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Professionals Perception of the Factors Causing Rework in Building Projects in Abuja

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Nigeria Construction Industry has been persistently faced with the problems of reworks in building projects. The aim of this paper is to investigate the causes of rework in building projects with a view to suggest means of reducing reworks. A total of 150 numbers of questionnaires were distributed to Engineers, Quantity surveyors, Project Managers, Construction Managers, Contractors, Consultant and Clients in construction industry in Abuja. The descriptive method of analysis was used to analyse the data obtained from the survey. The result obtained shows that poor leadership, lack of supervision, poor selection of sub-contractor, working overtime, design change, poor communication between parties and insufficient skill manpower are the main causes of rework in building projects. Similarly, the followings were established as means of reducing reworks. These includes: inadequate information and communication channels, uses of appropriate construction method, effective site management and supervision and quick decision making, systematic control mechanism, uses of experienced sub-contractor and suppliers, proper project planning and scheduling and delegation of authority. Therefore, the paper recommended that adequate attention should be focus on quality supervision, monitoring and communication between the players during the course of building projects. And also develop a systematic control mechanism that would reduce the shoddy work.

Keywords: Rework, Project delivery, Project manager, Project cost, and Building projects

Introduction

The high cost of building projects in all aspect as a result of project leadership, design changes, lack of supervision as well as reworks are problems which is becoming obvious especially in Nigeria. Moreover, Love *et al*. (2016) expressed that rework is a pervasive problem within the construction industry, but many firms are reluctant to openly acknowledge it as an issue because it can potentially damage their reputations. Love and Li. (2000) described construction rework as unnecessary effort of re-doing a process or activity that was incorrectly implemented at the first time. Construction rework can cause project costs to be higher than calculated at the start of the project (Josephson *et al.*, 2002). Nzekwe *et al.* (2015) asserted that the failure of projects due to excess rework from a cost perspective is a worrisome trend in the construction industry in Nigeria. Whereas in many cases, project cost variation is inevitable because of inflation and other unforeseen events, more often than not, poor project conception and design by themselves make it impossible to make credible estimates of the costs of materials and of the project itself (Nzekwe *et al.*, 2015). This trend has become a handy excuse for corrupt contractors and administrators who resort to varying the cost of ongoing projects in order to make money from the situation. The ultimate cost of the project after all the variations is several magnitudes higher than the initial projected cost. The inability to complete projects within the stipulated time and cost, always led to total project abandonment, cost overrun, and claims (Ogunlana, 2008).

Rework may occur as many conceived construction projects at both the design and construction stages and it could be in the form of variation, non-variation or design error or omission which may be direct or indirect (Nixon *et al.*, 2012). Reworks occurred in the building projects due to poor supervision, lack of coordination, poor communication, mistake during construction and poor contractor due to poor leadership (Love and Edward, 2004). Therefore, these effects of reworks are the motivating factors for this paper in order to identify the key factors that causes reworks with a view to establish the measures to overcome the challenges of reworks in building projects. Even though, Ajayi and Oyeyipo (2015) conducted a similar study on effects of reworks on projects performance in building projects in Lagos. And Oyewobi *et al.* (2011) conducted a study on evaluating reworks cost in Niger State. In spite of all these previous studies the challenges of reworks are still much available in Nigeria especially in Abuja. It is assumed that this study in Abuja will promote and facilitate the client to identify the real prevention measures to overcome the challenges of reworks right from the inception to the completion stage of projects to achieve the client satisfaction.

Rework

Rework is a terminology in construction dictionary literally mean to remove and correct any work that is not in conformity with the design. Rework can be referred to an activity in the field which had already been completed but need to be carried for a second time as a result of impending correction that is necessary to be carried out (Ibrahim, 2016). Fayek *et al.* (*2003*) described rework as a process of affecting a change order not due to change of scope of work by client. Rework was also revealed to be a significant factor that contributes to schedule time and cost overruns in project (Palaneeswaran *et al.*, 2007a). Burati *et al.* (1992) and Love and Li (2000) further described rework as unnecessary effort of redoing a process or activity that was non-conformance or quality deviation from the initial planned. Li and Taylor (2008) explained that rework occurred during the development process and a project can experience poor cost schedule performance. It is deduced from the above that rework is regarded as method of correcting the errors, mistakes and reinventing the wheel to meet the client satisfaction.

