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Professionals Perception on Causes and Effects of Non-Value Adding Activities on Infrastructure Projects Delivery in Abuja

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ABSTRACT
Non- value adding activities are the main challenges facing the Nigerian construction organisations during the course of the execution of infrastructure projects. This because Non-value adding activities, known as waste, influence projects in negative modes. Therefore, the aim of this paper is to assess the causes and effects of non-value adding activities on infrastructure projects delivery. A detailed review of relevant literature was conducted with the view of collecting relevant data necessary for this paper. A total of 150 numbers of questionnaires was distributed to Engineers, Quantity surveyors, Builders and Architects in construction firms that are based in Abuja. The descriptive method of analysis was used to analyse the data obtained from the survey. The result shows the followings as main causes of non-value adding activities on infrastructure projects delivery in Abuja. These are: (1) inconsistent client requirement, (2) damages resulting from poor storage of materials, (3) damages as a result of inappropriate materials handling during construction, (4) unethical practices among the client, contractors and subcontractors, (5) under supply of materials required at a given time leading to delay and (6) frequent design changes. In addition, the followings were established as main effects of non-value adding activities. These are: (1) time overrun, (2) additional resource allocation, (3) reduced profit, (4) client dissatisfaction, (5) overtime, (6) disruption/interruption of activity sequence and (7) cost overrun. The paper therefore, recommended that there should be proactive management strategies that will mitigate the causes and effects of non- value adding activities on infrastructure project delivery. The construction organisations should put more emphasis on training and re-training of employees through workshops, mentoring, seminars and conferences to acquire more knowledge on causes and effects of non-value adding activities.
Keywords: *Construction Organisations, Infrastructure Projects, Non-Value Adding Activities, Project Delivery and Project Performance.*

INTRODUCTION

A successful project is said to be the only project which has accomplished its technical performance, maintained its schedule and remained within budgetary costs (Olawale and sun, 2010). However, construction industry in Nigeria is 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 (Olawale and sun, 2010). That is why Alwi *et al* (2002) argues that activities which do not add value (waste) to construction work such as repairs, reworks and time delays etc. contribute to the reduction of construction work productivity. But waste goes beyond the loss of productivity due to inefficient use of labour and material. Saukkoriipi (2005) argued 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 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.

In view of the above, the study identified a problem of lack of adequate awareness of non-value adding activities by the relevant stakeholders in Nigerian construction industry. This results into inability to identify NVAAs in the construction process leading to higher incidences of NVAAs in building projects. The present problem of non-value adding activities (NVAAs) in Nigerian construction industry is that though NVAAs occurs in construction projects in other parts of the world and there

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seems to be commonality with NVAAs in other countries, the frequency of occurrence and their effects on public construction projects performance in Nigeria may differ. Since construction performance affects productivity across all other sectors of the economy (Hampson, 1997 and Alwi *et al*, 2002), 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. This study was undertaken along this direction with a view to establish the causes and effects of NVAAs on infrastructure projects delivery.

According to Olawale and sun (2010), a construction project is only considered to be successful if it could satisfy the three famous criteria: completion of projects on time, within budgeted cost and maintaining high quality standard of technical performance. since non-value adding activities such as repairs, reworks and time delays leads to time / cost overrun which contributes to the reduction of construction work productivity; there is the need to focus on non-value adding activities due to its importance to effective project delivery. In addition, so many studies have been carried out by many authors in the field of construction management on non-value adding activities in building construction projects internationally. However, because of lack of adequate knowledge of non-value adding activities by the relevant stakeholders in Nigerian construction industry; there are few published researches with regards to non-value adding activities in infrastructure projects when narrowed to Nigeria. Therefore, there is the need to fill the above stated research gap in order to give more exposure to the construction stakeholders on the identification, causes and effects of non-value adding activities on infrastructure projects.

The Non-Value Adding Activity

Alarcon (1997) defined waste as anything different from the absolute minimum amount of resources of materials, equipment and manpower, necessary to add value to the product. Serpell and Alarcon (1998) defined waste as any construction process / activities that incur cost but do not directly or indirectly add value to the construction projects. Moreover, Sawant (2016) defined waste as undesirable, time, money and / or resources consuming, and non-value adding to the product. This means that waste also includes anything that does not add value from the perspective of the customers (Hamzah *et al.*, 2012). Mahamid & Elbadawi (2014) state that, "any non-value adding activity carried out in any work system at any time can be defined as waste" and "any resources deployed in the work process which does not create utility for the stakeholders can be regarded as waste".

