An Overview of Using Building Information Modelling (BIM) in Construction Management

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Abstract— Building information modeling (BIM) is one of the most impressive recent developments in the architecture, engineering, and construction (AEC) industry. Using BIM technology, gives you a 3 D virtual model of a building digitally constructed. This operation called a building information model, can be used for planning, design, construction, and operation of the project. It (AEC) parts to have a clear sight for any potential design. In this paper, we present an over view for BIM, case studies for researchers. The findings of this study concluded that there's a great benefits provided by using BIM, and this usage will be reflected on the time and the cost of the projects.

Keyword—building information modeling, architecture, engineering, and construction (AEC), revit.

1. INTRODUCTION

BIM is an acronym that stands for Building Information Modeling. Some say BIM is a type of software. Another says BIM is the 3D virtual model of buildings. Or BIM is a process or BIM is nothing more than the collection of all building data organized into a structure database easy to query both in a "visual" and a "numerical" way. It is believed that BIM is all the above and some more.In last twelve years since the term " building information modeling " or BIM was first introduced in the AEC industry , it has gone from being buzzword with a handful of early adopters to centerpiece of AEC technology , which encompasses all aspects of the design , construction , and operation of a building .Most of the world's leading architecture, engineering, and construction firms have already left behind their earlier, drawing-based, CAD technologies and the using of BIM for nearly all their projects. The majority of other firms also have their transitions from CAD to BIM well underway. BIM solutions are now the key technology offered by all the established AEC technology vendors that were earlier providing CAD solutions. In addition , the number of new technology providers that are developing add-on solutions to extend the capabilities of the main BIM applications in various ways in growing at an exponential pace. In short, BIM has not only arrived in the AEC industry but has literally taken it over , which is particularly remarkable in an industry that has historically been notoriously resistant to change (LISTON 2011).

2. LITERATURE REVIEW

Building information modeling (BIM) is one of the most promising recent developments in the architecture, engineering, and construction (AEC) industry. With BIM technology, an accurate virtual model of a building is digitally constructed. This model, known as a building information model, can be used for planning, design, construction, and operation of the facility. It helps architects, engineers, and constructors visualize what is to be built in a simulated environment to identify any potential design, construction, or operational issues. BIM represents a new paradigm within AEC, one that encourages integration of the roles of all stakeholders on a project.

BIM is defined also as an approach to building design and construction through modeling technology, associated sets of processes and people to produce, communicate and analyses building information models(Haron 2013). Many benefits of BIM were defined as, improve the delivery of design and construction through 3D visualization, integrated and automated drawing production, intelligent documentation and information retrieval, Consistent data and information, and Automated conflict detection and automated material take off.(Haron 2013).

In his paper BIM Framework Variables Practicability Effectiveness Recent advancesin building information modeling Jung and Joo mentioned the multidimensional (nD) and talked about the disseminated the utilization of CAD information in the construction industry he said "the overall and practical effectiveness of BIM. His comprehensive BIM framework consisting of three dimensions and sixcategories was then developed to address the variables for theory and implementation.The study concluded that the framework can provide a basis for evaluating promising areas and identifying driving factors for practical(Jung and Joo 2011).On the other hand some papers tested BIM by taking case studies and analyzing datato get the benefits of BIM like Manning and Messner , they take two cases ,the firstproject was a trauma hospital in a developing country in conflict, and the other is a medical research laboratory in the United States , These case studies concluded an evidence of benefits of BIM upstream in the project lifecycle – such as the programming stage , the Benefits included visualization, time saved relative to concept updates, and quantity takeoffs (Manning and Messner 2008). Another case studies of BIM was on adoption for precast concrete design by mid-sized structural engineering firms, by Jung and Joo, he started with BIM descriptions as a complex technology, although its potential benefits are clear, itsintegration in structural engineering firms requires leadership and persistence as well as careful planning. His study was observed at two mid-sized engineering firms in thelast two years, have been recorded and analyzed. They shed light on the obstacles that had to be overcome, the achievements and disappointments, and the changes in workflow and personnel that the firms have experienced.The results reveal clear improvement in engineering design quality, in terms of error free drawings, and steadily increasing improvement in labor productivity. The firm's clients have also begun to exploit the rich information available with BIM, but not to the extent expected. Progress in adopting BIM is slow but certain (Jung and Joo 2011). Another paper talked about the same topic, Barlish and Sullivan asked a question, how can we develop a more complete methodology to analyze the benefits of BIM, and the answer was by apply recent projects to this methodology to quantify outcomes, resulting in a more a holistic framework of BIM and its impacts on project efficiency, so a framework calculation model to determine the value of BIM is developed and presented. The investment metrics were: design and construction costs. The methodology was tested against three separate cases and results on the returns and investments are presented. The findings indicate that in the tool installation department of semiconductor manufacturing. This study concluded that there is a high potential for BIM benefits to be realized. Actual returns and investments will vary with each project (Barlish and Sullivan 2012)