Classification of Rework

Palaneeswaran (2006) revealed the classification of rework in an undertaken study of construction projects to be categorized as designed and constructed. The categories included the types of the rework, the factors causing the rework and their descriptions. Love *et al.* (1998) explained types of rework in construction projects as aggravated by error made in the design process and only manifested during the procurement stage. The longer the error goes unnoticed, the greater the impact will be on the cost and schedule of the project (Love *et al.*, 2009; Ogunlana. 2008 and Jarad. 2012). The manifestation of error in most cases become evident during the incorporation stage (Palaneeswaran *et al.*, 2007b) thereby prolonging the extent of rework to be done. Similarly, omission contributes greatly to rework in a project, and this may be as a result of the work practice of the organization not incorporating sufficient project management procedure during the execution of the project. A study conducted by Love *et al.* (2009) investigated the impact of omission in construction and resource engineering projects. It was revealed that a major factor contributing to omission is the design error when discussing the design related rework.

Causes of rework in Building Projects

Smith and Jirik, (2006) highlighted that there are various factors that causes reworks in construction projects and group the causes into two such as direct causes of reworks and indirect causes of rework. The direct causes of reworks are: lack of quality supervision, lack of supervision knowledge, lack of quality work, sub-standard materials and repetitive from contract drawing. The indirect causes of reworks are: poor selection of sub-contractors, poor team

coordination, poor work sequencing and poor work protection. Love and Edward (2004) stressed that some of the factors that causes reworks are: poor communication, poor leadership, design change, variation, conflict between parties, poor financial control, insufficient skill manpower, mistake during the construction and lack of supervision. Mastenbroek (2010) added that factors that cause reworks in building projects are: leadership and communications; construction planning & scheduling; human resource capability; material & equipment supply and engineering & reviews.

The aforementioned are explained below:
(1) Leadership and Communication: there are four main factors causes rework under leadership and communication. These include lack of vertical communication between consultant or project manager, contractor/sub-contractor, foreman and the operatives/labour, poor management of the project team, lack of safety, quality assurance and quality control commitment (Love *et al.,* 1997). (2) Construction planning and scheduling: the factors that cause rework under this include, unrealistic schedule, late input by the client, untimely deliveries and insufficient commissioning and start up resourcing (Riemer, 1976 & Yang *et al.,* 2011). (3) Human Resources Capabilities: the factors that cause rework under this include fatigue, low level of skill operative, vague specifications, poor professionalism, incompetent supervision and poor planning or scheduling (Toole. 2005). (4) Materials and equipment Supply: the factors that cause rework under this include poor consideration to work specification premature delivery, poor assemblage of project components, delivery of materials to different location than where it is needed (Josephson *et al.,* 2003). (5) Engineering and Review: the factors that cause rework under this include insufficient design advancement, scope and design changes, and lack of document control errors or variation (Love *et al.,* 1997).

Mitigating Measure to Overcome Occurrence of Rework

Oyewobi *et al*. (2003) identified the following ways of reducing occurrence of rework in construction project. These are: supervision of the design process, a construction company must participate in the design process to avoid the problems related to design errors, and also providing its experience in design solutions. Mahamid (2016) added the followings means of reducing reworks in construction projects: coordination of the different construction specialist through a logic sequence of information transfer, avoiding incorrect assumptions, and giving a priority level for changes to avoid lack of coordination and improve the design compatibility. Wasfy (2010) listed out the possible means of mitigating reworks. These are **s**tandardization of design information, avoid the omissions, errors and continuous changes, these affect the normal development of the projects and control of the flow of information. Li and Taylor (2009) and Hwang *et al.* (2009) outlined the followings means of reducing reworks: delegation of authority, systematic control mechanism, information and communication strategy and uses of experience professionals.

Research Method

This paper adopted a questionnaire survey approach to pull out public opinion, such as beliefs, perception, ideas, views and thought about the factors that causes reworks in building projects in Abuja. In order to obtain the require population for this study, the stratified random sampling technique was adopted for the selection of the construction companies that participated in this study. The choice of stratified random sampling techniques was due to the fragmentation and diversification of the construction industry. And this was also 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 companies for the selection of construction players from the strata.

