International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Evaluation of the Current Situation to Application of Building Information Modeling in Iraq

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Abstract: ***Building Information Modeling has lately achieved extensive attention in the construction sector. Many researchers and professionals have proposed BIM as the general remedy to addressing the inefficiencies in the construction sector. In many cases in several countries, competitive advantages and possible benefits have been reported. However, in spite of the potentials and benefits of BIM system, it is not applied in the construction sector in Iraq just like many other countries of the world. Therefore, the purpose of this paper is to understand the uses of BIM for construction projects and to evaluate the awareness level and obstacles to applying this system in Iraq. This purpose has been done by achieving five main objectives by evaluating the knowledge level of BIM by engineers in the construction sector in Iraq, identifying obstacles to the application of BIM in Iraq, the government trends, external factors helping to implement BIM, the internal factors helping to implement BIM in the construction sector in Iraq. The research results indicated that the knowledge level of BIM by engineers in the construction sector in Iraq is very low.***

Keywords: Building Information Modeling, Construction sector, Awareness level, Knowledge level, BIM in Iraq.

1. Introduction

1.1 Overview

In the construction projects, there are communication weak between the different project members such as the owner, designers and builders. The weak is much more clear in the OM of the facilities. When the buildings are completed the owner does not just get new buildings, but also a plethora of projects information in electronic form and papers. It is then up to the owner to make sense of it all at their own expense of time and money.

The building information modeling (BIM) is a technological system to conveying and storing information for the buildings, with an ability to visually display buildings parts in a 3-D view. The 3-D capability is enhanced by the parametric modeling engine, which automatically interrelates building objects to other objects and coordinates changes and revisions across the project deliverables [1]. For instance, a change to the length of a wall in a building drawing is automatically reflected in the walls that connect to it. The idea is that the BIM produces a faster, cheaper, more accurate, and better-coordinated project experience during design, construction, and future use. With the growth of information technologies in the field of construction industry over the last years, numerical building information modeling and process simulation has evolved to a fully accepted and widely used tool for project life circle management [2]

Building information is present through the whole life cycle of the engineering and construction phases. Due to the long time period and the numerous contractors, the phenomena of mass information and information attenuation occur throughout the life cycle. The traditional methods of information exchange cannot meet the mass information processing requirements of modern large-scale construction projects [3]

1.2 Definitions

The Building Information Model (BIM) is a digital representation of physical and functional characteristics of a building [4]. As such, it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life cycle from inception onward (earliest conception to demolition) [5-7]. BIM is the process of using intelligent graphic and data modeling software to create optimized and integrated building design solutions. BIM encompasses the use of three-dimensional, real-time, intelligent and dynamic modeling, and can be a valuable tool in facilitating successful coordination and collaboration. This is critical to integrated building design because it allows all interested parties to, transparently and in real time, share, apply and update information about buildings [8].

1.3 Objective

The aim of the research is to develop a clear understanding about BIM for identifying the different factors that provide useful information to consider adopting BIM technology in projects by practitioners in the construction sector in Iraq. In achieving this aim, two main objectives have been outlined as follows:

a) To evaluate the awareness level of BIM by engineers in the construction sector in Iraq.
b) To investigate and rank the top BIM barriers which face the adoption of BIM in the construction sector in Iraq.

2. Understanding of BIM Concept

From technology perspective, building information model is a project simulation consisting of the 3D models of the project components with links to all the required information connected with the project planning, design, construction or operation as depicted in (Figure 1). The BIM technology is

hailed from the object-oriented parametric modeling technique [9]. The term ―parametric‖ describes a process by which an element is modified and an adjacent element or assembly (e.g. a door attached to a wall) is automatically adjusted to maintain a previously established relationship [10].

