Research Article

A Proposed Framework into the Integration of Building Information Modelling (BIM) in Nigerian Oil Industry Project: Enhanced Decision Making and Mitigation of Maintenance Cost

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Abstract

The main goal of this work was to propose a framework and possibly look at the integration of building information modelling (BIM) in Nigerian oil industry project so as to enhanced decision making and mitigate cost of maintenance and also to align the Nigerian oil industry to the international benchmark and bridging the gap. To achieve this effort must be made towards researching why there is little or no research on BIM adoption in the oil industry, what are the benefits and barriers, how will the barriers be overcome and BIM be adopted

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1. Introduction

In Architecture, Engineering and Construction (AEC) industry and Oil/Gas industry, there are various ways to realize projects. No matter in what way, the process and discipline are the two important components. With the traditional sequential process and fragmented disciplines, there are a lot of problems: progress at a
very low speed, miscommunications between different functional teams, too much rework coming at the very end, bad impact on knowledge harvesting and continuous learning, etc (Drejer & Vinding, 2004). Because of tremendous problems recognized, the traditional working approach is desperately needed to be changed. Under this situation, integration is needed so as to drive these changes, where process is changing from sequential to iterative and discipline structure is transforming from fragmented to collaborative. For construction industry, those changes are very welcomed as they are the desired trends of development in the construction industry.

**Building Information Modelling**

Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility, which can provide adopters many benefits and competitive advantages, assisting them to perform projects in a more collaborative manner, throughout the whole engineering life cycle (Fischer & Kunz, 2004). The new international benchmark for efficiency in design, construction and building maintenance is now BIM, it also has a significant advantage over design in particular, construction, facility management and the lifecycle itself, it is described as a set of powerful design management tools by Yan and Damian (2008). Among stakeholders in the construction industry all over the world, BIM has attained an extensive popularity because of the platform it provides for their collaboration which makes it easier to update, share and more valuable for businesses to create and use. Hence, it saves a lot of time, money and increase the productivity and quality of the project.

It was observed that many stakeholders within the construction organizations around the world are moving towards adoption of BIM in their respective practices (Haron et al., 2010).

**Oil and Gas Industry**

Oil and gas provide the world’s 7 billion people with 60 percent of their daily energy needs. Oil and gas are not only fuels for generating electricity and power, but also used as raw materials to manufacture plastics and many other products. Oil and Gas are both strategic materials and they are very critical to all countries. Firstly, from a business perspective, oil and gas stand for worldwide commerce on large scale. Therefore, oil and gas business is clearly a multifaceted, global industry that has impacts on many aspects of our lives.
The petroleum industry includes the global processes of exploration, extraction, refining, transporting and marketing products.

Oil & Gas industry is extremely complex and owns significant characteristics, which distinguish it from the AEC industry. To a large extent, Modern oil and gas industry is a Knowledge- and information industry, and techniques from computer science and informatics can make significant contributions to productivity and environment protection (Thorsen & Rong, 2008).

**Motivation of study**

BIM have been gaining popularity lately due to the benefits and promises it offers right from the inception stage to decommissioning stage. In conformity to that, Arayici et al; (2009) reported that, recently, UK, Australia, Sweden, Norway, Finland, Germany and France, within there construction process in order to facilitating construction lifecycle have demonstrated capability of using BIM in many pilots and live projects that was completed and documented.

However, not much attention has been giving to BIM in terms of research and adoption in the oil industry. It is true that current efforts and research are conducted regarding BIM and Nigerian context, but it is limited to the AEC industry. Hence, towards an effort to align the Nigerian oil industry to the international benchmark and bridging the gap, efforts must be made towards researching why there is little or no research on BIM adoption in the oil industry, what are the benefits and barriers, how will the barriers be overcome and BIM be adopted to enhance decision making and mitigate cost of maintenance. In essence this research hopes to develop a framework for integration of BIM to Nigerian oil industry projects in order to enhance effective decision-making and reduce the overall maintenance cost.

The aim of the work is to propose a framework for BIM implementation in the Nigerian oil industry project to enhanced effective decision-making and reduce cost of maintenance. To achieve this goal some major objectives have to b considered

1. To explore the current practice of the oil industry projects at the international level In this section, it is expected to study from literature and best practice the current practice of the oil industry in terms of project delivery. Both the international context and the Nigerian context will be studied and critically analyzed. This will give an insight into the process and expectations within the oil industry.
2. To understand the impact of BIM on the oil industry project and identify the gap between the international oil industry project practice and the Nigerian oil industry practice, it is expected to cover all the benefit of BIM, the barriers and drivers of BIM and the strategies that can be adopted. It is equally important to study cases of best practices at this point.

