

BLD502697-rt & BLD681789-rt

## Have You Started Your Digital Twin Journey? How & Why (or Why Not)?

**Marin Pastar, AIA, NCARB**

Jacobs I Global Technology Leader, Vertical Information Modeling

**Ian Harding**

Jacobs I BIM Section Head, Ireland

### Learning Objectives

- Identify currently viable Digital Twin platforms and use cases from real-world case studies.
- Develop a process for creating, integrating, and maintaining Digital Twins.
- Evaluate which Digital Twin platform best aligns with your business needs, and why.
- Understand some of the common Digital Twin obstacles and misconceptions, and how to overcome them.

### Description

Believe it or not, Digital Twins are more than just a buzzword! Owners are increasingly realizing there is a lot more they can do with the 95%+ of the Design and Construction Data that goes to waste (on average), and they are turning to us to help them make sure their data gets put to meaningful use! Prepare to hear about some real-world case studies showcasing why Digital Twins are here to stay!

Of course, the path to development and integration is never without bumps along the way! We will focus both on discussing common obstacles and challenges in getting started with Digital Twins, as well as evaluating the growing Digital Twin ecosystem with platforms like Autodesk Tandem, ESRI ArcGIS, EcoDomus, Unreal Engine and many others that can serve a variety of Owner needs.

Join this vibrant Roundtable and share your thoughts and experiences with Digital Twins and Digital Transformation in general! Let's discuss ways we can help transition our industry towards a better future state!

## Speaker:



**Marin Pastar, AIA, NCARB**

Global Technology Leader

Vertical Information Modeling

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Marin is a Registered Architect and Innovation & Technology expert. He started his professional career nearly 20 years ago as a technical production Architect and project manager. Through his personal practice and project experience, he realized how disjointed the Design and Construction industry is, and the vast amount of room for process improvement. As a result of his efforts to connect the AEC industry and improve his own projects, his career evolved towards Technology & Innovation. He led all aspects of Project Delivery from Design, Visualization and VR/AR, Integration of Reality Capture and UAS systems, to streamlining AEC Workflows from Planning, Design and Construction, into Facility Management and Operations. He is a strong advocate for the Owners, striving to eliminate the costly duplication of efforts in project execution, and move closer to the ideal Built Environment consisting of true Buildable Design followed by an IoT connected Digital Twin deliverable.

In his current role at Jacobs, Marin focuses on leveraging his extensive AECO industry experience to help global project teams discern project technology & innovation constraints and opportunities. He is passionate about developing the most suitable project execution strategies that leverage advanced Virtual Design & Construction tools and workflows in innovative ways to help streamline the Design/Construction delivery and achieve a digital handover of the Built Environment suitable for the Owner's Asset Lifecycle Operation & Management process. He focuses his Leadership and Advocacy for enhancing the Built Environment both internally at Jacobs to raise awareness as we Challenge Today and Reinvent Tomorrow, and externally with clients by enabling their beyond and leading them through their Digital Transformation journey towards a streamlined and optimized future state.

## Co-Speaker:



### Ian Harding

BIM Section Lead

Ireland Operations

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<https://www.linkedin.com/in/ian-harding-50441b3b/>

Ian is an Engineer with a focus on innovation. Ian has been involved in innovation since graduating from University 12 years ago. Ian has worked across design, construction and asset management throughout his career to date. His experience ranges from the latest Reality Capture technology, 3D design, Drones, Asset Management, Design and Construction. Ian is a practical innovator, who looks at the outcome first. Ian led the development of a digital twin prototype whilst working for an asset owner aswell as supported government in Australia in developing a Digital Twin Strategy. He looks forward to drawing on this experience as part of the round table.

Ian joined Jacobs 18 months ago to lead the Ireland Operations in BIM. Ian manages a team of 12 people who support the delivery of fast track projects across the world. The primary sector Ian focusses on is Pharmaceutical Construction which is seeing a significant digital transformation, including a push towards digital twins.

