THE ADVANTAGES OF BIM OVER TRADITIONAL CAD DRAFTING TO INCREASE THE PRODUCTIVITY IN BUILDING AND CONSTRUCTION INDUSTRY

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Building practices have to rely on drawings. Before the advent of Computer-Aided Design (CAD), the drawings were produced manually through hand drawing with traditionally drawing boards. It was a very time consuming, tedious and even frustrating way, especially when the buildings were complex.

In late 20th century, many CAD software have been developed to aid the drafting process with which the 2D and 3D drawings were generated more efficient and flexible over hand drawing. With the advantages of CAD tools[1], the drafting process was easier and less time consuming thus helped the productivity to increase to some extent.

As the complexity of buildings continues to grow, both technically and programmatically, thus the traditional 2D and 3D drawings reveals insufficient. Firstly, 2D and 3D drawings are created individually and separately thus the details among drawings may not consistent. Secondly, 2D drawings are normally represented for typical plans, sections, elevations and construction details of the building thus it is very difficult to produce 2D drawings for iconic buildings with unusual shapes such as the Beijing Olympic Stadium. Thirdly, complexity in building systems demands greater of information which is not only the visualization of the building but also other information that could be used to analyse the construction issues and find for optimal solutions of the building performance such as environmental data, financial data, legal data, etc. By integrated these information together, the building model will become an accurate representation of the building life cycle that enables people to understand how the building will be built from earliest conception to demolition. As 2D and 3D drawings are just visualization of the building appearance thus Building Information Modelling (BIM) approach has been introduced to overcome these shortcomings. BIM is defined as:

"a digital representation of the complete physical and functional characteristics of a built asset. A BIM model can contain information on design, construction, logistics, operation, maintenance, budgets, schedules and much more. This depth of information contained within BIM enables a richer analysis than traditional processes and it has the potential to integrate large quantities of data across several disciplines throughout the building's life cycle."

According to GSA BIM guide[2],

"The purpose of BIM is to make the design information explicit, so that the design intent and program can be immediately understood and evaluated...A BIM model, therefore, can live longer, contribute more to process efficiency, and provide superior accuracy than traditional 2D CAD drawings."

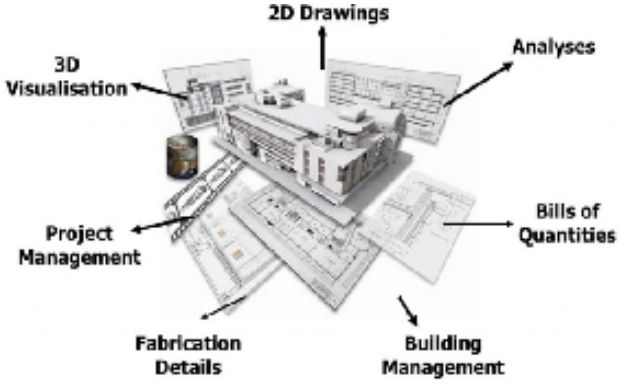

Figure 1: *An information-rich BIM model with integrated data (Source: codebim.com)*

[1] Kuzmanovski Zoran, Working in CAD instead of hand drawing! Advantages of using CAD verses manual drawing,http://www.topcadservices.com/2014/working-in-cad-instead-of-hand-drawing-cad-advantage-over-hand-drawing/#ixzz39lOUPdlk. Access date: 7 Aug 2014.

[2] GSA BIM Guide Series 1, www.gsa.gov/bim, p.4

For increasing productivity in building and construction productivity, BIM has the following advantages over CAD:

a) Automatic generation of drawings and reports

BIM allows for extracting different views from the BIM model for drawing production. It also offers the possibility to extract infinite plans, sections, elevations and 3D views thus making the drafting process faster, more accurate and highly consistent among different drawings. Besides the geometric data, the smart BIM model also enables to extract quantity of building objects and generate schedules. These sorts of functionality are clearly not possible in normal 3D CAD.

b) More predictable outcomes

• Clash detection

Clash detection is the process to detect the design clashes. As a BIM model is the integration of multiple disciplines such as architectural model, structural model and MEP model thus it allows for identifying the clashed issue such as elements of different disciplines penetrate each other.

• Design analysis

Design analysis is the ability of BIM to use analysis and evaluation programs to obtain the design feedback and predict performance of the project before built based on which the suitable decisions could be made to have optimization of the design work and also enhance design functionality. Some examples of BIM design analysis include: green design analysis, structural analysis, etc.

• Project planning

Project planning or 4D BIM provides powerful visualization of the planning sequence of construction activities and space requirement on a construction site. 4D modelling enables the project team to detect the issues in advance of the construction activities when they are much easier and less costly to resolve.

• Cost estimate

Cost estimate or 5D BIM uses to calculate and generate quantity take-offs and cost estimates throughout the project life cycle. In this way, BIM model enables project team to envisage the cost effects of their design decisions thus helps to curb excessive budget overruns.

c) Common platform for facilitating communication, collaboration and information sharing

BIM enables multiple disciplines such as Architects, Engineers, Project Managers and other stakeholders involved in the project to coordinate with each other to create the BIM model thus making BIM a common platform of communication. When team members are geographically distributed, BIM allows information sharing through central project model and multiple local servers. Specifically, team members could work simultaneously on the model stored on their computers and update to and view their works in the central model.

The concept of BIM is not new in building and construction industry. However, the issue of how to make full use of BIM in implementing process is still being discovered by many firms in Architecture, Engineering and Construction (AEC) industry. In Vietnam, the use of BIM has been adopted but only used by companies who are doing international projects. As the world now is moving from CAD to BIM because BIM has successfully demonstrated its advantages in improving productivity, it will be the dominant technology in Vietnam in the near future. Therefore, we should take BIM into account in education, research and practice to catch up with the world trendand to leverage efficiency in building construction operations and works.

The objective of this paper is to show the advantages of BIM over traditional CAD drafting to increase the productivity in building and construction industry. This paper consists of 4 parts. The first part shows the insufficiency of 2D and 3D drawings in supporting nowadays building and construction industry followed by the second part which is the introduction of BIM approach and concept. The third part elaborates on the advantages of BIM over CAD to support productivity. Lastly, the last part draws concluding remarks about the BIM approach in Vietnam.