



# DIGITAL TWIN – THE JOURNEY TO RESILIENT ASSETS

A human-and data-centric approach to asset management helps extract and protect asset value.

One of the main goals of asset management is to ensure that assets are more resilient. Whether it is a highway, a building, a railroad, or an entire city, all of these assets are subject to different types of deterioration due to disrupting climatic changes. As these assets age, significant investments are made to maintain basic performance levels.

In addition, the risk of natural disasters can mean that an organization not only loses its assets, but it is extremely difficult to identify the loss. This is why the digitizing assets and related information (asset functional and location hierarchy, asset attributes, asset condition, operational status, etc.), is so important.

**“...when we started to remove stops and switches (transformers, fuses, resistors, motors) it would be very helpful had we had a device list on hand...”**

*Federal Transit Administration (2015). SOGR Roundtable – quote from New York MTA related to response to Super Storm Sandy*

The good news is there is a whole new world (in motion) where asset information can be captured in real-time and used to understand/realize the maximum potential of the asset. This ability to integrate physical assets with information technology brings huge benefits for asset stakeholders.



To make informed decisions, we can analyze data obtained through BIM (Building Information Modelling) and real-time data obtained through GIS (Geographic Information System), AI (Artificial Intelligence), ML (Machine Learning), and other IoT (Internet of Things) sensory devices.

Digital Twin (DT) is a popular technology currently used worldwide in various sectors. The DT can be viewed as a combination of digitized asset (IoT, connected infrastructure) and the ability to analyze the data produced through technology. Without the operational technology, data itself is not enough.

**Digital Twin Consortium defines Digital Twin<sup>1</sup> as**

***“A digital twin is a virtual representation of real-world entities and processes, synchronized at a specified frequency and fidelity.”***

Infrastructure managers use this concept to make informed decisions in many ways.

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<sup>1</sup> Digital Twin

Some key examples include:

- Predictive maintenance - Improve current and future decision-making based on historical information;
- System lifecycle mirroring - Predict long-term performances/behavior, simulation of IoT devices, etc.;
- Remote control of systems;
- Real-time scenario testing; and
- Simulation of future designs.

With digital twinning capabilities, an organization can predict asset risks such as faults/failures, support asset operations, ensure maintenance, and do strategic capital planning. This improves *asset management practices* by extracting the maximum value from the asset while enabling better decisions in the future, through the use of technology.

Due to its enormous capability across the full lifecycle management of assets, various public and private sector organizations and asset owners are using DT and promoting its use around the world:



- o National Digital Twin project launched by Centre for Digital Built Britain
- o A new tool developed by Oak Ridge National Laboratory that creates digital twins of buildings to analyze energy efficiency
- o National Highways plans to develop a twin of its highway network to predict the time and location of maintenance issues
- o The US FTA (Federal Transit Administration) has set up a NTD (National Transit Database) as a repository of data about the financial, operating and asset conditions of American transit systems. This is a key step towards transit asset management and supports accurate estimating of system needs. E.g., Metra (commuter rail system in the Chicago) is using NTD to support TAM



- o Digital Twin of cities / regions – Boston, Incheon (Republic of Korea), Glasgow (Scotland), Jaipur (India), Singapore, New Zealand and Victoria (Australia)
- o A Digital twin of Brooklyn Navy Yard Bldg.77 formed to support its renovation



- o Retailer Marks and Spencer has created digital twins of its retail space to capture data being utilized to optimize its stores' physical layout, monitor the temperature of the coolers and the queues at its checkouts.
- o FedEx Office created a 'digital twin' of its print production and delivery network to plan potential operational changes.
- o Voda.ai (a US based company that uses AI to virtually assess pipes in water system), assessed more than 1,200 pipes for a Florida water utility, and saved the water utility more than US \$100,000 by predicting 18 avoidable breaks in reactive maintenance.

Sources: [Centre for Digital Built Britain](#), [ESRI](#), [The Construction Index](#), [Global Infrastructure Hub](#), [Federal Transit Administration](#)

Organizations that fully understand the capability of their assets can better understand asset management risks to address vulnerabilities and improve resilience.

At WSP, we understand that asset management goes beyond asset maintenance. That is why we

help our clients think more broadly, not only about how to extract the value from their assets but also how to protect their assets against value erosion by making them more resilient through digital best practices.



*“In recent times, we are seeing significant challenges impacting assets around the globe, across all sectors, due to natural and manmade disasters. This requires a paradigm shift in the way assets are managed through their lifecycle to increase their resilience and prevent value erosion. At WSP, we believe that a holistic approach to asset management is required, underpinned by the exploitation of data through technology such as Digital Twin. Organizations that adapt to the new reality and adopt new strategies will reap tangible value through the application of Digital Twin technology by developing a human- and asset data-centric approach!” - Nilmino Robert*

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