5 Things Every Heavy Civil Construction Team Needs to Know About

4D Digital Twins

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between the field and office

It's not new to say that the construction industry has been slow to adopt digital technologies. Despite employing 7% of the world's working-age population and being one of the world economy's largest sectors[1], it has the second-lowest overall digitalization rating according to McKinsey & Company's MGI Digital Index[2].

Recently, however, construction firms have begun to realize the significant benefits that digital workflows can bring. But while 75% of companies that have adopted BIM technology reported positive returns on their investments[3], the heavy civil construction industry has yet to see widespread adoption of BIM or 4D modeling.

Some of the reasons for this lack of adoption include the need for mobile mapping capabilities and communication between the field and office. For the civil industry specifically, it's been difficult for construction teams to model smaller pieces of civil structures and then combine them into a larger model.

But there is a solution, and it's been proven successful in the civil industry.

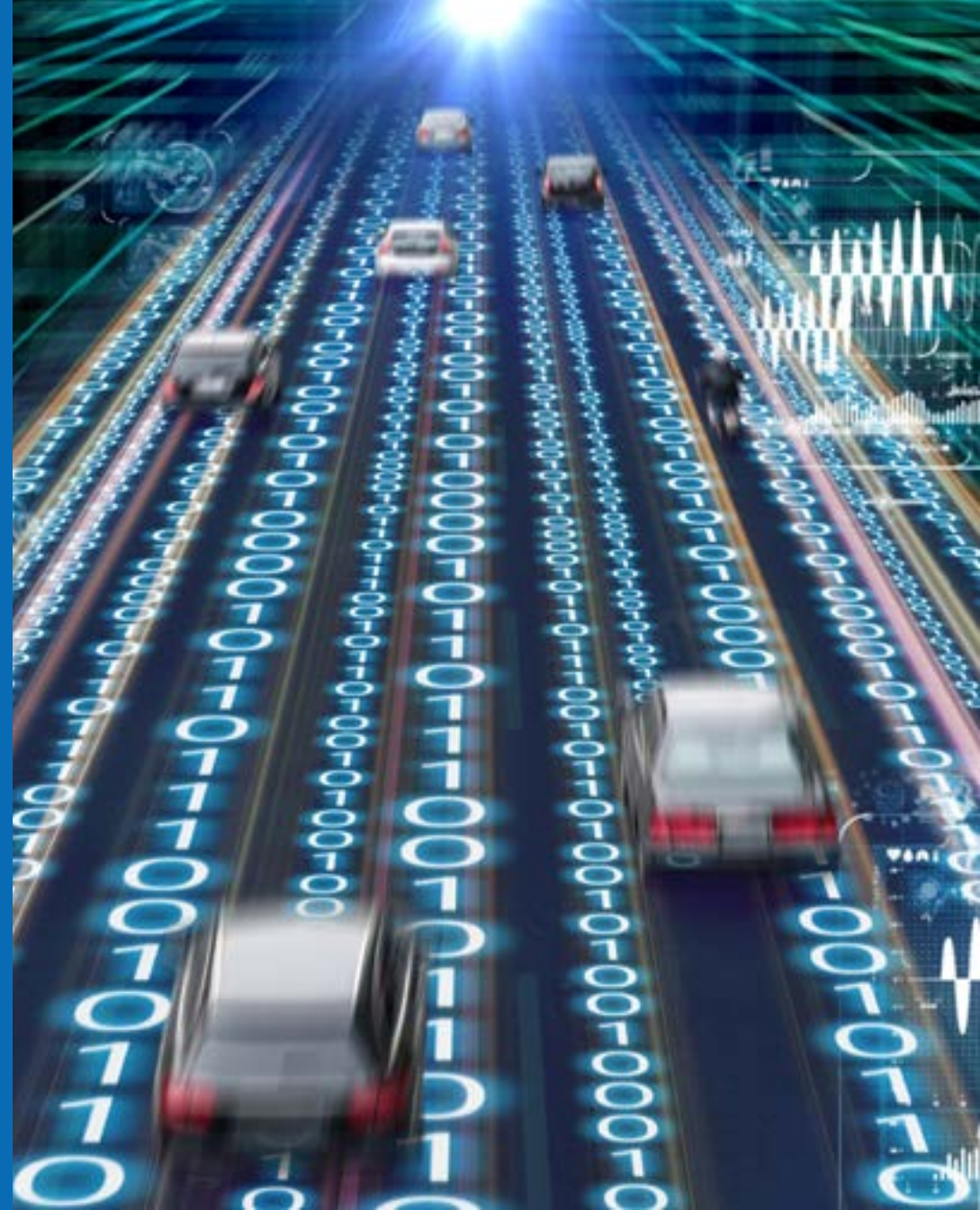
[1] Reinventing construction through a productivity revolution, McKinsey & Company, 2017.
[2] Digital America: A Tale of the Haves and Have-Mores, McKinsey & Company, 2015.
[3] Imagining construction's digital future, McKinsey & Company, 2016.

benefit from 4D

We know that 4D construction modeling is when you create a 3D construction model and add the fourth dimension of time to it. It lets you analyze and visualize the sequence of events on a timeline. And 4D construction digital twins take that 4D model and include all the information that allows you to understand the model and its performance. But how can the heavy civil industry benefit from this new technology?

