

Reaction of Poor Materials Management on Project Delay in the Construction Industry

¹Idowu Albert, ²Winston Shakantu, ³Emmanuel Dele Omopariola & ⁴Williams Dunu

^{1&2}*Department of Construction Management, Nelson Mandela University, Port Elizabeth, South*

³*Department of Construction Management and Economics, University of Cape Town, South*

⁴*Department of Civil Engineering, University of Witwatersrand, South Africa,*

Article DOI: 10.48028/iiprds/ijasepsm.v9.i1.09

Abstract

Project delay is when the construction period is prolonged beyond that which was estimated previously. When the problem of delay occurs, the companies stand to lose a large amount of money which can sometimes render the company insolvent. The study aimed to investigate the reaction of poor materials management on project delay with a view to enhancing materials management in the construction industry. The qualitative method of research inquiry that is rooted in the phenomenological paradigm was employed. The research activities included a comprehensive review of the related literature and study of selected cases. Abuja, the Federal capital territory of Nigeria was the selected scope of the research. Ten case studies were purposefully selected for the study. The research instrument was a direct observation with follow up questions used in conjunction with a tick box by the researcher. The study revealed that sub-optimal materials control leads to shortage of materials and results in delay has a negative reaction on project delay. The study recommends that construction professionals should be well informed on the reactions of poor materials management.

Keywords: *Construction, Delay, Effect, Materials Management, and Reaction*

Corresponding Author: **Idowu Albert**

Background to the Study

The present state of the construction industry in Nigeria reflects various problems, ranging from wastage of materials, poor quality of work, poor materials flow, delays in project execution/delivery, disputes, and the displacement of materials on sites, as well as poor accounting for materials (Kasim, Anumba and Dainty, 2005; Kayode, Olufemi and Olusegun, 2010; Okorochoa, 2013; Emmanuel, Ibrahim and Adogbo, 2014; and, Asmara, 2015).

Materials flow on the Nigerian construction sites is marred by the poor materials management (PMM) in the area of timing of materials arrival, lack of information for materials arriving at site, missing of materials, unavailability of storage space that makes it difficult to coordinate the storage requirements for the various sub-contractors and so forth (Donyavi and Flanagan, 2009; and, Kasim, Latiffi and Fathi, 2013).

One of the objectives of every contractor is to deliver a project on time while maximizing profit (Nguyen, Ogunlana and Thi Xuan Lan, 2004). However, the reverse is the case in many construction projects in Nigeria due to poor materials management which often increases waste generation and thereby reducing profitability, and results in project delay (Aiyetan and Smallwood, 2013). In Nigeria, the control of materials during the construction process is mostly handled carelessly by the planning and purchasing departments, site supervisors and engineers, as well as the contractor's organisation and this has been posing serious problems to contractors in term of profit margin (Dania, Kehinde and Bala, 2007; Aiyetan, 2013; and, Arijeloye and Akinradewo, 2016). Moreover, materials may be damaged or stolen during storage, unless special care is taken, delays and extra cost may be incurred and these reduce profitability (Patel, Pitroda and Bhavsar, 2015).

The delivery of any construction project within time, budget, and quality, in accordance with specifications, and to the satisfaction of stakeholders are important factors for measuring project success (Bossink and Brouwers, 1996; Dajadian and Koch, 2014; and, Hannure and Kulkarni, 2014). However, poor materials management (PMM) is an issue on every construction site which leads to project delay (Albert, Shakantu and Ibrahim, 2020). Construction waste is a problem in the Nigerian construction industry which negatively affects the performance of many projects (Adewuyi and Otali, 2013). For these reasons, this study aims to investigate the reaction of poor materials management on project delay with a view to enhancing materials management in the construction industry.

Literature Review

Project Delays

Construction project delay can be defined as the late completion of work as compared to the planned schedule or contract schedule (Obodoh and Chikasi, 2016). The delay in construction projects is a major problem negatively affecting the construction industry today (Addo, 2015). A project cannot be completed within the original schedule when the project period is delayed. Delays in construction projects may lead to either extension of time, termination of contract, non-completion, total abandonment or a combination of two or more of the factors mentioned (Akhir, *et al.* 2013; Bekr, 2014; and, Obodoh and Chikasi, 2016).

Assaf and Al-Hejji, (2006) report that the efficiency of construction projects rests on completion time but the construction process is subject to many variables and unforeseeable factors which result from many sources. These include the performance of parties, environmental conditions, resources availability, involvement of other parties, and contractual relations.

