Functional Suitability of BIM Tools in Pre-Construction, Construction and Post-Construction Phases of a Building Project

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ABSTRACT

Managing building projects and communication of information between the stakeholders of the projects is getting collaborative and faster, with the availability of Building Information Modelling (BIM) software system. Numerous BIM systems are offered by various software developers. Each one of these systems provides pre-construction, construction, post construction functionalities or all of them. Some are suitable for architects, contractors, engineers, clients or all of them. Therefore there is a need to develop a systematic approach to evaluate the functional suitability of these systems and guidelines to help the project stakeholders to evaluate the BIM software for their need. This paper presents a study of commonly used BIM systems for their functional suitability for Pre-construction, Construction and Post-construction phases of the Building Project. Various functionalities of these three phases are derived. The relevant functional areas in Pre-construction, Construction and Post-construction are identified. A scoring methodology is presented to rate the BIM systems based on these functionalities. This methodology forms the basic guideline for architects/engineers, general contractor, sub-contractors and facility managers to evaluate functional suitability of BIM systems for their respective functions.

Keywords: Application Area, Building Information Modelling (BIM), Construction Phase, Functional Parameters, Post-construction Phase, Pre-construction Phase, Score

1. INTRODUCTION

Building Information Modelling (BIM) is a model-based design concept, in which buildings are built virtually before they get built out in the field. The data models facilitate complete integration of all relevant functional factors in the building lifecycle. It also manages the information exchange between the AEC (Architects, Engineers, and Contractors) professionals, to strengthen the interaction between the design team, planning team and execution team. (Kumar & Mukherjee, 2009) The newer generation

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BIM systems have been evolved as 2D (dimensional), 3D, 4D, 5D and 6D. Each version has evolved with the functional capability of project life cycle resulting into a complete collaboration functions required by various stakeholders such as Architects, Engineers, Contractors, Clients, Suppliers, Consultants etc.

The Building Information Modeling (BIM) is an approach in which the management of design and documentation, information communication and the functional processing is carried out in the entire lifecycle of the building project. BIM systems facilitates the automatic generation of drawings, reports, design analysis, schedule simulation, facilities management – ultimately enabling the building team to make better-informed decisions in planning, monitoring and controlling the projects.

BIM supports people, tools, and tasks to effectively share information throughout the building lifecycle, thus eliminating data redundancy, data re-entry, data loss, and miscommunication and translation error. Most importantly the consistency in business meanings is maintained from its source to destination in spite of getting transferred to several levels of management.

2. BIM AND CONSTRUCTION MANAGEMENT

BIM is an approach to building design, construction, and management along with co-ordination and information sharing capacities between the project stakeholders. It supports the continuous and immediate availability of project design scope, schedule and cost information that is high quality, reliable, current, integrated and fully coordinated. It is an approach which has integration of several technologies in one system and integration of most of the business functionalities of pre-construction, construction and post construction phase of a building project. BIM is essentially the intersection of two critical ideas: 1) Keeping critical design information in digital form that make sit easier to update and share more valuable to the firms creating and using it, 2) Creating real-time consistent relationships between digital design data with innovative parametric building modelling technology that can save significant amount of time and money and increase project productivity and quality. (Autodesk, 2012)

Technically BIM is primarily a three dimensional digital representation of a building and its intrinsic characteristics. It is made of intelligent building components which includes data attributes and parametric rules for each object. BIM provides consistent and coordinated views and representations of the digital model including reliable data for each view. This saves a lot of designer’s time since each view is coordinated through the built-in intelligence of the model. (Hergunsel, 2011).

The recent developments in BIM systems provide different modelling levels ranging from 2D, 3D, 4D and 5D. It all starts with 2D drawings; then we receive or make the 3D models and coordinate them; then we use the construction-caliber quantities from the takeoff for the 4D schedule and the 5D estimate. (http://www.vicosoftware.com).

The 3D visualization allows project stakeholders to better understand the building as it comes alive before their eyes. A 4D model looks just like a 3D model, but it contains even more information about installation rates, productivity rates, crew sizes, and costs. And a 5D model looks just like a 3D model, but it includes component pricing and budgeting reports for the job. When all these are put together an iterative effect of 2D-3D-4D-5D BIM is resulted. As the model grows in complexity, it becomes the data-rich font of project knowledge. Each stakeholder can approach the model with different questions and what-if scenarios and receive near-instant analysis of the situation. (http://www.vicosoftware.com).

The next generation BIM provide 6D sustainability services and 7D Facility Management & Asset Management (http://www.elevations-bim.com).

Fairly good number of BIM systems is available today with various modelling capabilities, ranging 2D, 3D, 4D, 5D, and 7D.