

Factors Affecting Contractor Performance: A Comparative Study of Non Value-Adding Activities in Nigeria and Indonesia

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Abstract

This study aims to investigate the incidence of non value-adding activities as it affect business performance of the construction industry in Nigeria. Non value- adding activity is used to differentiate between physical waste found on site during construction and other waste which occurs during construction process. The purpose of the paper focuses on the severity of waste and waste causes variables, deepening the awareness of contractors in order to pay close attention to them thus reducing the incidences and offering better performance. Data was collected through questionnaire targeting 100 organisations consisting of contracting organisation, project managers, client organisations and consultants. The Indonesian study used data collected from 99 respondents from 46 different contracting organisations. Statistical analysis were used to rank the importance of waste variables and waste causes variables from different stakeholders in the industry. The findings suggest that repairs on finishing works, waiting for instruction, waiting for materials and materials not meeting specifications were identified as the key waste variables, while site condition, weather and lack of subcontractors' skill were identified as key waste causing variables. These findings contribute substantial detrimental effect to project performance, thus affecting the integrity of the construction industry.

Keywords: non value –adding activities ,waste, rework, contractors, performance, Nigeria.

INTRODUCTION

Non value- adding activity is used to differentiate between physical waste found on site during construction and other waste which occurs during construction process. Non value- adding activities known as waste affect, affect project in negative ways. The issue of performance has been a challenging occurrence in construction process for quite some time. The construction industry is mainly project based and various complexities are inherent in the construction projects. It involves mainly dealing with diverse interests of multiple stakeholders and resultant changes.

These changes {variations} are considered as non value - adding endemic symptoms that seriously affects the performance and productivity aspects in construction projects (Josephson et al 2002}. The rework occurrences in construction projects are mostly from the unnecessary redoing and rectifying efforts of incorrectly implemented processes or activities (Love, 2002).

The study was carried out in the two major cities of Abuja and Lagos because of the obvious level of construction activities there. However the limitation of time and the willingness of respondent to supply necessary information continue to be an obstacle to

obtaining necessary data for a research of this nature. The personal bias of respondents coupled with their work experience may also reduce the objectivity of responses.

The construction industry is very important in the economic development of any nation especially in expanding economy like Nigeria (Ibironke, 2003). An efficient construction sector is a pre- requisite to effective national development since building civil and industrial engineering works are usually a major contributor to Gross Fixed Capital Formation, Gross Domestic Product and National Employment (Oyewobi and Ogunsemi, 2010). The growth of construction industry in Nigeria in the past two decades indicates its success in greatly contributing to the country's Gross National Product, which was 1.72 in year 2007 (Federal Bureau of Statistics). Aminudin (2006) stated that up to 30% of construction is rework, labour is used at only 40% to 60% of potential efficiency and at least 10% of materials are wasted. It was posited that rework costs could be significantly higher than figures reported in the previous literature (Love and Smith, 2006).

Measuring performance for construction projects is a complex issue. Every project is unique in terms of location, design specifications, delivery methods,

administration, and participants (Alwi et al 2002). If the most important influencing factors in any contracting organization are identified, measures can then be taken to apply them in order to upgrade the contractor's performance (Ofori and Chan, 2001).

Non Value-Adding Activities

Non Value –adding activity is used to differentiate between physical construction wastes found on site and other waste which occurs during the construction process (Sugiharto et al 2002). The concept of lean production came from the manufacturing industry, which is applied in this research in the context of Nigeria construction industry in order to assist project managers identify the incidence of non value –adding activities.

Over the years the manufacturing industry has achieved great improvement in productivity, while the construction industry productivity has remained stagnant (Lee et al 1999). The core of the new production philosophy is in the observation that there are two aspects in all production systems, and are conversions and flows. Conversions were identified as value–adding activities whereas flows were identified as non-value adding activities (Alwi et al, 2002). A value–adding activity is one that converts materials towards that which is required by the customer. A non value – adding activity is one that takes time, resources or space but does not add value to the final output. In most cases a non-value adding activity is known as waste (Green, 1999). Koskela (2000) argues that if the project participants ignored the flow aspects, it will result in significant amount of wastes, non-value adding activities and loss of value in the construction industry.