Factors causing construction delays with projects differ from country to country due to different prevailing conditions (Addo, 2015). The common conditions that could influence project delivery time are political, economic and physical factors and also level of technological development, management style and construction techniques. Sweiset *et al.* (2008) believes that there are many reasons why delays occur. They may be due to strikes, rework, shortage of materials, poor organisation, failure of equipment, change orders and acts of God.

Typology of Material Related delays in Construction

Several studies have identified factors involved in materials related delays. Fugar and Agyakwah-Baah (2010) identify shortages of materials on site or market and late delivery of material as the factors which contribute to delays. Sweis *et al.* (2008) also write that shortage of materials, delay in materials delivery, loss of materials on site which leads to delay, materials price fluctuations, modifications in materials specifications are causes that contribute to delays. A study by Obodoh and Chikasi (2016) found that factors such as shortage of construction materials, poor quality of construction materials, poor procurement of construction materials which leads to disapproval, importation of construction materials, escalation of material prices, late delivery of materials and unreliable supplies were identified as factors that caused delays in construction projects. In addition, Arantes *et al.* (2015) found that inadequate material quality increases safety incidents which leads to delay, damaged materials, shortage in materials, delay in material delivery, changes in material specifications during construction, delay in materials procurement, and change in material prices contribute to material related delays. Sunjka and Jacob (2013) further identified poor quality of materials and material shortages as a major cause of delay. Thus, in summary, the following contribute to material related delay:

- i. Shortage of construction materials in market;
- ii. Poor procurement of materials leads to disapproval;
- iii. Changes in material types and specifications during construction;
- iv. Delay in material delivery;
- v. Loss of materials on site leads to delay;
- vi. Damage of sorted material while they are needed urgently;
- vii. Delay in manufacturing special building materials;
- viii. Late procurement of materials; and,
- ix. Late selection of finishing materials due to availability of many types in market.

Effects of delays on Construction Projects

According to Sunjka and Jacob (2013), the following are effects of project delay:

1. *Time overrun*: When the stipulated completion time is pushed forward, the project is said to have experienced time overrun.

2. *Budget overrun:* When a project is completed at a cost higher than what was budgeted, it is said to experience a budget overrun.
3. *Poor quality of a completed project:* As highlighted in the previous section inferior workmanship and/or inferior quality materials, can lead to issues of project quality.
4. *Bad Public Relations:* When projects are delayed, contractors, consultants and clients could put their public reputations at risk.
5. *Litigation:* Disputes can lead to court cases for resolution especially when large penalties are at stake.
6. *Arbitration:* The cost and time related to the engagement of professional arbitrators.
7. *Disputes and claims:* Disputes and claims arise against the losses incurred through delays.
8. *Total abandonment:* Delays in project execution could lead to total abandonment if issues leading to the delays are not resolved timeously.

Therefore, the reactions of poor materials management (PMM) on project delay are as follows:

1. Sub-optimal availability which results in delay;
2. Sub-optimal materials control which leads to shortage of materials and results in delay;
3. PMM Increases health and safety incidents which leads to delay;
4. PMM increases theft/security breaches on site which leads to delay;
5. Poor materials requirement planning leads to delay;
6. Poor materials control leads to sub-optimal labour output which results in delay;
7. PMM increases incidences of disapproval by development control agencies which leads to delay.

Research Method

The research adopted the qualitative method of research inquiry. The case study approach was deemed appropriate for this research because the researcher intended an in-depth study of reaction of poor materials management on project delay on construction sites. In essence, the multiple case studies approach was instrumental in providing an understanding of poor materials management in the selected construction industry, which is the purpose of the study. More so, information about the reaction of poor materials management was obtained through direct observation with follow up questions used in conjunction with a tick box.

The population is building construction sites within Abuja, the Federal Capital Territory of Nigeria. Abuja was chosen because it has the highest population of built environment professionals in the country, and it has many on-going building construction projects. From this population, a sample of ten (10) building projects were selected, with a value of 100 million Naira and above, using the purposive non-probability sampling technique. The rationale for the selection of purposive sampling is that building construction projects of this value and above are likely to have a much more challenging materials management requirement compared with projects of less value.

