BUILDING INFORMATION MODELING BIM

IMPLEMENTING BUILDING INFORMATION MODELING (BIM)

SUMMARY

Building Information Modeling (BIM) is one of the most promising development in the architecture, engineering, and construction (AEC) industries. With BIM technology, one or more accurate virtual models of a building are constructed digitally. They support design through its phases, allowing better analysis and control than manual processes. When completed, these computer-generated models contain precise geometry and data needed to support the construction, fabrication, and procurement activities through which the building is realized.

BIM also accommodates many of the functions needed to model the lifecycle of a building, providing the basis for new design and construction capabilities and changes in the roles and relationships among a project team. When adopted well, BIM facilitates a more integrated design and construction process that results in better quality buildings at lower cost and reduced project duration.

THE CURRENT AEC BUSINESS MODEL

Currently, the facility delivery process remains fragmented, and it depends on paper-based models of communication. Errors and omissions in paper documents often cause unanticipated field costs. Delays, and eventual lawsuits between the various parties in a project team. These problems cause friction, financial expense, and delays. Efforts to such problems have included: alternative organizational structures such as the design-build method; the use of real-time technology, such as project Web sites for sharing plans and documents; and the implementation of 3D CAD tools. Through these methods have improved the timely exchange of information, they have done little to reduce the severity and frequency of conflicts caused by paper documents or their electronic equivalents.

One of the most common problems associates with 2D-based communications during the design phase is the considerable time and expense required to generate critical assessment information about a proposed design, and so forth. These analyses are normally done last, when it is already too late to make important changes. Because these iterative improvements do not happen during the design phase, value engineering must then be undertaken to address inconsistencies, which often results in compromises to the original design.

BACKGROUND (OF BIM)

Building Information Modeling (BIM) has gained popularity in AEC industry recently, but was first coined over a decade ago to distinguish the information rich 3D modelling from traditional 2D drawings. It is widely adopted in the building industry due to its ability to correct errors in early stage as well as aids in accurately scheduled construction, construction sequencing, clash detection and an advocate design alternatives and facilitates easy solutions for complex projects.
BIM has evolved from the CAD development to generate integrated management of multi-disciplinary information that is produced in the process during the project's life cycle.

WHAT IS BIM?

BIM is a modeling technology and the associated set of processes to produce, communicate, and analyze building models. Building models are characterized by:

- Building components that are displayed as digital representations (Objects) that carry computable graphic and data attributes that identify them to software applications, as well as parametric rules that allow to be manipulated in an intelligent fashion.

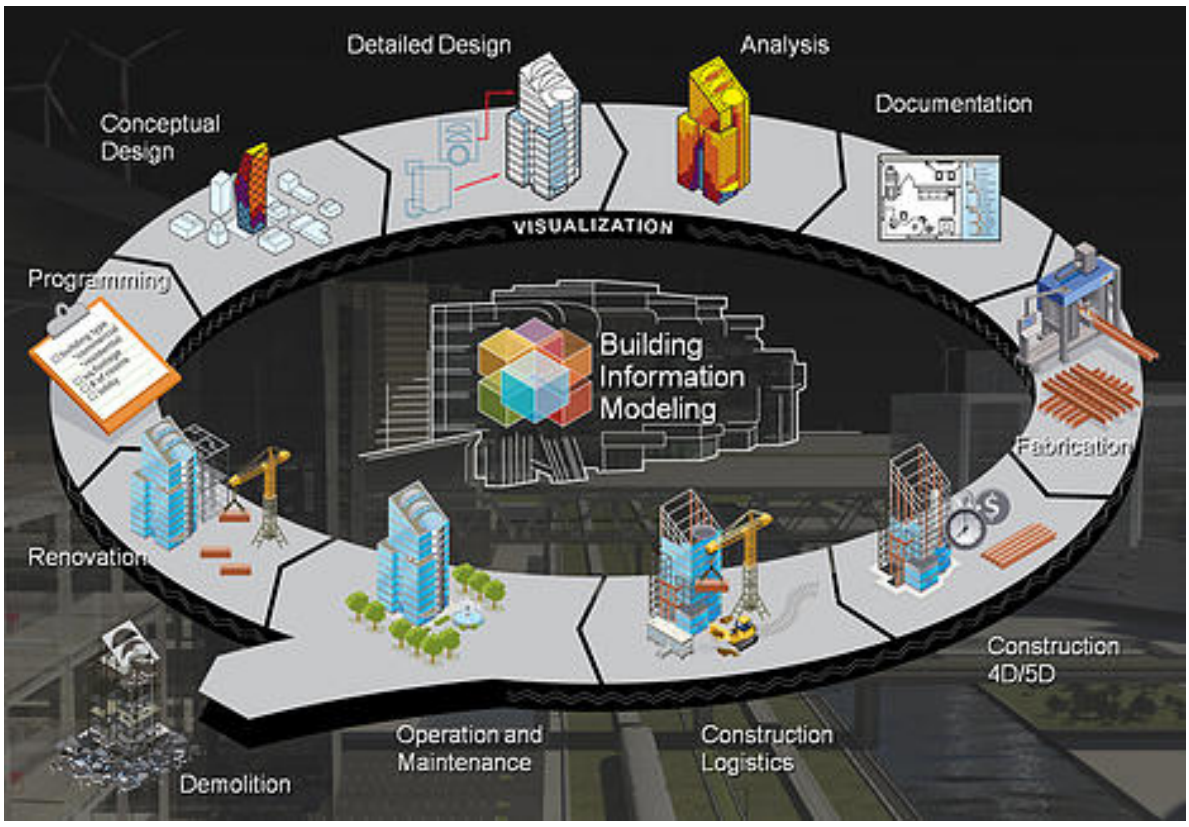
- Components that include data that describe how they behave as needed for analysis and work processes, for example, quantity take off, specifications, and energy analysis.