(Formoso et al 1999), Lee et al (1999), Pheng and Hui (1999) equally described the main categories of waste during construction process as reworks/repairs, defects, material allocation, unnecessary material handling and material waste. Rework in construction projects is referred to as the unnecessary effort of redoing a process or activity that was incorrectly implemented in the first instance. Rework can result from an array of factors such as errors, omissions, failure, changes, poor communication and poor coordination (Ekambaram, 2006). Rework could adversely affect the performance and productivity; and ultimately the profit margins as well. Reworks equally contribute to time and cost overruns in projects (Oyewobi et al, 2011).

METHODOLOGY

A questionnaire approach was adopted for the investigation which requires the development and dissemination of a questionnaire survey. One hundred questionnaires were sent to different contracting firms, project managers and consultants in Lagos and Abuja. Responses were requested for both ongoing

projects and recently completed in the last three years.

The survey was divided into two sections. Section A contained questions on the respondents characteristics. Section B has three divisions with the first referring to frequency of non value-adding activities. The second referred to level of effect of non value-adding activities while the third dealt with the causes of non value-adding activities. The distribution of the questionnaire was based on random sampling method. Fifty percent of the questionnaires distributed were returned.

DATA ANALYSIS

This analysis comprises of 50 respondents out of 100 questionnaires that were distributed to construction related organizations: architects, 16; contract managers, 5; contracting organizations, 13; engineers, 7; client organizations, 9 with university/polytechnic education at BSc level, 36%, and post graduate level, 64%. Considerable number of the respondents have engaged in project with contract sum over N100 million. About 52% alone had involved in over N200 million project and 38% alone had engaged in over N300 million worth of project.

The organization of the respondents are grouped into three types namely, consultancy organization, contracting organization and private client/corporate organization. From 48of 50 respondents that supplied information about organization type, 27.1 and 37.5% respectively were from consultancy and contracting organization, while 35.4% were from private client/corporate organization, among these are 28.2, 43.6, 25.6 and 2.6% sole proprietorship, partnership, limited liability and public quoted company respectively. It is estimated that about 26.1% of the respondent organizations are internationally certified, 8.7% about to be certified and 65.2% with no certification status.

For the analysis of waste variables, relative important index (RII) and analysis of variance (ANOVA) were the two methods conducted. The RII was used to rank the variables. This was computed for each variables in the analysis from the respondents' rating in the five-point like scale of 5 to 1, where 5 is the *most important* and 1, the *least important*. The computation was carried with the following formula:

$$(i) RII = \sum X_i Y_i / \sum X_i$$

Where;

\sum = summation

X_i = number of response of rating i_j

Y_i = the value of rating i ($i=1$ to 5)

From the general ranking of waste variables (table1), the respondents ranked *repairs on finishing works, waiting for instruction, waiting for materials and*

material not meeting specification as first, second and third waste variables. Other important variables on general ranking are *delay to schedule, tradesmen ineffectiveness, loss of material on site and repair on*

form work/flatwork. Unnecessary material handling and excessive accidents on site are the least waste variables.

