International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2163
Volume 1 Issue 9 (October 2014) www.ijirae.com

BETTER CONSTRUCTION WITH BUILDING INFORMATION MODELLING

Krish R. Villaitramani
Dept. of civil engineering, Mumbai University

Dhruv P. Hirani
Dept. of civil engineering, Mumbai University

Abstract— ***BIM systems collaborate data from architects, structural engineers and builders. While each of the members of the building team plans and designs different elements of the project, the information is organized and collaborated in the form of digital databases by the building information modeller. Each discipline interacts with familiar and customary view of the information while the bim system constantly updates the changes made in each presentation. This speeds up the design process and coordination between different team members. Many organisations in the construction industry are now seeing a requirement to deliver projects using BIM. With increasing competition and the low availability of land, the use of bim in construction industry has become imperative.***

Key words— Construction, modelling, architect, engineer, management.

I. INTRODUCTION

Building Information Modelling relates to the use of Information Technology in construction management. Softwares are used to store and process information about construction projects. Information about all the necessary materials and resources, including human resource i.e. labour, is input to generate a model for the proposed plan.

By storing and managing building information as databases, building information modelling solutions can capture, manage, and present data in ways that are appropriate for the building team member using that data. Because the information is stored as a database, changes in that data that so frequently occur during design can be logically propagated and managed by the software throughout the project life cycle.

BIM systems collaborate data from architects, structural engineers and builders. While each of the members of the building team plans and designs different elements of the project, the information is organized and collaborated in the form of digital databases by the building information modeller.

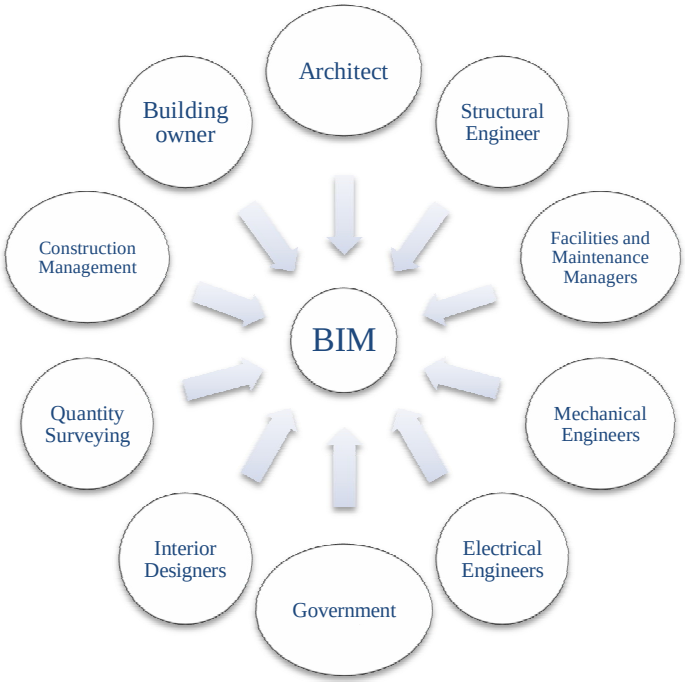

Fig 1. Data input for BIM in construction projects

Each discipline interacts with familiar and customary view of the information while the bim system constantly updates the changes made in each presentation. This speeds up the design process and coordination between different team members.

BIM 3D modelling helps design structures with more insight into the complex nature of the construction process. The following are the features offered by BIM based project planning:

- Visualization of design ideas
- simulation of alternatives
- identification of clashes
- Communication of intent
- Identification of opportunities to increase productivity and reduce waste

II. CHARACTERISTICS

A. Database Technology

BIM solutions create and operate on digital databases to collaborate different members of the construction team. Traditionally, building project plans and designs have been illustrated via drawings and information was added using notes and tables. CAD technology automated this process with the help of object-oriented design and information was directly fed into the models. The overall path that such developments were leading to was identical: the creation of a realistic graphical representation of the envisioned building design.

The principles of BIM reverse this relationship by starting with the idea of picking up and managing information regarding the building, and then showing that information back as conventional illustrations other applicable forms. From the moment of creation, a building information model starts capturing building information and stores and manages it in a database. The model makes this information accessible for use and reuse at every other point in the plan. Drawings become an assessment into the database that describe the building itself. Instead of established file formats (such as a drawing or excel sheet) for presentations, the building information model information is stored in a database. The modeller can use this database to extract information for editing and review in presentations.

Building information models organize collaboration by the building team through digital databases. Individual team members can work independently on the data shared on a central local network. Changes can be made by each member working on the model and view and compare their work with others. These dynamic changes and a record of the interactions made by each individual with the data model is available for review- a history of all changes made by all team members can be preserved in the building information model for as long as this information is useful. Changes can be selectively regressed to make certain corrections in the design path.

B. Optimisation of solution

At a point in the design process the building team might discover that a solution could be better and different from what they have planned. In this case an another iteration occurs that may reconsider earlier assumptions. Managing these iterative changes is essential to encourage the best possible solution to design problems. Repeated iterations enhance the design and eliminate possible errors. BIM solutions manage data and their changes efficiently, producing high quality project designs.

