

By Terry Bennett

**W**hat is my business strategy for the future? How do I stay competitive? What does the future hold for my employees? As surveyors and business owners, we often ask ourselves these questions whether we are a sole proprietor or head of a large company with many offices and employees.

Because of the technological advances in GPS, GIS, geomatics, surveying, and building information modeling (BIM) software, we are constantly re-tooling and updating our equipment portfolio to keep pace. But are we doing the same with our business process and strategy? For the most part, many of us use similar hardware and software both in the field and in the office, so how do we turn that consistency into a competitive edge? And how is laser scanning going to redefine surveying and all AEC businesses over the next five to seven years?

Although laser scanning is still new, expensive, and complicated, it's already having a major impact on traditional surveying and opening new fields to surveying and measuring

expertise. For instance, laser scanners are now used for factories, forensic analysis, media and entertainment, historical preservation, and transportation. And the list of applications will only grow as the technology becomes more common and less expensive—similar to how GPS has been widely adopted as the price has dropped.

For a few key reasons, companies are beginning to look at laser scanning for buildings over other techniques. First, with the complexity of buildings, no other technique can capture the same level of detail as the laser scan. Second, laser scans provide for significantly higher degrees of accuracy for construction documents. Ultimately, this combination of detail and accuracy allows the creation of a model well suited for communicating intent, efficient collaboration, and presentation purposes.

### Process as Important as Technology

While terrestrial laser scanning holds great interest as a technology, its true power comes when that technology combines with new modeling and analysis tools and BIM workflows. Together, they are breathing new life into

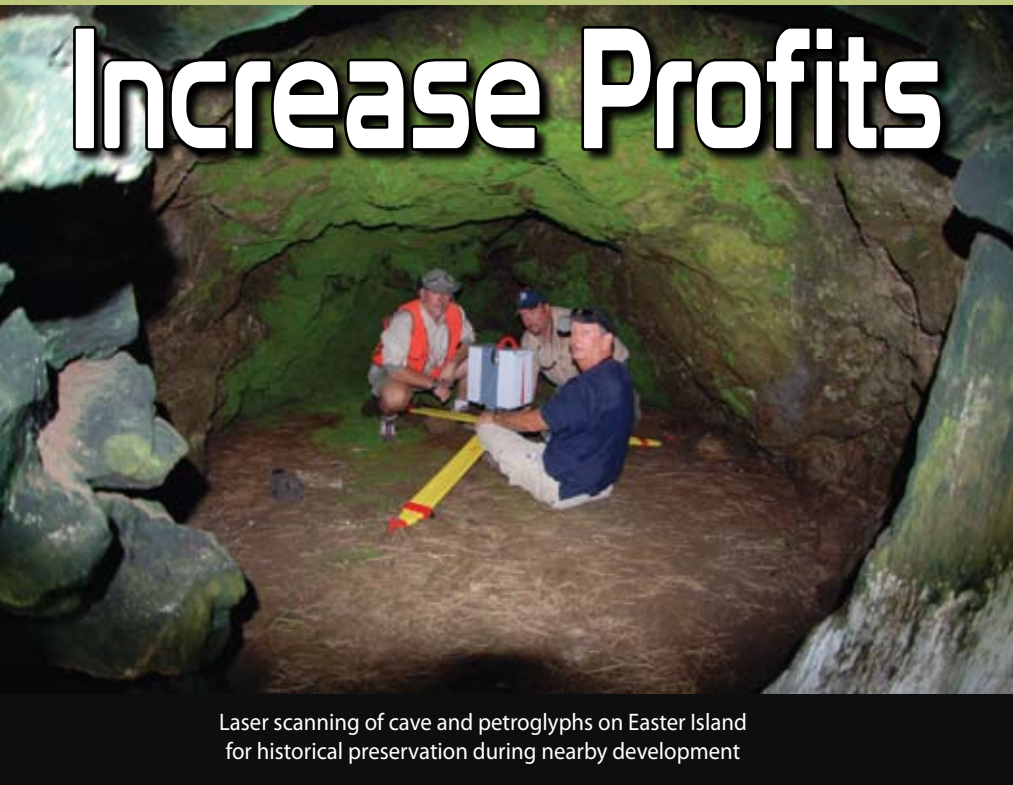
old infrastructure by modernizing as-built information to a current state. Energy conservation and sustainability are top priorities in the United States and many places around the world today. Efforts are under way in many states to reinforce that focus, with an increasing number of local governments offering fast-tracked permitting to projects that are green, or sustainable, in approach.