According to Fidelis & John (2011), the construction waste can be defined as every resource that is spent in excess, further than the strict necessary to execute a service. Hamzah *et al.*, (2012) defines construction waste as all resource consumed beyond a pre-determined value of reference for one determined period of the construction. For many years, waste in construction has also been known as the loss of productivity due to labours, inefficient use of materials, repairs and reworks that result in cost and time overruns of projects. Alwi *et al.* (2002) argues that activities which do not add value (waste) to construction work such as repairs, reworks and time delays etc. contribute to the reduction of construction work productivity. But waste goes beyond the loss of productivity due to inefficient use of labour and material. That is why; Muhwezi & Chammuriho (2012) 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

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failure to accurately interpret the clients' needs and problems. Alwi *et al.* (2002) argued that waste in the construction industry has been the subject of several research projects around the world in recent years and to date, no attempt has been made to systematically observe all forms of waste in the construction process. However, some researches have investigated specific areas of waste and the root causes (Alwi *et al.*, 2002). In most cases, Construction Managers do not know of, or recognize, the factors that produce wastes, nor do they have measurements of their own performance (Serpell *et al.*, 1998). This is because most of the factors are not observable. The identification of these factors, 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 (Alwi *et al.*, 2002). 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 of activities. This has led to uncertain flow processes, expansion of non-value adding activities (NVAAs) and reduction of output value.

Causes of Non Value-Adding Activities

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).

Effects of Non Value-Adding Activities

Alwi *et al.* (2002) concluded that non-value adding activities (NVAAs) in various forms have a detrimental effect on construction projects. Hwang *et al.* (2009) stated that, specifically; non-value adding activities (NVAAs) in the form of rework impact cost negatively, while Alwi *et al.* (2002), Horman

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and Keenly (2005), Hanah *et al.* (2005), Han *et al.* (2007), and Abdel-Razek *et al.* (2007) all concluded that non-value adding activities (NVAAs) in the form of rework impact construction productivity negatively. Horman and Keenly (2005) further contend that as much as 49.6% of construction operative time may be devoted to NVAAs. Even overtime that seems to be the norm rather than the exception in the construction industry negatively impact productivity and may increase fatigue, incidents and accidents that eventually increase the cost and time spent on construction projects (Hanah *et al.*, 2005). These non-value adding activities (NVAAs) if left unchecked may have severe consequences for the competitiveness of organizations and by extension the productivity of the industry (Alwi *et al.*, 2002) and (Koskenvesa *et al.*, 2010).

Non-value adding activities (NVAAs) have a detrimental effect on construction projects (Alwi *et al.*, 2002) and have been identified as one of the problems negatively impacting issues relative to variation (Fidelis and John, 2011). Nagapan *et al.*, (2012) in a study that focused on two completed apartment complexes in Cape Town, South Africa; determined that design changes, design errors, design omissions, and construction changes were the most frequently cited root causes of variation orders on the two projects. Furthermore, these variation orders resulted in completion delays that were approximately 33% for one project and 9% for the other project when compared with completion dates agreed upon at project inception. The variation orders also increased the project cost of the two complexes by an average of 6% when compare with budgeted project cost (Fidelis and John, 2011). In another study conducted in Cape Town, South Africa, which was quantitative in nature; research findings by Nghona *et al.* (2009) pointed out that inadequate scoping of work, unnecessary redesign of work, poor design

management, and inadequate design briefs lead to NVAAs during the design stage of construction projects. The NVAAs that were identified during the design stage do not only consume resources in an attempt to remedy the situation, they also influence activities downstream of the construction supply chain (Nghona *et al.*, 2009).

Ways of Minimizing Non-Value Adding Activities in Building Construction Projects

Waste minimization is any technique that avoids, reduces or eliminates waste at its source (Priyadarshi & Sameersinh, 2012). The construction management literature is populated with excess problems associated with the construction process to the extent that failure to attempt redress through a multi-dimensional perspective may not augur well for the industry and academia (Emuze, 2011). Hence, the efforts of researchers, especially the lean construction researchers, must be applauded in terms of performance improvement through the elimination of NVAAs (Emuze, 2011). Proponents of lean construction argue that wasteful activities in the construction processes can be identified; concessions for them can be made and this will lead to a better understanding and overall performance improvement of construction processes (Csatelo, 2007). For example, Kraemer (2007) contend that from 1993 to 2001, approximately 48% of conference papers presented at the IGLC annual conferences addressed issues surrounding value adding and non-value adding activities in construction Kraemer (2007). Still, while recognizing the efforts of the lean construction researchers, it is important to note that due to the nature and characteristics of NVAAs, their management in the construction process requires a holistic approach (Han, 2007), which attempts to correct the problems by focusing on the whole rather than individual processes/organizations involved in project objective realization

