

SmarTwin

NOVEMBER 2021

Digital Twin + BIM for Construction and Owners

The SmarTwin™
Solution

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Brief History of DIGITAL TWIN

Digital Twin (DT) refers to the virtual copy or model of any physical entity (physical twin) both of which are interconnected via exchange of data in real time. Conceptually, a DT mimics the state of its physical twin in real time and vice versa. Application of DT includes real-time monitoring, designing/planning, optimization, maintenance, remote access, etc. Its implementation is expected to grow exponentially in the coming decades. The advent of Industry 4.0 has brought complex industrial systems that are more autonomous, smart, and highly interconnected. These systems generate considerable amounts of data useful for several applications such as improving performance, predictive maintenance, training, etc.

Digital Twin Positioning and Target Markets

Digital twins are increasingly being employed to facilitate more efficient planning, design, and construction of new projects, and they can improve operations of the facility post-construction, as well. Digital twins provide a high-fidelity digital replica of a physical asset and can serve as an intuitive display of the extensive data sets required for a project. They encompass not only the design and engineering aspects of the project, but also its physical environment, economic neighborhood, construction process, and utilization and performance once complete.





Digital Twin GOALS FOR 2022

Digital Twin Projects Highlights for Construction

The Strategic Case

**70% SAY DIGITAL CAPABILITIES
SIGNIFICANTLY HELPS THEM TO
COPE WITH CHALLENGES -DELOITTE**

The Economic Case

**69% OWNERS AND CONTACTORS
AGREE ON QUATITATIVE TOOLS TO
PREFORM FINACIAL AND RISK
ANALYSIS**

Transformative Change

**TOP 20 PERCENT:
INNOVATIVE LEADERS
MIDDLE 60 PERCENT:
FOLLOWERS
BOTTOM 20 PERCENT:
BEHIND THE CURVE**

Contrasting Strategies

**THE TOP 20 % ARE SIGNIFICANTLY
AHEAD WHEN IT COMES TO
GOVERNANCE AND CONTROLS –
WHICH IS REFLECTED IN THEIR
PROJECT PERFORMANCE - KPMG**

So how do you develop a digital twin? The first priority is to define common data standards, and connect previously disparate systems, so that a single, continuous, 'live' picture of a building's use and performance can be generated. Achieving this takes a combination of existing domain knowledge from the built environment, digital skills and some new IT investment. Achieving an effective integration of these elements is the central challenge.

Machine Learning Powers:

Well before your digital twin gains machine learning powers, you should see great return on investment, with useful operational insights from a unified picture of your asset's operations. By introducing this new level of control, businesses should be able to trim running costs and make savings almost immediately.

From current tools to tomorrow's services:

The playbook for the digital twin has been pioneered by some of the world's biggest, complex engineering companies. For some time, firms like Rolls-Royce have been running highly sophisticated digital twin models to understand how those engines are performing, but also allows them to advise the people who use their engines over the whole lifetime of the asset.

There's no reason why the same approach can't be taken by non-engineering or product-based businesses.

