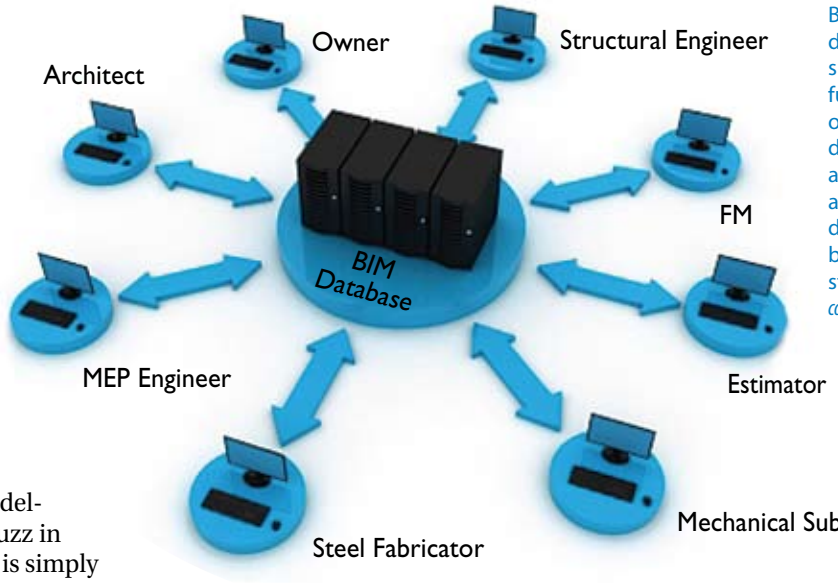
by Geoff Jacobs

Scanning for BIM: Today's Reality



BIM is a central database. Its successful use fully depends on accurate data, including accurate as-built and other survey data that is used by virtually every stakeholder. *courtesy: Beck Group.*

BIM (building information modeling) has been getting a lot of buzz in the survey industry. Part of this is simply to ensure that surveyors use BIM-compatible tools and workflows for their usual survey tasks. The more exciting aspect of the buzz is that creating intelligent 3D models of buildings represents a potentially significant new business opportunity for surveying professionals. A sweet spot of this buzz is documenting existing buildings targeted for refurbishment or modification.

What's Driving All the Attention?

First is the general green initiative compounded by today's intense scrutiny on energy costs and efficiency. A significant outcome of this one-two punch is a national goal to increase energy efficiency, including the energy efficiency of buildings.

Well, it turns out that the best way to analyze a building's energy efficiency is with an accurate computer model of it. The model includes detailed geometry of the building (spatial envelope, wall thicknesses, window locations, and orientation toward the sun, etc.) and information about its thermal properties. This information (which can be derived from a BIM) lets professionals estimate potential energy reductions (and annual cost savings) from proposed improvements.

A second buzz generator has been the GSA program (www.gsa.gov/bim). GSA (Government Services Administration) is landlord for approximately 8,600 U.S. government properties with 350 million sq. ft. of space. What better place to start going green and reducing energy consumption than with the government's own buildings? So, GSA initiated a pilot program a few years back to evaluate the idea of creating BIM models of its buildings for improved construction efficiency, better security planning, and energy efficiency analysis. GSA immediately saw the potential cost, schedule, accuracy, and collaboration advantages of laser scanning for establishing a building's accurate geometry and helping BIM modelers create intelligent models.

GSA's BIM and laser scanning pilot program was large and visible. After all, it was creating significant demand for laser scanning surveying services at a time when the economy was tanking. Dozens of GSA pilot projects *requiring* laser scanning were contracted worth millions of dollars.

GSA's pilot projects were deemed successful, and in October 2009 a contracting vehicle to procure BIM and laser scanning services for GSA projects over the next five years was put in place. GSA negotiated six national IDIQ (indefinite delivery/indefinite quantity) contracts for laser scanning services and ten for BIM modeling services. What generated the buzz was their size: up to $6 million/yr for a maximum of five years for *each* contract—a whopping $180 million total potential just for scanning services for GSA!