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(Senge, 2006). Therefore, to be able to eliminate NVAAs and improve construction project performance learning must recognize good performance in the past, and improve upon it systematically and continuously (Cooper, 2002). The basic improvement rationale is to compress the cycle time which includes inspection time, wait time, process time and movement time, by eliminating non-value-adding time and the only process time is when value addition takes place (Koskela, 1999). Though various management concepts that make up lean production have reviewed the numerous barriers to lean production; barriers to team work include unavailability of organizational culture that supports team work, working teams not being at par with other teams, an ill-defined focus, lack of ability to accurately measure team performance, inadequate knowledge and skills, inability to gauge team's progress, lack of group culture, individual needs and personal differences, shared vision and shared consensus (Foo *et al.*, 2013).

A detailed waste minimization strategy is required to manage and monitor the different waste streams on a construction site. To ensure its success, effectiveness and compliance with building regulations; careful planning throughout the design, build and occupancy phases is required. Prevention of waste should be the focus and this can be addressed by first identifying possible waste streams early on in the build process, and then designing for their minimization (Augustine, 2011). To ensure exact calculations of required materials are made, better communication between building professionals is essential so that waste is prevented. Once waste has been produced, the best method of managing it is through reuse either on the existing site, or a nearby site. Many materials can be usefully reclaimed, and even sold to offset the costs of a building project. Recycling materials is the final option for managing waste. Materials that

can be reused or recycled need to be identified early on the build process, and segregated for easy storage, collection and transfer (Augustine, 2011). The minimization of waste is no longer optional but a necessity with topmost priority because Wastages do not only incur extra costs to the contractors and developers; it also impacts negatively on the environment (Nizam and Yusoff, 2010). And thus; recycling has been identified as one of the best option to convert waste materials into recycled contents (Ndihokubwayo & Haput, 2008). There are growing concerns over the amount of wastes generated in the construction industry. Recycling has been identified as one of the most feasible way to overcome construction wastes and aggressive recycling of construction materials due to its numerous benefits is now being embarked by many countries most especially the developed countries. In many cases, up to 90 percent of construction wastes are now recyclable (Nizam and Yusoff, 2010).

RESEARCH METHOD

This study adopted quantitative research approach via survey questionnaire to sample individuals from a population with a view towards making statistical inference about the population using the sample (Creswell, 2011). And also to pull out public opinion, such as beliefs, perception, ideas, views and thought about the causes and effects of NVAAs on infrastructure projects delivery. In order to obtain the require population for this study, the stratified random sampling technique was adopted for the selection of the construction firms that participated in this study. This selection was in line with concept of Creswell and Tashakkori (2007) that respondents are arranged in strata for the convinienency in questionnaire distribution and assessment. In addition, the simple random sampling was adopted in each of the construction firms for the selection of construction professionals from the strata.

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The questionnaire that was used to record the responses of each respondent contained mainly closed ended questions using a five-point Likert scale ranged from very high; high, slightly high, low and none. The scores of the respondents were computed based on the variables used in the questionnaire. As earlier explained that simple random sampling techniques was adopted in each of the construction firms for the selection of construction professionals. 150 numbers of professionals in the construction firms were selected in Abuja. These professionals are: Quantity Surveyors forty numbers (40), Architects forty numbers (40), Builders forty numbers (40) and Civil Engineers thirty numbers (30). However, only one hundred and forty-four (144) numbers of those selected professionals were able to returned the questionnaire, while three (3) of the one hundred and forty-four (144) were ignored for incorrect entry. The inference statistic was adopted to summarise the sample, rather than use the data to learn about the population and sample. In this paper, inference statistic was used to present means score, standard deviation and frequency counts. The mean score was used to ranked the respondents' opinions or responses obtained.

Findings and Discussion of Results

The results of the demographic profile of the respondents that participated in this research work were presented in section 4.1 to 4.4 respectively.

