Challenges and Obstacles of Adoption BIM Technology in the Construction Industry in Iraq

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Abstract— Lack of application modern information technology in the construction sector in Iraq leads to complexity in understanding and interpreting diagrams and data, especially in large construction projects. Building Information Modeling (BIM) has a vital role in the construction industry through using the intelligent software by all of the specialists in the project team such as Architecture, civil engineer and MEP engineer. By using a new technique, BIM, can be determined and detect all the potential conflicts in design, construction and operation phases. A questionnaire has been designed to investigate perceptions related to BIM challenges and obstacles, besides to the desired benefits from using BIM technique. About 36 valid responses received from interested companies. The responses referred that BIM adoption in Iraqi construction industry was very low. There are many factors prevent or, at least, do not encourage the adoption of BIM technology in the construction industry. The most important factor is the cost of adoption the hardware and software related to the BIM technology and lack of request from owner.

Keywords—Building information modeling; Iraqi construction industry; BIM challenges and obstacles

1. INTRODUCTION

The National Building Information Model Standard Project Committee (NBIMS) defined the BIM as a digital representation of physical and functional characteristics of a facility. Also, can be say that BIM is a computer-aided modeling technology in order to manage the information of a construction project focusing on production, communication and analysis of building information models. In addition, BIM model as a source for a database can be relied upon to get the necessary information for the building during the project life cycle. The construction industry in developed countries have adopted the BIM technology in the construction projects since the nineties of the last century, where it was used in certain sectors such as steel structural and construction building when they were limited to certain software, while now the BIM software become accessible to everyone and can be used in various construction sectors [1]. Lack of modern technologies in the construction sector in Iraq led to increase the complexities and difficulties in the understanding of diagrams and schedules, especially in the large construction projects. Construction companies would achieve many advantages by adopting BIM technology in their works. The slow adoption of the BIM technology in the construction industry occurred due to the availability of number of technical and human barriers. Therefore, the aim of this paper is to identify challenges and obstacles that reduce of adoption and implementation BIM technology in the construction industry in Iraq.

2. BENEFITS OF BIM ADOPTION

There are many benefits to be derived from the adoption and implementation of building information modeling technique in the construction industry that could be used in all stages of the construction from the design and planning stages to the implementation and operation stages. The benefits include all disciplinary architectural, structure, MEP engineering. These

benefits can facilitate the construction process flow easily by reducing the cost and time required to complete construction projects, in addition to a high quality to the final product. The benefits of BIM can be summarized briefly as follows:

- Improving of communication among stakeholders.
- Improving of collaboration among stakeholders.
- Improving of visualization for project activities.
- Improving of analysis for project model.
- Improving of project quality by improving final product.
- Clash detection and collisions in early stage of project and solving it.
- Faster project delivery by follow a certain approach.
- Reducing of wastages.
- Reducing of project cost.
- Reducing of project time.
- Attract owners and investors to achieve high profit.

3. CHALLENGES AND OBSTACLES

Challenges and obstacles to adoption and implementation of BIM technology is different from one country to another and from company to another, according to the company's size and differences in the work nature. For example, the large volume companies' that have a high annual yield have the ability to adopt the BIM technology faster, unlike small businesses and medium-sized because of the need to money and time required. A questionnaire survey was conducted recently by [2] claimed that the challenges that facing the adoption of BIM technology in the construction industry can be divided into four categories. One of the categories was the cost of purchasing a new software and hardware, and cost of training on BIM technique. In addition to that, many studies identified the BIM challenges, in different countries, as shown in table 1.

Table 1: the challenges that faced the adoption of BIM technology in the construction industry.