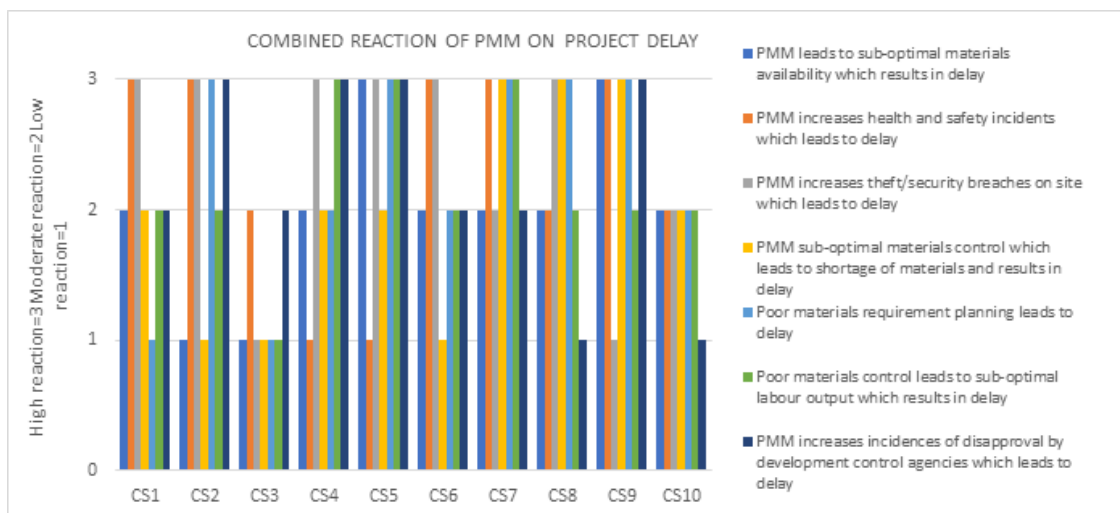
The data for this research were generated through semi-structured interviews conducted in conjunction with a tick box of questions marked/ticked by the researcher in the course of the interview, in order to evaluate the rate of occurrence of the issues leading to poor materials management in the study area. A semi-structured interview was conducted with the project professionals (Architects, Builders, Project Managers, Quantity Surveyors, and Site Engineers) on the issues relating to reaction of poor materials management on project delay in the Nigerian construction industry. The interviews were conducted at the interviewee's offices; and they lasted from 40 to 60 minutes each. The parameters adopted in developing the research instrument were rating scales. Regarding the reaction of PMM on project delay, the rating scales used were: High reaction; Moderate reaction; and, Low reaction.

The Statistical Package for the Social Sciences (SPSS) version 23 was used to conduct descriptive analysis of the data computing the mode that describes the most frequently occurring reaction of poor materials management on project delay and the results of combined ten case studies was presented in bar chart. For the purpose of anonymity, the names of the project sites are not disclosed in this article but are represented by case study (CS) numbers CS1-CS10.

Result

The results in Figure below show a combined high reaction on the following: (a) PMM increases health and safety incidents which leads to delay; (b) PMM increases theft/security breaches on site which leads to delay; (c) poor materials requirement planning leads to delay; and (d) PMM increases incidences of disapproval by development control agencies which leads to delay.

Figure 1: Combined reaction of PMM on project delay



Discussion of Findings

To provide a better understanding of the research, and the problem that led to the investigation is that site materials management is poor.

Reaction of PMM on Project Delay

Construction delay is when the construction period is prolonged beyond that which was estimated previously. When the problem of delay occurs, the companies stand to lose a large amount of money which can sometimes render the company insolvent.

The research found that PMM has a moderate reaction on materials availability. However, there is need for improvement because if materials are not available when needed, there will be delay on the project. This corroborate the submission of Assaf and Al-Hejji (2006), that when materials are not delivered to site as per the project programme, it results in delay in construction projects.

Moreover, PMM has a high reaction on health and safety. This means that PMM negatively impacts on or increases health and safety risks on sites. Essentially, when materials are lying around unattended on site, workers are more likely to trip over them and injure themselves. When such incidents occur on site, the management teams would, most likely stop the work to rectify, which leads to project delay.

With respect to theft/security, it was found that PMM's reaction was high. This means that PMM increases theft/security breaches on site which leads to delays on projects. Sweiset *al.* (2008) confirmed this, as highlighted in section 2.1 of this study. This implies that some of the materials that are meant to be used at that time are pilfered and the project work does not proceed because of missing materials. With regard to materials control, PMM has a moderate to high reaction on this. This means that PMM's sub-optimal control leads to shortage of materials and associated delay. This was in line with the findings of Sunjka and Jacob (2013), as discussed in section 2.3 of this study. Sub-optimal materials control has a negative reaction on project delay.