Years of Experiences of Respondents in Construction Firms

Figure 1 shows that 35.94% of the respondents have 11-15 years of working experiences and 26.56% of the respondents have 6-10 years of working experiences. In addition, 16.41% of the respondents have years of working experiences within the age of 1-5 years. And 7.03% of the respondents have years of working experiences within 20 years and above. This indicates that the

majority of the respondents have working experiences in infrastructure projects. This signify that the right people were selected for this research work.

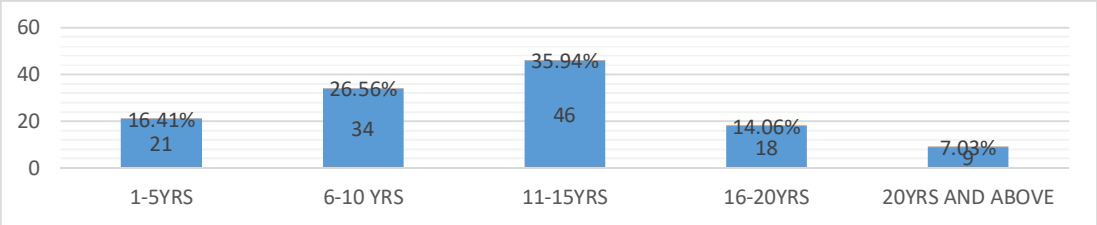

Figure 1: Years of Working Experiences in construction (Field work, 2018)

Qualification of Respondents

Figure 2 shows the followings qualification of the respondents: 35.94% of the respondents have B.Sc/B.Tech degree, 25% of the respondents have HND, 17.97% have MSc degree and 6.25% respondents have ND. This reflect that the respondents have required qualification in different background of knowledge of infrastructure projects.

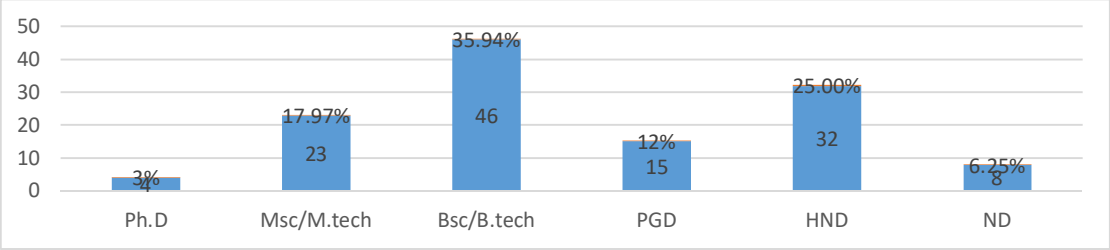

Figure 2: Qualification of Respondents (Field works, 2018)

Activities of Respondents

Figure 3 shows that 42.19% of the respondents are consultants, while 35.94% of the respondents are contractors. In addition, 21.88% of the respondents are client's representative. This implied that majority of the respondents that participated in this research work are contractors, consultants and clients. This

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indicates that the respondents are people that are frequently involved in infrastructure projects.

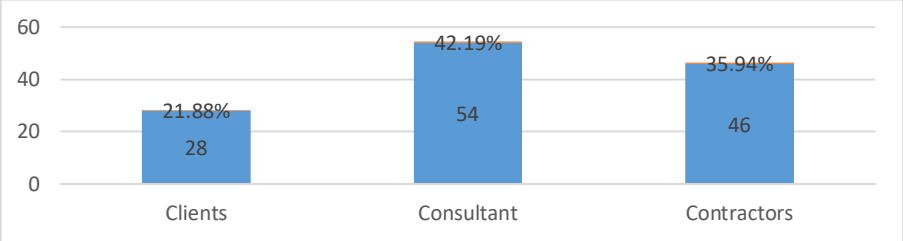

Figure 3: Activities of Respondents (Field work, 2018)

Profession of Respondents

The profession of respondents that participated in this research works were analysed in Figure 4 and the result show that 37.5% of respondents are Quantity Surveyors, 28.91% are Architect; 16.41% are Engineers and 14.06% are Builders. This reflect that the professions of the respondents are the thus that required in the infrastructure projects.