Challenges	References
1.Cost	[3, 4]
2.Demand by owner and market requirements	[5]
3.Time	[6]
4.Acceptance by staff	[7]
5.Knowledge and skills	[8]
6.Top management	[9]

4. RESEARCH METHODOLOGY

In order to data collection, a questionnaire survey method has been adopted that consists of 5 questions as can be seen in the appendix, for the fulfillment of research objectives. The sample for this research was chosen from the Iraqi construction industry which including Architects, civil Engineers, Owners, General Contractors and Consultants. Of the total 100 questionnaires sent out by email to the professionals in the Iraqi construction industry, just 36 are received. This survey started on 5 December 2015 and finished on 20 February 2016. Data analysis started after gathering the data from the questionnaire by representing the data on the pie chart, and compared the results gained from the questionnaire with the previous studies. The purpose of the data analysis is to find out important of challenges that reduce adoption the BIM technology in the Iraqi construction industry.

5. RESULTS THE STUDY

The results of the survey shown that most of the respondents were from Architects, who represent (40.5%), followed by civil engineers, who have reached the participation in the Questionnaire Survey proportion (23.8%), while the lowest participation in the survey, were Owners, which amounted to (9.5%) Just as it is shown in Fig. 1, which refers to that most of the respondents were from Architects, because the survey concentrated on this category which has a strong applied business related by new technologies in the construction industry.
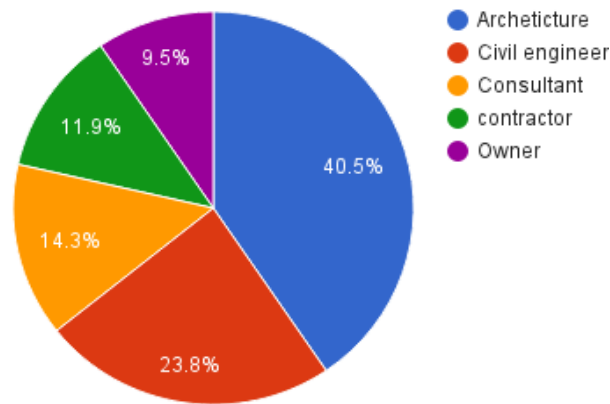
Figure 1: the proportion of specialists in the construction companies

Also, the result of the survey discovered that the companies which using BIM technology in their projects reached to 9.5% only which refer to a very low adoption for this technique in the construction industry in Iraq as shown in Fig. 2 below. In addition to that, should be noted the companies that adopted the BIM technology are international companies with branches in Iraq. The results refer to the slowdown to adoption this technology in Iraq because of the many reasons, especially the situation of security and the wars taking place in the country since the eighties the last century until now.
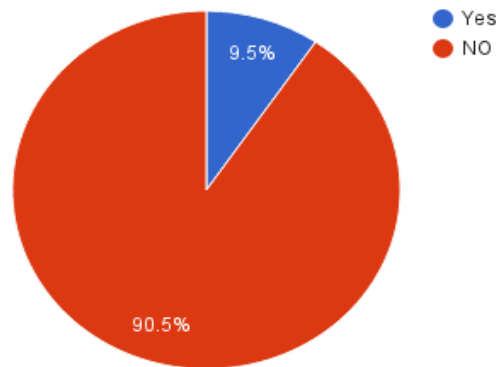

Figure 2: the proportion of companies that used the BIM technique in their projects

There is a good range of age group between the respondents which were 35.7% for persons have more than 50 years and 23.8% for the persons who's their ages between 20-30 years while only 19% for persons whose have between 31-40 years as shown in Fig. 3 below. Regarding age, the researcher concentrated on the greatest age categories which have more experience regarding construction industry than others.
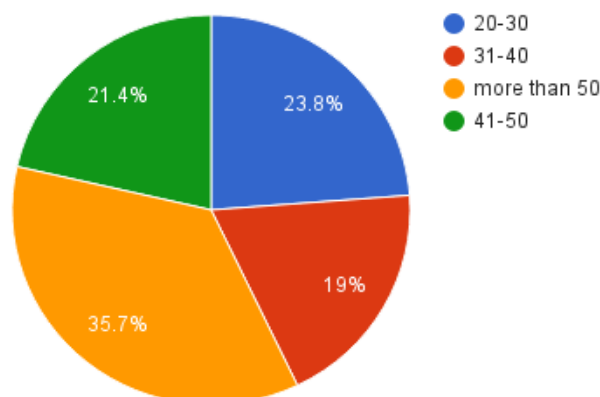

