AN INTEGRATED FRAMEWORK FOR THE ADOPTION OF LEAN CONSTRUCTION PRINCIPLES FOR THE REAL ESTATE INDUSTRY IN GHANA

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ABSTRACT

In general, a very high level of waste exists in construction; according to Koskela (2012). Although it is difficult to systematically measure all wastes in construction. Various studies from various countries have confirmed that waste represents a relatively large percentage of production costs. The main objective of this research among others is aimed at developing an integrated framework for the adoption of lean construction principles as a tool to revolutionize Real estate industry in Ghana. The researcher purposively selected a sample size of forty (40) out of the total population of four hundred (400) registered Real estate Development companies of GREDA (Ghana Real Estates Development Association) as multiple case studies to respond to the research questions.

Keywords: *Adoption; Lean; Construction; Real Estate; Ghana*

INTRODUCTION

In recent times, the manufacturing industry has seen great performance improvement in productivity by the implementation of Lean production principles. This manufacturing principles seek to remove various stages of waste by continues improvement of operations.
Waste reduction has become an important issue to improve the performance of the Real estate industry in terms of economics, quality and sustainability. One way of achieving this target is by reducing the waste at all stages of the construction process in Real estate development using lean construction principles. A study by Garas (2001), explains that contractors have the perception that waste whenever found, is not considered valueless as long as the contractor can sell it to waste dealers at any cost, not one comparable with the cost, at the end of the project. Material loss is seen as an inevitable by-product of estate development.

An unacceptable level of material waste creates growing tension for local authorities in many countries. Although the waste problem is well known, it does not seem to be given the recognition it deserves because of the trend to underestimate waste levels. According to

McGrath and Anderson (2000), wastage within the United Kingdom (UK) construction industry is as high as 17%.

Construction wastage is estimated around 70 million tonnes per annum. Research has shown that the Brazilian construction industry has a waste rate of 20–30% if compared to the weight of materials on site. The Netherlands site waste averages 9% (by weight) of the purchased construction materials. In addition, construction waste has become a burden to clients, as they eventually have to bear the costs of waste. The same is also a major problem to contractors, as it leads to loss of profits and potential bankruptcy (Skoyles & Skoyles, 1987, Ekanayake & Ofori, 2000). As a result, minimization of construction waste has become a sensitive topic among professionals in the construction industry (Poon, Yu, Wong & Cheung, 2004)

In the Real estate's development industry, waste is a loss of profit. Building materials are far too expensive to waste, but in spite of this, money is being wasted because of breakages and losses during development. This waste also results in higher building costs to the end user (Skoyles & Skoyles, 1987).
Waste, according to Skoyles and Skoyles (1987), can occur in many ways. Materials may be lost in the ground or be damaged by lying around and have to   be discarded, or they may be rejected as unsuitable for the purpose for which they were purchased, thereby becoming surplus to the site. Additional materials may be needed to renew damaged work or to replace articles missing through lack of materials control.

Motivation for the Study
The main motivation for this research stems for the need to apply lean principles in the reduction of waste in real estate development in Ghana. Besides, there is no any known integrated frame work for the adoption of lean construction principles for the real estate industry in Ghana.
The study hopes to fill the gap in the area of real estate construction projects and could be implemented in other developing countries.

Significance of the Study
The generation of material waste in Real estate's development site leads to a decrease in profitability and increase in cost, increase resource dissipation culminating in low productivity and an increase in pollution.

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Problem Statement

The cost of materials being used on site contributes between 55 – 60% of the total construction cost of the building (Illesanmi, 1986). Material left after an operation is just dumped anywhere and not used again.

Construction waste is not just about environment and health issues, but also related to contractor's profit. (Trignunarsyah 2006). According to Trignunarsyah (2006) in the developed countries such as the US, the volume of construction waste produce contributes up to 23% of the total volume of solid waste. This leads to the need for the construction industry to reduce the amount of waste produced by construction projects.

Studies show that the waste rate in the Brazilian construction industry is 20 to 30% of the weight of total materials on site. On the other hand, work in the Netherlands found that the amount of waste for each building material lies between 1% and 10% of the amount purchased, depending on type of material. (Ekanayake & Ofori, 2000)

Further, it was concluded that an average 9% (by weight) of the purchased construction materials end up as site waste in the Netherlands. Moreover, whereas the waste problem is well known, it seems not to be given the recognition it deserves. One reason may be to underestimate waste levels. Past studies have found that, most of the time, actual percentages of site waste generation have been much higher than the initial recommended waste norms for the project the projects. (Ekanayake & Ofori, 2000)

In the UK, the BRE studied the waste levels for specific materials on 230 different building sites and found that the actual waste levels is consistently higher than the estimated level for all materials studied. New purchases to replace wasted materials cause heavy financial losses to the contractor.