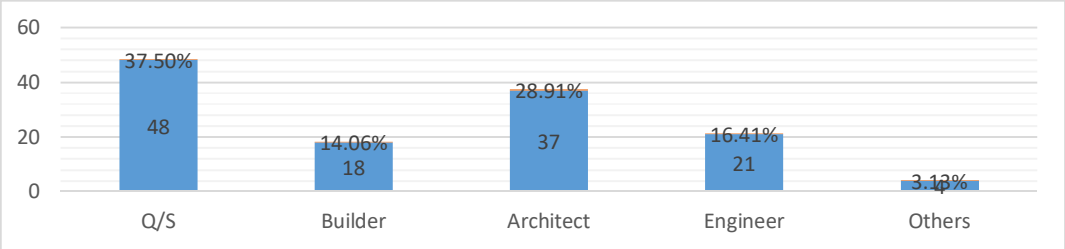

Figure 4: Profession of respondents (Field work, 2018)

The causes of Non-value adding activities on infrastructure projects

The causes of non-value adding activities on infrastructure projects delivery were examined in Table 1 with a view to establish the main causes of non-value adding activities.

Table 1: The causes of Non value adding activities on infrastructure projects

Causes	Mean	Std. Deviation	Rank
Inconsistent client requirements	3.932	1.223	1
Damages resulting from Poor storage of materials.	3.744	1.233	2
Damages as a result of inappropriate material handling during construction.	3.718	1.437	3
Unethical practices among the client, contractors and subcontractors	3.667	1.259	4
Under supply of materials required at a given time leading to delays	3.633	1.362	5
Frequent design changes	3.513	1.393	6
Movement of men	3.496	1.304	7
Incomplete drawings/design at the time of tender and inadequate design details	3.402	1.445	8
Rework due to sudden requirement of the client after contract approval	3.197	1.481	9
Plant and equipment wrongly located	3.153	1.381	10
Lack of good communication system between the client and contractor	2.992	1.441	11
Lack of proper site layout	2.932	1.513	12
Under supply or Lack of required competencies of construction workers	2.915	1.483	13
Lack of appropriate skilled site management personnel	2.795	1.229	14
Errors in materials specifications	2.786	1.502	15
Inadequate site supervision	2.667	1.396	16
Unnecessary design changes	2.658	1.463	17
Lack of cooperation on site	2.590	1.457	18
Conflict of interest	2.556	1.523	19
Delays in materials procurement/transportation	2.538	1.387	20
Not complying with all legal obligations during the contract period	2.462	1.405	21
Contradiction in design documents	2.291	1.313	22
Omission of item(s) from the contract documentation	2.231	1.185	23
Poor decision making ability	2.222	0.984	24
Poor planning of construction activities	2.120	1.035	25
Poor coordination of available resources	2.094	0.881	26
Lack of leadership ability	1.992	0.689	27
Inadequate construction techniques	1.974	0.771	28
Inadequate working experience	1.795	1.063	29

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Effect of climatic change/weather on personnel	1.675	0.741	20

Source: Field survey (2018).

Table 1 shows the followings as main causes of non-value adding activities in infrastructure projects: (1) inconsistent client requirement, (2) damages resulting from poor storage of materials, (3) damages as a result of inappropriate materials handling during construction, (4) unethical practices among the client, contractors and subcontractors, (5) under supply of materials required at a given time leading to delays (6) frequent design changes. These non-value adding activities were ranked 1st, 2nd, 3rd, 4th, 5th, & 6th with the followings mean scores of: 3.92, 3.774, 3.718, 3.667, 3.633 & 3.513 respectively. These aforementioned are the major causes of non-value adding activities in infrastructure projects. 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. Nagpan and Rahman (2016) with contrary opinion that professional management plays a very important role in contributing to non-value adding activities (waste) generation. If poor planning skills are exhibited by the management on site and less attention is paid to workers most especially during material handling on site; this problem occurs. Emuze (2011) added that inappropriate construction methods may lead to rework, concomitantly affecting worker morale through exhaustion and stress, which thusly engenders poor perfection in the construction process.

In addition, the followings were also established as causes of non-value adding activities in infrastructure projects: (1) movement of men, (2) incomplete drawings/design at the time of tender and