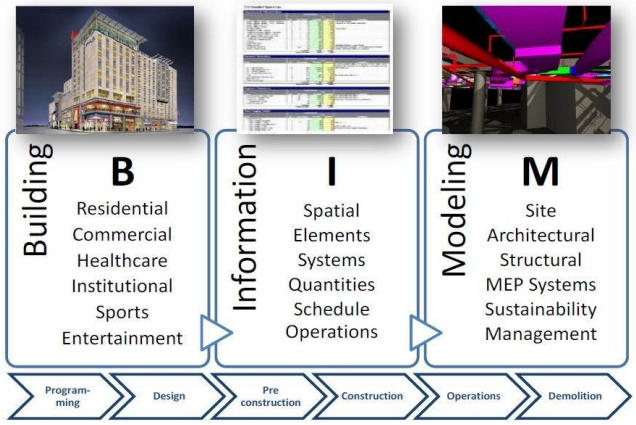

Figure 1: A Visual Representation of BIM Concept [11]

Eastman et al. (2008) [12] explain that the following types of digital models do not fall under the category of BIM:

1) Models that contain 3D data only and no object attributes (i.e. missing - I‖ of BIM);
2) Models with no support of behavior;
3) Models that are composed of multiple 2D CAD reference files that must be combined to define the building; and
4) Models that allow changes to dimensions in one view that are not automatically reflected in other views.

3. Awareness level of BIM

There is a pressing demand for improved awareness and understanding of BIM across the AEC industry, according to many studies related to BIM. Lack of knowledge regarding BIM has led to a slow uptake of this technology and ineffective management of adoption [13].

In general, many studies, such as Arayici et al. (2009) [14]; Elmualim and Gilder (2013) [15], concluded that there are a lack in the awareness of BIM and its benefits in the field of construction industry as well as the business value of BIM from a financial perspective. More precisely, there is a large lack in understanding of BIM (the core concepts of BIM) and its practical applications throughout the life of projects. In addition, there is a lack in technical skills that professionals need to have for using the BIM software as well as lack in knowledge of how to implement the BIM software to be helpful in construction processes.

4. Differences between BIM and CAD

The differences between BIM and computer-aided design (CAD) is that a traditional CAD system uses many separate (usually 2D) documents to explain a building. CAD output is essentially a collection of lines, numbers and text on a page. Because CAD documents are created separately as shown in (Figure 2), there is little to no correlation or intelligent connection among them. For example, a door is represented as a line or a curve, without a detailed understanding of its basic attributes and without any inherent understanding. A wall in a plan view is represented by two parallel lines, with no understanding that those lines which represent the same wall in a section. The possibility of uncoordinated data in a CAD based work environment is very high.

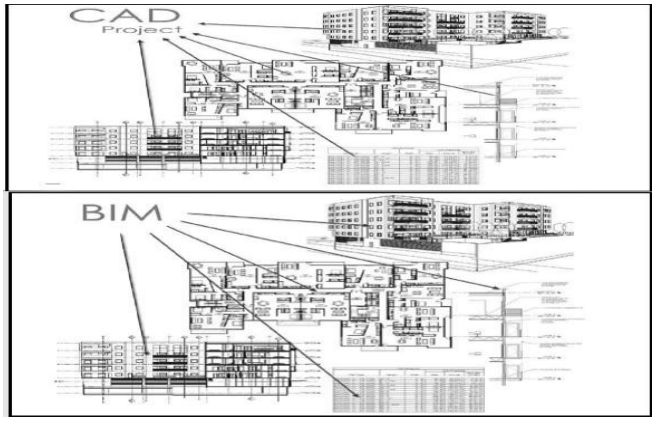

Figure 2: Differences between CAD and BIM [16]

BIM takes a different approach in comparison with CAD. The BIM model serves as a central database, by collecting all information into one location and cross-linking that data among associated objects. As shown in (Figure 2) the main difference between BIM and CAD is the "I" in BIM "information". All documents within the BIM model are interdependent and share intelligence. A change anywhere in the BIM model is propagated throughout all relevant views and documents for the project. The BIM application has an intelligent understanding of the fact that objects created by users represent real-world components of building such as windows, walls, doors and roofs. Thus, BIM objects have characteristics similar to their real-world counterparts such as windows, which can only exist in a wall, and walls always have a thickness attribute. Use of such intelligent objects distinguishes the geometry created by BIM from a 3D model.

5. Evaluation of the Current Situation

In the previous sections, the researcher completes the part that relates to the literature review for the subject of research. The main objective of this section is to collect information relating to Application of Building Information Modeling in Iraqi construction sector through investigating the following matters:

1) The problems and challenges related to the Building Information Modeling.
2) Applied the Building Information Modeling in the construction sector.