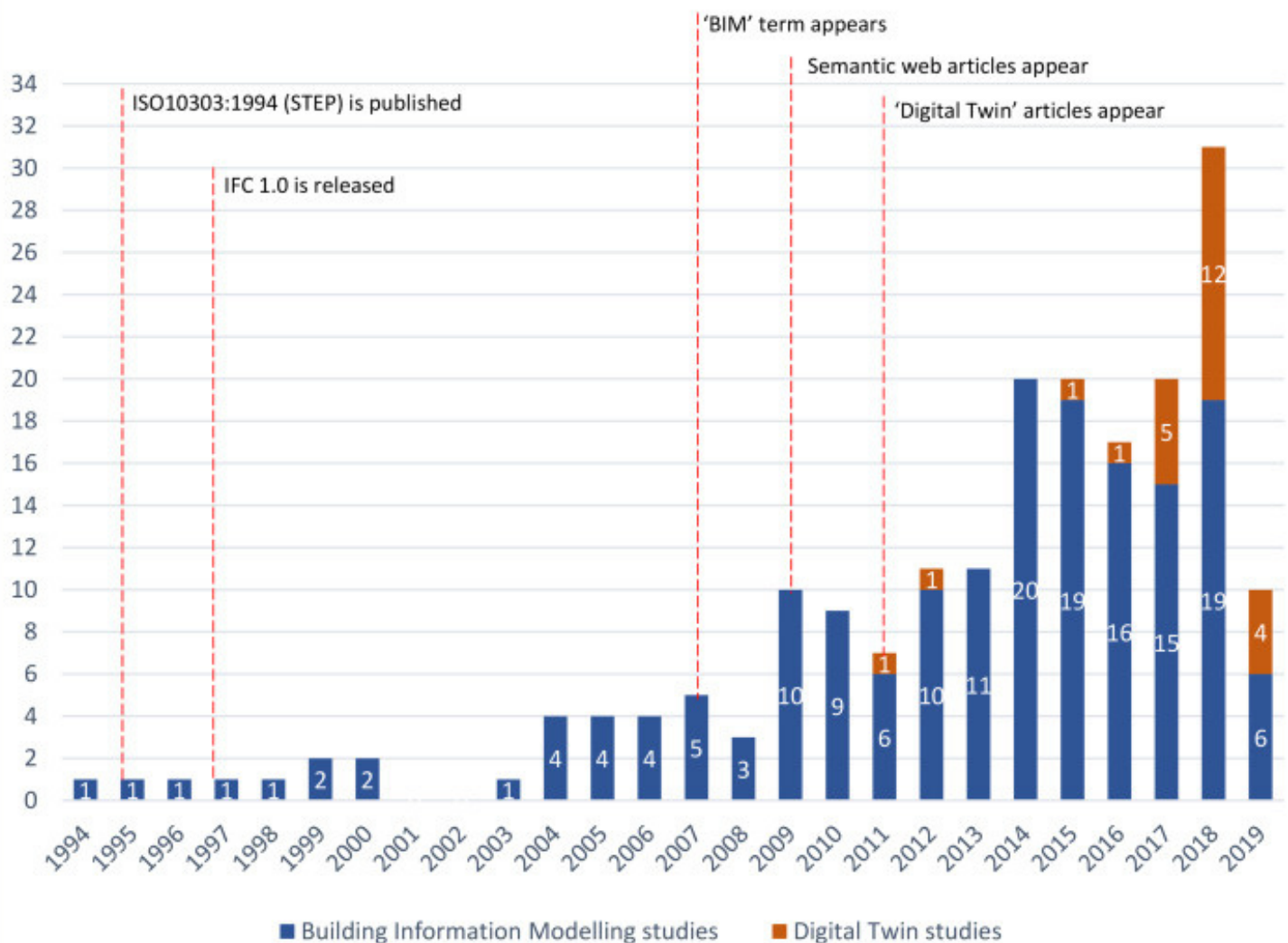
The learning asset

Beyond these medium-term benefits lies perhaps the greatest prize: buildings and assets whose automated systems can learn and optimize their own operation. A digital twin that can learn from and then shape the workings of its physical brother or sister.

Industry Data Analysis

The figure below outlines 196 research articles reviewed by their publication date. Showing there has been an increase in use of linked data technologies (Digital Twin) to integrate the traditionally dispersed data across the construction industry. The Digital Twin term re-emerges in several adjacent engineering fields in more recent years.

In order for BIM to adapt to newer, more integrated approaches on the construction site and the city level, the adoption of a Digital Twin paradigm is required.



