



The Authority in Digital Twin

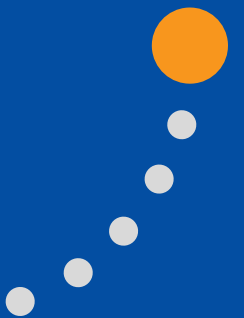
Richard Mark Soley, Ph.D.

November 2020



Market Research from the Internet*

*This data is publicly available on the web but Digital Twin Consortium has not received permission from any of these firms to use the reports or data within subsequent documentation.



Maturity of Digital Twin Market

13%

organizations that have already used digital twins

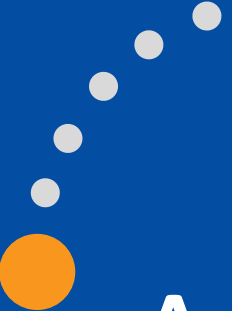
62%

organizations in the process or plan to use digital twins within 1 year

67%

companies implementing IoT will have at least one digital twin in production by 2022


Source: 2019 IoT implementation survey by Gartner



As enterprises struggle to gain value from the explosion of operational data to support actions and decision making, digital twins for operations offer a promising solution.

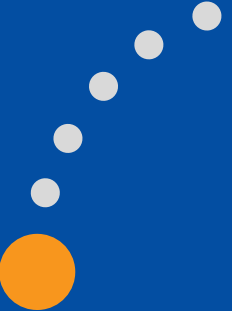
IDC





If policy makers and businesses get it right, linking the physical and digital worlds could generate up to \$11.1 trillion a year in economic value by 2025.

McKinsey



By 2020, 30% of G2000 Companies will have implemented advanced digital twins of their operational processes.

IDC



The Digital Twins market is projected to reach US\$ 26B by 2025 with CAGR of 38%.

Grand View Research



The digital twin market is anticipated to witness a CAGR of 35.0% over the forecast period 2019 – 2024.

Mordor Intelligence



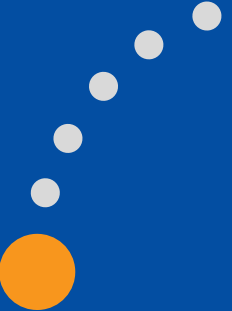
Linking the physical and digital worlds could generate up to \$11.1 trillion a year in economic value by 2025.

McKinsey




The automotive segment is expected to hold a significant share, over 16% by 2025 in the digital twin market due to the increasing adoption of IIoT in the automotive industry for several purposes such as manufacturing, assembly line, and designing.

Global Market Insights




Europe is the second-largest market in digital twin and is expected to hold a market share of over 22% by 2025.

Global Market Insights

- 
- The world will need to spend \$57 trillion on infrastructure by 2030 to keep up with global GDP growth.¹ This is a massive incentive for players in the construction industry to identify solutions to transform productivity and project delivery through new technologies and improved practices.

McKinsey Global Institute 



Worldwide mining operations are as much as 28 percent less productive today than a decade ago—and that’s after adjusting for declining ore grades...Achieving a breakthrough on productivity performance demands rethinking how mining works.

McKinsey Global Institute

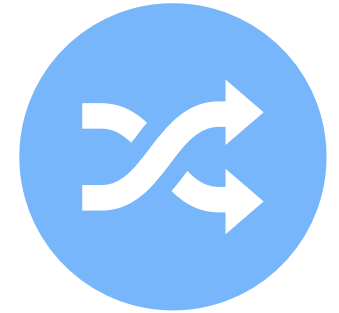
Challenges you face to implement a digital twin



Limited
Interoperability



Market
Confusion



High
Stakes

Limited interoperability

- There is no standardization, definitions and common language
- Digital twins can be difficult to apply across the product lifecycle
 - Often there are multiple digital twins, versions or views that don't interoperate
 - You may be locked in with one vendor
 - Your efficiency could be limited by data silos
- You need to fit digital twin technology within a legacy environment
 - Brownfield integration
 - Existing technology portfolio
 - Technical Debt

Market confusion

- Limited use cases and research available to learn from others
 - How much to budget?
 - What are your requirements?
- It's difficult to know where to start to quickly get value
 - How do you decide what technologies to use?
 - What is your minimally viable digital twin?
- In most cases, your employees haven't done this before.
 - Knowledge gap
 - