ADOPTING LEAN MANAGEMENT IN NIGERIAN CONSTRUCTION INDUSTRY

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I affably dedicate this thesis to my family and my country.
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ABSTRACT

Recently the research about waste in construction industry has attracted many researchers around the world. Lean management techniques has is widely accepted as main strategy for waste elimination in work processes. The aim of this study is to propose an efficient and effective methodology to manage construction workflow and minimize waste generation in the Nigeria construction industry based Lean principles. Data were obtained through comprehensive literature review and the used of the questionnaire survey method distributed to clients, consultants, surveyors and contractors in Nigeria construction industry. Also, a case study from the Nigeria highway project was selected and used to create a traditional work process model and an improved lean based work process model. In this study, 35 work process have been identified and evaluated for their contribution to waste. The findings concluded that 22 of them have been identified as contributing to waste at the various stages of construction work. The study also revealed key strategies to improve work process by adopting Lean management techniques supported by other contemporary approach like Concurrent Engineering and Just-In-Time. Adopting the lean based work process model resulted in a shorter project duration and more efficient work proces compared to the traditional. Finally, it is recommended that practitioners should employ lean strategies for the improvement of work process in Nigeria construction industry.
ABSTRAK

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CAGR  Common Annual Growth Rate
GDP   Gross Domestic product
IGLC  International Group of Lean Construction
JIT   Just In Time
LCI   Lean Construction Institution
MRP   Mass Production Concept
NUMMI New United Motors Manufacturing Incorporation
PWD   Public Works Department
TPS   Toyota Production System
TQC   Total Quality Control
TQM   Total Quality Management
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CHAPTER 1

INTRODUCTION

1.1 Introductory Background

The construction industry as seen by different researchers has been tagged as a slow progressing industry associated with many problems such as low productivity, unsatisfactory quality, poor safety, extended project time, which obstructs a customer based oriented project value. Construction projects are diverse in nature as it could either be a stodgy (slow, simple and certain) project on one end or a dynamic (fast, uncertain, and complex) project on the other end (Ballard and Howell, 1998). However, this sector has been experiencing an enormous drawback, which is “Waste”. Various researches have been conducted in the area of construction waste, all recognizing the huge volume of waste generated during a construction project. During the last decades, various methods have been exploited to address the reduction of construction waste and its consequences. One innovative approach suitable in this context is “Lean Construction”, which the construction industry in 1990s was introduced to. Lean construction is based on a successful manufacturing theory, i.e. lean production (Hosseini, et al. 2012).

In manufacturing, lean production philosophy improved competitiveness by the identification and elimination of wasteful activities (non value-adding). However, construction often is viewed and structured as a series of conversion activities only (value-adding). Take for instance, waste activities such as waiting, inventory storage, material movement, and inspection are not normally put into
consideration in Critical Path Models or other construction control tools (Koskela, 1992). Construction has been struggling with integration of the lean management approach into their current project management practice. Traditional and lean management approach have essential differences of the lean “pull” concept compared to the traditional “push” concept (Juanfang and Xing, 2011). But judging from the success of manufacturing, remarkable improvement could be realized by construction simply by identifying and eliminating non conversion activities (non value-adding). In other words, construction should seize to be viewed as just a conversion process but rather should be viewed as flow processes (comprising of waste and conversion activities together) (Koskela, 1992).

This study is based on the evaluation of construction process waste in accordance with the approach of lean thinking. Adopting Lean construction will maximize value and reduce waste by applying specific techniques in a new construction project delivery approach (Ko, 2010). Lean thinking focuses attention on how value is generated rather than how any individual activity is managed. Where current project management view a project as the combination of activities, lean thinking view the entire project in production system terms, that is, as if the project were one large operation (Hosseini, et al., 2012).

1.2 Problem Statement

The notion of quality started way back in time when people attempted to discover an apt quality in every artificial object. Construction industry according to Jimoh, (2012) is regarded as a unique entity which was further described by Wahab and Lawal (2011) as one of the most dynamic and complex industrial development in the world. Jimoh (2012) further emphasized the importance of construction industries as fundamental to the existence of other industries by stating that construction industry provides the environment for the operation of other industries. Nwachukwu and Emoh (2010) ranked construction industry as among the top four of about twenty economic sectors in terms of inter-sector linkages which they
further identified as important to the growth of the economy of a nation by enhancing development through employment provision for a nation.

Construction industry may be responsible for about 20% GDP (Gross domestic product) of a nation and about 12% employment of the total labour force (Wahab and Lawal, 2011). Similarly, Nigerian construction industry plays a major role in the nation’s economy, contributing about 61% of the GDP (gross domestic product) of the country and also provides up to 20% of the labour force (Jimoh, 2012, Wahab and Lawal, 2011). Therefore, construction can be considered as one of the major value adding source to the development process of a nation’s economy. Nwachukwu and Emoh (2010) further stated that “construction industry is a catalyst, a rock, and the strongest base for rapid economic growth”. This is achieved through the job opportunities it creates directly or indirectly to unskilled, semi-skilled and skilled labour. Furthermore, construction also contributes to development of infrastructures such as schools, houses, hospitals, offices, railways, airports, road networks and other relevant infrastructure. However, Nwachukwu and Emoh (2010) emphasized that any constraint to the success of the construction sector will have an overall effect on the growth of economy of a nation.