- Consistent and non-redundant data that changes to component data are represented in all views of the component and the assemblies of which it is part.

- Coordinate data such that, all views of the model are represented in a coordinated way.

BIM is a fundamentally different way of creating, using, and sharing building life cycle's data. This involves the whole cycle of BIM stakeholders including owners, architects, engineers, and designers.

Generally, BIM technology allows an accurate virtual model of the facility to be constructed digitally. Completed computer generated models contains accurate and a well-defined geometry and pertinent digital data required to facilitate the construction processes such as, construction sequencing, fabrication, procurement activities, etc., which are necessary to realize the final building.



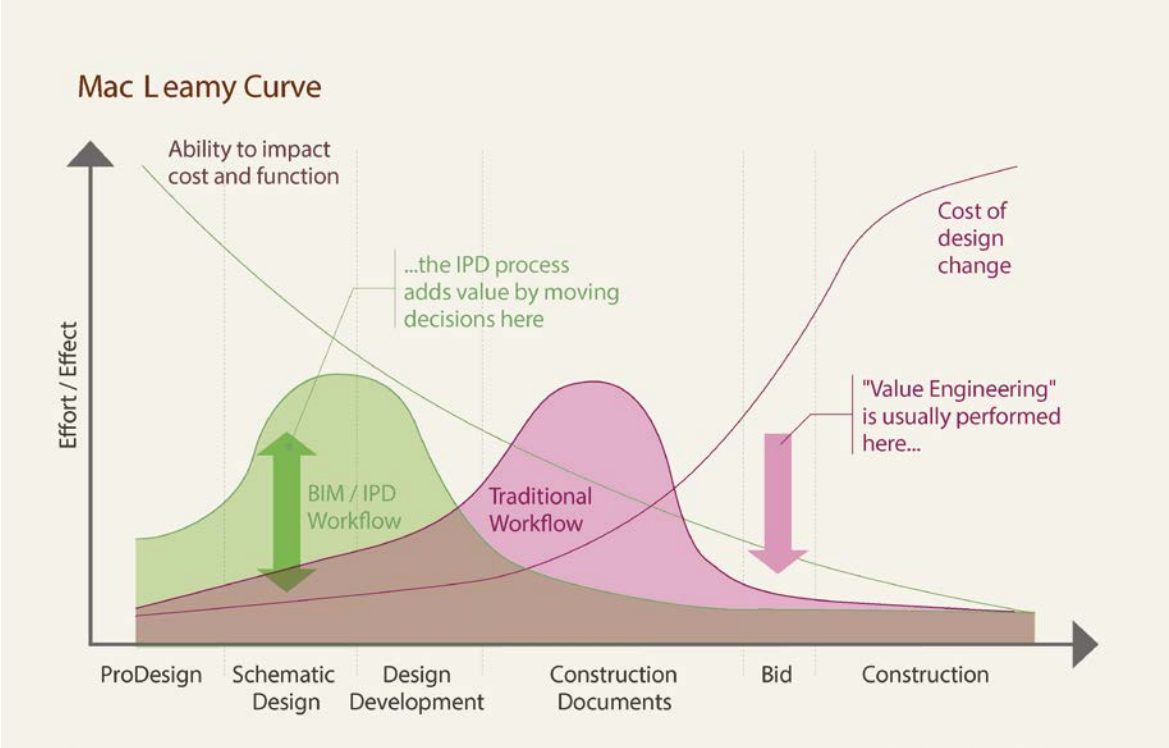
WHAT ARE THE BENEFITS OF BIM?