A third big buzz generator has been a rapid switch to BIM within just the last year or so by many large architectural, engineering, and construction (AEC) firms, independent of GSA. Many firms have been realizing on their own the practical economic and schedule benefits of 3D and BIM for various

aspects of their projects. In addition, having BIM capability was being increasingly seen by many AEC firms as a competitive differentiator. It's my observation that in the last year BIM went from a "nice to have" software tool and process to a "must have," not only for big AEC firms but also for many subs.

Lastly, BIM software vendors have been heavily promoting BIM and their BIM solutions, further fueling the buzz.

Today's Reality

It's my observation from talking to many laser scanning service providers and AEC firms involved in BIM projects, including GSA and non-GSA projects, that BIM is indeed creating good traction and demand for laser scanning services, but ironically it's not coming from where it was most expected.

The big expectation for significant, ongoing scanning business tied to BIM was centered on the GSA IDIQ's negotiated in 2009. Laser scanning service providers were anticipating a rush of funded GSA projects that would take advantage of the new IDIQ contracts. However, to the disappointment of almost everyone involved, this has not yet happened. It's my understanding that as of April 2010, thus far only a very few GSA BIM/scanning projects have been green-lighted using the IDIQs. At the moment, the GSA rush looks more like a crawl.

Why? It turns out that decision making on capital projects for government buildings is, just as in the commercial world, fully in the hands of the project manager. It can take time to convince individual project managers why BIM and scanning are worth their cost. There also appears to be a timing issue regarding access to Recovery Act funding. Plus, everyone is scrutinizing costs, and government staff are often a more conservative lot.

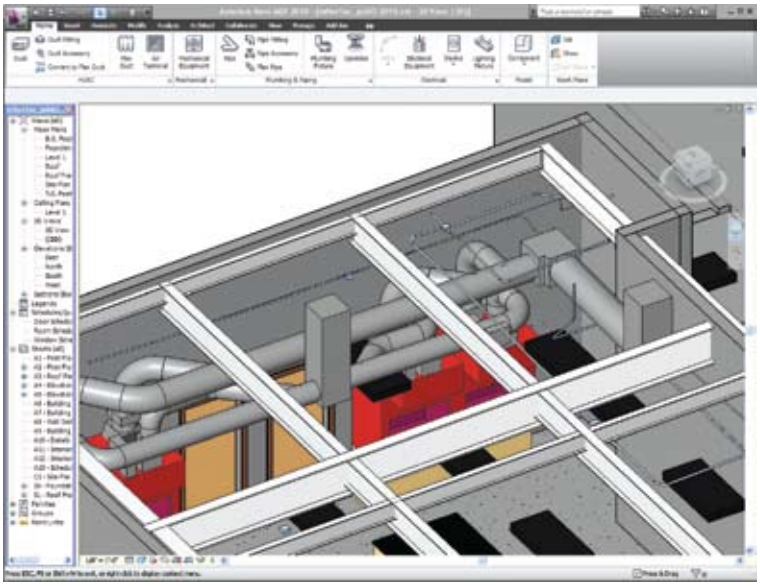
Many GSA staffers nevertheless remain convinced of BIM/scanning's benefits. So, to try to accelerate things GSA has recently identified "BIM champions" for each geographic region (~40 champions in total). Their goal is to help educate stakeholders about the benefits and practical aspects of implementing BIM. Unfortunately, like many education processes, thus far it's been a slow go.