When applied to existing buildings, bridges, dams, railroads, and even subways, laser scanning exterior and select interior locations produces a point cloud of the structure that can be used to create 3D models. These models, in turn, can be used in a BIM process. This integrated approach allows professionals to use coordinated, consistent information to explore a specific project's key physical and functional characteristics digitally from design to construction, before it's built.

By capturing the geometry and characteristics through laser scanning, the resulting model can be used in a BIM process to conduct many aspects of energy performance analysis, retrofit approaches, iterative design options, detailed construction sequencing, and support contracting processes. These range from basic models to energy and investment-grade audits to implementing measures that enable better decision-making.

BIM helps users create a model so they can visualize and simulate the performance, appearance, and cost of renovations on any piece of infrastructure.

# New Workflows Increase Profits



Laser scanning of cave and petroglyphs on Easter Island for historical preservation during nearby development

Integrating laser scanning with BIM can yield profitable new business processes for surveyors. The secret lies in keeping the various stakeholders on the same page.



Historic bridge scan in the U.K.—courtesy Plowman Craven

Recent reports indicate that the world's population is moving to urban centers, growing from 53 percent today (or 3.6 billion people) to 70 percent (6.3 billion people) by 2050. Pressure on the global urban infrastructure will rise dramatically. To redesign infrastructure in dense urban settings where this mass migration is heading, designers need very detailed and accurate as-builts of what exists.

Today, surveyors have the opportunity to step up to that business challenge. Whether it's the billions of dollars spent greening our buildings or fixing roads, bridges, and waterlines, the density of the sites will require the clarity and resolution that laser scanning provides. The resulting digital model that surveyors can provide engineers, architects, or building owners is a valuable part of the process and one that reaps great advantages over the traditional processes and general CAD drawings.

Determining physical properties by using laser scans with BIM allows you to more quickly and more accurately analyze and assess the performance of infrastructure. With this data in hand, you can better evaluate, compare, and rank the environmental and financial affect of proposed renovations. Possessing this deeper understanding of the relative performance of the infrastructure portfolio, stakeholders can prioritize an overall infrastructure modernization program and focus on those projects that have the greatest affect. However, technology may well be the easy part, while the change in process and new thinking needed to take advantage of the technology is the hard part—the business side of the equation.

### Becoming Model Centric

For many of us, changing the focus of our business processes requires a change from being application-centric to model-centric, i.e. BIM. This proves true as we look at the proliferation of point clouds and masses of 3D information ready and waiting for a BIM workflow. What does this mean? While the survey department focuses on the software best suited for a data collector or total station, the engineering department is contemplating which design software and wireless devices for inspections are best.

*Here's the key:* Have the two really communicated with each other from a process standpoint? When you have models becoming the commodity for design, how does the transfer of models between professionals (surveyor to engineer or architect) change the workflow? While each department may efficiently perform its own tasks, this type of department- or task-focused approach leads to restricted and regimented workflows that make it difficult to innovate even with new tools and technologies. Not to mention that numerous agencies may need to review the information and require custom reports that also need to be re-run with each change. This creates critical pain points where the information must be created again and again in different formats.

When looking at a process change such as going from standard survey deliverables to contributing laser scanning point clouds to a BIM workflow, consider the following aspects. Like before, understanding the process of BIM—what it does, what existing processes it will allow us to do differently, and what it will enable us to do that we haven't before—is vital. Think back on the reluctance to the first 2D CAD systems. When 3D modeling systems appeared, there was even more resistance. This same resistance to change holds true for BIM solutions. These create and operate on digital databases for collaboration and manage *change* throughout those databases so that a change to any part is coordinated in all other parts, and they capture and preserve information for reuse by additional industry-specific applications.

A formal implementation strategy is an essential component of any successful laser-scanning-to-BIM deployment and must go well beyond a simple training and rollout schedule. It should address the workflow and organizational changes inherent to BIM. Laser scanning and BIM open many doors for designers, but to make it all work, you must have models generated from the get-go with reality-based data. That's why laser scanning and the data it creates are critical. More than a point cloud, it is a 3D starting point for design. An implementation strategy also needs to address how the new solution will initially coexist with existing 2D drafting or 3D modeling applications.