Table 1: General Ranking of Waste Variables

No	Waste Categories	Frequency		Effect		Weighted	
		Index	Rank	Index	Rank		
A	Repair:	0.52		0.48			
1	On structural works	0.49	8	0.46	16	0.23	13
2	On foundation works	0.46	13	0.52	3	0.24	9
3	On finishing works	0.60	1	0.49	9	0.29	1
4	On formwork/flatwork	0.57	3	0.43	20	0.25	5
B	Waiting periods:	0.49		0.47			
1	Waiting for instructions	0.58	2	0.46	16	0.27	2
2	Waiting for materials	0.51	5	0.51	5	0.26	3
3	Waiting for equipment repair	0.47	12	0.50	7	0.24	9
4	Waiting for equipment to arrive	0.50	6	0.47	12	0.24	9
5	Waiting for labour	0.42	18	0.47	12	0.20	16
C	Material:	0.47		0.47			
1	Waste of raw materials on site	0.50	6	0.47	12	0.24	9
2	Material does not meet specification	0.48	10	0.55	1	0.26	3
3	Loss of material on site	0.48	10	0.53	2	0.25	5
4	Too much material handling	0.45	14	0.42	21	0.19	17
5	Unnecessary material handling	0.45	14	0.38	22	0.17	22
6	Damaged materials on site	0.43	17	0.44	19	0.19	17
D	Human resource	0.43		0.49			
1	Lack of supervisor/poor quality	0.38	21	0.51	5	0.19	17
2	Tradesmen slow/ineffective	0.49	8	0.52	3	0.25	5
3	Idle tradesmen	0.42	18	0.46	16	0.19	17
E	Operations	0.44		0.48			
1	Excessive accident on site	0.38	21	0.48	10	0.18	21
2	Equipment frequently breaks down	0.45	14	0.48	10	0.22	14
3	Unreliable equipment	0.41	20	0.50	7	0.21	15
4	Delays to schedule	0.54	4	0.47	12	0.25	5

Repair on Finishing Works

For the architects and engineers, *repair on finishing works* is identified as the 1st waste variable contributing to construction non value- adding activities. On the other hand, this is considered as the 2nd most important by client organization, 10th and 20th by the contract managers and contracting organizations, respectively. The ANOVA test indicates no significant difference in the scores and ranking of *repair on finishing works*, among the different professionals in the construction industry.

Waiting for Instructions

Waiting for instruction is the second important waste variable on general ranking but ranked differently on individual construction professionals ranking. The variable is on the 10th position according to the Architects and Client organization, meanwhile it is on 9th position for Engineers. Contract managers and Contracting organizations respectively considered it

as 21st and 16th most important variable. The scores attributed to the variables by the professionals are not statistically different as the F statistic from ANOVA test is very low.

Waiting for Materials

Architects and Client organizations ranked waiting for materials as 5th and 6th important variable to the activities on construction site. This is as well considered important by Engineers on 6th position and by Contract managers and Contracting organizations as 10th important variable. Through the ANOVA test we could not identify any difference in the level of effect cause while *waiting for materials*, among the professionals.

Material Does Not Meet Specification

Inability of materials to meet construction specification is the most important variable to the Architects and second most important variable to the

Engineers. To the Contracting organizations, inability of material to meet construction specification is considered as the third important variable while the same is the sixth and seventh variables to Client organizations and Contract managers, respectively.