The study found that PMM has a high reaction on poor materials requirement planning which in turn leads to delay on projects. This shows that the majority of the organisations do not adequately conduct materials requirement planning. The moderate to high reaction of PMM on materials control leads to sub-optimal labour output which results in delay of projects. Sub-optimal labour output because of poor materials control leads to projects falling behind schedule and increases the cost overrun of the projects. These findings corroborate those of Chan and Kumaraswamy (1996); Mezher and Tawil (1998); Ellis and Thomas (2002) and Al-kharashi and Skitmore (2009), who found issues of delay in construction projects as a result of poor site management of materials and supervision, poor procurement of materials, poor quality of materials, shortage of materials, late delivery of materials and so on. Therefore, there is need for efficient materials management in construction projects. This is because poor materials management does affect the overall construction time, quality and cost.

Moreover, the study found out that PMM has a high reaction on increases incidences of disapproval by development control agencies which leads to delay. This supports the findings of Obodoh and Chikasi (2016), as highlighted in section 2.3 of this study. This implies that development control agencies stop projects when they have issues with materials on site. Therefore, an effective materials management practice is required to avoid problems such as delays in construction projects.

Conclusion and Recommendations

The aim of this study is to investigate the reaction of poor materials management on project delay with a view to enhancing materials management in the construction industry. Materials management is an important function that needs to be taken into consideration at all phases of the construction projects. The literature and the findings from the study have established that site materials management is poor. The study concludes that poor materials management was found to have a negative reaction on project delay.

It is also concluded from the findings that PMM increases health and safety incidents which leads to delay; PMM increases theft/security breaches on site which leads to delay; Poor materials requirement planning leads to delay; PMM increases incidences of disapproval by development control agencies which leads to delay; PMM leads to sub-optimal materials availability which results in delay; PMM's sub-optimal materials control leads to shortage of materials and results in delay; and poor materials control leads to sub-optimal labour output which results in delay have a negative reaction on the projects. The study also concludes that an effective project control system is essential to the successful delivery of a construction project.

The study recommends that Construction professionals should be well informed on the reactions of poor materials management on project delay so that it can be minimized. The construction industry in Nigeria should collaborate with government agencies to develop guidelines for preparing a waste management plan for the construction industry. Site materials management practices should be promoted by professional bodies in construction, such as the Nigerian Institute of Building (NIOB), the Nigerian Institute of Architects (NIA), and the Nigerian Institute of Quantity Surveyors (NIQS).

References

- Addo, J. N. T., (2015). Delay and its effect on the delivery of construction projects in Ghana, *African Journal of Applied Research (AJAR)*, 1(1), 236-246.
- Adewuyi, T. O. & Otali, M. (2013). Evaluation of causes of construction material waste: Case of River State, Nigeria, *Ethiopian Journal of Environmental Studies and Management*, 6(6), 746-753.
- Aiyetan, O. & Smallwood, J. (2013) Materials management and Waste minimisation on Construction Sites in Lagos State, Nigeria, In *Proceedings of the 4th International Conference on Engineering, Project, and Production Management (EPPM)*, 1161-1172.
- Aiyetan, A. O.(2013). Causes of rework on building construction projects in Nigeria, *Interim: Interdisciplinary Journal*, 12(3), 1-15.
- Akhir, M., Solehah, N., Abdul Rahman, I., Memon, A. H. & Nagapan, S. (2013). *Factors of waste generation throughout construction life cycle*, 1-6.
- Albert, I., Shakantu, W. & Ibrahim, K. (2020). A theoretical framework of lean production approach to materials management in the construction industry, *Sapientia Foundation Journal of Education, Sciences and Gender Studies (SFJESGS)*, 2(3), 189-200.
- Albert, I. & Shakantu, W. (2018). An appraisal of control of construction materials in the Nigerian Building Industry: A Case Study of Abuja, Nigeria, *Civil Engineering Research Journal* 6(4), 001-006.
- Al-Kharashi, A. & Skitmore, M. (2009). Causes of delays in Saudi Arabian public sector construction projects, *Construction Management and Economics*, 27(1), 3-23.
- Arantes, A., da Silva, P. F. & Ferreira, L. M. D.(2015). Delays in construction projects- causes and impacts, In *Industrial Engineering and Systems Management (IESM), 2015 International Conference (IEEE)*, 1105-1110.
- Arijeloye, B. T. & Akinradewo, F. O.(2016). Assessment of materials management on building projects in Ondo State, Nigeria. *World Scientific News*, 55, 168-185.
- Asmara, S. (2015). *Managing and minimizing wastage of construction materials on selected public building projects in Addis Ababa*, Unpublished Master thesis at the Addis Ababa University.
- Assaf, S. A. & Al-Hejji, S. (2006). Causes of delay in large construction projects, *International Journal of Project Management*, 24(4), 349-357.
- Bekr, G. A. (2014). Study of the causes and magnitude of wastage of materials on construction sites in Jordan, *Journal of Construction Engineering*, 1-6.