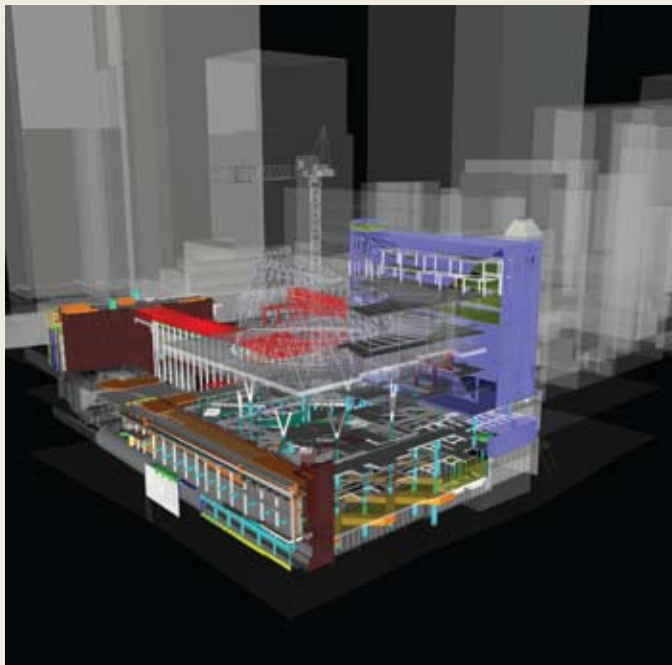
Wholesale abandonment of these legacy design applications is impractical and often ill advised, but as the implementation expands, the strategy may also include plans for the phased retirement of legacy systems. Firms should look at how the BIM model can be accessed by related applications. Specifically, look at the work you need to accomplish today and match that to the tools you put in place today. For firms that handle large projects, your implementation strategy should include guidelines for creating and working with large models (additional hardware requirements, techniques for reducing model complexity, etc.).

Because BIM represents a new approach to design and not just the implementation of new supporting technology, firms should pay close attention to the makeup of the transition team, ensuring they comprise both technically forward-thinking people and senior leaders. Because change sometimes disrupts ongoing operations, it needs to be addressed head-on, prior to implementation. Education and awareness about BIM are key tools when tackling the natural resistance to change, particularly in firms where organizational structure and disparate locations make communication more complicated. Select the right project to start with, something your firm already

knows how to do, so there's only a single dimension of learning. Gathering these statistics can substantiate the promised ROI of the system and help garner support among the "show-me" members of the firm.

## The Way Forward

Comprehension of these complex technologies is essential, and as surveyors we are called upon to speak a common hardware and software language with other AEC professionals, most notably civil engineers. As professionals, we need to step back and look at the bigger picture. We need to focus on not only what we are charged with—resolving land boundaries and providing the data framework for the building of infrastructure—but how best to redefine design and construction to leverage the extensive knowledge we have and the services we can provide.



Fulton Street Transit Center in New York City, combining laser scanning and BIM—*courtesy Parsons Brinkerhoff*

What should you look for as you review technology, solutions, and systems for your business? Look for companies that want to be your business partner, not just providers of technology. And look to those that have a solution and a model-centric approach, one that can leverage your laser scans and models throughout the entire design and construction process.

They are the ones that will give you the best chance of evolving and leveraging all the technology we have at our disposal. We owe it to ourselves, our customers, and the future of our businesses. Some key aspects to consider: Information exchange between land development professionals on a project team is a given, but the degree of that exchange and ease at which it is accomplished is not. Traditionally, this breakdown in communication of design information is one of the leading causes of project overruns and delays. The ability to mitigate communication breakdowns to a minimum through business process improvement (and not just focusing on operational efficiency) is a critical step in decreasing liability exposure. Increasing accuracy and coordination between departments and different elements of the infrastructure work process will reduce errors and redundancy of information, all with the goal of decreasing the risk of business failure by avoiding high fixed costs or over-staffing in periods of high demand. Laser scanning and models in a BIM process have proven to address this.

At the top of the checklist for a smooth deployment of laser scanning and a BIM solution are these critical success factors:

- develop a sound, comprehensive implementation strategy for each,
- assemble the right team, those that comprise both senior and technology progressive people—you need advocates who will garner respect,
- select a suitable starting project, and
- be prepared for the inevitable resistance to change that a revolutionary approach like laser scanning and BIM will provoke.

At some point, we all will face making a change in our business strategies. To prepare for the future, we must be ready to change and know why. Change is never easy, but it is the one constant of business. So in thinking about laser scanning, it's not what you are looking at that is key (just a technology), but what you see—a way to differentiate yourself and your firm, to become a key player in the move to BIM and the rebuilding of our world's infrastructure. †

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