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The Magazine for Professional Engineers

**Got the
Message?**

For many years, there has been a confusing mixture of messages about the engineering profession. The National Academy of Engineering wants professional and technical organizations to help change that.

All Together Now

Collaboration tools used to be about making paper-based information available electronically. Now, these tools have matured and allow users to manage many kinds of business processes.

BY EVA KAPLAN-LEISERSON

When the noted architect Sir Christopher Wren designed St. Paul's Cathedral at the turn of the 18th century, he insisted that all the engineers and architects work together at the London site. He knew that would help speed the transfer of ideas and communication of plans, explains Joe Croser, global marketing director for platform products and subscriptions at Bentley Systems, makers of ProjectWise, an online project collaboration system for engineering.

"The motivations then to connect the teams were the same as the motivations are today, which is to share information to increase the speed of ... time-to-market," says Croser. Today, when building project teams are flung around the U.S. and the globe, online collaboration tools are making it easier to bring people together virtually to work. And even when members of a team are located across the hall from each other, the ability to view one common set of docu-

ments and be notified of needed actions can reduce errors and speed up work.

In the past, collaboration processes for design and construction were slow and inefficient, Croser explains. Mailing paper rolls of designs or, eventually, floppy disks or CDs took too long, and by the time the drawings arrived, they'd be out of date. E-mailing files to multiple people created separate versions, causing confusion, and e-mail programs often limited file size, while File Transfer Protocol sites that enabled uploading and downloading of files were slow.

Tracking project progress also presented difficulties before the advent of online collaboration tools. Individual spreadsheets used to be the norm, explains Jonathan Antevy, CEO of Web-based capital project management and collaboration software e-Builder. Each person kept his or her own set of logs and had a different basis

for decisions, Antevy says. But disputes would arise about whose information was correct, he explains, leading to delays on projects that increased costs and, sometimes, litigation.

Online collaboration tools developed specifically for the AEC industry have sidestepped all those issues, ensuring rapid and easy access to one common set of documents, including CAD files, meeting minutes, specifications, schedules, and daily reports. Login profiles manage who has access to various types of information, and the tools provide the ability to share, view, comment on, and mark up drawings.

The "software-as-service," Web-based platforms enable people to log in from home, the office, or the field, without having to install anything or reconfigure their machines, Antevy points out. And allowing the architect, engineer, contractor,



and owner to all view the same information increases accountability, speeds decision making, and improves the quality of decisions, he says.

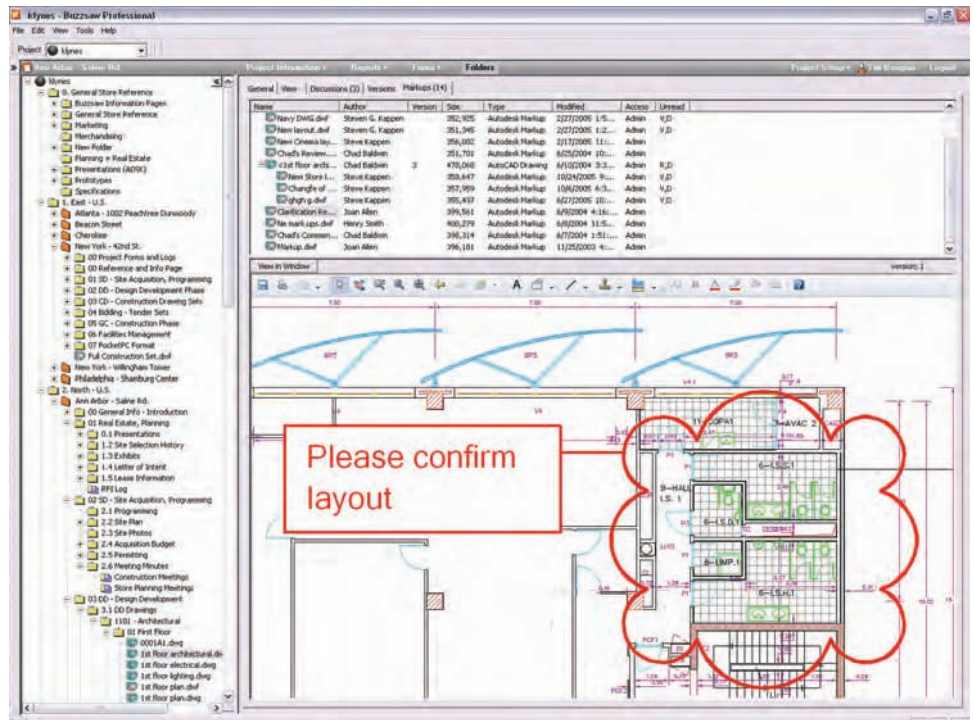
Because there's a "single version of truth" and the system provides the most up-to-date information, there's no excuse for working on outdated information and having to do rework, says Paul Wilkinson, head of corporate communications at BIW Technologies, headquartered in the United Kingdom, and author of *Construction Collaboration Technologies: The Extranet Evolution*. BIW provides online business applications to support delivery and management of built assets.

But online collaboration tools now go beyond simple document management, says Wilkinson. Although earlier in the decade, the focus on collaboration tools was in taking paper-based information and making it available electronically, today's customers are now moving to managing business processes with the tools.

Tim Douglas, senior marketing manager for collaborative project management at Autodesk, whose collaboration tools Buzzsaw and Constructware can integrate with its AutoCAD and Revit BIM platforms, echoes this sentiment. "The process component is key," he says. "It's not just about implementing a piece of software. You have to understand where you want to go, what you want to accomplish, what processes you need to consider, and how the application will support those processes."

