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Suitability Of Lean Construction Approach In Nigerian Project Delivery

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***Abstract*—It was established that Nigerian construction industry suffers frequent problems of cost and time overrun, low productivity, poor quality and safety which seriously affects customer satisfaction. The ugly performance of the industry was attributed to the waste generation and non-value adding activities in the project delivery process. Lean construction approach adoption has shown significant success in addressing these problems in some developed countries. Lean construction is yet to be adopted in most of the developing countries, as is still new concept developed from Toyota that addresses these problems. This research reviews literature on progress achieved using lean construction approach in developed nation toward improving project delivery, and compare with the problems that exist in the current traditional approach. After critical review it was established that based on theory of knowledge finding, adopting lean approach will definitely address the problems that exist in current traditional approach of project delivery in Nigeria.**

Keywords- Cost and time overrun, low productivity, poor quality and safety, project delivery

I. INTRODUCTION

The construction industry was characterized as an industry progressing slowly, and suffers problems of cost and time overrun, poor quality and safety and low productivity which affect client's value and needs, (10, 19). Lean construction approach was introduced to address these issues by (18). He divides construction activities into conversion and flows. Conversion activities aimed to provide satisfactory output and flow activities bind the conversion activities to give the required output at the project delivery process period. Conversion activities add value, so it must be efficient, and non-value adding activities need to be eliminated or minimized, (18). While the traditional approach of project delivery ignores flow and value creation activities, it merely focuses only on conversion activities. The traditional project delivery does not consider non-value adding activities as waste, such as material waste and delays during construction, transportation of materials, inspection and others, (2). Waste is also described as any human activities that observed resources and does not add any value to the end product, (34). The adoption of lean approach eliminates waste, that is providing more with less of everything, (34;15). A lot of researches revealed that flow process of construction contain considerable amount of waste, (30). It was established that flow process waste in construction constitute a certain percentage of construction cost. Findings revealed that, non-conformance to quality consume 12% of project cost, time expended on activities that do not add value covers 2/3 of total project time, poor management of material covers 10-12% of total labour cost, accidents due to lack safety amounts to 6% of total project cost, (20). The amount consume by flow waste in construction necessitate the adoption of lean construction approach in project delivery.

This study viewed lean construction approach as a suitable for adoption in project delivery in Nigeria. A test is conducted to support its suitability in project delivery as discussed in the next section.

II. SUITABILITY OF LEAN CONSTRUCTION APPROACH TEST

It was affirmed that if an approach can be used to overcome weakness, the approach will be suitable for adoption, (7). Waste is considered as the greatest weakness in the construction industry, (32). It was declared that before the introduction of lean construction approach no effort for identification of flow waste was attempted by construction practitioners, (20). Therefore, as identified in the construction industry, waste is the greatest weakness; the most suitable option to overcome it is by adoption of lean construction approach. Many studies on adoption of lean approach have identified categories of flow waste in different stages of project delivery.

Among the leading pioneers of lean concepts such as (31), identified seven different waste associated with flow waste. This includes waste generated due to defect, operation, transportation, waiting period, stock, over production, and the system itself.(20) also revealed waste that exist in the construction process includes; rework, omissions, safety cost, number of defects, design errors, and excess material consumption. It was also identified that waste exists in

work method, material handling, time utilization, labour, equipments and operational planning, (2). It was also revealed that inactivity and ineffective work result to waste of productive time, (30). (29) Synthesised these identified waste into three categories as outlined in table below:

TABLE 1 IDENTIFIED WASTE AS SYNTHESIZED (29)

Mentioned commonly	Mentioned occasionally	Unmentioned
Waiting period Defects Excess material Design errors Transport/ Handling time Activity delay Operation waste Stock/Excessive space Rework	Safety cost Over production Equipment waste Resting time Inventing work Need for clarification	Pilferage Management time spend on fire fighting

Many construction professionals are aware of the existence of these wastes, because they seem to be undetectable and intangible, and they possess significant amount of "temporal waste". To address the issue of flow waste by adopting a suitable approach requires identification of cause and source of the flow waste. Study on lean construction has established that flow waste are generated due to many reasons, the cause are categorized by (30) as follows:

