



4 WAYS ENGINEERS
CAN **OVERCOME** BIM
ADOPTION CHALLENGES
IN INFRASTRUCTURE

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THE TRANSITION FROM 2D TO 3D MODELING IN INFRASTRUCTURE DESIGN REQUIRES A FUNDAMENTAL CHANGE IN PROJECT DELIVERY — AND MAY BE ONE OF THE BIGGEST CHANGES THE INDUSTRY HAS EVER SEEN.

Pen, paper and 2D drawings only go so far when creating and managing design data. Today's increasingly complex infrastructure projects need innovative technology like building information modeling (BIM) to support efficient planning and design, accurate and on-budget construction, and targeted asset management.

BIM brings a host of benefits to infrastructure projects — from running clash detection to eliminating rework. It involves a data-rich, intelligent 3D model containing not only the physical objects that accurately represent the components of a building or piece of infrastructure (a bridge, for example), but also data about each of these components. For engineers specifically, the use of BIM maps out important details and answers crucial project questions that historically have been difficult to resolve.

Daniel Jensen, a civil bridge engineer at Michael Baker International, says that simply being able to visualize a project in 3D is a serious benefit. "It's

very difficult to visualize a 2D plan set and piece together what the bridge or structure looks like in your mind. The spatial awareness you get from using a model of all the different disciplines allows you to access and digest information very quickly."

Until recently, the right tools haven't been accessible to help drafters and engineers effectively design and model in 3D after spending their entire careers working in 2D drawings and CAD platforms. Although many in the infrastructure industry are beginning to realize the powerful benefits BIM can bring to their projects, they still face major obstacles to adoption and integration.

In this playbook, we'll explore the largest hurdles engineers face in BIM adoption — and practical ways to overcome them.



CHALLENGE #1

PICKING THE RIGHT BIM PARTNER

Improving engineering and construction processes for infrastructure projects comes down to tools, people, workflows and infrastructure owners.

Jensen first used BIM on an infrastructure project about five years ago when the Utah Department of Transportation (UDOT) added digital model delivery to its contractual documentation. According to Jensen, this was likely one of the first projects of its kind in the country to require digital model delivery.

After his company won the project, it was Jensen's job to figure out their BIM process. He had an interest in modeling and the workflows required to support it, so he was ready to dig in. His top priority: finding the right software to help.

"I didn't realize BIM was going to be as important as it is now and move the industry as much as it has already," Jensen says. "Finding the right software

was essential. We were having major problems with the modeling and visualization software we had at the time, and we needed something that would work with our roadway files, drainage, utilities and other disciplines."

It is critical to implement tools that will make your BIM workflows accessible for ordinary deliverable production, and it's vital to weigh your options. Investigate software choices and do a trial run of your top choice(s) on a pilot project to determine whether the tool is:




Easy for your team to use



Aligned with your team's existing skillset



Designed so everyone can understand the inputs and outputs



“Your BIM platform can’t be a black box – mysterious and difficult to decipher what the data going in and coming out means,” explains David Loughery, business development manager at ALLPLAN. In other words, a Nobel Prize in physics shouldn’t be a prerequisite to using it.

The people behind the tool are an important consideration, too. You need a tool that works and is easy to use – and one that connects you to experts who can answer questions, provide training and even listen to your feedback and make adjustments accordingly.

ASK YOURSELF:



Do they understand your unique challenges?



Are they responsive when you reach out?



Do they regularly touch base to check on progress?



Are they able to make changes and adapt accordingly when you provide feedback or constructive criticism?



CHALLENGE #2

MAKING BIM DELIVERABLES ACCESSIBLE TO EVERYONE

One of the biggest advantages of using BIM for infrastructure projects is its ability to bring teams and organizations — the owner, contractor, engineer, designer, etc. — together to work from the same project data at the same time.

For this level of collaboration to occur, however, BIM processes can't be used in isolation or on one element of a project. Solutions must be interoperable so they can connect to and be accessed by the platforms each discipline uses, from roadways and bridges to utilities and right-of-way.

BIM INTEROPERABILITY SUPPORTS:



Several users working simultaneously in one model, regardless of their location



Delivering to and reading from the IFC (Industry Foundation Classes) data model



Direct integration with other applications




An open API so you can create your own extensions, automate repetitive processes, etc.



Management of collaborative workflows based on open standards



Other exchange formats



"[BIM] enables a single deliverable everyone can use," explains Loughery. "You no longer have one set of PDFs describing a roadway, another set describing a bridge, six more for each of the culverts nearby and separate PDFs for geotechnical and utility design. You have one 3D model with all the information you need to plan the project better and understand what you built."

Interoperability is especially critical for infrastructure projects where deliverables are often generated using a variety of software, survey data is collected in different formats and structural information still exists in 2D plans.

"YOU HAVE ONE 3D MODEL WITH ALL THE INFORMATION YOU NEED TO PLAN THE PROJECT BETTER AND UNDERSTAND WHAT YOU BUILT."

David Loughery,
business development manager at ALLPLAN.