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 none=1, low=2, moderate=3, high=4 and very high=5. The questionnaire was divided into two parts. First part is related to demographic profile of the respondents. The second part includes list of identified factors that causes reworks in building projects and mitigating measures to overcome the challenges of reworks in building projects in Abuja. However, a total number of 150 questionnaires were distributed to Quantity Surveyors, Architects, Engineers, Project Managers, Construction Managers, Contractors, Consultants and Clients in the construction industry in Abuja. And only 112 questionnaires were filled correctly and returned, which represent 74.67% of the Questionnaires used for the analysis.

Data analysis

The descriptive method of analysis was adopted to summarise the sample, rather than use the data to learn about the population and sample. In this paper, descriptive analysis was used to present means score and standard deviation values as well as frequency counts on the data. The mean value was used to ranked the respondents' opinions or responses obtained.

Findings and Discussion of Results

Demographic Survey of the Respondents

Figure 1 the distribution of respondents' organization 34% of respondents belong to client organization while 33% each belongs to consultants and contracting organizations.

Figure 2 the profession of respondents revealed a composition of Quantity surveyors, Architects, Builders, Civil engineers, Electrical and Mechanical engineers representing 40%, 22%, 18%, 13% and 7% respectively.

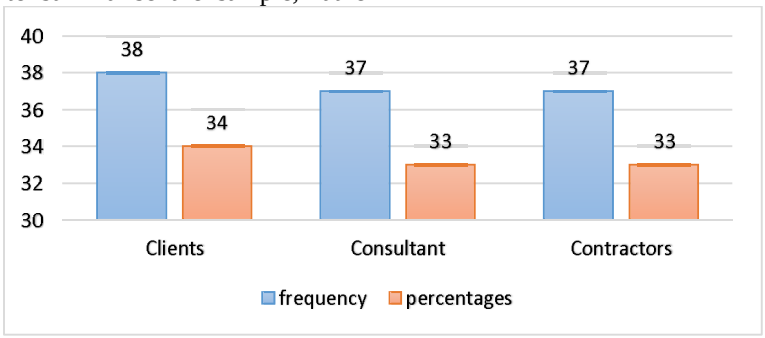

Figure 1: Nature of Respondents**.** Source: Field Work, (2 017)

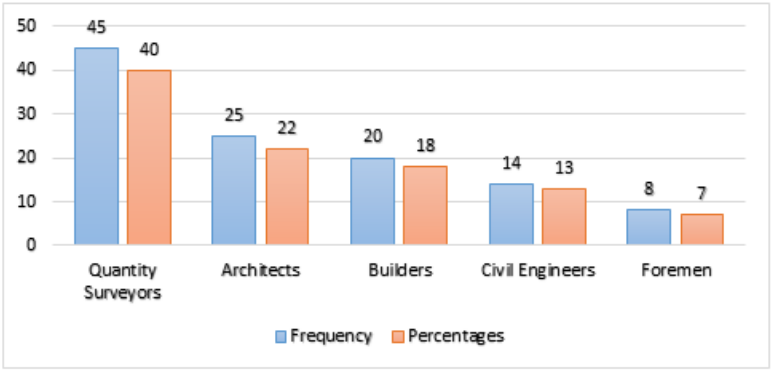

Figure 2: Respondents profession. Source: Field works, (2017)

Figure 3 show the respondent's years of working experience in the construction industry. 9% of the respondents have 1-5years working experience; 13% of the respondents have 6-10 years of working experience; 18% of the respondents have 11-15 years of working experience; 40% of the respondents have 16-20 years of working experience and 20% of the respondents have 20 & above years of working experience. This reveals that majority of the respondents have the required years of working experience in the construction industry.

The professional perception of the factors causes reworks in building projects

Table 1 shows the class range of average index obtained from the Likert scale as a decision rules used to explain the results in Table 2 & 3.