The researcher adopted the questionnaire method to collecting data because it an effective method of collecting data simply and quickly. It can be conducted to involve a wide range of people from different professions, experience and knowledge levels, and other aspects, and it requires relatively low costs and effort.

6. Questionnaire Organization

The questionnaire was design to be as understandable as possible in order for the engineers to answer the questions easily. The questionnaire form was firstly provided with an introduction in order to define the research purpose, describe the reasons for which the questionnaire was conducted, ensure the security of information filled in the questionnaire forms, describe a scale by which the answers are assessed, and define the terms involved in the questionnaire. Then, the questionnaire was divide into six parts as shown in (Table 1):

Table 1: The questionnaire parts

Part name	Description
Part one	Gives general information such as organization, years of experience, functions, academic certificates and engineering fields.
Part Two	Ask for information about the availability of computers in the organization and ways to save the information of project and documentations.
Part three	The obstacles to the application of Building Information Modeling in Iraq.
Part four	The government trends.
Part five	The external factors helping to implement Building Information Modeling.
Part six	The internal factors helping to implement Building Information Modeling.

7. Description of the Sample of the Questionnaire

A total of 55 copies of the questionnaire forms were distributed. 43 copies of the questionnaire were returned with returning percentage is (78%). Of the returned questionnaire forms, two forms were incomplete these two forms were dropped from the analysis. Therefore, the net number of questionnaire forms was (41) with percentage of (75%) of the distributed questionnaire forms. The percentage of respondents and their organizations are shown in (Figure 3).

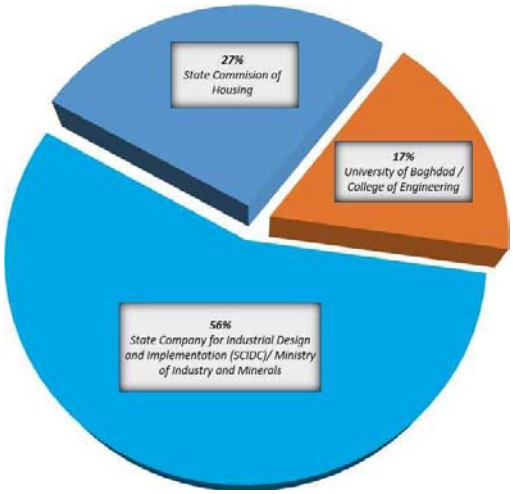

Figure 3: Organization of the respondents

In addition, charts are shown in figures (Figure 4), (Figure 5) and (Figure 6) demonstrate the percentages of the respondents according to the engineering fields, academic certificates and years of experience respectively.