Figure 3: distribution of respondent's age

While, the distribution of respondents in terms of working experience. The results of questionnaire survey refers to that only 40.5% of persons whose have more than 21 years of working experience in construction industry, 26.2% for persons whose have less than 5 years working experience in construction industry and 19% for persons whose range their experience

between 11-20 years, while 14.3% for persons have experience 6-10 years as shown in Fig. 4 below, means that the respondents have deep knowledge about challenges and benefits of their work and know how solving the problems and issues in the construction industry.
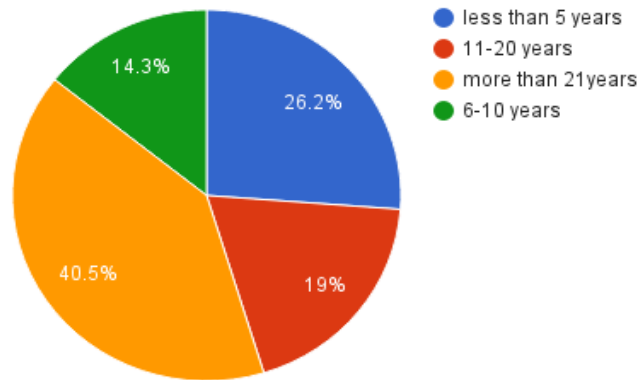

Figure 4: working experience in the construction industry.

The study results of the challenges facing and reduce the adoption and use of BIM technology in the construction industry in Iraq were as can be seen in Fig. 5. the cost of buying a new hardware and software related BIM technology in addition to cost of training on the new hardware and software which constituted 33.3%, while 16.7% was demand of the market or request by owner.
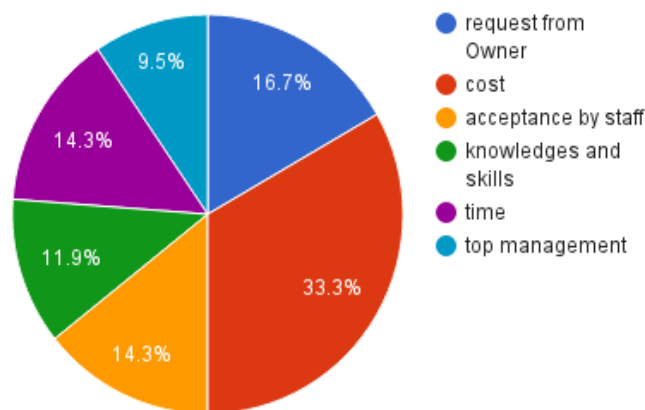

Figure 5: challenges that reduce of adoption BIM in construction industry

While the time obstacle constituted only 14.3% which was like of percentage the obstacle of acceptance by staff, and the last challenge was knowledge and skills that were only 9.5%, as shown in Fig. 5. Deterioration of the security situation in a country like Iraq since of the eighties the last century until now, it difficult to investigate a new technology such as other stable countries.

6. DISCUSSION THE RESULTS

A.   Cost challenge

We noted that the costs of the purchase and adoption of modern hardware and software, as well as training of personnel cost is the biggest barrier to the adoption of BIM technology in the Iraqi construction industry, which accounted for 33.3% of the total sample, which had been questioned by Questionnaire Survey. From significantly, look at the benefits resulted from the adoption of the BIM technology in the construction projects, if the adoption the modern software and hardware will achieve and add the benefits to the company or not. In this regard, there is a study compared the cost in the case of training for someone on BIM technique with applying them by the needed tools is about £10,000 [3, 4]. The cost to adopt BIM tools, the companies need to incurring the large cost to buy the new hardware and software in addition to sending all stakeholders involved to attend BIM training on software. The cost to adopt BIM software such as Revit, Tekla, Archicad and Naviswork is high if compared with the traditional design tools [10].

