Career Advancement of Civil Engineers through Application of BIM in Construction Industry

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Abstract

BIM (Building Information Module) is a concept used for Project - Planning, Designing, Analysis, Monitoring, Costing and Data Management in construction. The concept of BIM functions can be related to PMI project phases starting from Initiation to closure and for facility management also. By which the project life cycle is taken care by adaptation of single concept in construction.

In projects the team of Architect, Consultant and Engineers forms the peer group to handle the project lifecycle from Inception to complete. During the project phases the simulation of 3D, 4D, 5D, 6D, and 7D is taken care by BIM concept by which BIM act as a Pivot for the entire span of project. The BIM provides information and tools for decision making initially to analyses the conceptual three dimensional structure with layers of Timeline, Cost implication, sustainability factor and facility Management in the Planning stage and the implementation stage Project Management.

Keywords: BIM – Building Information Module, 3D, 4D, 5D, 6D, Revit – Review Instant Naviswork - Integrated software.

1. Introduction

Building Information Modeling (BIM) has been defined as “the act of creating an electronic model of a facility for the purpose of visualization, engineering analysis, risk analysis, code criteria checking, cost engineering, as-built product, budgeting and many other purposes.” To foster better communication within the industry, it is important to define a consistent language to describe the focused use of BIM on a capital facility project.

BIM Use can be defined as “a method of applying Building Information Modeling during a facility’s lifecycle to achieve one or more specific objectives.”

The BIM Use Purpose communicates the primary objective of implementing the BIM Use. The BIM Use Purposes, shown in Figure , fall into five primary categories: gather, generate, analyze, communicate, and realize. Of these primary categories there are numerous subcategories that further specify the purpose of the BIM Use.

In general the concept of BIM facilitates beyond 3D parametric virtual representation in to 4D Parametric in Scheduling, 5D parametric in Costing, 6D parametric in sustainability and 7D parametric in facility management.
II. Electronic Model Preparation
The BIM concept is made as electronic model by using the following software’s as Tools for decision making. After acquiring the concept and requirement of project, The Architect can Plan the project and design the components using the list below software.

Autodesk products service as a platform to convert concept to model.

a) Autodesk – Revit Architecture.
b) Autodesk – Revit Structure.
c) Autodesk – Revit MEP.
d) Autodesk – Naviswork.

Autodesk – Revit Architecture.
Revit Architecture software turns maximum flexibility into competitive advantage in creating Construction Modules. It Combines AutoCAD, AutoCAD- Architecture software applications into a single, comprehensive model allows you to transition to make building information modeling (BIM). Autodesk Revit Architecture delivers a powerful competitive advantage by helping in speed creative design work, facilitate analysis for alternatives and sustainable design, and automatically deliver coordinated, consistent documentation. Support ongoing work in either AutoCAD or AutoCAD Architecture while you make the switch to BIM with Autodesk Revit Architecture.

In general Autodesk Revit Architecture provides a single screen administration for developing an Architectural Plan, 3D Modeling, Working Drawings and Quantity schedules for all components.

Autodesk – Revit Structure.
Revit Structure software offers building information modeling (BIM) to structural engineering firms, delivering a better coordinated and more reliable model for more efficient and more accurate Layout, design and documentation. Help improve multidiscipline coordination by using crucial information from architectural and
engineering files, whether from Revit models or from 2D file formats. Incorporate analysis through bidirectional linking to popular structural analysis software, including Autodesk Robot Structural Analysis Professional software. Powerful parametric change management technology assists in coordinating modifications and updates across the model and documentation. Utilize a comprehensive set of drafting tools to help complete your construction drawings in Revit Structure, and share your design data with project teams for more efficient collaboration.

In general Autodesk Revit Structures provides Structural model and Analytical model to enhance the possibility of Design and Drawing.

Autodesk – Revit MEP.
Revit MEP software is a comprehensive engineering design solution for mechanical, electrical, and plumbing (MEP) engineers, designers, and drafters. Work in a familiar AutoCAD®-based environment while helping to increase drafting productivity with tools designed specifically for building systems design with AutoCAD® MEP software. Gain from the competitive advantages of BIM to support better decision making with Revit MEP software. More clearly identify, share, and resolve system interferences and clashes when collaborating with other design disciplines. Help accelerate engineering design with tools that help to provide increased drafting productivity and support sustainable design and analysis.