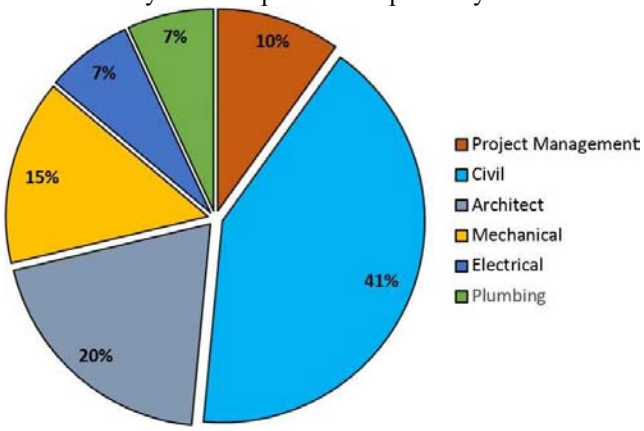

Figure 4: Engineering Fields of the Respondents

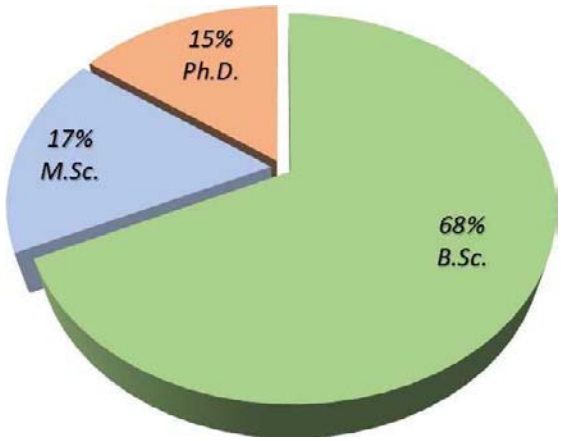

Figure 5: Academic Certificates of the Respondents

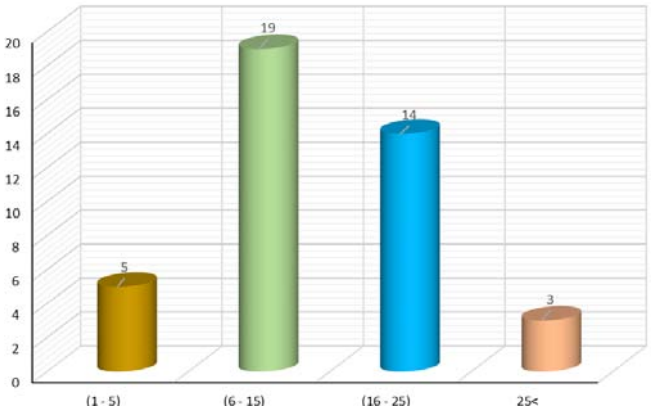

Figure 6: Years of experience

8. Data Analysis

The data obtained from the questionnaire were analyze using Statistical Package for the Social Sciences program (SPSS Version 22). This program provides useful and suitable tools for processing the data and statistical analysis of the results rapidly. The questionnaire items included two types of choices; the first type whose answer (Yes) or (No), and the second part is Quinary appreciation whose answers lie in five choices. In the analysis process, the choices were code numerically in the SPSS program in order to ease the process of analyzing the questionnaire forms. The different choices of the questionnaire and their codes are as follows:

1. Yes (1) No (2)

2. Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), Strongly Disagree (1).

Part Two: Check the current situation.

(Figure 7) Indicates the result of how to documentation for project files.

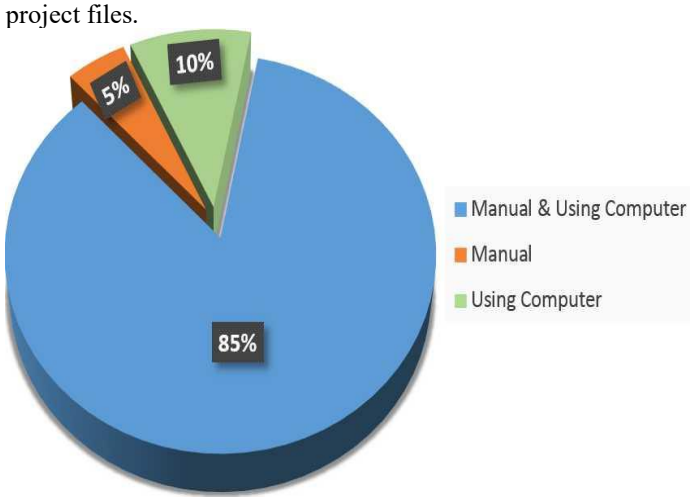

Figure 1: Documentation for project files

Figure 8 indicates the reality of BIM knowledge where their knowledge came from the effort of self-learning.

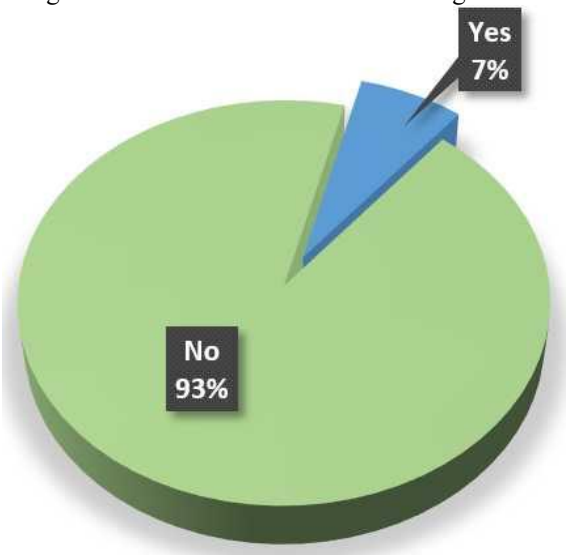

Figure 2: The extent of BIM knowledge

Part Three: obstacles to the application of Building Information Modeling in Iraq.