Research Questions

Based on the research problem, a few research questions emerged as stated below;

RQ1. What are the major sources and causes of waste in estates development activities?

RQ2. What are the views of professionals on materials waste minimization?

RQ3. What are the views of estate developers on materials wastage and minimization?

RQ4. What are the views of estates developers on the concept of lean construction?

RQ5. What are the perceptions of construction professionals on the concept of lean construction principles?

QR6. What are the potential barriers that hinder the implementation of lean construction principles in the Ghanaian estate development industry?

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Research Objectives

In order to provide answers to the research questions and achieve the aim of the research, the following objectives are set to:

RQ1. To establish current theories and literature in real estate construction projects and identify gabs that is worth considering.

RQ2. To come out with ways of minimizing material wastes on estate development sites and to make necessary recommendations on effective waste management through the use of lean construction principles on construction sites to maximize profit.

RQ3. Develop an integrated frame for the adoption of lean construction principles in the real estate industry.

RQ4. Serve as a tool for the estate developer to design projects with lean principle in mind and the economic use of materials resulting for greater profitability, resource conservation and pollution prevention.

Purpose Of The Study

The purpose of this research is to develop an integrated framework to guide the adoption of lean construction principles in the Real Estate Industry. The study will examine suitable criteria and variables as benchmark in previous studies to aid the implementation of lean construction framework.

The research is also aimed at advancing knowledge in the application of lean construction principles as a tool to revolutionize Real estate development industry in Ghana.

Value Of The Study

This research will contribute to body of knowledge, reveal various losses arising from material wastage and to propose measures that will enhance judicious use of developers' money coupled with an overall effect on cost savings on Real estate projects, as well as leading to increase profit and time saving on the construction period of Real estate housing projects.

The implementation of lean construction would help to remove waste at design and construction stage through to the selling point thereby reducing the cost of production and increasing productivity.

This study will create the awareness of the benefits of minimizing material waste on estate development sites.

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It will also serve as a guide to potential real estate developer and existing ones in the Real estate development and construction industry.

LEAN CONSTRUCTION FRAMEWORK
This will represent the review of related literatures on the topic. It will indicate clearly what has already been written on the topic in terms of theories, concept and empirical evidence on the topic; examining the concept of waste, theory of waste management and waste in the Real Estate and construction industry.

The concept of waste
Waste is the unnecessary depletion of the natural resources, unnecessary costs and environmental damage which can be avoided through improved waste ethics. The Waste Framework Directive (European Directive 2006/12/EC) has defined waste as "any substance or object the holder discards, intend to discard or required to discard".

Theory of waste management
In industrialized nations the waste management practices evolved with the 1970's focusing on reducing environmental impacts (Tanskanen 2000). This was done by creating controlled landfill sites- starting from 1970 – today (Environment to resource recovery).

Classification of waste
Rama Rao (2009) classified waste on the basis of: Waste resources, Origin of waste, Property of waste and Recoverability. Taiichiohno (1988) classified waste into Defect, Overproduction, inventory, Unnecessary processing, Transportation, Motion, Waiting

Waste in construction Industry
According to koskela (1992) defined waste as "any inefficiency that results in the use of equipment material, labour or capital in larger quantities than those considered as necessary in the production of building

Productivity theories in relation to waste management
Several productivity enhancement techniques and theories have emerged over the last five decades with the clear objective of minimizing waste e.g. JIT, TQM, TPM, Concurrent Engineering , Value Management, Continuous Improvement, Re- engineering

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PROPOSED METHODOLOGY

In this study the researcher will collect information from reference books and journal articles to introduce some theories regarding to lean production principles, lean construction materials and other materials relating to waste elimination.

Moreover, internet sources are also a part of the research methodology for the researcher to get the latest updated information of Real estate development and construction waste issues. In order for the researcher to get some practical information from the estate and construction industry, the data collection can be collected by using survey questionnaire.

The method and detail on this data collection, location, and analysis will be explained in more detail manner when this proposal is approved.

RESEARCH AREA AND TARGETTED RESPONSE

The study will be conducted in the Ghanaian real estate industry. The research will limit the types of respondents who are involved in real estate construction projects. People who have extensive experience and possess decision-making. They will represent Ghana Real Estate Developers Association, environmentalists, environmental protection agencies, construction consultants, contractors, designers, engineers, project managers, town planners and architects.

SAMPLE AND DATA COLLECTION

The data collection for the study will comprise of primary and secondary data.

In conducting a research, it is often impossible, impracticable or too expensive to collect data from all the potential units of analysis (population). Hence a smaller number of units (sample) are often chosen to represent the whole population.