CHALLENGE #3

ADAPTING 2D SKILLS TO 3D ENVIRONMENTS

For the most part, project delivery has remained unchanged over the years. The biggest transition occurred a few decades ago when engineers began using computers instead of hand drawings to make the drawing process faster and easier.

But that transition didn't require learning a new process, explains Loughery. An engineer could quickly learn how to apply their drawing skills in CAD to create lines on digital paper instead of physical paper.

"When it comes time to do quality assurance work, many companies today still print out 2D drawings and annotate on large sheets of paper," he says.

Because engineers are used to working with flat drawings, transitioning those 2D skill sets to 3D environments can be a much greater challenge. A 3D BIM platform that's "2D friendly" makes the shift more manageable. It allows engineers to design a 3D model while working in 2D so they

can progressively become more comfortable with new workflows.

"Naturally, questions come up during this 2D-to-3D transition," explains Loughery. "For example, when a line is drawn in CAD, it's a line. When modeling in 3D, the engineer's level of thinking needs to expand. It's no longer, 'I do X, and Y comes out.' It's, 'I do X, Y and maybe Z, and the results look different.' In a bridge project, for example, the end result is a 3D surface describing a bridge deck from which you can extract line work and verify accuracy."

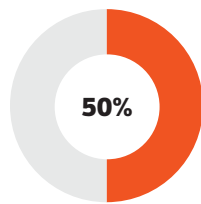
Such a fundamental shift can feel like a big hurdle, but it doesn't have to be. The right BIM partner can help you through the transition with a variety of training and consulting options. "Even with a 2D-friendly BIM platform, training is needed early in the process so no one feels worried about it or threatened by it," explains Loughery. "Your vendor partner should be able to support you with that training, so your existing staff will be confident with the software and workflows."

Jensen agrees. "Training is a big time investment," he says. "But if you want to adopt 3D processes, you're going to need it."

"We opted to do pre-recorded sessions that were available online for our team to watch at any time," he describes. "We could use those to walk through our workflows, and they were supplemented with live training sessions at least once a week."

Each session had an agenda with plenty of time reserved for open discussions so everyone could ask questions. They were able to work through a real project as they were training, making it easy to ask direct questions that applied to their specific workflows.

Loughery says choosing the right software provider – one that offers hands-on training and consulting – can reduce learning time by up to 50%.



Choosing the right software provider can reduce learning time by up to 50%



CHALLENGE #4

PREPARING FOR FUTURE

While the industry may be evolving toward BIM, not everyone is moving at the same pace. Consultants are expected to provide today's 2D deliverables while also developing the expertise to deliver projects in 3D so they're ready when the inevitable transition occurs.

"The day a DOT pulls the trigger on 3D modeling, there will be a scramble," says Loughery.

"Everyone will need software and training at the same time, and there could be some significant time delays before you're up and running. If you start now, you'll be well ahead and ready to quickly respond to what clients ask for."

The right BIM platform should support the internal 3D workflows you need while also accommodating whatever your clients ask for, such as 2D delivery – without breaking the bank or requiring engineers to do the same work twice, once in 2D and again in BIM. A strong BIM workflow will help deliver drawings, models and data all from one place, allowing you to better manage changes, reduce risks and more economically complete project work.

Project owners that dictate digital delivery are also likely to dictate the standards and best practices they want to follow. In the meantime, consultants are left to determine their own workflows and practices. For the team at Michael Baker International, this is a continuous process.

"As we train our people, we let them know we put a specific set of steps or workflow together and ask them to use it. If they don't like it, we want feedback so we can continue to revise and modify our approach," Jensen explains.

To level the playing field and align vendors, Loughery says that stakeholders – DOTs, the American Association of State Highway and Transportation Officials (AASHTO) and others – are working to develop nonproprietary standards for 3D model delivery. This will allow for more consistency across the process and ensure that no vendor has significant industry leverage over other actors, including DOTs and consultants.

For example, the Pennsylvania Department of Transportation's Digital Delivery Directive 2025 will replace PDF plans with 3D-engineered models. It will require all project elements to be contained within a signed and sealed digital model that includes 2D and 3D model elements with attached attributes and references.

Completing projects with a BIM workflow now, even when 2D documents are specified, can not only help deliver better projects today, but also prepare firms for the coming shift to nonproprietary model delivery standards.

IF YOU THINK BIM CAN GIVE YOU A SLIGHTLY BETTER UNDERSTANDING OF YOUR STRUCTURE, HELP REDUCE CLASS DETECTION, OFFER INSIGHT INTO HOW PARTS FIT TOGETHER OR HELP YOU GET READY FOR THE FUTURE, THEN BIM IS ABSOLUTELY WORTH IT FOR YOUR INFRASTRUCTURE PROJECTS.

Daniel Jensen,
a civil bridge engineer at Michael Baker International



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ALLPLAN is a global provider of BIM design software that accompanies and integrates the design and construction process throughout all project phases for architects, engineers and contractors.

Its central platform enables customers to realize sustainable, functional and outstanding structures for a better-built environment, increasing efficiency in design-to-build workflows and creating deliverables of the highest quality and level of detail through:



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The ability to freely switch between 2D and 3D working methods



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