B.   Demand by owner and market requirements

Market needs or Owner requirements for the application of Building Information Modeling have a significant role in facilitating the adoption of BIM technology by the construction companies. Through understanding and full absorption to the capabilities of technology in reducing costs and time for completion projects. Besides, improve the quality of the final product. There will be an essential requirement by the owner to adopt that technology in future construction projects. For example, the study was conducted by the [5] showed that companies that do not use Building Information Modeling in their projects were claims that the main reason is the lack of a request from the client. Where we noticed that the percentage of respondents in the survey was 16.7% who asserted that the owners requirements are an obstacle or challenge reduces or limits the adoption of BIM technology in the Iraqi construction companies.

C.   Time

The respondents referred to that adoption of BIM technology in the construction industry can be take a long time because of the transition from a traditional technology to a new technology not easy. One of the challenges is that, there is not much of experience about applications of this technology in construction fields, therefore, such as these technologies maybe takes much time to become more widely adopted. In addition the time required for staff training on the hardware and software related of BIM technology not available in many companies [6].

D.   Acceptance by staff

Any new technology must have a new features to gain the staff acceptance and satisfy need all the parties involved in the project, especially personnel whose have the executive authority to make crucial decisions. There are numerous studies showing that mindset of staff and determine acceptance or not accepting any new technology poses an obstacle to the adoption of BIM technology, from these studies was [7] which proved that mindset of personnel play a vital role in accepting BIM technology in construction industry.

E.   Knowledge and skills

Regarding of the knowledge challenge that facing clients and other stakeholders in project, lack of the knowledge needed for implementation the new technologies can be considered that one of the important obstacles in reducing of adoption BIM technology [8]. Lack of necessary knowledge for the application of modern technologies in the construction projects as well as the lack of adequate knowledge of the benefits to be derived by applying BIM technique. In addition to not continue the implementation of similar projects to be familiar with all issues and problems is one of the most important obstacles in slowing the proliferation of BIM technology on a large scale [11].

F.   Top management

For the purpose of implementing any technology in construction projects, especially modern construction techniques, there should be strong support from the senior management of companies and organizations. In addition to that, the top management should be have aware for the benefits the application of BIM technology in the construction projects and thus how these benefits would increase the company's profits [9]. In addition, the top management have a significant and effective role in making decision about adoption of BIM technology in the construction projects rather than traditional methods because of their powers to take decisions within the scope of the company.

7. CONCLUSION AND RECOMMENDATION

Based on the results of current study, the results show that adoption of BIM tools is a very low in the construction industry in Iraq. The slow adoption of BIM technique in current practices in construction field have many challenges. Results of the survey claimed that the cost factor has the most effective weight among other factors, percentage of each challenge factor as illustrated in below:
1- The cost 33.3 %.
2- Demand by owner and market requirements 16.7%.
3- Time 14.3%.
4- Acceptance by staff 14.3%.
5- Knowledge and skills 11.9%.
6-Top management 9.5%.
Current state to adopt BIM technology is not satisfactory in the construction industry in Iraq that is only 9.5% due to many causes that mentioned above. The current situation in Iraq is not stable because the bad security situation which leads to reducing of adoption BIM technology or any new technique in the construction industry. Therefore, most of the large companies in Iraq left the country to other countries to take a new security place to practice their works far from problems.

The value of the study is to find out the challenges and obstacles that prevent adoption the BIM technology in the construction industry in Iraq. The government and other agencies must encourage the construction companies through overcoming on the challenges mentioned above to apply the BIM technology in the construction industry.

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APPENDIX: QUESTIONNAIRE FORM:

1. What is your current job title? *

Architect	Civil engineer	Consultant	Contractor	Owner

2. Did your company currently using the BIM technology in their projects? *

Yes	No

3. How old are you? *

20-30 years	31-40 years	41-50 years	more than 50 years

4. How many years does you have experience in the construction industry? *

Less than 5 years	6- 10 years	11-20 years	More than 21 years

5. Which challenge reduce adoption the BIM technology in the construction industry?*

Cost	Demand by owner	Time	Acceptance by staff	Knowledge and skills	Top management