There are 5 main benefits that the heavy civil industry can realize by implementing 4D construction digital twins, which include:

1. Gather and share data from the designer to construction office to the field
2. Generate a construction-focused model from design model
3. Analyze and simulate construction workflows to optimize project execution
4. Streamline communications throughout the entire project team
5. Realize the benefit on key project outcomes



gather and share data from designer to construction office to the field

The flow of accurate information can be a significant challenge for a civil construction team. Data from the designer may not always be easy for the office team to compile and then get out to the field teams. It can also be a struggle to find and update the feedback and flags from each team member.

Today, construction teams on jobsites—especially large, horizontal heavy civil projects—are utilizing technology by using web and mobile applications to gather data right on the site and send instant feedback to the office teams. 4D construction digital twins provide a single, mobile management environment where all project participants can upload and access data. Features like PDF mark-ups and raising issues within a model-view allow teams to communicate within moments. Some 4D modeling applications even let teams access, capture, and communicate information when offline and then sync immediately when they are back online.

generate a construction-focused model from design model

When mapping out a vast heavy civil construction project, it's often difficult to begin the process of estimating quantities, resources, and accurate schedules. This process has historically been manual, which can lead to errors in calculations due to the sheer size of the project site. There hadn't been an option to breakdown the large project into smaller sections.

With 4D construction digital twins, however, heavy civil construction teams can determine a specific element of the project, allowing the team to add construction-focused properties to the model. To determine the placement of these elements, team members can include an automatic geolocation feature that pinpoints within a map view and then add time by connecting the model to a schedule. This is a game changer, allowing teams to know exactly where to flag an issue and communicate it with everyone. Adding cost codes and quantity calculations to constructible components leads to faster, more accurate model-based quantity take-offs (QTOs). Tracking actual costs versus cost-loaded schedules can ensure that projects stay within budget.

analyze and simulate construction workflows to optimize project execution

Rework is a major added and often unexpected expense for construction companies. It's difficult to anticipate issues ahead of time when it is hard to find data from a previous similar project or progress within the current project. Schedules and plans are outlined without seeing potential pitfalls.

By connecting the digital twin to a schedule, heavy civil construction teams can run a simulation of the schedule and begin to visualize the build before it happens out on site. Analyzing the simulation allows team members to identify pain points and errors, limiting the need to adjust the overall plans in the field. We've seen that scheduling and simulation can reduce labor cost by 50%, increase field labor productivity by 75%, and reduce schedule time overall by 15%.

streamline communications throughout the entire project team

Communication is key to any successful effort. However, it can be extremely complicated with several stakeholders involved in a large heavy civil construction project. Decision delays can become costly project delays.

4D construction digital twins allow crews to share real-time data to the entire team in an interface that supports workflows in construction project context, as well as 4D model-views in web, mobile, and desktop applications. With clear and constant communication throughout the project lifecycle, projects run smoothly. Everyone is aware of important and timely information, allowing for them to make data-driven decisions.

the benefit on key project outcomes

At the beginning of each project, teams are encouraged to have a lessons-learned review from a previous project with a similar framework and plan. Without proper documentation of data as a reference, however, remembering specific issues and how they were addressed can be nearly impossible, as well as risky. As guidelines change and become stricter for inspections and requirements, it's become more important than ever to easily reference previous project information.

By using 4D construction digital twins, heavy civil construction teams can realize and confirm their project outcomes in advance through real-time data sharing. It's possible to track a project's progress to reduce risk and ensure that the team is meeting all the major milestones on time and within budget. By better keeping the project on schedule, they are saving money by avoiding rework or penalties for late projects. By saving this data beyond the project in a space where it is easily referenced, teams can save significant time on their current project.

About Bentley Systems

Bentley Systems is a leading global provider of software solutions to engineers, architects, geospatial professionals, constructors, and owner-operators for the design, construction, and operations of infrastructure. Bentley's MicroStation-based engineering and BIM applications, and its digital twin cloud services, advance the project delivery (ProjectWise) and the asset performance (AssetWise) of transportation and other public works, utilities, industrial and resources plants, and commercial and institutional facilities.

Bentley Systems employs more than 3,500 colleagues and generates annual revenues of more than $700 million in 172 countries. From inception in 1984, the company has remained majority-owned by its five founding Bentley brothers. www.bentley.com

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About SYNCHRO

SYNCHRO is a portfolio of integrated solutions that enables construction firms to win projects faster, deliver better results, and get paid for their work. SYNCHRO advances civil infrastructure by providing a central place for project data, allowing users to establish a design-build 4D digital twin.

with synchro, you can

Advance Civil Infrastructure Construction

Enable civil construction models for 4D and 5D that include field inspection purpose-built for DOTs, location-based services, and off-the-shelf civil content.

Provide a Single Place for Data

Manage data in a single shared solution to save time, improve communication, and enable better decision-making.

Deliver a Design-build 4D Digital Twin

Create an information-rich construction model to deliver a full project lifecycle for civil projects

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