- Bossink, B. A. G. & Brouwers, H. J. H. (1996). Construction waste: quantification and source evaluation, *Journal of Construction Engineering and Management*, 122(1), 55-60.
- Chan, D.W. & Kumaraswamy, M. M.(1996). A comparative study of causes of time overruns in Hong Kong construction projects, *International Journal of project management*, 15(1), 55-63.
- Dajadian, S. A. & Koch, D. C. (2014). Waste management models and their applications on construction sites, *International Journal of Construction Engineering and Management*, 3(3), 91-98.
- Dania, A.A., Kehinde, J. O. & Bala, K. (2007). A study of construction material waste management practices by construction firms in Nigeria, In *Proceedings of the 3rd Scottish Conference for Postgraduate Researchers of the Built and Natural Environment, Glasgow*, 121-129.
- Donyavi, S. & Flanagan, R.(2009). The impact of effective material management on construction site performance for small and medium sized construction enterprises, In *Proceedings of the 25th Annual ARCOM Conference, Nottingham, UK*, 11-20.
- Ellis, R. D. & Thomas, H. R.(2002). The root causes of delays in highway construction, In *82nd Annual meeting of the transportation research board*, Transportation Research Board Washington, DC. 1-16.
- Emmanuel, A. J., Ibrahim, A. D., & Adogbo, K. J. (2014). An assessment of professionals' perception of the sustainability performance of infrastructure projects in Nigeria, *Journal of Construction Project Management and Innovation*, 4(Supplement 1): 912-932.
- Fugar, F. D. & Agyakwah-Baah, A. B. (2010). Delays in building construction projects in Ghana, *Construction Economics and Building*, 10(1-2), 103-116.
- Hannure, N. K. & Kulkarni, S. S. (2014). Comparative study of traditional material management and material management with ICT application, *Current Trends in Technology and Science*, 3(4), 301-307.
- Kayode, A. J., Olufemi, D. & Olusegun, A. E. (2010). A study of material control strategies in some selected construction firms in Nigeria, *Continental Journal of Applied Sciences*, 1, 62–72.
- Kasim, N., Latiffi, A. A. & Fathi, M. S. (2013). RFID technology for materials management in construction projects–A Review, *International Journal of Construction Engineering and Management*, 2(A), 7-12.

- Kasim, N. B., Anumba, C. J. & Dainty, A. R. J. (2005). Improving materials management practices on fast-track construction projects, In *Proceedings Twenty First Annual Association of Researchers in Construction Management (ARCOM) Conference, Khosrowshahi*, 793-802.
- Mezher, T. M. & Tawil, W.(1998). Causes of delays in the construction industry in Lebanon, *Engineering, Construction and Architectural Management*, 5(3), 252-260.
- Nguyen Duy, L., Ogunlana, S.O. & Thi Xuan Lan, D. (2004). A study on project success factors in large construction projects in Vietnam, *Engineering, Construction and Architectural Management*, 11(6), 404-413.
- Obodoh, D. A. & Chikasi, O. (2016). Causes and effects of construction project delays in the Nigerian construction industry, *International Journal of Innovative Science, Engineering & Technology*, 3(5), 65-84.
- Okorochoa, K. A. (2013). Evaluation of materials management strategies in the Nigerian construction industry (A case study of selected buildings sites in Lagos State), *International Journal of Management Sciences and Business Research*, 2(3), 82-90.
- Patel, H., Pitroda, J. & Bhavsar, J. J. (2015). Analysis of factor affecting material management and inventory management: Survey of construction firms in Gujarat region of india, *International Journal of Advanced Research in Engineering, Science and Management*. 1-6.
- Sunjka, B. P. & Jacob, U. (2013). Significant causes and effects of project delays in the Niger delta region, Nigeria. In *Southern African Institute of Industrial Engineering*. 641-14.
- Sweis, G., Sweis, R., Hammad, A. A. & Shboul, A. (2008). Delays in construction projects: The case of Jordan, *International Journal of Project Management*, 26(6) 665-674.