Table 2: Ranking of Waste Variables According to Respondent Type

No	Waste Categories	Architect		Contract Mgr		Contr. Organ		Engineers		Client Organ.		ANOVA TEST
		Index	Rank	Index	Rank	Index	Rank	Index	Rank	Index	Rank	
A	Repair:	0.39		0.34		0.56		0.46		0.57		2.940*
1	On structural works	0.36	19	0.36	16	0.62	8	0.51	5	0.42	14	3.614**
2	On foundation works	0.39	15	0.30	20	0.67	2	0.43	13	0.71	1	3.975**
3	On finishing works	0.44	8	0.44	10	0.48	20	0.49	8	0.62	2	0.971
4	On formwork/flatwork	0.37	18	0.32	19	0.46	21	0.40	18	0.53	8	1.588
B	Waiting periods:	0.39		0.41		0.58		0.42		0.52		2.115
1	Waiting for instructions	0.43	10	0.28	21	0.55	16	0.46	9	0.51	10	1.912
2	Waiting for materials	0.45	5	0.44	10	0.60	10	0.46	9	0.56	6	1.536
3	Waiting for equipment repair	0.43	10	0.50	4	0.60	10	0.34	21	0.60	3	1.653
4	Waiting for equipment to arrive	0.39	15	0.45	7	0.58	12	0.43	13	0.48	11	1.327
5	Waiting for labour	0.38	17	0.45	7	0.57	15	0.40	18	0.58	4	1.638
C	Material:	0.38		0.43		0.55		0.42		0.49		1.212
1	Waste of raw materials on site	0.41	14	0.25	22	0.63	5	0.37	20	0.53	8	3.132*
2	Material does not meet specification	0.49	1	0.45	7	0.65	3	0.54	2	0.56	6	0.786
3	Loss of material on site	0.43	10	0.55	2	0.65	3	0.46	9	0.58	4	1.196
4	Too much material handling	0.36	19	0.40	14	0.49	18	0.46	9	0.38	19	0.834
5	Unnecessary material handling	0.36	19	0.44	10	0.42	22	0.26	22	0.44	13	1.638
6	Damaged materials on site	0.35	22	0.50	4	0.49	18	0.43	13	0.48	11	0.629
D	Human resource	0.45		0.48		0.65		0.53		0.34		2.193
1	Lack of supervisor/poor quality	0.44	8	0.60	1	0.68	1	0.54	2	0.31	20	2.946*
2	Tradesmen slow/ineffective	0.48	3	0.44	10	0.63	5	0.63	1	0.40	17	1.591
3	Idle tradesmen	0.43	10	0.40	14	0.63	5	0.43	13	0.31	20	2.121
E	Operations	0.46		0.43		0.58		0.52		0.33		1.085
1	Excessive accident on site	0.45	5	0.52	3	0.54	17	0.51	5	0.42	14	0.388
2	Equipment frequently breaks down	0.45	5	0.36	16	0.58	12	0.51	5	0.42	14	1.115
3	Unreliable equipment	0.48	3	0.48	6	0.58	12	0.54	2	0.40	17	0.670
4	Delays to schedule	0.49	1	0.36	16	0.62	8	0.43	13	0.24	22	1.939

**(*)Significant at 1% (5%)level.

Table 3 and 4 show the ranking of waste causing variables. Among the 30 identified variables, site condition, weather and lack of subcontractors skill are the first, second and third waste causing variables, respectively. The construction professionals also generally considered poor design and poor coordination among project participants as fourth and fifth causing variables.

Site Condition

The findings shows that architects, contract managers, contracting organizations and engineers are of the opinion that site condition is the most cause of waste on construction site. The consideration given to site condition as cause of waste by Client organizations is 18th among other 30 identified waste causing variables. However, we cannot identify any difference in the cause effect of this variable among the professionals on construction site.

Weather

Three groups of construction professionals, the architects, the contract managers and the client organizations believed that weather is the second contributing factor to waste on construction site. While the same is 16th and 8th cause factor by the engineers and the client organizations respectively.

Lack of Subcontractors Skill

As the third waste cause variable based on general ranking, lack of subcontractors skill is noted by the architects, engineers and client organization as the fourth waste causing variable while contract managers and contracting organizations referred to it as the eighth waste causing variable contributing to construction non-value added activities. For each of these three variables the opinions of the professionals are not statistically different.

