Structural Engineering &DESIGN

Crossing platforms
EXPERTS DISCUSS THE GOALS — AND PITFALLS — OF BIM AND INTEROPERABILITY

By Randy Hofbauer

It's safe to say that by now, most design teams understand the tremendous value that can be harnessed through building information modeling (BIM) and 3D design tools. Gary Wyatt, business line manager, structural engineering, AEC at San Rafael, Calif.-based Autodesk, Inc., says that the rapid adoption of BIM is helping project teams and owners alike discover opportunities throughout a project's design and construction phases.

"BIM allows greater collaboration," Wyatt says. "And as a result, many clients — including government agencies — have started mandating BIM on projects across the globe."

Whether it's the architect with architectural modeling software, the structural engineer with structural modeling software, or the steel fabricator with modeling software, each participant in the design process can use his or her own BIM authoring software to create a domain model, saving time and money through collaboration in the end.

"Interoperability in BIM is the ability of a software application to exchange data effectively with different types of applications. In BIM, that is IFC, or industry foundation class," notes Daniel Monaghan, Scia engineer manager with Nemetschek North America, Columbia, Md.

To Monaghan, interoperability is all about efficiency — faster creation, error reduction, cost control, predictability, and better coordination — all on account of the ability to reuse data from one stakeholder to the other.

"However, even among those who embrace BIM, today's typical implementation involves project team members using independent platforms — Revit, Bentley, Tekla, et cetera — which typically do not interact with each other in a truly collaborative way," he notes.

What's the problem?
True, interoperability is a noble concept. But all too often, a wrench is thrown in the works. Woodie Rush, Vice President for Global Strategic Services at ReproMAX, Chesterfield, Mo., believes the biggest problem designers face in regards to BIM and interoperability is "selfish BIM" — which he believes is based largely on proprietary interests and closed-source systems.

"Vendors want to sell their own version of BIM software; designers are reluctant to entrust 'their model' to the construction team, a process which cascades down the project team to include even subcontractors and suppliers," he notes.

Until this changes, Rush believes those who employ BIM will continue to develop and foster what's only in their best interest. The most practical solution lies in the adoption of BIM standards that are based upon open architecture and data exchange. As an example, he says the solution could allow an architect using Revit to provide data that can be accessed easily and used by a consultant using Bentley Architecture.

Collaborative BIM can provide the basis for making BIM the standard process for the AEC
industry in the future.
ReproMAX

"While standards such as those being developed by the National Building Information Model Standard
Project Committee — in concert with BuildingSMART — provide an excellent vehicle to address this
problem, many seem reluctant to push for adoption," Rush says. "In August 2010, this alliance began to
assemble a panel of industry experts [that] will work to develop a truly consensus BIM standard, which
could be adopted on a global basis. To me, this represents the 'best solution' to the current problems
associated with … dysfunctional BIM."

Monaghan adds that designers have to waste valuable time separating marketing hype by software vendors
from the practical issues that matter.

"Software vendors still have some work to do to support true interoperability across all platforms and
processes," he says.

In addition to the technical issues are business and legal considerations to be taken into account when
sharing BIM models.

"Who owns the BIM model?" Monaghan asks. "When exchanging models, who's responsible for what?
The AIA (American Institute of Architects) with their E202 documents, the AGC (Association of General

Contractors) with their 300 Series ConsesusDocs, and others are helping to improve this part of the interoperability process by clearly defining the model exchange process."

Staying state-of-the-art
Another problem designers sometimes face when exchanging BIM models is the difficulty of keeping their model up to date with the latest information, adds Ricky Gillenwater, IT director with New Millennium Building Systems, Fort Wayne, Ind. Since the trades involved in a project don't stop for each other to finish their parts of the overall model, information can become quickly outdated.

"An example would be a structural detailer passing a copy of their model to a joist detailer," he explains. "The structural detailer is going to continue working on the structural layout in his or her model. The model sent to the joist detailer may have some incorrect column elevations. The structural detailer may find and correct the errors in his or her model, but they still exist in the joist detailer's model."

Kevin Lea, BIM business development manager with CSC, Inc., Chicago, adds that as changes occur, manual editing might be required, which can slow down productivity and possibly open up the designer to the risk of errors.