Business process features in online collaboration tools for the AEC industry range from the basic to the more complex. Simple ones include "e-mail on steroids," as Antevy describes it, structured ways to communicate issues, requests for information, or change orders. Another tool, dashboards, indicates important information, such as where decisions or actions are needed or what's not going right on a project.

Some tools such as e-Builder include a scheduling component. If a change is made to an activity that affects other tasks, the



AUTODESK'S BUZZSAW COLLABORATION TOOL ALLOWS USERS TO MARK UP DESIGN DRAWINGS FOR REVIEW AND COMMENT BY OTHERS.

system notifies the individuals responsible for those items, Antevy explains. This automatic streamlining of administrative tasks Antevy calls "dynamic workflow."

In addition to saving money by reducing errors and rework, online collaboration systems can save money by keeping staffs

neering drawings, apply costs to them, and then import them into budget modules, explains Douglas.

One of the most important features available in online collaboration tools for the AEC industry is the ability to create a record of who did what on the system.

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lean, Antevy says. "You don't have to call 10 people to find something," he explains. "It's a productivity saver." On the flip side, Croser points out that companies that can't find enough engineers can manage their human resources with a tool like ProjectWise, using the system to connect people so that engineers at a slower office can help out those at a busier one.

Some tools ultimately interface with back-office systems to manage things like project costs. Constructware is one tool that includes a cost management capability. It can generate bills of materials from engi-

"This is an audit trail that can be investigated," Wilkinson says. "It helps avoid a lot of disputes to which the construction industry used to be very prone." Antevy explains that the audit trail can keep engineers from being blamed for delays caused by other parts of the process. "When a claim is potentially thrown up, the system will set them free," he says.

All these capabilities don't come cheap, however. Prices vary widely depending on configuration, but expect to pay tens of thousands of dollars. Douglas quotes \$15,000–\$20,000 for 50 users. Croser says

the core content management part of ProjectWise runs \$50,000 for an unlimited number of connections, with an extra \$360 passport fee per person. Additional features and implementation consulting will bump the price up further.

However, users say the tools are worth their cost. Wayne Lawson, P.E., principal for CBI Consulting Inc., an architectural design and structural engineering firm, uses e-Builder for cost, schedule, and document management. Now he has the ability to manage multiple projects without having to hunt for information on servers or hard drives. "It may seem a little pricey at first, but I think the more you use it, the more benefit you get out of it," he says. "Anything, like AutoCAD, seems pretty expensive between the cost of the program itself and training, but once folks are up to speed on it, it just becomes another tool."

David Moore, P.E., mechanical engineer for Flack and Kurtz in San Francisco, selected Buzzsaw because of its compatibility with Autodesk and AutoCAD products. He uses it to share CAD files, specifications, and product literature and to notify people automatically when drawings are updated. "How can you put a price on the ability to have all this information shared in one place?" he says.

The advantages of online collaboration tools aren't limited to engineering companies. Project owners, for example, can use the systems to get an overview of progress on all their projects in a single screen, Wilkinson points out. Contractors can view a similar "headlines" page that identifies where "firefighting" is needed, he says. And getting materials suppliers, manufacturers, and subcontractors to use the system and participate in decision making earlier on can reduce rework and save time and money.

Engineering and consulting firm Michael Baker Corp. commissioned an independent analysis of its use of ProjectWise on a highway design project by SMART Business Advisory and Consulting. The findings: In addition to increasing project quality and

profitability, team productivity, and staff morale, the system provided a peak return on investment of five times its cost, with a payback period of six months—twice the industry benchmark.

Time for validating drawings dropped by 20%, and team members saved an average of one hour per drawing by reducing rework. The system saved subcontractors an hour a day, reduced travel for half the project team by eight hours a month, and cut seven hours per month of work for remote colleagues. In addition, use of the system released two full-time CAD coordinators to other billable work and eased recruiting of staff since new team members could be placed in any office.

But people's fear of change, especially while working on deadline, can hinder adoption of an online collaboration system, says Croser. According to Wilkinson, the general rule of thumb is that use of a collaboration system is 80% people and processes and 20% technology. The real test is getting people to adapt their behaviors to use the system appropriately, he says.

It comes down to the individuals, Wilkinson stresses. "Do they have a collaborative mindset or are they stuck in a cubicle mindset where they're trying to be the hero engineer and not share their ideas with anyone else?"

Antevy and Douglas stress the need for an executive sponsor who can take a holistic approach by examining what the tool is trying to accomplish. "These types of things are business-level decisions driving adoption," says Douglas, "so there needs to be an executive-level business leader who drives decision making and the support for change required."

It's also important to take an incremental approach in implementing the tools, says Douglas. The companies that are most successful look at what they want to accomplish and where they can get started and then build on that success, he notes. "Companies doing it all at once overwhelm themselves—and people trying to manage the change—and are less successful."



Antevy agrees. He encourages clients to start with the "big wins" first. Where are the biggest problems? Where can e-Builder get the easiest successes? As people get excited about eliminating the problems they've had, they will then start to ask to use the tool in more places. Or in other words, "People need to have been in the position where they've been hurt before," he says. "If they've been hurt before, then they have their eye on what needs to be solved."

Wilkinson notes that it's important to sit down with team members early in the process to get an understanding of their roles and responsibilities, the information they've created to date, and the technology and file formats they've used. Then the system can be configured to support their needs. When there's a degree of ownership and people feel involved and consulted, he says, they will be much more likely to adopt such a tool.

Lawson encourages bringing clients and subconsultants on board with the use of an online collaboration system. In the future his company will include the cost of licenses in the fees it charges and may require subcontractors to purchase licenses as well. His best advice: "Just use it." ■