inadequate design details, (3) rework due to sudden requirement of the client after contract approval and (4) plant and equipment wrongly located. These non-value adding activities were ranked 7th, 8th, 9th, & 10th with followings mean score of: 3.496, 3.402, 3.197, & 3.153 respectively. These above mentioned causes are also contributing to non-value adding activities on infrastructure projects. Dajadian & Koch (2014) agreed with finding that reworks, inadequate design, cost overrun, variations and poor planning are the main causes of non-value adding activities in infrastructure projects. Aziz and Hafez (2013) argued that unnecessary handling and utilization of inadequate materials as well as terrible states of driveways may cause this sort of waste that exacerbates the occurrence of NVAAs. The followings were considered lowest causes of non-value adding activities in infrastructure projects: (1) poor coordination of available resources, (2) lack of leadership ability, (3) inadequate construction techniques, (inadequate working experiences and (5) effects of climate change/weather on personnel. These non-value adding activities were ranked 26th, 27th, 28th, 29th. & 30th with the followings mean scores of: 2.094, 1.992, 1974, 1.795 & 1.675 respectively. These causes outlined are the lowest in mean ranking in non-value activities in infrastructures. This indicate that the above mentioned causes have less impact on non-value adding activities in infrastructure projects. Dajadian and Koch (2014) were of the opinion that different types of waste are generated as a result of the various types of activities in construction projects causing the projects millions of dollars every year, which if managed properly or minimised, could actually save construction contractors a tremendous amount of money and be more profitable for firms.

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The effects of Non-value adding activities on infrastructure projects delivery

The effects of non-value adding activities on infrastructure projects delivery were examined in table 1 with a view to establish the main effects of non-value adding activities.

Table 2: The effects of Non value adding activities on infrastructure projects

EFFECTS	Mean	Std. Deviation	Rank
Time overrun	4.060	1.036	1
Additional resource allocation	3.915	1.250	2
Reduced profit	3.786	1.325	3
Client dissatisfaction	3.752	1.224	4
Overtime	3.744	1.353	5
Disruption/interruption of activity sequence	3.735	1.296	6
Cost overrun	3.667	1.152	7
Time-space conflict	3.624	1.406	8
Poor quality of work done	3.479	1.179	9
Variation and claims	3.342	1.469	10
Project abandonment	3.153	1.381	11
Damage to the environment	2.821	1.436	12
Incidents and accidents	2.812	1.414	13
Loss of future work	2.615	1.502	14

Source: Field survey (2018).

Table 2 shows the followings as main effects of non-value adding activities on infrastructure projects: (1) time overrun, (2) additional resource allocation, (3) reduced profit, (4) client dissatisfaction, (5) overtime, (6) disruption/interruption of activity sequence, (7) cost overrun, and (8) time space conflict. These effects of no-value adding activities were ranked 1^{st},2^{nd},3^{rd},4^{th},5^{th},6^{th},7^{th}, & 8^{th} with the followings mean scores of 4.060, 3.915, 3.786, 3.752, 3.744,3.735, 3.667 & 3.624 respectively. These aforementioned are the major effects of

non-value adding activities on infrastructures projects. This result was in line with the findings of Rahman & Wang (2012) that non-value adding activities have effects on the followings: (1) reduce contractor profit, (2) causes delay, (3) causes time and cost overrun, (4) poor quality and (5) disputes. Nghona, Crowe & Ndihokubwayo (2009) agreed with findings that the followings are effects of non-value adding activities. These are time/cost overruns, additional resource allocation, poor quality of work done, client dissatisfaction, reduced profit, overtime, disruption/interruption of activity sequence, time-space conflict, clash/overlapping of activities.

CONCLUSION

This paper sort to assess the non-value adding activities in infrastructure projects delivery in Abuja with a view to establish the main causes and effects of NVAAs on infrastructure projects. Thus, the paper was able to establish that, the non-adding value activities in infrastructure project delivery in Nigeria is still high. Therefore, the paper concluded by established the following as main causes of non- value adding activities on infrastructure projects delivery. These are: (1) inconsistent client requirement, (2) damages resulting from poor storage of materials, (3) damages as a result of inappropriate materials handling during construction, (4) unethical practices among the client, contractors and subcontractors, (5) under supply of materials required at a given time leading to delay and (6) frequent design changes. Furthermore, the followings were established as effects of non-value adding activities on infrastructure projects delivery. These are: (1) time overrun, (2) additional resource allocation, (3) reduced profit, (4) client dissatisfaction, (5) overtime, (6) disruption/interruption of activity sequence and (7) cost overrun. The paper therefore, suggest that there should be proactive management strategies

that will mitigate the causes and effects of non- value adding activities on infrastructure project delivery. The construction organisations should put more emphasis on training and re-training of employees through workshops, mentoring, seminars and conferences to acquire more knowledge on causes and effects of non-value adding activities. Building construction clients should ensure the promotion of assignment of construction project management responsibilities to appropriately skilled internal experts to forestall clients induced NVAAs. A similar study with wider sample sizes should be conducted and the results should be compared with the findings of this research. However, this paper contributes to the body of knowledge by established the causes and effects of non-value adding activities on infrastructure projects delivery.

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