Table 2 shows the factors that causes reworks in building projects. The top ranked factors are: poor leadership, lack of supervision, poor selection of sub-contractor and working overtime. These factors were ranked 1st, 2nd, 3rd, & 4th with the mean scores of 4.86, 4.76, 4.66 & 4.61 respectively. This implies that the above-mentioned factors are main factors that cause reworks in the building projects. In addition, the followings were considered very essential factors that courses rework in building projects. These are: design changes, poor communication between parties, insufficient skill manpower, lack of professional knowledge by project managers and lack of participation of client in the design process, conflict between parties, early delivery of materials, mistakes during the construction, poor management of site and poor contractor selection. These factors were ranked 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, &14th with the mean scores of 4.42, 4.17, 4.10, 4.08, 4.05, 3.83, 3.77, 3.71, 3.61 & 3.59 respectively. This show that the above listed factors are also leading factors that causes reworks in building projects in Nigeria.

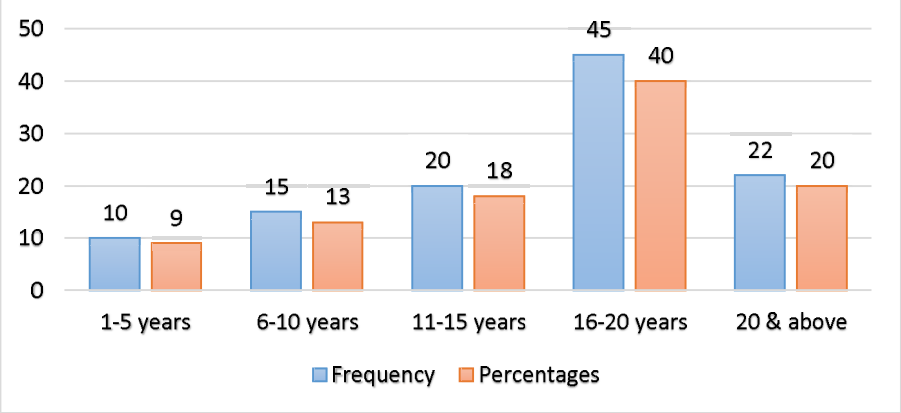

Figure 3: Respondents years of working experience**.** Source: Field works, (2017)

Table 1: Class range of Average Index

Mean Range	Likert Scale
0.00 ≤ Mean Value <1.49	None
1.5 ≤ Mean Value < 2.49	Low
2.5 ≤ Mean Value < 3.49	Moderate
3.5 ≤ Mean Value < 4.49	High
4.5 ≤ Mean Value <5.0	Very high

Source: Kasimu (2016)

Table 2: The causes of reworks in building projects

Causes of reworks	Mean	SD	Rank
Poor leadership	4.86	.341	1
Lack of supervision	4.76	.424	2
Poor selection of sub-contractor	4.66	.515	3
Working overtime	4.61	.735	4
Design changes	4.42	.713	5
Poor communication between parties	4.17	.440	6
Insufficient skill manpower	4.10	.679	7
Lack of professional knowledge by project manager	4.08	.273	8
Lack of participation of client in the design process	4.05	228	9
Conflict between parties	3.83	.890	10
Early delivery of materials	3.77	.634	11
Mistakes during the construction	3.71	.1.41	12
Poor management of site	3.61	.622	13
Poor contractor selection	3.59	.524	14
Change of government	3.38	1.35	15
Variation	2.97	1.412	16
Inflation	2.64	.315.	17
Absent of construction Data	2.54	.955	18
Design error	2.53	1.168	19
Poor financial control	2.52	.961	20
Economic recession	2.52	.905	21
Inexperience of project team	1.84	1.370	22

Source: Field Work, (2017)

Similarly, the followings were considered as least factors that causes reworks. These are: design error, poor financial control and economic recession. These factors were ranked 19th, 20th, 21st, & 22nd with the scores of 2.53, 2.52, and 1.84 respectively. This reflect that these factors ranked low have little effective on the causes of reworks in building projects. These results were in line with Love *et al*., (2016) that highlighted the followings as causes of reworks in construction projects: variation, poor leadership, poor management of site, lack of supervision and poor financial control. Similarly, Hwang *et al*., (2007) agreed with findings that causes of rework depend on the management roles in supervision, monitoring, and coordination of construction activities to accomplish the targeted. Oyewobi *et al.* (2011) argued that the causes of reworks are poor workmanship, lack of details working drawing and method of construction projects adopted. In addition, Olawale and Sun (2010) agreed with findings that the causes of rework are: delay, cost overrun and reworks are poor leadership, poor contractor selection and mistakes during construction, design change and lack of supervision of construction works. Therefore, this paper deduced the followings factors that causes rework: These are: lack of supervision, poor selection of sub-contractor, working overtime, design changes, poor communication between parties, insufficient skill manpower, lack of professional knowledge by project managers and lack of participation of client in the design process.