C. Replication

Successful BIM designs can be reused in other construction-industry related projects. The model information stored in databases can be put into application for similar plans. This considerably reduces design time and possible problems can be tackled before-hand. This results in a smoother construction process as the design is already tested multiple times and makes construction more mechanical. Accurate prediction of building periods increases project certainty. The economics of the project are vastly benefitted.

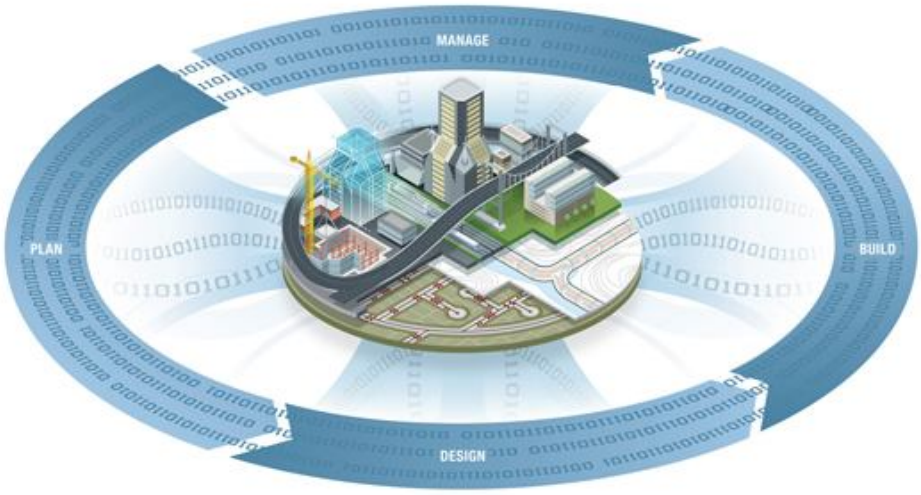

Fig 2. Source: McGraw-Hill construction, 2009, 2010

III. BENEFITS

The key benefit of BIM is its accurate geometrical representation of the parts of a building in an integrated data environment (CRC Construction Innovation, 2007). Other benefits include-

A. Higher Quality

Experts in various fields are brought closer with the BIM model forming the nexus. Without encountering tedious tasks, the project team can explore various changes and improvements to the design. Since the time lag in conveying information from one person to another is reduced, coordination is increased. Experienced people work with other project members on one common platform. The building owner uses building information models to improve quality in the management of the building. The building information model provides a digital record of building renovations and improves move planning and management.

B. Speed

Design and documentation of the building can be done concurrently instead of serially. As the design proceeds, drawing, graphs and tables are simultaneously created for presentation purposes. The design team can deliver better work in a faster way. Building information modelling also fast-tracks the adaptation of standard building prototypes to site conditions for businesses such as retail that require similar buildings in many diverse locations.

Quicker estimation of time and costs allows builders to exploit prefabrication technologies which greatly reduce time for construction. The prefabricated elements are ordered and are manufactured in far-away factories at the same time when the site is prepared. These elements can be directly assembled on-site saving substantial time. Prefabrication technologies are tremendously changing the AEC industry due to its immense potential in BIM models.

C. Cost

Using building information modelling, design teams get more work done with fewer people. A smaller design team means lower costs and less chance for miscommunication. Because the documents are coordinated by the computer and therefore can be more complete, the cost of changes and coordination in construction administration is reduced.

Better and efficient planning helps to minimize waste materials generated as a consequence of construction. The builder has more certainty so as to allocate and use the resources optimally as shown in the model.

IV. CONCLUSION

Information technology has revolutionized many industries all around the world. It continues to do so with the tool of Building Information Modelling. BIM collaborates different members using digital database where these members operate and provide changes to the design. These changes are stored and tested and the solution is optimized with necessary revisions in the plan. This results in lower costs, better efficiency and higher quality in the least possible time with the help of BIM aided construction management practices.

The future of the construction industry is increasingly inclined to adapt to these BIM systems due to extreme competition in a world of depleting resources and rapid development of cutting-edge technologies.

References

[1] Azhar, Salman. "Building information modeling (BIM): Trends, benefits, risks, and challenges for the AEC industry." *Leadership and Management in Engineering* 11.3 (2011): 241-252.

[2] Kymmell, Willem. *Building information modeling: planning and managing construction projects with 4D CAD and simulations*. New York: McGraw-Hill, 2008.

[3] Succar, Bilal. "Building information modelling framework: A research and delivery foundation for industry stakeholders." *Automation in Construction* 18.3 (2009): 357-375.

[4] Jernigan, Finith E. *Big BIM, little bim: the practical approach to building information modeling: integrated practice done the right way!*. 4site Press, 2008.

[5] Yan, Han, and Peter Damian. "Benefits and barriers of building information modelling." *12th International Conference on Computing in Civil and Building Engineering 2008*. 2008.