BENEFITS:

Availability to use single prepared 3D frame model for: visualization, structure analysis, final adjusted 3D model and Facility Management model with related information. It was saved ~20% of time for plan and view drawing with AutoCAD and time for redrawing with mistakes correction when changes occur. The 3D model was used for estimation of the bill of quantities for most of work packages that made easier negotiation process with subcontractors and suppliers. In general the procurement and supply of manufactured elements and details was improved essentially. The personnel time wasted for disputes about volumes of works done during work acceptance phase was decreased and specialist could pay more attention on quality of performed works as well as got time to discuss how to improve methods of work.(Migilinskas et al., 2013) some countries using BIM was studied by researchers one of them talked about UK experiment he said Substantial impacts through BIM implementation may be achieved throughout all stages of the construction process. The paper measures BIM use throughout the project lifecycle, confirming BIM is most often used in the early stages with progressively less use in the latter stages. His research demonstrates via 92 responses from a sample of BIM users that collaboration aspects produce the highest positive impact. The process aspects are more important than the software technology. BIM necessitates investment in software and training however, smaller practices can afford it. Stakeholder financial benefits are ranked concluding that clients benefit most financially from BIM followed by Facilities Managers. Despite this, over 70% do not provide a 3D model and Cobie dataset at the conclusion of a project. Identification of Key Performance Indicators currently being used for BIM is provided and findings indicate a lack of industry expertise and training providing an opportunity for education providers (Eadie et al., 2013).Several software programs used BIM were reported by many researchers. This software is, Autodesk, Revit, Federation – Navis works, and Field BIM 360.

3. CASE STUDY USING BIM

A villa was designed by (475.7) total building area, Revit software was used. First of all,several instructions were followed: The AutoCAD file must be divided for it to become easier to work; otherwise it will start to lag a lot.In the case of recalling any part of the AutoCAD, the suitable units must be chosen to limit the occurrence of errors.When copying anything in the same level, copy it using 2D but if you want to copy it on another level you must use3D then copy it then go to the "Modify" menu and choose "Paste-aligned to selected level". In the case if any error the program will give you a warning massage.Using this program will save a lot of time unlike the ordinary work. The grid lines must be selected in order for it to become easy to deal with in the project.Then I started design using Revit, and the final output was as bellow:

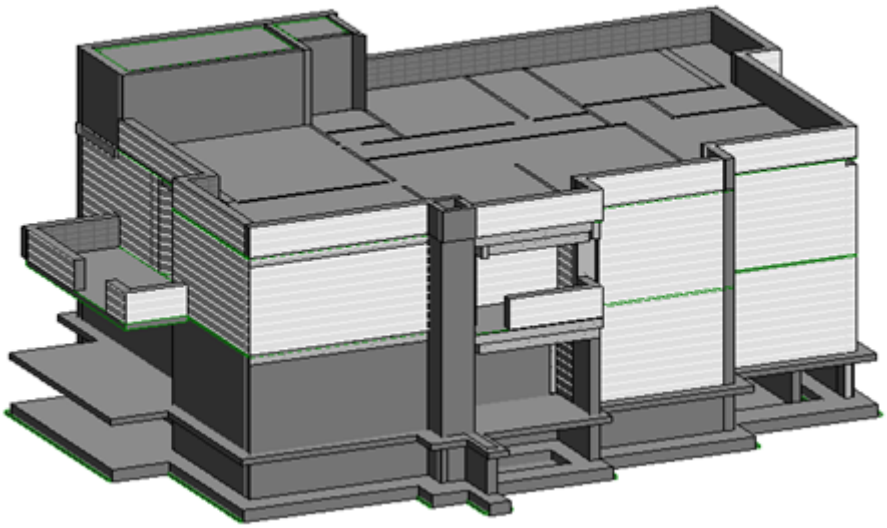

Figure 1: Output of Revit Software

4. CONCLUSION

The AEC industry will earn a big benefits and new ways to plan, design, and implementing its projects by using BIM.All of the projects details will be clear and accurate with BIM, it's not required to know everything in BIM to use it , but a part of it will save your time and money .

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