1) The results show that (80.5%) of the respondents strongly agree or agree that the lack of education for Building Information Modeling and programs to implemented it in universities and institutes.
2) (100%) of the respondents strongly agree or agree that the lack of adequate training for the application of the Building Information Modeling in the construction projects.
3) (81%) of the respondents strongly agree or agree that the Lack of demand for this system by the customer or the government.
4) (88%) of the respondents strongly agree or agree that the lack of publicity and awareness for this system.
5) The results show that (90%) of the respondents strongly disagree or disagree that the Lack of clarity of the benefits for BIM system.
6) (83%) of the respondents strongly agree or agree that the lack of standards and clear guidelines for the application of this system.

Part Four: the government trends

1) (68.3%) of the respondents strongly agree or agree that the Sufficiency programs and systems currently that used for project work, such as AutoCAD software.
2) (80.5%) of the respondents strongly agree or agree that the Lack of support for the development by senior management of the institution or company.
3) (92.7%) of the respondents strongly agree or agree that the lack of initiatives to application for this system by competitors (the lack of the spirit of competition in the use of the system).
4) (83%) of the respondents strongly agree or agree that not wanting to change by the company or institution.

Part Five: external factors helping to implement Building Information Modeling.

1) (85.4%) of the respondents strongly agree or agree that the government support for the implementation of this system.
2) (92.7%) of the respondents strongly agree or agree that the customer orientation to demand the application of building information modeling in his projects.
3) (95.1%) of the respondents strongly agree or agree that the educate Building Information Modeling and programs its own in universities.
4) (92.7%) of the respondents strongly agree or agree that the development of standards and rules and regulations of the exchange of data for Building Information Modeling.
5) (95.1%) of the respondents strongly agree or agree that the providing guidance on how to apply and use of Building Information Modeling.
6) (100%) of the respondents strongly agree or agree that a request to the use of Building Information Modeling by the other parties involved in the project (consultant, architect, civil engineer or contractor).
7) (100%) of the respondents strongly agree or agree that the establishment of a experimental project by Building Information Modeling (To find out how effective it is in Iraq).
8) (97.5%) of the respondents strongly agree or agree that the collaboration institutions with universities to conduct research on Building Information Modeling and apply it to some of the projects.
9) (90.3%) of the respondents strongly agree or agree that the lower cost and time, improve the quality of building, to identify errors in the early. etc.

Part Six: the internal factors helping to implement Building Information Modeling.

1) (95.2%) of the respondents strongly agree or agree that the support from the senior management of the institution / company.

2) (87.8%) of the respondents strongly agree or agree that the intention to improve the quality of production projects.
3) (82.9%) of the respondents strongly agree or agree that awaited and expected benefits of Building Information Modeling.
4) (87.8%) of the respondents strongly agree or agree that the having employees with technical competency for the application of Building Information Modeling.
5) (90.3%) of the respondents strongly agree or agree that the provide staff training on the use of Building Information Modeling.
6) (95.1%) of the respondents strongly agree or agree to put the requirement by companies engineers must be have skill in the use of building information modeling programs.

9. Conclusions

The extensive review of the literature was conducted to achieve the object of the research. The object of this research was to develop a clear understanding about BIM system for identifying the different factors that provide useful information to consider utilize BIM technology in projects by a stockholder in the construction sector in Iraq. The research leads to the following conclusions:

1) The study shows that the awareness level of BIM system is low and not satisfactory. This is because of many reasons, for instance:
   a) The lack of education for Building Information Modeling and programs to implement it in universities and organizations.
   b) The lack of adequate training for the application of the Building Information Modeling in the construction projects.
   c) The lack of demand for this system by the customer or the government.
   d) The lack of publicity and awareness for this system.
   e) Lack of clarity of the benefits of BIM system.
   f) The cost of staff training for BIM system.
   g) The lack of standards and clear guidelines for the application of this system.
2) It is required to improve the knowledge level of engineers with respect to BIM softwares.

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