

Optimize BIM to Achieve the Promise of Integrated Project Delivery

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The Problem

Recent studies show that the U.S. construction industry has not taken full advantage of available technology and progressive business practices to boost productivity and lower costs in the design, construction and operation of buildings.

In August 2004, the U.S. National Institute of Standards and Technology ([NIST](#)) issued a report titled “Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry.” The report stated that the U.S. capital facilities industry loses conservatively \$15.8 billion a year because of inadequate interoperability due to “the highly fragmented nature of the industry, the industry’s continued paper-based business practices, a lack of standardization, and inconsistent technology adoption among stakeholders.”

The Promise

Inefficiencies and waste in the construction industry have been increasing, and, coupled with the emergence of new technologies, owners, architects and contractors are looking to Integrated Project Delivery (IPD) as a better way.

Using early involvement of key participants collaborating in an open process, IPD promises to produce projects at a lower cost with far fewer disputes and with a higher rate of on-time completion than traditional delivery models. Better informed, collaborative, early decision making defines the project earlier when the cost of making changes is the least.

One key technology making the promise of IPD more achievable is Building Information Modeling (BIM). A digital representation of the building process, BIM facilitates exchange and interoperability of information throughout the life cycle of a building. The benefits of BIM include better understanding of the design, greater design option evaluation, early detection and resolution of clashes between building components and better quantity and performance analysis. When used to its fullest capacity, greater prefabrication, optimized site utilization, just-in-time delivery and reduced waste are some of the benefits.

BIM covers geometry, spatial relationships, geographic information, quantities and properties of project components (for example, sustainability or energy performance). Using BIM can enhance the entire building life cycle including construction and facility operation. Beyond illustrating the physical relationships of the project components, BIM is increasingly being used to predict performance, cost and time to construct.

BIM allows the entire project team to “construct” a virtual building, allowing each team member to add its own discipline-specific knowledge to the single model, or in most cases, multiple coordinated models. This process greatly reduces the information loss that occurs when a new participant joins the project and provides extensive information to building owners far beyond that which they usually receive.

However, optimizing BIM and IPD within the project team to reap these benefits brings significant new challenges to people, processes and projects.

People

IPD encourages participants to work together to do what is best for the project. It rewards working collaboratively and sharing information as opposed to protecting one's turf and retreating into silos of separate responsibilities. However, the transition period to IPD will produce challenges for some key players, not the least of which is transitioning from two dimensional (2D) software to BIM.

First, the management of the firm has to be committed to the idea and willing to provide the support needed to get the ball rolling. Management needs to be aware of the benefits so that it can explain those benefits to clients, to its various consultants and contractors and to its employees – especially to the employee who is the most proficient at 2D software, such as CAD, and may perceive that his or her skill set is now becoming extinct. Although the cost of the hardware and software is not insignificant, another important consideration is the cost of training, which will include an initial loss of productive time.

Processes

It is important to determine who will manage the data, whether it is the project manager for any given project or a central person for all projects. This model manager will need to set a standard for how much or how little should be modeled. However, too much unnecessary detail greatly reduces the speed of the software and adds little to the overall productivity of the project.

Because numerous stakeholders will need to access the various models to add or retrieve information, the model manager also will be responsible for managing the central model and alerting individuals if conflicting information arises.

The model manager will also need to coordinate with individuals to let each know when enough of the model is finished so that he/she can complete his/her part. For instance, an electrical engineer in a college laboratory project might be waiting on the placement of the cabinets before determining where to extend utilities.

Another difference that is inherent in BIM is the division of labor. Unlike traditional methods, BIM requires a lot of labor up front, but not so much in the middle of the design process because the computer does the drafting. Similarly, construction use of BIM also requires greater effort in early planning of the procurement and construction activity.

While BIM is a great step forward, all the players must acknowledge how the model will, and will not, be used. Knowing what is not modeled and understanding whether some or the entire model can be relied on as contract document is important. Most early adopters first use the model to improve understanding while still relying on drawings produced using BIM as the authoritative source. As the industry gains experience there will be greater reliance on the model itself.

Managing the relationships to optimize the benefits of BIM requires new ways of working together. The AIA recently released two variants of IPD contracts both of which require the use

of BIM. One type provides a family of owner-architect and owner-contractor contractor agreements. Those agreements share a general conditions document that provides the roadmap for how the owner, architect and contractor will work together at each phase of the project. The other type creates a limited liability company with the single purpose of delivering the project in an “all for one and one for all” environment.

Projects

It is best to begin the switch to IPD and BIM with plenty of time and a project that you could do in your sleep. To adjust for the learning curve, you may need a bit more time than usual to complete the first project so this is not the time to start a new or exotic endeavor. However, the changeover may not be as laborious as one might think. At our firm we had planned only to use the software for the preliminary data on our first BIM project, but we then found that the rest of the drawings were easier to do in BIM than CAD.

In conclusion, BIM offers:

- 1) Improved visualization
- 2) Improved productivity due to easy retrieval of information
- 3) Increased coordination of construction documents
- 4) Embedding and linking of vital information such as vendor specific materials, location of details and quantities required for estimation and scheduling
- 5) Increased speed of project delivery
- 6) Increased prefabrication, reduced waste, reduced costs

The promise of Integrated Project Delivery fueled by BIM is real. So are the challenges. The time to face the challenges and push the envelope is now.

For more information, visit <http://www.aiacontractdocuments.org/ipd/> to learn more about the AIA’s contract documents for IPD and download [*Integrated Project Delivery: A Guide*](#) describing methodologies for implementing IPD.