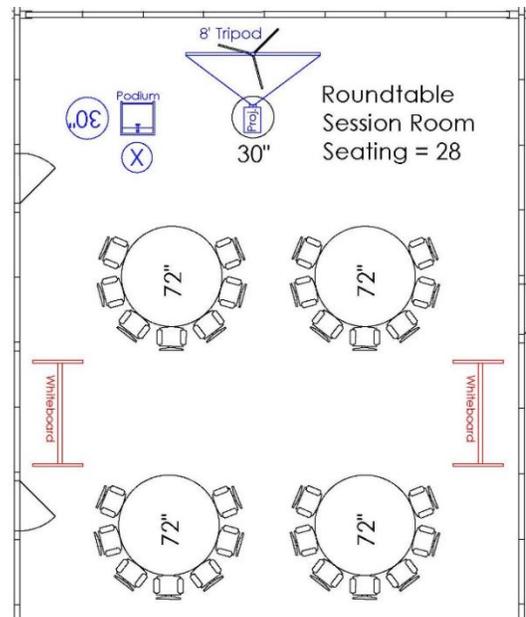
## Roundtable Discussion Agenda

Thank you for considering joining us at Autodesk University in what I hope becomes a very vibrant discussion around Digital Twins. We are very excited to be back in person this year and we look forward to an even more engaging face to face experience where you can share your valuable insights about your professional practice.

Unfortunately, an in-person Roundtable Discussion is once again capped at 28 participants to allow for a more manageable experience. This brings me to an important ask: **Speak Up, and Don't be Shy!** Virtual roundtables with more attendees had their perk in where more and more participants felt confident about asking a chat question without having to speak up in front of a large group. Ian and I will do our best to get everyone engaged and discuss all the questions during the allotted 90 minutes for the discussion, but you will have to raise your physical hand and speak up this time!

The nature of the roundtable class is structured around the discussion, and we will do our best to keep the general Digital Twins overview presentation down to a minimum. Think of it as a Firestarter to get our creative minds going! The goal is for everyone to hopefully review the Handout information prepared herein, and use a few key slides during the roundtable to introduce the discussion topics, keep us focused, and guide the Digital Twin conversation along the following key agenda topics:

- **Digital Twin Introduction & Overview**
- **Implementation & Development Challenges**
- **Development Process & Needs Assessment**
- **Technology Platforms & Client Use Cases**
- **What should we focus on from here?**
- **What did we miss? Open Discussion**
- **Closing Remarks**



We are allowing roughly 15 minutes for each topic of discussion before moving to the next one. If there are aspects of Digital Twins that are not mentioned in this agenda, please **feel free to ask questions** and we will certainly evolve the conversation any way you want to take it! That is the beauty of this class – it can be whatever you want it to be!

## Part 1: Digital Twin Introduction & Overview

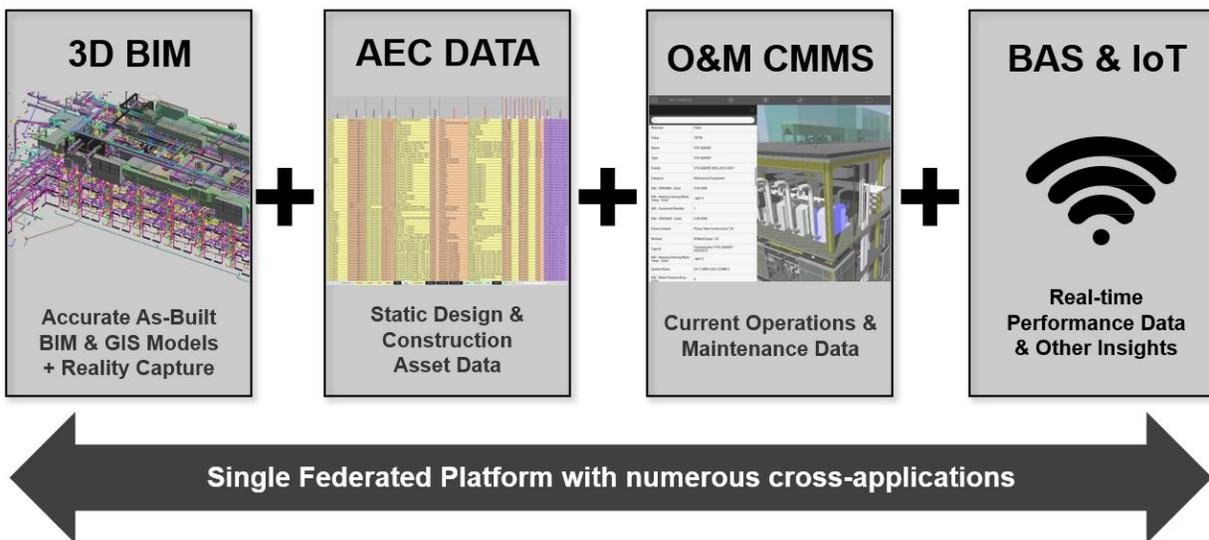
### What Are Digital Twins??