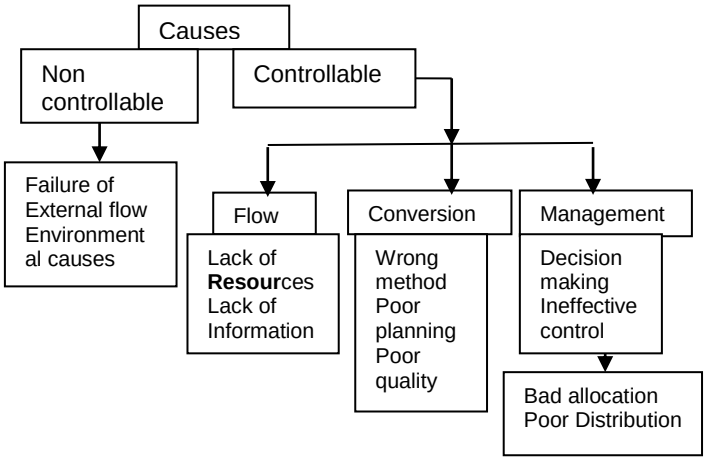

Figure 1 Causes of waste modified from (30)

The As per result above all causes of waste will be effectively controlled with exception of external and environmental causes, (30). Another cause of waste was classified as unmeasured waste, uncontrolled and rigid process, hierarchical organization, material flow and complicated information, (18). Waste causes are also classified into sources, management, material and information. Based on this waste are generated from project definition to construction period.

It was established that, all these flow waste exist in Nigerian construction industry, (5). It was also established that the current traditional project delivery approach has significant relationship to the industries poor performance, (1) ; (26).

Based on the extant result of application of lean construction approach in some developed nation the following question emerged:

What is the suitable approach that will address the current problems existing in the project delivery process in Nigeria?

III. METHODOLOGY

This research method adopts a literature review system to answer the research question based on general world view or knowledge enquiry, as an inductive reasoning method which initiate from particular facts in some individual cases that arrived to general conclusion, (23).

IV. DISCUSSION

It was established that Researchers continue to search for ways to improve on efficiency and effectiveness of project delivery process, so as eliminate waste and non-value adding activities (24). Lean construction approach has been proven to minimize, if not completely eliminate waste and non-value adding activities. In early 1990 the construction research community started analysing the possibility of applying the principle of lean production to construction, the idea of understanding construction as production was introduced by (20). The significant contribution for formulation of theoretical foundation of lean construction was done by International Group for Lean Construction (IGLC), by abstracting and applying the core concept of lean production to the management of construction (27). The application of the lean construction approach in some developed countries and emerging economies has improved their project delivery process from planning to total completion of tasks in their construction industry.

It was proven by extant research that the application of lean approach in Brazil, Finland, Japan and UK has improved the project delivery method of the construction industry, (12);(25); (8); (14). It also shows the reduction of direct cost, time in transportation and communication in Brazil and UK, (22, 28). It was affirmed by (13); (23); (17); (11), that the application of lean approach has Improved quality control and

minimization of risk in Korea. In Germany, UK and Singapore minimization of conflict that can dramatically change budget and schedule was witnessed after the adoption of lean, (4);(16). The lean construction application in Denmark Canada, Chile, USA and UK in housing construction has improved workers safety, customer satisfaction, increase value and reduce cost drastically, Reduction of cycle time, Reduction of expected total construction time and cost, Improved supply system, flow of construction process and minimize waste, Reduction in project duration and cost, improved communication flow, (9); (6); (3); (33); (35). Based on general world view or knowledge enquiry, the application of lean construction approach has addressed the problem of identified flow waste in project delivery process in the countries where they are applied. Therefore, it can equally be applied in the countries where their project delivery process still lags behind.

V. CONCLUSION

The study has considered lean construction approach as a suitable approach to address the problems of flow waste in project delivery process. In effort to transform Nigerian construction industry the study will further test the suitability and acceptability of the lean construction approach by identifying the flow waste that exists in the current project delivery process and their causes? A proposal for the application of the new approach will be studied using opinion survey based on judgmental sampling.

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