Unfortunately, Nigeria’s construction amongst other developing countries is lagging behind in terms of performance in her construction industry. This can be associated with the adaptation of traditional method of construction which generates various problems such as delay in projects, loss of productivity, cost overrun, abandonment of projects, reworks and sometimes project termination. Traditional construction work process has a lot of wasteful activities associated with it which majorly consumes time and effort without added values to the work (Alwi, et al. 2002a). Wahab and Lawal (2011) highlighted improper control over materials during the various stages of construction process as the source of waste. Alwi et al, (2002b) further stated that design changes, waiting for instructions, poor quality site documentation amongst others as variables of non value added activities which is associated with the traditional method. Garas et al. (2001) in their study pointed out changes in design as a source of waste of time in construction work process, the study also believed that late information is another fundamental cause of material
waste on site. However, it can be recognized that traditional construction method has failed in terms of dealing with problems such as errors and change in design on non value adding activities in construction work process (Sangwon, et al 2007).

The major problem that prompted this study is to find out how wastage in construction work process which commands a significant ratio in terms of time and materials can be best managed to ensure better performance in construction works in Nigeria by adopting a different and effective work process. Various researches have been carried out to identify a lasting solution to reduce construction waste and its effects. One approach which has gained attention and has proven to be effective is “Lean construction theory”. Waste elimination is one of the top main focuses of lean construction theory. However, if Nigeria construction industry continues to adopt the traditional method, not only will this result in waste of time and money, but also hinder the rate of development of the nation considering the impact of construction on the nation’s economy. In order to benefit fully from construction, Nigeria needs to integrate Lean philosophy management approach into her construction sector.

1.3 **Aim and Objectives of the Study**

The aim of the study is to develop a new lean based work process for construction project in Nigeria to achieve better lean and efficient performance model. This study consists of a set of objectives as follows:

1. To evaluate waste generated in the current construction work process in Nigeria construction
2. To evaluate the potential benefit of applying Lean principles to Nigerian construction industry
3. To develop and compare the benefit of Lean process model compared to traditional process model for Nigeria construction industry.
1.4 Scope and limitations of the Study

The scope of study is focused on reviewing Nigeria construction companies in adopting a lean based work process. Concentration would be on developing a lean process model and identifying the potential benefits when measured up against the current work process. The study limitations are thus stated below:

1. The study is only conducted for Lagos state construction industry in Nigeria, so did with the primary data collection
2. The construction process that will be covered in this study is related to improving site management by reduction or elimination of waste on site during the construction work process.
3. The case study selected for the model in this research was a highway rehabilitation project related to reduction or elimination of waste during the construction work stages

1.5 Significance of Study

The construction industry has a dynamic nature due to the continual increase of uncertainties in technology, budget and development process. Nowadays, projects are getting complex and becoming difficult. However, this sector is of great importance as construction contributes to the economy as stated earlier. Unfortunately, traditional construction is mostly practiced in developing countries like Nigeria, and it is associated with various problems such as non value adding activities “waste” reducing the value of construction.

The importance of this study is considered to be a means to generate value from construction. Lean construction principle is aimed at generating value for both the client and final customer by eliminating factors that do not add value which is considered as “waste”. The project work when completed is expected to recognize the benefits of lean work process over traditional construction work process.
1.6 Brief methodology

The methodology adopted for this study has been presented in a flow chart as shown in figure 1.1 below. This shows the stepwise approach undertaken to achieve the objectives of the study.

The research methodology has been grouped into three (3) stages where the first stage involved thorough review of past journals, articles, conference papers, thesis and books relevant to the study in view.

The second stage is the data collection which is achieved in two (2) ways. Firstly, secondary data was extracted from past journals, articles, conference papers, thesis and books which are then used in the development of questionnaire. Secondly, the primary data was obtained through the use of questionnaire survey to experts in the Nigerian construction industry.

The final stage involved analysis of the obtained data through average index value. This stage also involved the development of the proposed model.

The detailed methodology adopted is thus presented in chapter four (4) of the study.
Stage 1

Research Question and Problem

Literature Review

Lean Production Management

Nigerian Construction Industry

Waste in Construction Work Process

Stage 2

Survey Data Collection

Specific Project Survey

Clients

Contractors

Consultants

General Survey

Stage 3

Data Analysis

Data Collection Analysis

Develop and Compare Lean and Current Work Process Models

Findings and Results

Figure 1.1: Research methodology flow chart
1.7 Organization of report

This thesis is made up of seven chapters, where by the first chapter clearly states the motivation and objectives of this work. The second and third chapters described the relevant literature review, with focus on lean management and Nigerian construction industry. Chapter four introduced the methodology that was used to obtain all the data used for the subsequent chapters. Data obtained and analysis was presented in chapter five with clear representation of data breakdown and detailed bio data on the respondents. Detailed discussion of results was presented in chapter six. Also, the proposed models were generated using work breakdown structure of the construction work process in this chapter. Both models were later compared to identify the potential of the improved lean work process model. The final chapter of this work concluded it all and also presented recommendations for further study.
REFERENCES