A **Digital Twin** is a connected digital representation of a physical system that unites real-time data, simulation, analytics, and visualization to support both human and autonomous decision making.

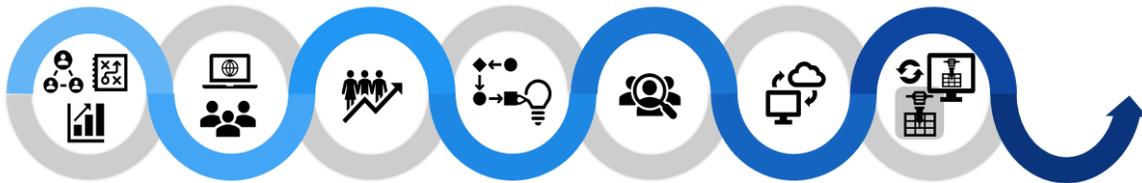
The **Physical System** is the real-world element(s) on which the Digital Twin is based. The Physical System represents an asset, system, or process at any stage of their lifecycle and vary widely across use cases.

For the purpose of this Roundtable Discussion, we will focus primarily on Digital Twins in which the Physical System they represent are geometric in nature (i.e., we will not focus on Digital Twins used for simulation or testing of processes and workflows). We will focus on AEC Digital Twins that are at the most simplistic core - a Single Source of Truth digital representation of a facility or a campus that can be used for a variety of use cases described later in this handout.



However, Digital Twins cannot be considered as a siloed topic. There is a lot of strategic planning and needs assessment before any real development of Digital Twins can begin. If taken too lightly, Digital Twin initiatives can fail their intended purpose and result in significant

loss of resources - time, money, and people. In order to have a successful Digital Twin implementation, there needs to be a well-balanced blend of Strategy, Technology, People and Process.



**70%**

of all  
Digital Transformation  
efforts Fail!



Lack of Stakeholder Support



Too Much, Too Fast



Focus on Technology First

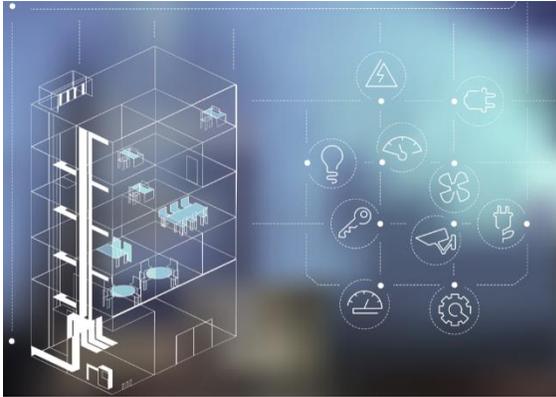


**Discussion Considerations:**

- *Does this align with your definition and understanding of Digital Twins?*
- *Are there other considerations not mentioned you would like to bring up for discussion?*
- *Do you want to focus more on various platforms and functionalities of Digital Twins, or the strategy needed to enable them to be successful in the first place?*

## Discussion Topic 1: Implementation & Development Challenges

Like with many new technologies, there are a lot of challenges associated with Digital Twins. Everyone has heard the new buzzword, and no one wants to be left behind. Clients are starting to ask for Digital Twins, and there are many solutions out there promising a lot, but not delivering to client's expectations....because they weren't discussed to begin with.



A common challenge is that many Digital Twin conversations get started around Technology first, which is a prime recipe for a disaster. Someone sees a new platform that looks amazing, and they dive into deployment before assessing whether that is the appropriate solution that aligns with their business goals. When failure happens, the platform often gets the blame. However, the platform may be great - but not the right fit for the need. Digital Twins that start without a strategy under the umbrella of Digital Transformation is bound to fail more often than not.

Another challenge is associated with mis-aligned levels of Digital Maturity. When clients dive into their Digital Transformation, they want to move extremely fast and change everything, which their organization and their people are simply not ready for. Change is not easy, and failure to address People as the primary factor in the success of Digital Transformation and Digital Twins will often result in failure of the overall initiative. Organizational Change Management program needs to be at the center of a successful Digital Transformation process.