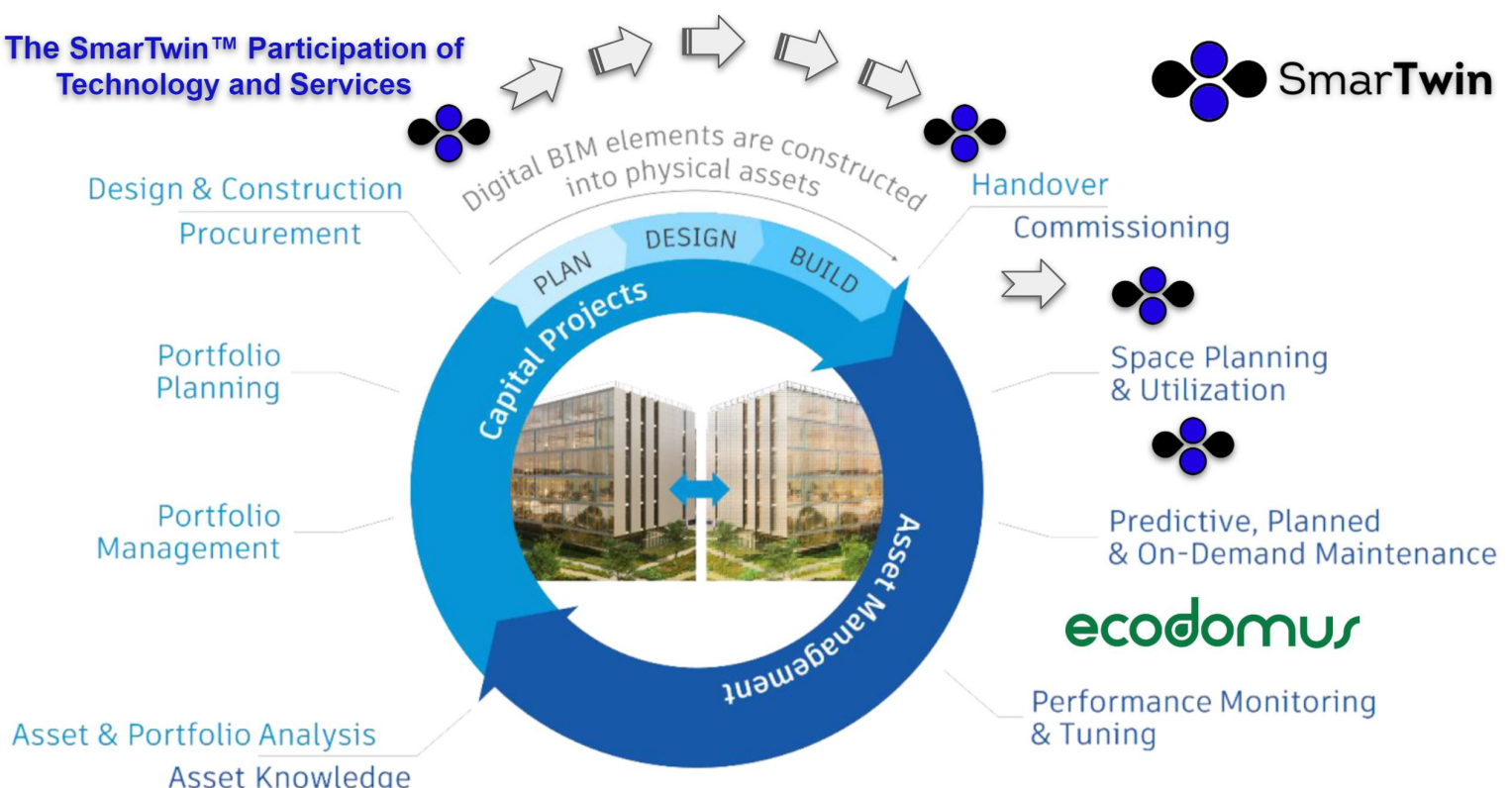
Digital Twin Strategies for Construction Improvement

“Once we have project thinking replaced with product thinking, construction will be replaced with assembly,” Holzer - Digital Twin Consortium

Below summarizes the main benefits of adopting a digital twin approach.

- Increase productivity and collaboration.
 - Vital information about the built asset can be stored and analyzed throughout its lifecycle, and kept current.
- Reduce construction and operating costs
 - Virtual scenarios on construction sequencing and logistics can be run and visualized, familiarizing workers with required tasks and reducing costly re-works.
- Performance and sustainability.
 - Operational and occupational data can be monitored and analyzed in real-time, providing valuable insights on how the asset is used and currently performing.
- Improve safety
 - On-site workers can get real-time tracking and alerts about the site, including hazardous area notifications and emergency situation response instructions.

The SmarTwin™ Participation of Technology and Services



Improve your bottom line and project acquisition plan.