Table 3: General Ranking of Waste Causes Variables

No	Waste Causes	Level of Effects					Level Index	Rank
		1	2	3	4	5		
A	People						0.843	
1	Lack of trade skill	8.2	14.3		8.2	69.4	.83	9
2	Poor distribution of labour	12.2	18.4	4.1	20.4	44.9	.73	27
3	Supervision too late	6.3	10.4	6.3	22.9	54.2	.82	17
4	Too few supervisors/foremen	4.1	12.2	8.2	26.5	49.0	.81	19
5	Lack of subcontractors skill	6.5	2.2	6.5	15.2	69.6	.88	3
6	Inexperienced inspector	14.9		2.1	19.1	63.8	.83	9
B	Professional management						0.833	
1	Poor planning and scheduling	8.2	10.2		18.4	63.3	.84	6
2	Poor provision of information to project	106		6.4	29.8	53.2	.83	9
3	Poor coordination among project participants	12.5		8.3	8.3	70.8	.85	5
4	Slow in making decisions	4.3	4.3	8.5	36.2	46.8	.83	9
C	Design and Documentation						0.836	
1	Poor quality site documentation	14.6	2.1		25.0	58.3	.82	17
2	Unclear specifications	10.2	4.1	6.1	18.4	61.2	.83	9
3	Unclear site drawings supplied	14.6	2.1	2.1	18.8	62.5	.83	9
4	Slow drawing revisions and distribution	10.4	2.1	8.3	35.4	43.8	.80	20
5	Design changes	4.1	6.1	6.1	32.7	51.0	.84	6
6	Poor design	8.5	4.3		17.0	70.2	.87	4
D	Material						0.468	
1	Poor quality of materials	14.3	2.0	2.0	10.2	71.4	.84	6
2	Delay of material handling site	6.1	8.2	10.2	49.0	26.5	.76	25
3	Poorly scheduled delivery of material to site	12.2	4.1	8.2	51.0	24.5	.74	26
4	Inappropriate/misuse of material	12.2	22.4	10.2	20.4	34.7	.69	28
5	Poor storage of materials	14.3	22.4	10.2	26.5	26.5	.66	29
E	Execution						0.765	
1	Too much overtime for labour	20.8	14.6	16.7	25.0	22.9	.63	30
2	Inappropriate construction methods	12.2	4.1	6.1	28.6	49.0	.80	20
3	Equipment shortage	14.3	4.1	12.2	20.4	49.0	.77	23
4	Poor equipment choice/ineffective	12.5		25.0	16.7	45.8	.77	23
5	Outdated equipment	10.4	4.2	4.2	22.9	58.3	.83	9
6	Poor site layout	10.2	6.1	4.1	18.4	61.2	.83	9
F	External						0.868	
1	Site condition	2.0	2.0	4.1	14.3	77.6	.93	1
2	Weather		4.1	14.3	16.3	65.3	.89	2
3	Damage by other participants	6.1	6.1	8.2	44.9	34.7	.79	22