3. To establish a conceptual framework for BIM integration with oil industry project based on the results gotten from the above objectives, data from secondary sources (literature) and from primary sources (case studies). This is basically an idea on how the researcher presumes the framework should look like.

**Methodology of proposed framework**

There are 3 basic methodologies adopted; the use of literature review, case study and field survey. In order to understand the research methodology, the concept of research onions by Saunders, Lewis & Thornhill (2007) will be adopted. The research philosophy is an idea or a belief regarding the collection, interpretation, and analysis of the data collected. Positivism philosophical belief holds reality as stable and therefore this can describe an objective research philosophy viewpoint. This research philosophy further says that knowledge that is not based on positivism is blurred and invalid (Miller Strang & Miller, 2010).

The research approaches are of two types; the Deductive and Inductive research approach (Jonker & Pennink, 2009). This research study will be a qualitative research approach with a deductive research approach. The research strategy is the next important layer in the Saunders research onion and therefore it explains the various types strategies that researchers adopt for a particular research study in which it includes the experiment, survey, action research, case study, grounded theory, ethnography and archival research (Saunders, Lewis, & Thornhill, 2007).

The research choice is the next layer in the research onion and these can be divided into mono method, mixed method and multi method. (Saunders, Lewis & Thornhill, 2007). The combination of deductive, action research and case study will be administered. This research will have a mixed research strategy. The time horizons can be denoted as a fixed time target and a time limit for the completion of a task or an activity. There are two types of time horizons; the cross-sectional which have a prefixed time for the completion of the study and the longitudinal which has no specific time for the data collection, analysis and
completion of the study (Saunders, Lewis, Thornhill, 2009). The cross sectional will be adopted in this research.

**Proposed Mode of Data Collection and Analysis**

These are the most important elements in the research study and a systematically collected data and its proper analysis will answer a research question and it is a technique with a procedure (Bryman & Bell, 2007).

**The primary data** are the first time generated information that are generated to meet up to specific requirements and its major disadvantage is that it is time consuming (Reason & Bradbury, 2006). Hence, the case study is chosen among others.

**The secondary data** are the data collected by others not directly from the respondents (Bhattacharyya, 2006). This will be collected from various materials pertaining the topic of research consisting of books, journals and articles, web pages and statistics. Data Analysis in this research involves the use of self-analysis method of data collected and the information will be presented systematically in tables, chats and diagram.

**Framework development**

Conceptual Framework: This is the initial framework generated from a conceptual idea; it is subjected to improvement depending on the research findings. The data used for the development of this framework is secondary data from best practices. After rigorous analysis and critical study, it would pave a way for the development of the new theoretical framework.

**Theoretical Framework:** This framework would be theoretical and will be deduced from the conceptual framework. This will cover all the flaws of the conceptual framework and would consider all the suggestions from the previous framework. Careful consideration would be observed during the collection and use of primary data to suit the Nigerian oil industry context.

**Prototype Model development**
Due to the size of the oil industry, careful selection of the infrastructure to use for the case analysis is needed. The criteria derived from best practices are expected to serve as a guide in generating the BIM based prototype.

**Ethical considerations**

Since the collection of primary data is prominent, certain ethical issues are considered. The research involves participants in the working environment, therefore “participant information sheet” in order to be attached to the email of invitation to participate in the research. This will serve as the major medium to address the issue of ethical issues, consent of participants, the aim and purpose of studies and confidentiality and data security. Saunders et al (2009) suggested other ethical issues in which most are considered in this study. This ethical issue includes; Ethical approval form by the University, assurance of data security, Participant information sheet with option of withdrawing from participating anytime within the research, confidentiality of participant information and assurance of data security.

**Expenses**

No extra expenses and no special bench fees since it is catered for in the tuition fees but provision for International Conferences to exchange ideas about my research with researchers of similar field.

**Expected outcome**

At the end of the research, it is expected that the three initial research questions are answered. These research questions are; why is BIM not adopted in the oil industry, what are the benefits, barriers and strategies needed, how will BIM be adopted or how will the barriers be overcome.

So also, a proposed framework for integrating BIM to oil industry project will be developed and a prototype of a BIM based platform will be designed. This outcome would amount to enhancing decision-making and reduce cost of maintenance in oil industry projects using BIM.

**Conclusion**
This work gives a way out in integrating BIM into Nigerian oil industries projects. Its effort is to align the Nigerian oil industry to the international benchmark and bridging the gap. Efforts must be made towards researching why there is little or no research on BIM adoption in the oil industry, what are the benefits and barriers, how will the barriers be overcome and BIM be adopted to enhance decision making and mitigate cost of maintenance. In essence this research proposes a framework for integration of BIM to Nigerian oil industry projects in order to enhance effective decision-making and reduce the overall maintenance cost.

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