- **Preconstruction Benefits to Owner**
  - Concept, Feasibility, and Design Benefits
  - Increased Building Performance and Quality
  - Improved Collaboration Using Integrated Project Delivery

- **Design Benefits**
  - Earlier and More Accurate Visualizations of a Design
  - Automatic Low-Level Corrections When Changes Are Made to Design
  - Generation of Accurate and Consistent 2D Drawings at Any Stage of the Design
  - Earlier Collaboration of Multiple Design Disciplines
  - Easy Verification of Consistency to the Design Intent
  - Extraction of Cost Estimates during the Design Stage
  - Improvement of Energy Efficiency and Sustainability

- **Construction and Fabrication Benefits**
  - Use of Design Model as Basis for Fabricated Components
  - Quick Reaction to Design Changes
  - Discovery of Design Errors and Omissions before Construction
  - Synchronization of Design and Construction Planning
  - Better Implementation of Lean Construction Techniques
  - Synchronization of Procurement with Design and Construction

- **Post Construction Benefits**
  - Improved Commissioning and Handover of Facility Information
  - Better Management and Operation of Facilities
  - Integration with Facility Operation and Management Systems

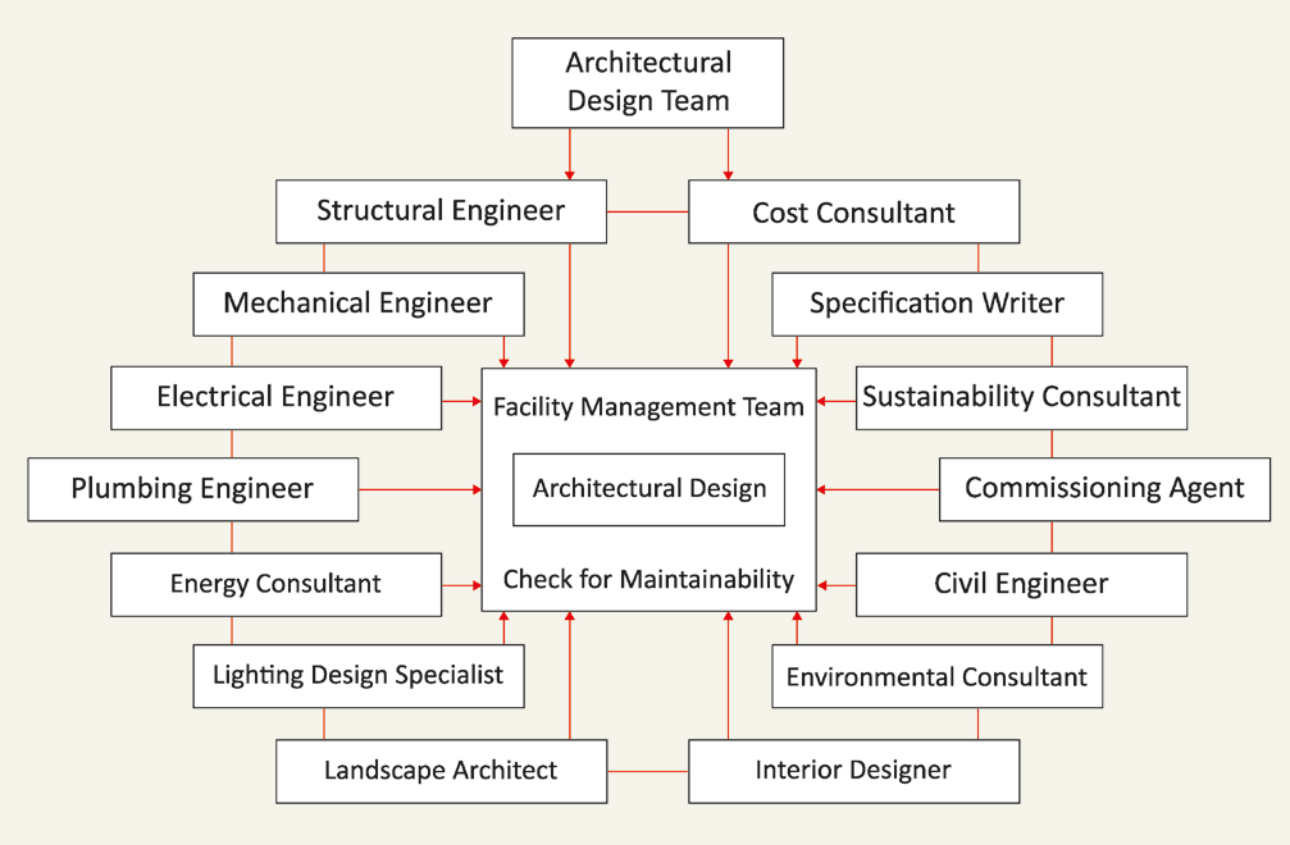


COLLABORATIVE DESIGN AND DELIVERY PROCESS

Collaboration is the best approach in the pursuit of successful application of BIM in a project. The fragmented nature of the building industry, its complexity and multiple phases of the construction life cycle make the collaboration of multidisciplinary teams to be very important. The involvement of multidisciplinary teams, (Owner, architects, consultants, engineers, contractors, subcontractors, suppliers, etc.) and the use of heterogeneous ICT tools provide an opportunity to achieve efficient and effective collaboration. Checking for maintainability of the facility for instance should be fully addresses by the design team from early design stage. Architects and Owners should be at the center of the process to manage all information.

Through collaboration, project teams quickly generate design options with relevant building systems alternatives and other works that add value to the client. Moreover it is emphasized that user's ability to understand the design is enhanced to make necessary early and more efficient decisions. For instance, early environmental impact analysis, early building performance such as, energy and thermal building performance helps to foster effective communications among end users, owners, and project teams.