More important than asking What needs to be implemented and How, is the question of Why it is being implemented to begin with. Compatibility with the current workflows and alignment with business goals of the organization is critical to the success. Part of the workflow consideration needs to be associated with long-term platform management and maintenance, so identifying champions to keep it "alive" and provide support for the long term is a must, since no Digital Twin implementation is a static, one-time development.

Success drives adoption. In order to prove success, there must be a clear mechanism of tracking, reporting, and improving KPI's that indicate success. Failure to develop a way to track success may ultimately result in doubt and questioning of the true ROI. We often times get asked a question "How much will this cost me, and what ROI can I expect?" We all wish it was that simple, but we all know that one can't "buy" a successful Digital Twin. Success depends on so many more factors than just money. If the client asking for a Digital Twin can't commit to the process it takes to achieve success, it may be better to walk away from the ask and seek other opportunities to succeed, than attempt doing it anyway and ultimately watch it fail.



*Discussion Considerations:*

- *How do you respond when a client is convinced, they need a Digital Twin?*
- *How do you respond to the inevitable ROI questions?*
- *Do you have a process to mitigate Resistance to Change (OCM strategy and plan)?*
- *Have you addressed the long-term management of Digital Twins, and how?*
- *Has your client experienced any the challenges described? How did you deal with it?*

## Discussion Topic 2: Development Process & Needs Assessment



As soon as the topic of Digital Twins gets brought up, most people tend to gravitate towards the vanity of the “new shiny object” they got a chance to see, and they want to jump right into getting their own. People get excited about the notion of Digital Twins and typically have zero patience to go through the necessary steps to get it done right, which statistically leads directly into failure. Like I mentioned above, it is critically important to answer the question *Why* the client needs a Digital

Twin, then *What* it will look like or *How* you will create it. The journey starts with a discovery process to clearly understand and align why it is needed and what it is supposed to do. A successful discovery will also identify people that the new solution may impact (both positively and negatively) so that a proper Organizational Change Management and Training/Education program can be developed and implemented to mitigate the high risk of failure.

Another consideration for the development process is timing and scheduling the development work. The workflow will look much different if it is started during the project planning phase (where it ideally belongs), versus during the Design and Construction process or at existing facilities. Managing the Design and Construction Delivery Roles, Responsibilities and deliverables contractually is a critically important task for those projects developing Digital Twins through the complete Design/Construction/Handover lifecycle, since there are many milestone deliverables along the way that should be clearly defined, delivered, and checked to achieve the most cost-efficient Digital Twin Development. Failure to do so often result in duplicated and erroneous work that typically gets scrapped and re-developed specifically for the Digital Twin use, defeating the purpose of an integrated and efficient lifecycle design and delivery.

The Digital Twin Development process should start very similarly to a development process for a new software application. Functional Requirements describing the minimal viable product (MVP) need to be clearly documented, as do the different types of end-user personas and their associated workflows. Everything about the Digital Twin experience like the hardware / OS it will be accessed on, user interface, permissions, common data environment etc. needs to be well documented and even mocked up prior to figuring out how to get it done and jumping into the development process.

An Agile approach works well for Digital Twins, since there is a slim chance there is a platform that can achieve all of the functional requirements out of the box. Digital Twins typically require data normalization, extraction and mapping between various parameters and platforms in order to achieve the desired functionality. There are likely going to be multiple API links from one software platform to another, as well as various data dashboards to both enable the desired Digital Twin insights as well as keep track of success KPIs. The point is, a Digital Twin

development is a complex process requiring deep client engagement, an iterative development process, and a talented team of product managers, subject matter experts and software developers alike.