(Source-autodesk_revit_mep_suite_product_description_us)

III. CAREER ADVANCEMENT THROGH BIM:
The construction project consists of engineers in different roles and responsibilities namely Client Engineers, Architects and Consultant, Construction engineers namely Project Manager, Planning Manager, Billing Manager, Quality Manager and Execution Engineer. The BIM concept is an integrated solution for all level of Engineers to enrich their day today activates using the Autodesk software. As for as BIM is concern it can be related to project life cycle starting from Initiation to closure. The following flow diagram explains the concepts

Initiation Stage:

The architect can use the Autodesk Revit software for preparing the conceptual floor Plans, Sections, 3D - Elevations, structural detailing, MEP Services & Estimate for quantity. The time factor can be drawn by using any of the Planning tools like primavera or Microsoft project in the initial stage. By using Autodesk Revit software the architect can prepare multiple options with different modules and shapes in a single screen with utility benefit analysis.
With the use of BIM concept, now the concept and requirement of Client / Owner is converted into electronic model. By viewing the model in screen client / Owner can very much correlate his requirement vs. actual. All the comments and corrections can be take place at the initiation time itself by having a walkthrough option. Once the model was ready the project can be moved to Planning stage.

Computers have made our lives better in various ways. They provide the wealth of knowledge through internet, instant communication, tools for creating and sharing the information. Its uses in business are nearly infinite. But this modern world’s greatest tool is among the most disposable and resource-heavy items. Performance-wise, computer design has progressed staggeringly well and astonishingly fast but looking at it from a green perspective, the work has barely begun. Manufacturing computers means the use of lead, cadmium, mercury, and other toxics in general and laptop in particular. Further, it consumes a lot of energy to create, package, store, and move every 10-20 megabytes of data. Even with energy prices as cheap as they are now, it will soon cost more to power a computer for four years than it does to buy a new one [1]. When a computer dies it either rots in a landfill, or is melted to recover heavy material or hammered to make its components apart. To counter this growing pollution threat all over the world due to the growing use of electronic device in general and computers in particular, there is a need to look for green computing.

**Planning stage:**

In planning stage the project details like Site layout, Floor plans, Structural drawings & details, Architectural drawings & details, Sections, Elevation views, detailed specification etc was given by Architect / Consultant to the contractor. Based on the input contractor will plan the establishment and Mobilize the resources to start the project.

**Execution stage:**

![Figure 5: Planning Stage](image1)

![Figure 6: Execution Stage](image2)
In Execution stage contractor will pursue the details given by architect and consultant for BIM outputs. Contractor can also use the electronic model drawn in Autodesk rivet as a basis for his linear measurement purposes, comparing the actual dimensions, studying the callout details, understanding the sections with respect to 3D views and extracting the quantities. The one more advantage is by keeping in tile view, plan or section or 3D Vs. Quantity schedule can be verified with individual elements by their grids as reference. By which the omission or double entry can be well controlled. On the whole we can use the application as a guide rope to execute our project.

Monitoring Stage

In monitoring stage Architect / Consultant will import the Autodesk Rivet outputs to Naviswork and by comparing the time line from primavera or Microsoft project in single entity. Naviswork is an integrated software which will import Rivet file and Program file and make a single view for studying the planned vs. achieved. In single screen the monitoring process can be performed by comparing the targeted vs. actual in electronic model with references to time and quantity. By adoption of BIM concept we can enjoy the benefit of visualizing the project objects as model in 4D and 5D. By clicking the structures we can understand the target vs. actual for time and cost.

Closure:

In Closure stage contractor will complete the project structures as the details supplied by him and handover the structures to Architect / Consultant. Architect will conduct a post study on the planned vs. actual in all stages of construction and agrees the project. If any change made in between the BIM model and site, the same can be redrawn by highlighting the existing and new creation option in the phases comment. By which the as built...
drawing can be readily extracted from the electronic model. The completed structures can be studied by comparing the planned model in software and constructed structures in the project. This on site comparison is most useful for visualizing the service lines and hidden elements.

IV. Conclusion:
The Advantage of using BIM by all the stakeholders above integrates the individual expert’s decision to a coordinated effort and eliminates time and cost overrun. The understanding of the Scope and deliverables of the project is made clear without antiquity. Above all the Client gets a project executed economically, that at right quality, at right cost and right time. When the application of BIM is known to any Engineer he will be the master of construction practices and for whom so ever he works, he will become the indispensable Engineer Manager. His carrier will be flourishing in the form of steep up slope.

V. References
[5] https://www.google.co.in/?gws_rd=cr&ei=gtmzuV6yD8mPrQe9xIDQAQ&q=100+words+on+river+architecture