

Model-based Design Requires More Than BIM

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Building information modeling (BIM)—it's the Holy Grail of design: by having architects, engineers and contractors work with one big model, we'll resolve the coordination issues that have traditionally plagued our fragmented, multi-discipline industry. Unfortunately, this view of building information modeling fails to address the realities of how BIM is being executed today.

In practice, no single model will (or should) contain ALL of the information about a building or infrastructure project. Experience is showing us that one model does not meet the diverse needs of the entire project team. Nor will every team member use a single BIM system.

Successful BIM projects demonstrate the adoption of a *federated* approach—a series of *BIM models* (note the plural) that are related, but serve different purposes. For example:

- Autodesk Revit is the popular choice for architects to create design intent models.
- Many designers also create conceptual models using Google SketchUp for initial design studies.
- Energy performance models are being created using IES <Virtual Environment>.
- Structural engineers tend to choose Tekla Structures to create their structural analysis models.
- Contractors like to use Graphisoft ArchiCAD to create detailed construction models that can be related to a quantity take-off, estimating and scheduling model managed by Vico Software.
- Autodesk Navisworks is a favorite for generating a coordinating model to combine BIM models from different authoring systems.
- Other purpose-built models being used to describe the full contents of a building

project include fabrication models, as-constructed models, specification models, equipment models and space program models, to name a few.

Given the necessity to share basic model information among diverse team members and then have each different discipline be able to add the explicit detail that they need, this federated application of BIM, far from consolidating all information in one single model, instead demands that more information than ever needs to be exchanged and managed!

In addition to transferring information among different purpose-built models, the very size of a model for a large and complex building, such as a hospital, often demands that the model be broken down further; for example, into separate shell and core models. This reality further complicates coordination and control. Project team members need to track which parts of the model have been sent to whom, when and in what state of completion.

The increased information flows of BIM require software to manage them

The industry is still developing efficient ways to exchange purpose-driven information. Consider these use cases:

- The synchronization of the planning grid in the design intent model and the structural grid in the frame analysis model.
- Reconciliation of spaces in the design model with zones in the energy performance model.
- Aligning expected submittals in the specification model with the submittals log.

Ideally these purpose driven exchanges will be implemented using industry protocols such as CIS/2, gbXML, agcXML, IFC, COBie and equivalent open standards.

Also, much of the essential project delivery information occurs *outside* of the

different BIM models, such as meeting minutes, change orders, RFIs, submittals, project milestones, action items, analysis results, transmittals and site instructions.

The companion technology that has emerged to capture and organize all of the related information that is external to these BIM models is project information management (PIM) software. PIM tasks related to BIM workflows include logging model exchanges as transmittals, capturing decision trails otherwise buried in email inboxes, tracking design review markups, searching the contents of sheet sets, and sharing model views—snapshots of the model—to facilitate discussions about the design and augment project workflows such as a submittals and RFIs.

Conclusion

Without a doubt, BIM models (plural) are the source of truth for certain classes of information about a project—primarily geometry, element type, semantic relationships (assemblies) and object properties. But in addition to facilitating information exchanges *among* models, progress will depend on capturing and sharing information *about* models, as well. As we continue along the path of industry-wide adoption of BIM, it is becoming increasingly apparent that model-based design requires more than BIM alone. ●

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