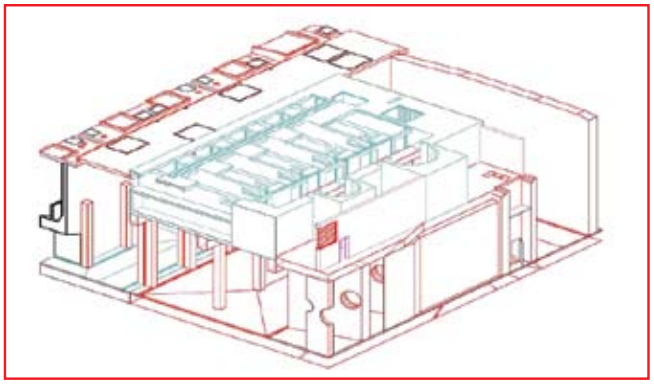
However, all is not lost. In fact, overall, the BIM/scanning picture today is actually very bright, thanks largely to the commercial market. As noted above, the commercial AEC market has made a recent, dramatic switch to BIM with subcontractors quickly falling in line. Consider this startling example: at a recent industry conference, a leading provider of laser scanning services for architectural applications told attendees that over the last 12 months his company's scanning business deliverables had switched from 90 percent traditional 2D elevation and plan deliverables to 90 percent 3D BIM deliverables! Now, that's a dramatic switch.

One particular sweet spot stands out. The AEC community has discovered the value of 3D modeling combined with high-definition surveying specifically for designing modifications to mechanical rooms and utilities, including utilities stuffed into the interstitial space above ceiling panels. This aspect of a project is often referred to as "MEP"—mechanical, electrical, plumbing.

Just as high-definition surveying has long had a sweet spot in large industrial and process plant retrofits (e.g., refineries, pulp and paper plants, etc.), it provides exactly the same type of compelling benefits for many MEP aspects of building projects. Buildings with heavy MEP content, such as hospitals, are especially good candidates. BIM and high-definition surveying also provide compelling benefits for architectural projects with complex geometry, such as theater renovations.

At a recent industry conference for design professionals, another leading provider of laser scanning services for architectural projects (Mitch Schefcik of Optira, Inc.) asked attendees at his talk on laser scanning for BIM projects,



