

How Digital Twins Benefit Contractors and Owners

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Today's sophisticated capital projects must make heavy use of real-time data and advanced technologies to deliver on agreed-upon quality, cost, and schedule outcomes. The digital twin, a real-time 3D virtual representation of an asset used to analyze and predetermine project behavior over time, is a natural fit.

Entering the mainstream industry consciousness over 20 years ago, the digital twin has only recently gained significant traction. As the use of IoT (internet of things) sensors, drones, and machine learning has increased, there's been a parallel rise in the use of digital twins, which rely on these advanced technologies. Let's take a look at some of the key ways that digital twins benefit both capital project contractors and owners.

HOW DO DIGITAL TWINS BENEFIT CONTRACTORS?

By creating a twin for capital assets, contractors can more easily predict how various changes will affect asset performance over time. While digital twins have primarily been associated with and applied to the post-handover portion of the project life cycle, there are even more benefits to be gained by using them during the construction phase.

Identifying design discrepancies up front. As virtual representations of physical objects, digital twins can reveal



design flaws and potential problems that could cause the project to fail prematurely or otherwise perform poorly over its lifetime. Such a heads-up keeps those errors from being built into the structure and gives the design team and the contractor a chance to make necessary modifications. Ultimately this can stave off costs associated with wasted materials purchase and late-stage rework while accelerating project delivery.

Seeing the impact of design changes before the project is built.

A digital twin can be used to experiment with changes and different design options by simulating how they might perform under various conditions, including environmental factors such as weather patterns and temperature changes. So, for example, it can be used to answer questions such as, Will this change increase or decrease energy consumption? Will it cause more wear and tear on equipment? Will a particular modification make the building easier or harder to maintain? The digital

twin becomes a decision-making tool, helping designers and contractors analyze the impact of proposed alternatives on cost, safety, and performance before making critical decisions about how to proceed with the project.

Reducing safety risks during construction. When it comes to safety, one of the best ways to minimize risks is to have a clear picture of what's always happening on-site. A digital twin helps contractors monitor safety by using machine learning to analyze data from sensors (such as temperature or structural stress points) and drones to provide critical information about potential hazards that could result in injury or damage. Leveraging these data-informed insights enables contractors to better manage their assets and reduce the likelihood of accidents during construction. They also feed into the project's history to inform its operational phase.

Simplifying and streamline handover documentation. A digital twin links handover documentation to project data for a 360-degree representation of the built asset that includes the entire set of deliverables captured during construction – eliminating the need for multiple sets of paper documents that need constant updating as work progresses on site.

Forging stronger relationships with owners. Created using data input from IoT sensors within the physical asset, a digital twin provides ongoing objective, real-time information about the state of the structure. Project owners get an accurate, current representation of their asset before it's built so they can better understand how things will work once it's completed. That representation introduces transparency of project data and overall progress, creating trust between owners and contractors. Coupled with owner access to this data, a digital twin helps reduce miscommunication, increase accountability, and ultimately strengthen relationships between everyone involved in the project's completion process.

HOW DO DIGITAL TWINS BENEFIT OWNERS?

When companies invest in capital construction projects, they look for long-term value. They want to know that the new building or facility they are taking on will be operational and well-functioning for decades to come. With these goals in mind, owners can benefit operationally and financially from working with digital twins. Here's how.

Tracking structural integrity and safety. In our industry, digital twins have been used to better understand how building structures react and respond under specific conditions. These models provide valuable insight into not only how buildings will perform during earthquakes, hurricanes, floods, fires, and other extreme events but also how they may react during normal operation over time and during maintenance activities.

And because digital twins are constructed using data collected from sensors that monitor the real-world conditions of a property during operation, they can also be used to predict failure modes and risks before they occur, allowing owners to avoid costly downtime and accidents.


Improving maintenance quality. Maintenance is more than just keeping equipment and systems running; it's also understanding their performance and maintenance issues to help prevent failures that could cause delays. Often, maintenance data is scattered throughout multiple systems, making it difficult for contractors to get an overall picture of their assets' health. Naturally, this becomes problematic when it comes time for repairs or upgrades. Through sensors and machine learning, a digital twin delivers real-time data about each asset, making it far easier to prioritize maintenance activities based on actual performance, saving precious money and downtime.

Exerting more control over current performance. Digital twins can help owners understand how their assets are performing so they can make better decisions about how to improve their operations. Drawing on data coming in from sensors and machine learning allows owners and their facilities management teams to understand and monitor the condition and performance of their assets in real time. For example, if the temperature in one room suddenly rises above optimal levels, they can identify the problem by analyzing data collected from sensors throughout the structure. This lets them quickly zero in on high-temperature areas and take action before incurring any damage due to overheating components or equipment.

Better predicting future performance. The digital twin's value extends beyond current performance by helping owners anticipate future issues with their assets that can inform decisions about structural or system investments and improvements. So, for example, the twin can be used to predict how the building will behave based on different scenarios

– such as increased energy demand, equipment failure or replacement, or environmental conditions – so they can better plan future operations around them. Through simulations (like those done at the design stage), it's possible to see how potential changes will affect its performance, giving owners the opportunity to plan when considering investing in equipment or system upgrades or additional capacity.

DIGITAL TWINS AS A STRATEGIC PROJECT PERFORMANCE TOOL

A digital twin can bring numerous benefits, ranging from more effective budgeting and better decision making to more easily predicting and mitigating risks. Developing that twin as construction begins ensures you can capture all the relevant details to be used during execution and into the operation and maintenance phase. 



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