"When changes occur, the design model and BIM model [need to] remain up to date," he says.

Gillenwater believes there are a few possible solutions to the problem of making sure. First, each trade could make a strong effort to keep the other trades informed of changes that might affect them. Second, periodic updates could be sent to the master model's hosting party.

"Updates can be sent to each trade so that they can update their model with information from the other trades," he points out.

And third (and perhaps most effective), the model could be hosted on a common server with all trades sharing the model. However, there are many factors involved with this option, which could make it unfeasible in many cases, Gillenwater warns.

"Everyone would need to use the same software package with the same version," he emphasizes. "The software would also need to allow multi-users in a single model. Another big factor would be bandwidth and security."

Limitations of the amount of information that can be transferred is another quandary, some experts believe. Amber Freund, P.E., director of marketing at Foothill Ranch, Calif.-based RISA Technologies, says the industry has made big strides in expanding the amount of information that is transferred, but there remains much information that needs to be communicated.

"And the biggest hurdle is determining what information needs to be available to transfer within the BIM software's API (application programming interface)," she points out.

To solve this problem, Freund recommends that better communication be made between the BIM software supplier and the individual discipline software suppliers. This could determine what needs to be added to the BIM API to transfer all pertinent information.

Continual education
Freund also believes that in the end, proper education is key when it comes to BIM and interoperability. Designers still are learning how to use their tools effectively, which can create a slow learning curve.

"BIM has brought a revolution to the industry and blurred the lines between engineer and drafter," Freund explains. "As a result, there are many inefficiencies in the first few BIM projects [that] any firm does, and it can tend to make designers hesitant to use the system again."

In the end, a properly trained design team will have fewer problems on its first BIM project, Freund believes.

"Fortunately," she says, "there are many educational opportunities available, not only on the specifics of how to use the software, but also on best workflow practices for companies."

Carl Taylor, business manager, engineering at Tekla, Inc., offers up an example of proper education. First, he believes too many project team members believe that to share models, they must all be using the same software products, which means the team might end up choosing a tool that isn't optimal for it because it was designed for another purpose. This is where education is necessary.
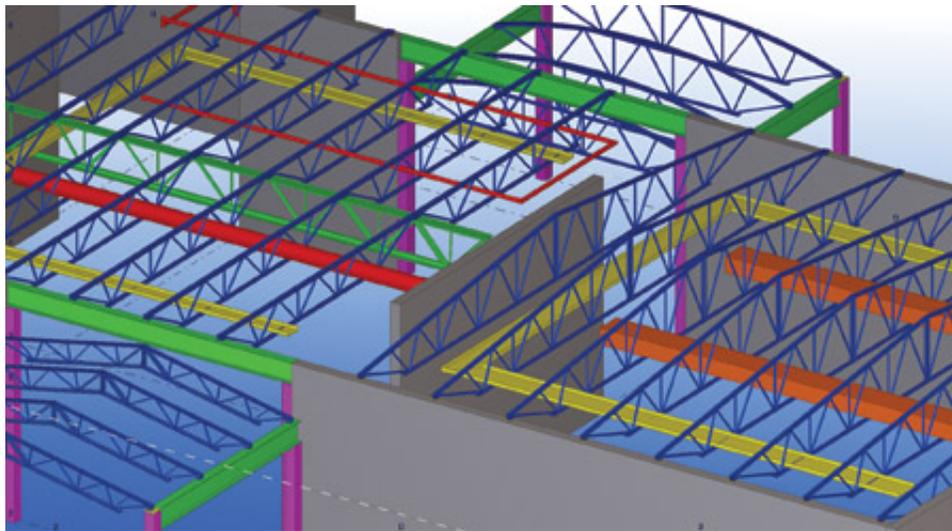
Example showing objects being coordinated through/around joist webbing.
New Millennium Building Systems

"The IFC standard enables the sharing of models between a wide variety of BIM tools — architectural, structural, MEP, construction — as it is supported by all of the major vendors," he says. "It's a robust solution that has a proven track record on large and small projects in the U.S. and Europe. We simply need to educate more engineers and architects about it so they can feel confident that they can choose the BIM tool that's right for their own purposes and will enable collaboration all the way from design to the job site."