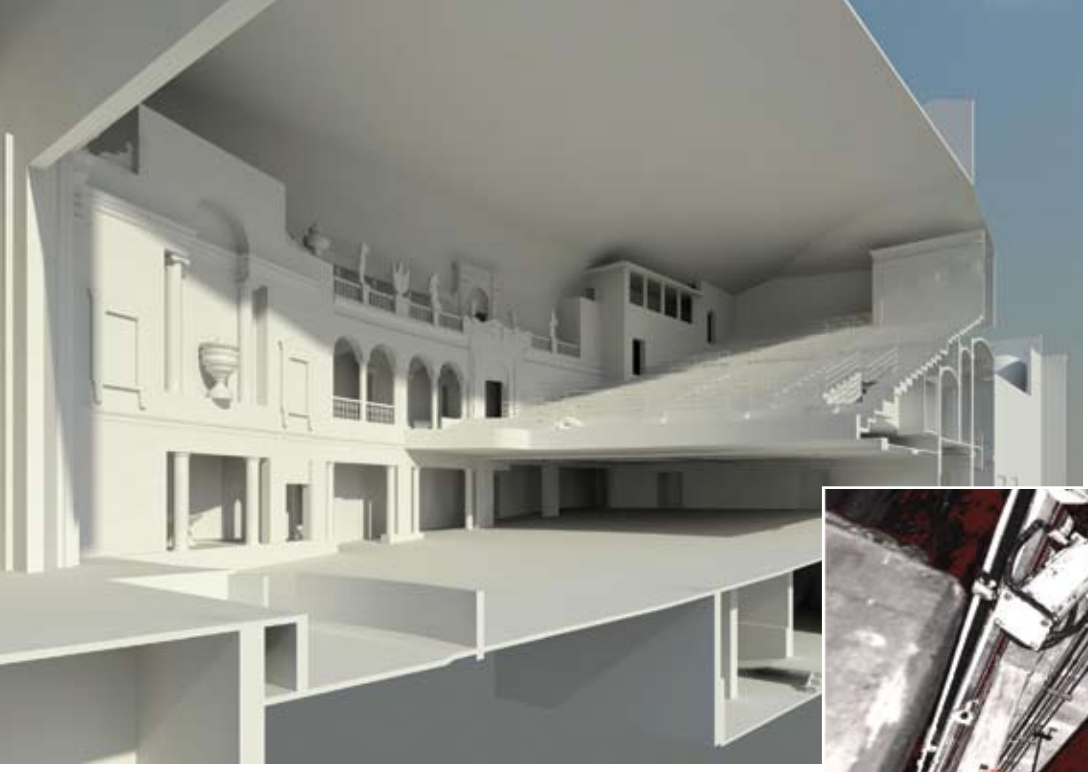


Clockwise from left

True color laser scan of parking garage for CDC building modernization project using BIM—*courtesy: Beck Group and LandAir Surveying.*

Laser scanning was used to capture part of a building's above-ceiling utilities area for this BIM Revit model—*courtesy: InNovTec.*

Hoffman Construction uses both laser scanning and BIM on many projects, including new construction. Scanning was used for concrete coordination on this water treatment plant—*courtesy: Hoffman Construction.*



Left
Cutaway view of BIM of theatre with complex geometry; Revit model was made from a high-definition survey—*courtesy: 3D Laser Imaging.*

Below
Scanning was used for BIM on this wastewater treatment plant upgrade project—*courtesy: HNTB and Meridian Associates.*

"Which type of organization are you with?" About 60 percent of the packed room raised their hands as being with contractors. This confirmed what I've been hearing from others: the main traction of BIM and scanning for BIM is with contractors. Contractors have the most to gain from project cost and schedule savings, which often drop right to the bottom line. They also benefit from happier clients, as these complex projects tend to run more smoothly with BIM and scanning.

How Big Is the Opportunity?

Very big. According to McGraw Hill Construction's recently published "Green Building Retrofit & Renovation" SmartMarket Report, there are 4.4 million non-residential buildings in the United States representing 77 billion square feet of space. Only about 1.5 percent of these buildings are new each year. The rest are candidates for retrofits. Within the retrofit market today, an estimated 5-9 percent of retrofit projects are green-driven, but that figure is projected to skyrocket to 20-30 percent within just five years. To put this into perspective, within five years, the size of just the green-driven building retrofit market alone will be almost one-fifth the size of the entire U.S. infrastructure construction market.

Of special interest for those in scanning, two-thirds of projects today in the green-driven segment include energy-efficiency content; this is projected to grow to 90 percent within five years. Moreover, 90 percent of these projects involve installing more energy-efficient mechanical and electrical systems. BIM and scanning are also increasingly used for facility management; firms such as Coign AMT even focus on this.

How to Get Involved

Based on discussions with those actively involved in this area, providing laser scanning services for BIM projects is one thing. Actually creating intelligent BIM models of buildings is another.

To provide laser scanning services for BIM projects, it's helpful to have some understanding of what you're looking at before you start scanning. Different architectural elements may need to be scanned at different densities to create an accurate 3D model.

In addition, it's important to understand precisely what the client plans to use the high-definition survey information for and what they're planning on using the BIM model for. It turns out, for example, that Autodesk's popular BIM application, Revit, is based on perfectly plumb walls, flat floors, etc. We all know that's not always the case. So, in some cases, this Revit idealization of reality may be okay; in others, it may be better to use raw scan data or models that reflect non-orthogonal and non-planar geometry.

If you want to provide a final BIM model to your client, you could be taking on a much bigger level of engagement. To populate a BIM model of a building, office staff need to be fluent in terminology of architectural building elements.

To properly populate a BIM model of an existing building, staff may not only have to scan it, they may also have to rely on other data sources, such as construction and maintenance records. They may also have to do visual on-site inspection to identify specific architectural elements. Likewise, staff may have to use non-destructive methods to identify the locations of beams or other hidden structures often required for a BIM. These activities can add time and cost to the overall project and may add some uncertainty. If not already part of an organization with these skills, many surveying organizations interested in delivering BIM models or pursuing BIM opportunities have teamed with partners that have architectural and building expertise.

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