Table 4: Ranking of Waste Causes Variables According to Categories of Respondent

	Waste Categories	Architect		Contract Mgr		Contr. Organ		Engineers		Client Organ.		ANOVA TEST
		Index	Rank	Index	Rank	Index	Rank	Index	Rank	Index	Rank	
A	People	0.89		0.57		0.85		0.91		0.85		2.293
1	Lack of trade skill	0.90	7	0.56	12	0.87	4	0.91	5	0.76	26	1.856
2	Poor distribution of labour	0.75	27	0.44	26	0.82	18	0.66	27	0.82	21	1.861
3	Supervision too late	0.81	23	0.60	8	0.85	8	0.86	11	0.88	11	1.126
4	Too few supervisors/foremen	0.86	13	0.56	12	0.83	12	0.83	16	0.80	22	1.658
5	Lack of subcontractors skill	0.92	4	0.60	8	0.85	8	0.93	4	0.93	4	2.037
6	Inexperienced inspector	0.88	9	0.52	17	0.87	4	0.89	8	0.85	17	1.863
B	Professional management	0.87		0.58		0.79		0.89		0.93		2.206
1	Poor planning and scheduling	0.88	9	0.56	12	0.83	12	0.91	5	0.87	13	1.699
2	Poor provision of information to project	0.91	5	0.48	23	0.73	29	0.94	1	0.93	4	5.607**
3	Poor coordination among project participants	0.88	9	0.60	8	0.83	12	0.86	11	0.98	1	1.560
4	Slow in making decisions	0.81	23	0.68	4	0.85	8	0.86	11	0.91	7	1.067
C	Design and Documentation	0.88		0.61		0.83		0.87		0.87		1.161
1	Poor quality site documentation	0.84	17	0.52	17	0.80	19	0.86	11	0.96	2	2.174
2	Unclear specifications	0.89	8	0.52	17	0.80	19	0.91	5	0.89	8	2.487
3	Unclear site drawings supplied	0.85	14	0.52	17	0.85	8	0.89	8	0.88	11	1.690
4	Slow drawing revisions and distribution	0.84	17	0.56	12	0.80	19	0.83	16	0.84	18	1.374
5	Design changes	0.91	5	0.72	3	0.87	4	0.77	22	0.80	22	1.150
6	Poor design	0.93	2	0.65	5	0.83	12	0.94	1	0.87	13	1.275
D	Material	0.75		0.51		0.78		0.76		0.77		1.319
1	Poor quality of materials	0.88	9	0.64	6	0.87	4	0.89	8	0.84	18	0.704
2	Delay of material handling site	0.78	26	0.56	12	0.77	26	0.83	16	0.80	22	1.300
3	Poorly scheduled delivery of material to site	0.79	25	0.48	23	0.77	26	0.77	22	0.76	26	1.676
4	Inappropriate/misuse of material	0.68	28	0.52	17	0.77	26	0.63	29	0.73	28	0.736
5	Poor storage of materials	0.65	29	0.36	30	0.73	29	0.69	26	0.71	30	1.731
E	Execution	0.77		0.47		0.82		0.75		0.86		2.715
1	Too much overtime for labour	0.56	30	0.40	28	0.78	22	0.54	30	0.73	28	2.499
2	Inappropriate construction methods	0.83	19	0.48	23	0.83	12	0.77	22	0.89	8	2.281
3	Equipment shortage	0.83	19	0.44	26	0.78	22	0.83	16	0.80	22	2.045
4	Poor equipment choice/ineffective	0.83	18	0.40	28	0.83	12	0.66	27	0.87	13	4.079**
5	Outdated equipment	0.83	18	0.52	17	0.88	3	0.83	16	0.93	4	2.461
6	Poor site layout	0.85	14	0.60	8	0.78	22	0.86	11	0.96	2	1.588
F	External	0.92		0.76		0.87		0.83		0.87		1.738
1	Site condition	0.98	1	0.84	1	0.93	1	0.94	1	0.87	13	0.984
2	Weather	0.93	2	0.80	2	0.90	2	0.83	16	0.89	8	0.666
3	Damage by other participants	0.85	14	0.64	6	0.78	22	0.71	25	0.84	18	1.209

**Significant at 1% level.

Table 5: Ranking of Waste Variables in the two Comparable Countries

Rank	Indonesia	Nigeria
1	Repairs on finishing works	Repairs on finishing works
2	Waiting for materials	Waiting for instruction
3	Delays to schedules	Waiting for materials ; Materials not meeting specification
4	Tradesmen slow/ineffective	
5	Waste of raw materials on site	Repairs on formwork/flatwork; loss of material on site; tradesmen slow/ineffective; delay to schedule
6	Lack of supervision/poor quality	
7	Waiting for instructions	
8	Loss of materials on site	
9	Repair on structural works	Repair on foundation works; waiting for equipment repair; waiting for equipment to arrive; waste of materials on site
10	Equipment frequently breaks down	
11	Repair on formwork	
12	Waiting for equipment repair	
13	Waiting for equipment to arrive	Repair on structural works
14	Damaged materials on site	Equipment frequently breaks down
15	Too much material inventory on site	Unreliable equipment
16	Waiting for labour	Waiting for labour
17	Material does not meet specification	Too much material handling; damaged materials on site; lack of supervisor/poor quality; idle tradesmen
18	Unnecessary material handling	
19	Unreliable equipment	
20	Idle tradesmen	
21	Repair on foundation works	Excessive accident on site
22	Excessive accident on site	Unnecessary material handling