- A CHANGE OF DATA SETS TO DIGITAL TWIN WILL IMPROVE THE COLLECTION OF A MENAGRE OF DATA SETS FROM ACTIVE CONSTRUCTION SITES.
- IMPROVE RFP PROCESS WITH BEST PRACTICES CAPTURED WITH PAST DIGITAL TWIN PROJECTS

The design of the database structure for the DTC data, information, and knowledge is a highly unconstrained problem and many alternative configurations are possible. Whereas current modes of data storage in construction projects almost exclusively consider file-based storage, object-based graph networks stored using cloud services are likely to be preferable for DTC. The reason is that aspects of PII, PIK, PSI, and PSK may overlap and share common resources and data at the object or property levels. Some examples:

- An architect designs a double-swing door and models it as an instance of a door class with appropriate property values in a BIM model (product PII). Once approved it is digitally signed by setting a meta-data property to “approved for construction”. The contractor uses the BIM model for procurement. Later, an inspector (or a smart software agent) compares the door installed to the design intent and confirms. In this example, both the intent and the status information and knowledge are associated with the same single BIM element instance.
- Where file-based storage is used, it will be more common for the general contractor to generate their own BIM models for construction.
- During initial design, or during construction, an engineer prepares a construction plan using 4D simulation software and an optimization engine. The input to the plan includes the planned tasks and their related BIM elements. The output of each run of the analysis is a set of predicted outcomes.



Each of these examples represent different configurations of the data storage. This is not an exhaustive set, and there are likely numerous additional configurations and permutations of them. The results of other research suggest that property graph representations with late binding schema objects are apparently most appropriate.

In many industries, platform business models have proved to be effective for offering products or services with great variety while benefiting from the economies of scale of the underlying platforms. In construction, general contractors, essentially function as platform organizations. They provide management and coordination services with a lean core of management and administrative staff but rely on subcontracted supply chain partners to provide construction personnel, equipment, and materials. However, their growth is constrained by the need to provide core management, which has limited capacity and is difficult to scale. Digital Twin helps with this business need to scale up and gain more projects.



Digital twin technology can help with decision making, planning, monitoring accurate current conditions, reality capture, data collection, environmental monitoring, post-construction and more.

- Dave Burns, VP of project delivery at McCarthy

Improve your project execution plan.

- Write better emails.
- Focus on helping subscribers.
- Create a lead magnet

new process or technology is only as effective as its capabilities. Digital twin solutions differ greatly in both their implementation and how they're actually used, so it's not always clear-cut to find a partner based on a contractor's specific needs. Here are things to consider:

- **EASE OF USE**
 - No matter how a construction executive approaches the challenge, creating a usable and accurate digital model of a jobsite is a difficult task which sometimes requires advanced IoT and management platforms. The right solution often lies somewhere in-between, but will differ depending on what is required from a digital twin.
- **COLLABORATION**
 - New users of digital twin technology need to have a very clear understanding of how their platform will upload and organize information. From that they can develop processes for their internal teams to make to best use the twin.
- **SCALABILITY**
 - Digital twins have the ability to be an enormously powerful collaboration tool for virtually every construction company—but one size does not fit all. If an enterprise goes into the exploration and selection process with the above elements in mind, they're much more likely to select the solution that best serves their needs, can scale and succeeds in making a measurable business impact.

XYZ

SmarTwin™ other Construction Solutions for 2021 and 2022

From Digital Twin to other complementary solutions like Engineering Grade AR and BIM Space Management tools



DE-RISKING YOUR PROJECT WITH HOLOSITE

SmarTwin has partnered with XYZ Reality to bring HoloSite, the world's most accurate Engineering-Grade Augmented Reality system, to your project sites. With the HoloSite system, you can superimpose your latest hyperscale BIM models to within 5mm accuracy on the actual construction site. Fundamentally, you can de-risk with your project by using HoloSite.



Using Google AdWords will ensure the online visibility of our company, while content marketing improves our SEO ranking.



Click [here](#) for a XYZ video



Meet The SmarTwin™ Team

These are your hardworking Digital Twin ninjas who have made it possible to reach our customer's goals.



What's Next for Us in the New Year

TIMELINE OF OUR UPCOMING STRATEGIES

1ST QUARTER

- Push strategies: Project acquisition, project ROI, project impact, customer satisfaction.

3RD QUARTER

- Cause marketing: work with charities and foundations, fundraising centered initiatives

2ND QUARTER

- Brand strategies: PR, podcast, industry events, blog posts and industry publication articles.
- Call to action: turn web traffic into sales through enticing text and graphics on your website or social media channels
- PR marketing: take advantage of media relations and build stronger connections while simultaneously carrying out our marketing and advertising initiatives

4TH QUARTER

- Funding for next level attainment.