Table 3 shows the measures to overcome the challenges of reworks in building projects. The main measures are: proper information and communication channels, uses of appropriate construction method, effective site management and supervision, quick decision making and systematic control mechanism. These measures were ranked 1st, 2nd, 3rd, 4th, & 5th with mean scores of 4.30, 3.43, 2.95, 2.78 &2.51 respectively. This indicates that the above mentioned measures are the most imperative means of reducing reworks in the building projects.

Table 3 Measures of reducing reworks in building projects

Measures	Mean	SD	Rank
Proper information and communication channels	4.30	1.175	1
Uses of appropriate construction method	3.43	.728	2
Effective site management and supervision	2.95	1.104	3
Quick decision making	2.78	.584	4
Systematic control mechanism	2.51	.692	5
Uses of experienced subcontractor and supplier	2.32	.709	6
Proper project planning & scheduling	2.30	1.469	7
Delegation of authority	2.14	.751	8
Use of standard construction materials	2.08	.363	9
Proper financial control on site	2.05	.329	10
Effective strategic planning	2.00	.882	11
Frequent progress meeting	1.97	.552	12
Working strictly with design	1.76	1.188	13
Prompt payment of labourers	1.57	.647	14
Availability of skilled labour and construction materials	1.57	.502	15
Meeting with the stakeholders	1.41	1.117	16
Adequate knowledge of construction	1.41	.498	17
Avoid working overtime	1.22	.417	18
Prompt materials and equipment	1.14	.34	19

Source: Field Work, (2017)

Similarly, the followings measures were ranked lowest. These are: meeting with the stakeholders, adequate knowledge of construction, avoid working overtime and prompt materials and equipment. These measures were ranked 16th, 17th, 18th, &19th with mean scores of 1.41, 1.22, and 1.14 respectively. This shows that the above listed measures have little significant influence in reducing the causes of rework in the building projects. Moreover, Palanesswaram (2006) conducted a study and outlined the followings as mitigating measure to reduce reworks in construction projects such as effective strategic planning, working strictly with working drawing, proper information and communication and meeting with stakeholders. However, Love and Edward (2004) agreed with findings that the followings are the measures to reduce reworks in building projects. These are: effective site management and supervision, frequent progress meeting, availability of skilled labours and materials, use of appropriate construction method, uses of experienced sub-contractor and suppliers and adequate knowledge of construction projects. The paper therefore deduced the followings as means of reducing reworks in building projects in Nigeria. These are: proper information and communication channels, uses of appropriate construction method, effective site management and supervision, quick decision making and systematic control mechanism.

Conclusion

The factors that causes reworks in building projects are varies depend on the nature & type of projects/contractors involved. However, this paper identifies Nine (9) main causes of reworks in building projects: These are: (1) poor leadership, (2) lack of supervision, (3) poor selection of sub-contractor and (4) working overtime. Others include: (5) design change, (6) poor communication between parties, (7) insufficient skill manpower, (8) lack of professional knowledge by project managers and (9) lack of participation of client in the design process. In addition, the followings were established as means of reducing reworks in building projects.

These are: (1) proper information and communication channels, (2) uses of appropriate construction method, (3) effective site management & supervision; (4) quick decision making and (5) systematic control mechanism. Therefore, the paper recommended that adequate attention should be focus on quality supervision, monitoring and communication between the players during the course of building projects. The contractors should engage experienced and qualified professional for effective site management and supervision and also encourage the use of appropriate construction method to achieve quality project delivery. The consultant should ensure quick decision making to avoid mistakes that will result into reworks and also develop a systematic control mechanism that would reduce the shoddy work. There is need for further empirical research on the elements that causes reworks frequently and the cost implication of reworks during the construction projects. However, this paper contributes to the knowledge in the areas of causes, effects and means of reducing reworks to achieve quality projects delivery.

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