Table 6- Ranking of Waste Causing VARIABLES in the two Comparable Countries

Rank	Indonesia	Nigeria
1	Design changes	Site condition
2	Slow in making decisions	Weather
3	Lack of trades' skill	Lack of subcontractors' skill
4	Inappropriate construction methods	Poor design
5	Delay of material delivery to site	Poor coordination among project participants
6	Poor coordination among project participants	Poor planning and scheduling; design change; poor quality of materials;
7	Poor planning and scheduling	
8	Slow drawing revision and distribution	
9	Inexperienced inspectors	Lack of trade skill; inexperienced inspector; poor provision of information to project; slow in making decisions; unclear specification; unclear site drawings supplied; outdated equipment; poor site layout
10	Unclear site drawings supplied	
11	Poorly scheduled delivery of material to site	
12	Poor design	
13	Poor quality of materials	
14	Inappropriate/misuse of material	
15	Lack of subcontractor's skill	
16	Weather	
17	Unclear specifications	Supervision too late; poor quality site documentation
18	Poor provision of information to project participants	
19	Outdated equipment	Too few supervisors/foremen
20	Equipment shortage	Slow drawing revisions and distribution; inappropriate construction methods
21	Too few supervisors/foremen	
22	Poor storage of material	Damage by other participants
23	Site condition	Equipment shortage; poor equipment choice/ineffective
24	Poor equipment choice/ineffective equipment	
25	Too much overtime for labour	Delay of material handling site
26	Poor material handling on site	Poorly scheduled delivery of material to site
27	Poor site layout	Poor distribution of labour
28	Supervision too late	Inappropriate/misuse of materials
29	Poor quality site documentation	Poor storage of materials
30	Poor distribution of labour	Too much overtime for labour
31	Damage by other participants	

DISCUSSION

Key Waste Categories Affecting Contractor's Performance

Out of the key waste categories in Indonesian construction projects, repair on finishing works was

the most significant variable in frequencies while delays to schedule was the most significant in effects. Delays can occur for a number of reasons like inclement weather, poor planning and scheduling, delay of materials to site resulting in negative impact

on project cost and estimate (Sugiharto, et al, 2002). Al-Khalil and Al-Ghaffy (1999) stated in their study that delays in project completion are a major problem leading to costly disputes and acrimonious relationships between the parties involved.

From the Nigerian construction perspective in this study, repairs on finishing works was also found to be the most significant variable as in Indonesian scenario. However, materials does not meet specification was the most significant in effects. Other variables having significant effects are loss of materials on site and ineffective tradesmen (see table 6)

Key Waste Causes Variables Affecting Contractor's Performance

In the Indonesian construction projects, the key waste causes variables are design changes, slow in making decisions, lack of trades' skill, inappropriate construction methods, delay of materials to site (see table 9). In Nigerian situation however, site condition, weather, lack of sub-contractors' skill, poor design, poor co-ordination among project participants (table 9) are the major waste causes variables. It is only in the **people (lack of trades' skill and sub-contractors' skill)** that both Indonesian and Nigerian construction projects agreed to be a significant waste causes variable. This is a major challenge in the construction industry at present resulting in reworks and delays with a negative impact on the overall performance of the industry.

CONCLUSION AND RECOMMENDATION

It is evident that many variables interplay to determine the performance of construction works. Many activities do not add value to the work such as waiting for instructions, waiting for materials, lack of coordination between supervisory personnel. This study provides a useful tool for awareness and understanding of the concept of non value-adding activities in construction works.

The incidences of non-physical waste in construction projects have been identified in this research. This is because most actors before now had a mind set of wastes that are physical in construction process. With the identification of these key waste variables and key waste causes variables, construction managers are expected to be more pro-active in their planning and work schedule. This will result in better alternative solutions thus reducing wastes, redoing/rework occurrences. The productivity of the construction industry will improve, enhancing the integrity and the image of the industry.

From the study, it is therefore recommended that thorough site investigation should be carried out before project design and construction activities. The

knowledge of average climatic condition is also important prior to commencement of work while adequate attention should be given by clients to efficiency and experience of project consultants before engagement. The sources and quality of materials to meet specifications should equally be established as an antidote to aid project performance.

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