

For Digital Twins, Openness Wins

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Advancing Infrastructure

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What would you say if you could wave a magic wand and eliminate all the time and effort that you and your organization spend on transforming data, integrating data, and aggregating data? What if you could spend your time generating insights and helping your teams make decisions that can save you money and reduce your risk?

When I began my career, our industry was going through the digital transformation of CAD, which was taking what we were doing on paper and moving that to the computer. The next disruption was when the industry moved from CAD to BIM—building information modeling. Now, our industry is advancing beyond BIM with the emergence of infrastructure digital twins—what we call iTwins. These iTwins bring in the missing dimensions of context—the physical characteristics of where the asset is on the planet—and the dimension of time, nothing is static in our world—as well as other types of data such as Internet of Things (IoT) and operational data. We’ve gone from document-centric workflows to model-centric workflows, and now in the era of the digitally built environment, the next logical step is the move to data-centric workflows.

We are collectively becoming data-driven enterprises, and the organizations that are going to succeed are going to be those that can convert data into actionable information and maximize its value over the asset lifecycle. Infrastructure data can benefit from network effects, which means that the more people that use the data, and have access to the data, and contribute to the data, the more valuable the data becomes. Therefore, openness and connectedness are going to be the enablers for maximizing the value of data and causing those network effects to thrive in the infrastructure ecosystem at large.



Modernization of Big Bend Power Station in Apollo Beach, Florida, U.S.A. The digital twin was critical to allow visualization and access to the physical and engineering data throughout design and construction, and will be key to future operation of the facility. Image courtesy of Sargent & Lundy.

The objective is to federate data coming from engineering technology (ET), information technology (IT), and operational technology (OT) and bring it together where it can be viewed through a single pane of glass. We’ve been speaking to many practitioners to understand the barriers that stand in the way of achieving this. One of the primary challenges in orchestrating this data aggregation has been the time and effort involved in transforming and aligning proprietary and incompatible data formats. What is needed to solve this problem is an open platform that can extract all these different types of information and integrate them together seamlessly.

It's not just Bentley Systems that recognizes the need for an open framework for infrastructure digital twins. In a paper titled "The Gemini Principles," the Centre for Digital Built Britain (CDBB) identifies "openness" as the central principle for achieving "effective information management of the built environment." Their conclusion is that open source and collaborative models build trust, reduce costs, and create value better than any other approach.

For a digital twin platform to be "open," we at Bentley think that it must meet three primary criteria. First—it must be vendor neutral with regard to the applications being used. It should not matter whether the applications used are from Bentley or from other vendors such as Autodesk, Graphisoft, Hexagon, Trimble, and Aveva. The system needs to be able to extract all this information and make it available in an open context.

Second—the system must be open to where the files are located. It should not be expected that all the data that you're working with is going to be in one homogenous, structured space or monolithic database. Connectors can be built to go find the data, where the data lives. Third—the system must be open in terms of the semantics of the data, with the ability to take data in its native format and open it into an open standard that you can query, interrogate, and integrate the information.

In June 2019, Bentley Systems released version 1.0 of the iModel.js platform on GitHub. iModel.js is an open source platform for creating, visualizing, and analyzing infrastructure digital twins. iModel.js is open, flexible and built for the cloud, web and mobile world we live in. It establishes an open platform for you and your supply chain to build upon, to connect, and to be able to derive value from infrastructure digital twins across all your workflows. iModel.js is written using modern cloud and web technologies and is available for building your own solutions to visualize and connect with the rest of the digital world.

You might be surprised that Bentley is willing to take its most innovative and new technology and make it available as open source. We have done this because we have a fundamental belief that—in the long run—an open system is the most successful system to create a thriving digital twin ecosystem for infrastructure.

Complex infrastructure projects will benefit from a thriving, open and interconnected data ecosystem. Data should flow freely—in and out of infrastructure digital twins, and it should be transparent and easily understandable by users. It should also be easy to develop workflows that access and take advantage of the data within digital twins.

The potential for infrastructure digital twins is truly unlimited. Openness will be a prerequisite for delivering digital twins that will advance our industry beyond BIM—helping us derive greater insights during design and construction and ultimately deliver more sustainable and resilient infrastructure during operations. For digital twins, openness wins.