**Discussion Considerations:**

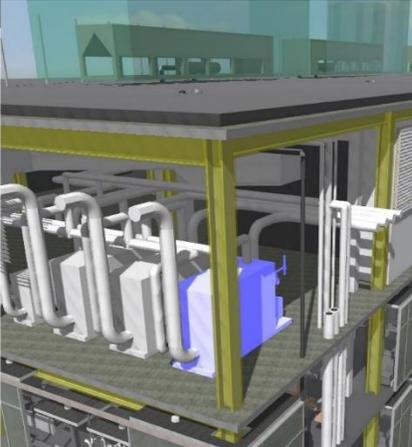
- *How and When do you get started with your Digital Twin development?*
- *Have you developed a “menu” of services related to development of Digital Twins?*
- *Have you developed a lifecycle BIM execution plan that addresses Design, Construction, Handover, Activation and Operations of facilities in one place, along with the corresponding RACI matrix and deliverable expectations / schedule?*
- *Do you always start with a high-level Digital Transformation strategy?*
- *What does your discovery and needs assessment process look like?*
- *What is your process for Digital Maturity Assessment / Client Readiness?*
- *What type or experts does your Digital Twin development team consist of?*

### Discussion Topic 3: Technology Platforms & Client Use Cases

When it comes to Digital Twin use cases, the sky is the limit. This is why it is imperative to understand What our client wants to achieve and Why before figuring out what platform to leverage and how to make it do what the client needs.

The baseline use case is a Digital Twin for Design and Construction of the Built environment. We have the ability to leverage a single source of truth virtual 3D models to facilitate Design, Visualization, Coordination, Simulation, Logistics, Quantification and Fabrication of the facilities being Designed and Built. Directly tied to that is the ability to associate and track additional

[Asset] Type	All	Component	All		
x [Type] Name	A/E	x [Component] Name	A/E	Reverses	False
x [Type] Category	A/E	x Type Name	A/E		
x [Type] Description	A/E	x Space	Arch/GC	Value	78756
x Asset Type	A/E	x [Component] Description	A/E		
x Manufacturer [ref: Contact Tab]	Subs	x Serial Number	Subs	Name	VTG-6000DF
x Model Number	Subs	x Installation Date	Subs	Type	VTG-6000DF
x Warranty Guarantor Parts	Subs	x Warranty Start Date	Subs	Owner	Family
x Warranty Duration Parts	Subs	x Tag Number [Sys Tag]	A/E		VTG-6000DF_RFA_2013-0207
x Warranty Guarantor Labor	Subs	x Bar Code	Owner		
x Warranty Duration Labor	Subs	Spatial Placement			
x Warranty Duration Unit	Subs	Sequence Number			
Replacement Cost		x Asset Identifier	Owner	Category	Mechanical Equipment
x Expected Life	Subs				
x Duration Unit	Subs				
Warranty Description		<b>System</b>			
Nominal Length		[System] Name	HAI - GPM MIN - Schd	0.00 GPM	
Nominal Width		[System] Category	HAI - Heating Leaving Water Temp - Schd	-460 °F	
Nominal Height		Component Name			
Model Reference		[System] Description	HAI - Equipment Number	1	
Shape					
Size		<b>Assembly</b>	HAI - GPM MAX - Schd	0.00 GPM	
Color		[Assembly] Name	Phase Created	Phase "New Construction", #3	
Finish		Sheet Name			
Grade		Parent Name	Workset	M Mech Equip - EC	
Material		Child Name			
Constituents		Assembly Type	Type Id	FamilySymbol "VTG-6000DF", #2052673	
Features		[Assembly] Description			
Accessibility Performance					
Code Performance		<b>Connection</b>	HAI - Heating Entering Water Temp - Schd	-460 °F	
Sustainability Performance					



documentation about the maintainable assets in a handover format that can be translated into various CMMS systems for an enhanced way to manage built assets throughout the lifecycle. BIM to FM is a term we often see associated with that Design-Build-Handover-Operate workflow.

Moving beyond, we can connect those assets to various sensors to collect various life “streams” of data in order to inform decision about optimal operations of that facility. Various occupancy, temperature, humidity, vibration, air quality, lighting level and countless other IoT sensors can provide valuable insights about the use and operation of the facility and utility resources and trigger automated functions when connected to facility BMS and SCADA systems.



But it doesn't stop at managing the facility or streamlining operations and maintenance. Digital Twins are capable of so much more. They can provide wayfinding and situational awareness to various end-users. They can streamline supply-chain and provide an efficient way to make informed real-estate decisions. They can provide an augmented way to interact with the built environment and harness the power of data for many different purposes. They can help plan and simulate events and identify/locate non-facility assets, track their movement, and optimize efficiency. They can help predict and evaluate risk when connected to various external social, political, environmental, and economic feeds. Like I mentioned above – the sky is the limit. We just need to have an open and creative mind, set clear goals and realistic expectations, and align the appropriate technologies into a connected ecosystem that can achieve what needs to be done now and in the future.



