MIS of 2.538 was ranked fifth. This mean that damages resulting from Poor storage of materials, damages as a result of inappropriate material handling during construction and under supply of materials required at a given time leading to delays as a NVAAs are high in building projects in Niger state since their MIS is between 3.10 to 4.0 while errors in materials specifications and delays in materials procurement/transportation are at average level since their MIS is between 2.1 to 3.0.

On Competency of site management personnel; the result shows that low employee morale with a MIS value of 2.983 was ranked first by the respondents. Under supply or lack of required competencies of construction workers was ranked second with a MIS value of 2.915, followed by lack of appropriate skilled site management personnel with a MIS value of 2.795 which was ranked third. Inadequate site supervision with a MIS value of 2.667 was ranked fourth. Unnecessary design changes with a MIS value of 2.658 came fifth while poor decision making ability with a MIS value of 2.222 was ranked sixth and Poor planning of construction activities with a MIS value of 2.120 was ranked seventh. Poor coordination of available resources with a MIS value of 2.094 was ranked as eighth position while lack of leadership ability with a MIS value of 1.992 came ninth and inadequate construction techniques with a MIS value of 1.974 was ranked at tenth position. Inadequate working experience with a MIS value of 1.795 was ranked eleventh and effect of climatic change/weather on personnel with a MIS value of 1.675 was ranked as twelfth. This implies that low employee morale, under supply or lack of required competencies of construction workers, lack of appropriate skilled site management personnel, inadequate site supervision, unnecessary design changes, poor decision making ability and Poor planning of construction activities were rated as average by the respondents as NVAAs present in building projects in Niger state since their MIS is between 2.10 to 3.0 while poor coordination of available resources, lack of leadership ability, inadequate construction techniques, inadequate working experience with Effect of climatic change/weather on personnel were rated as NVAAs having low presence in building projects in Niger state since their MIS is between 1.1 to 2.0

On Contract practices; unethical practices among the client, contractors and subcontractors with a MIS value of   3.667 was ranked by the respondents as first. Frequent design changes with a MIS value of 3.513 was ranked as second and rework due to sudden requirement of the client after contract approval with a MIS value of 3.197 came third. Lack of good communication system between the client and contractor with a MIS value of 2.992 was ranked fourth. Lack of cooperation on site with a MIS value of 2.590 was ranked fifth and conflict of interest with a MIS value of 2.556 was ranked sixth while not complying with all legal obligations during the contract period with a MIS value of 2.462 was ranked seventh. This implies that unethical practices among the client, contractors / subcontractors,

frequent design changes rework due to sudden requirement of the client after contract approval were rated as NVAAs having high presence in building projects in Niger state since their MIS is between 3.1 to 4.0 while lack of good communication system between the client and contractor, lack of cooperation on site, conflict of interest and not complying with all legal obligations during the contract period were rated as NVAAs having average presence in building projects in Niger state since their MIS is between 2.1 to 3.0

Table 3: Analysis on the Causes Of non-Value Adding Activities on Building Projects

S/N	Factors	Mean	Rank
1	**Information and documentation**		
A	Inconsistent client requirements	3.932	1
B	Incomplete drawings/design at the time of tender and inadequate design details	3.402	2
C	Contradiction in design documents	2.291	3
D	Omission of item(s) from the contract documentation	2.231	4
E	Poor dissemination of information	2.026	5
2	**Site setup**		
A	Movement of men	3.496	1
B	Plant and equipment wrongly located	3.153	2
C	Lack of proper site layout	2.932	3
D	Poor working space	2.897	4
E	Dumping and storage of materials	2.837	5
3	**Materials and material specifications**		
A	Damages resulting from Poor storage of materials.	3.744	1
B	Damages as a result of inappropriate material handling during construction.	3.718	2
C	Under supply of materials required at a given time leading to delays	3.633	3
D	Errors in materials specifications	2.786	4
E	Delays in materials procurement/transportation	2.538	5
4	**Competency of site management personnel**		
A	Low employee morale	2.983	1
B	Under supply or Lack of required competencies of construction workers	2.915	2
C	Lack of appropriate skilled site management personnel	2.795	3
D	Inadequate site supervision	2.667	4
E	Unnecessary design changes	2.658	5
F	Poor decision making ability	2.222	6
G	Poor planning of construction activities	2.120	7
H	Poor coordination of available resources	2.094	8
I	Lack of leadership ability	1.992	9
J	Inadequate construction techniques	1.974	10
K	Inadequate working experience	1.795	11
L	Effect of climatic change/weather on personnel	1.675	12
5	**Contract practices**		
A	Unethical practices among the client, contractors and subcontractors team	3.667	1
B	Frequent design changes	3.513	2
C	Rework due to sudden requirement of the client after contract approval	3.197	3
D	Lack of good communication system between the client and contractor	2.992	4
E	Lack of cooperation on site	2.590	5
F	Conflict of interest	2.556	6
G	Not complying with all legal obligations during the contract period	2.462	7

Source: Field survey (2018).

Conclusion

The aim of this research work is to examine non-value adding activities (NVAAs) in building construction projects in Niger State, Nigeria through the identification of the causes of non-value adding activities (NVAAs) in building construction projects in Niger State, Nigeria as objective. In achieving this objective, extensive literature review of former writers in this field was undertaken and their various NVAA causing factors were collated, sieved and adapted for use.

Thus, the data collected were subjected to examination by 117 respondents and the major findings pointed to the facts that inconsistent client requirements; incomplete drawings/design at the time of tender and inadequate design details; movement of men; plant and equipment wrongly located; damages resulting from poor storage of materials; damages as a result of inappropriate material handling during construction; under supply of materials required at a given time leading to delays; unethical practices among the client, contractors and subcontractors; frequent design changes and rework due to sudden requirement of the client after contract approval were major causes of NVAAs in building construction in Niger State, Nigeria.

In conclusion, the findings of this study in the opinion of the researcher revealed that management of building projects is centered on the competence of key project stakeholders in the construction sector. In order to forestall client induced NVAAs, the building clients should entrench the promotion of assignment of construction project management responsibilities to appropriately skilled internal experts. The use of graduates without prerequisite knowledge and experience should be avoided by the consultants as it creates poor project performance. Continuing professional development of contractor's employees should be prioritized by the Contractors. This will ensure employees suitability for the ever challenging roles in the building industry, most especially in the ability to identify the causes of NVAAs during pre-construction and construction process. This also applies to Government employees. Lean construction workshops on its practical adaptability should be constantly organized so as to drastically reduce or eliminate non-value adding activities in building construction projects. Further research should cover major the entire country in order to generalize the findings.

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