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Software finds design flaws early in project, saves time, cash

Building industry slow to move from traditional practices to new technology

Sacramento Business Journal - by [Michael Shaw](#) Staff Writer

While vying for the contract to build the **University of California Davis'** new Graduate School of Management building this past summer, **Sundt Construction Inc.** and architectural partner **Sasaki Associates Inc.** went in fully loaded with a three-dimensional computer model that allowed judges to take a virtual tour.

When the university wanted cost options for using the same Indian sandstone that adorns the Mondavi Center nearby, the answer lay a few mouse clicks away -- the computer program they use calculates material costs on the fly.

The team believes its use of technology -- known in the trade as building information modeling, or BIM -- helped win the contract.

"No question about it," said Steve Humphreys, a vice president at Sundt, noting that the team won both on the merits of its design and its lowest bid. "We could push the envelope with our design. The technology really helped us do that."

Three-dimensional building modeling, which traces its roots to the now ubiquitous 3-D modeling in the auto, airline and product manufacturing industries, is emerging as a revolutionizing force in construction, its proponents say.

But the changeover has been slowed by the significant costs and training involved and the resistance to abandoning traditional construction documents that have been the industry standard for hundreds of years.

Models have layers

Unlike paper construction documents, the BIM software flags any design conflicts, which can then be fixed before construction begins, saving time and money. Lots of time and money, Sundt said. For an additional cost of about \$20,000 to use BIM on a recent wastewater treatment project, the technology saved the company an estimated \$300,000 by speeding up the build phase and eliminating costly on-the-job changes, said Dan Russell, a Sundt official.

One of the most powerful effects of this new technology is that a single computer model can be passed between architects, engineers and builders. The model can be viewed in its



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Chuck Hack of Lionakis Beaumont Design Group: "If you have to move a window or a column, you'd much rather do it in the computer than at a job site."

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entirety or peeled like an onion to reveal electrical and mechanical systems, plumbing, structural steel, and dozens of other layers. Builders' refinements can be made quickly without having to redraw dozens of pages. Subcontractor tweaks are integrated into the model, too.

"If you have to move a window or a column, you'd much rather do it in the computer than at a job site," said Chuck Hack, business development director at **Lionakis Beaumont Design Group**. "We're seeing our clients ask for this more and more. They don't want to get hit with a bunch of change orders."

BIM is pushing the industry away from the traditional model of a separate bidding process for design and construction, said Matthew Shigihara, a principal at Lionakis Beaumont.

The technology calls for much more interaction between the players, resulting in a better product earlier on and making a design-build approach more attractive to clients.

smart walls

A handful of software companies are competing to become the must-have 3-D modeling application. Sundt uses a program by **NavisWorks Inc.** after switching to BIM two years ago, while Sasaki also uses a program by **Autodesk Inc.**, a company that has supplied computer-

aided drafting software for years. In August, Autodesk acquired NavisWorks in an effort to bolster its presence in the 3-D design field.

While architects have been using computer-aided drafting for years, the new technology represents a giant shift. That's because the old CAD programs might have sped up the drawing process, but they didn't make the drawings any smarter, said Strachan Forgan, a senior associate with Sasaki.

"A line has no intelligence," under the old system, Forgan said. "It doesn't know it's a wall." In the new software, however, designers can select walls, doors, windows and other components that are self-aware, complete with noise and fire safety ratings, a set of components and a cost. Forgan doesn't have to count all the doors in a massive hospital project -- the computer does it for him. It also ensures that every hinge, bolt and knob is accounted for.

Forgan demonstrated the software's versatility while giving a virtual tour of a new recreational facility Sasaki is designing for **California State University Chico**. He traveled through a hallway and looked up to see the climbing wall that showed a beam mistakenly running through it. Without the model, that clash wouldn't have been caught.

These 3-D tours are a boon to clients, too. For a planned Antioch Courthouse expansion, designers took the judges into their future chambers and adjusted courtrooms to their tastes.

The latest versions of this technology incorporate construction schedules -- what insiders call 4-D technology -- ensuring that workers of different trades, such as electricians and plumbers, won't be working on the same part of a building at the same time.

no compatibility

At Lionakis Beaumont, the team has gone one step further. The company purchased a

"printer," which is really more of a model maker that can take the designs and build them overnight.

The \$65,000 machine, manufactured by **Z Corp.**, builds a replica of the building out of gypsum and glue, one thin layer at a time, at a rate of about an inch of vertical height per hour. The ending model has the consistency of a sugar cube and has to be handled delicately.

Shigihara noted that Lionakis Beaumont's model of a water intake site near Freeport, which would have taken a model maker a month to build out of wood at a cost of \$20,000, was completed overnight for about \$3,000.

Lionakis Beaumont's model "printer" is one of only two in California owned by architects, Hack said.

Despite the seemingly obvious advantages of switching to BIM, there have been some hurdles that have slowed its adoption. In a recent survey by the **American Association of Architects**, only half of the country's large architectural firms have used building information modeling on at least one of their projects.

Besides the significant cost and training involved, there's another factor that has slowed BIM's expansion, said Kristine Fallon, a Chicago architect and chair of the **American Institute of Architects'** Technology in Architecture Practice Committee. There's been a delay in creating a set of standards that would allow a 3-D model to be passed between any BIM software programs.

The software companies, which are still fighting for market share with this new technology, have been reluctant to voluntarily make it easier for users to select whichever program they choose, Fallon said.

"Until we create a market incentive to do so, this isn't likely to change any time soon," she said.

As architects embrace the new technology, however, they'll drag builders with them.

"This is really about attitude," Shigihara said. "This is the way the industry is going. We're looking for like-minded people."

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