The respondents will be selected through purposive sampling based on their experience on the culture of Realty estate business and the work performance. A purposive sample is a sample selected in a deliberative and non-random fashion to achieve a certain goal (Children's mercy, 2012). The researcher chose the sample based on who the researcher thinks would be appropriate for the study. According to Kumar (2005), the primary consideration in purposive sampling is the judgment of the researcher as to who can provide the best information to achieve the objectives of the study. The researcher only goes to those people who in his/her own opinion are likely to have the required information and be willing to share it. The researcher uses his discretion in selecting samples for his research.

Forty (40) respondents will be conveniently selected from the entire population of four hundred (400) registered members of GREDA (Ghana Real Estate Developers Association) as multiple case studies for the research.

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This forms 10% of the total population of Real Estate Developers in Ghana. These are companies that are doing well in the industry.

LIMITATION AND DELIMITATIONS OF THE STUDY

In such a research there is bound to be several constraints to be encountered.

Firstly, there are several Real Estate firms in the country hence the study will not be necessarily representative of all the overall population.

Secondly, the study will also be constrained in terms of time. The researcher will be constrained by the limitedness of time in which this thesis is supposed to be presented. This may not allow the researcher to critically assess large numbers of the Real estates work force. Cost is another issue that will limit how widespread the researcher's data can be collected, as more data can be necessary to have a better assessment of clients.

Nevertheless, in the face of all of these limitations, it is believed that the core objective of seeking to develop an integrated framework for the adoption of lean construction principles as a tool to revolutionized Real estate development in Ghana can be achieved with high confidence.

The limitation is being considered in relation to the natural explanation to which the searcher has limited the study and the active choices to limit the study area that is material wastage as a determinant of Estate development.

By considering the material wastage aspect of Estate development relating to existing theories and models, the researcher intends to mark a demarcation for the study. The researcher considered limitation in line with the research objectives believing that, with the changing nature of the work force the selected companies, recent trends in development, information and technology, the issue of material wastage will become consent on one of the most essential assets in Real Estate organizations.

This research will consider the inside work forces as a starting point. Ideally, a study of all the explanatory objectives will be considered appropriately in order to capture the interactive influences of other objectives and thus be able to come up with holistic and generally more acceptable results of material wastage in Estate development.

ENVISAGE FINDINGS

It is expected that the study will contribute to the development of the Real Estate Industry in Ghana. A lot of work has been done by way of practice and policies worldwide. This proposal is in response to a call in the Real Estate Industry in Ghana to develop measures to enhance their sustainability in business.

The major objective of the thesis is to develop an integrated framework for the adoption of lean construction principles in the Real Estate Industry. It is expected that the framework will therefore fill a theoretical gap in lean construction in Real Estate business literature with respect to the Real estate construction sector to achieve its sustainability and profitability goal.

Furthermore, the research is also expected to identify and propose areas in lean construction which can be further investigated to additionally enhance the sustainability and profitability goal of the Real Estate Industry in developing countries such as Ghana and beyond.

The research is also envisaged to make some practical contributions to the Real Estate industry; it is expected to provide an innovative and practical framework which will help Real Estate professionals in the discharge of their duties. The study is also expected to educate the various respondents who will take part in the study.

The study will reveal several disturbing issues in the industry and if the findings of this research are to be extrapolated to the entire industry there will be the need to be awakened.

ETHICAL STATEMENT

Ethical consideration issues are vital in this study. This requires people to participate in the study voluntarily. It will not coheres nor compel participants into partaking of the study.

The researcher will seek the consent of Participants before they are involved in the study. The privacy of the participants will be heavily protected and kept anonymous throughout the study.

OVERVIEW OF THE CHAPTERS

The thesis will be organized as follows;

Chapter one will focus on the introduction to the study, problem statement, research objectives, research questions, research relevance, the scope and limitations of the study.

Chapter two will focus on the literature review that has been written on the topic to provide a background and the context for understanding the problem at stake.

Chapter three will outline the research methods used to generate information to answer the research objectives and research questions. Specifically, it includes the research design, population of interest, sampling size & techniques & procedures, instrumentation, methods of data collection and data handling procedures.

Chapter four is concerned with the data analysis and discussion.

Chapter five draws the curtains by providing conclusions and recommendations in relation to the key issues of the research problem and objectives.

CONCLUSION

Conclusion will be made on the main findings as well as possible recommendations for further research. It will also focus on proposing practical steps for the implementation of lean construction principles as a tool to eliminate waste in the processes leading to production of housing and to enhance the profitability of the developer thereby making cost of housing cheaper for the average Ghanaian worker.

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