Furthermore, effective collaborative design process is more dependent on the richness of the shared model, and the quality of the design analysis being undertaken to support the early decision making, to resolve issues through negotiation and evaluation.



IMPLEMENTATION ISSUES

Replacing a 2D or 3D CAD environment with a building model system involves far more than acquiring software, training, and upgrading hardware. Effective use of BIM requires that changes be made to almost every aspect of a firm's business (not just doing the same things in a new way). It requires some understanding of BIM technology and related processes and plan for implementation before the conversion can begin. A consultant can be very helpful to plan, monitor, and depend on their sector(s) of AEC activity, the general steps that need to be considered are similar and include the following:

- Assign top-level management responsibility for developing a BIM adoption plan that covers all aspects of the firm's business and how the proposed changes will impact both internal departments and outside partners and clients.

- Create an internal team of key managers responsible for implementing the plan, with cost, time, and performance budgets to guide their performance.

- Start using the BIM system on one or two smaller projects in parallel with existing technology and produce traditional documents from the building model. This will help revel where there are deficits in the building objects, in output capabilities, in links to analysis programs, and so forth. It will also allow the firm to develop modeling standards and determine the quality of models and level of detail needed for different uses. It will also provide educational opportunities for leadership staff.

- Use initial results to educate and guide continued adoption of BIM software and additional staff training. Keep senior management apprised of progress, problems, insights, and so forth.

- Extend the use of BIM to new projects and begin working with outside members of the project teams in new collaborative approaches that allow early integration and sharing of knowledge using the building model.

- Continue to integrate BIM capabilities into additional aspects of the firm's functions and reflect these new business processes in contractual documents with clients and business partners.

- Periodically re-plan the BIM implementation process to reflect the benefits and problems observed thus far, and set new goals for performance, time, and cost. Continue to extend BIM-facilitated changes to new locations and functions within the firm.

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