### Discussion Considerations:

- *What is your process for determining the right platform for your client?*
- *Are you leveraging multiple platforms or focusing your effort on a particular one?*
- *Have you developed any tools or platforms to help your Digital Twin Journey?*
- *Do you guide your client about the “art of the possible” or are they set on particular functionality they want you to enable?*
- *What Digital Twin use cases do your clients request the most?*

## **Discussion Topic 4: What should we focus on from here?**

There are a lot of activities associated with Digital Twins. The ecosystem alone is expanding rapidly, creating a lot of noise and distractions that may take away from success (or make it harder to get there). One thing is certain – we must focus on framing the problems before creating solutions. A focus on a clear Digital Transformation strategy that aligns business goals with technology solutions is paramount to success of Digital Twins.

But what else should we focus on? Developing our own solutions? Providing consulting to advise and educate clients on how to get there? Helping our clients track success? Developing success case studies to make Digital Twins more appealing to our clients? Keep exploring other ways to use Digital Twins and increase benefits? Develop ways to easily maintain Digital Twins (or find ways for them to maintain themselves)? How about improving awareness and providing education and training surrounding Digital Twins? Do we need more dedicated events and organizations promoting them and developing standards?

Please Bring your thinking hats and let's discuss what we need to do next to make Digital Twins an essential deliverable of the Built Environment Lifecycle!



### **Discussion Considerations:**

- *Has this discussion changed your mind about Digital Twins? If so, how?*
- *Are you likely to recommend Digital Twins to your clients?*
- *Is there a certain aspect of Digital Twins or Digital Transformation you will focus on?*
- *Are you going to explore additional platforms? Start developing your own?*
- *Did you learn about new use cases you will start focusing on?*
- *Did you learn about new workflows you will explore?*
- *What does our industry need to make Digital Twins more useful?*
- *How can we increase Digital Twin adoption?*

## **Additional Resources:**

What is a Digital Twin?

<https://intandem.autodesk.com/what-is-a-digital-twin/>

Benefits of Digital Twins:

<https://intandem.autodesk.com/benefits-of-digital-twins/>

Start digital, stay digital and deliver digital, with Autodesk Tandem:

<https://intandem.autodesk.com/what-is-autodesk-tandem/>

Digital Twins Empower People To Do More:

<https://www.bentley.com/en/products/product-line/digital-twins>

Digital Twin for facilities and infrastructure:

<https://new.siemens.com/global/en/products/buildings/digital-building-lifecycle/ecodomus-software.html>

Esri Digital Twin Technology and Resources:

<https://www.esri.com/content/dam/esrisites/en-us/media/brochures/digital-twin-technology-resource.pdf>

Embracing digital twin technology for engineering assets:

[https://engage.aveva.com/rs/986-YIS-805/images/Whitepaper\\_AVEVA\\_AIM\\_EmbracingDigitalTwinTech\\_22-07.pdf](https://engage.aveva.com/rs/986-YIS-805/images/Whitepaper_AVEVA_AIM_EmbracingDigitalTwinTech_22-07.pdf)

Omniverse for Architecture, Engineering, Construction, and Operations:

<https://www.nvidia.com/en-us/omniverse/architecture-engineering-construction/>

National Highways Digital Roads 2025:

<https://nationalhighways.co.uk/our-work/digital-data-and-technology/digital-roads/>  
<https://nationalhighways.co.uk/media/2chotw13/introducing-digital-roads.pdf>

Flipping the Odds of Digital Transformation Success:

<https://www.bcg.com/publications/2020/increasing-odds-of-success-in-digital-transformation>

Starting Your Digital Transformation Journey:

<https://www.autodesk.com/autodesk-university/article/Starting-Your-Digital-Transformation-Journey-2021>

Digital Engineering eBook:

[https://willow.kinsta.cloud/wp-content/uploads/2021/03/Digital\\_Engineering\\_eBook-June2019.pdf](https://willow.kinsta.cloud/wp-content/uploads/2021/03/Digital_Engineering_eBook-June2019.pdf)

Getting started with Digital Twins:

<https://www.unrealengine.com/en-US/blog/getting-started-with-digital-twins>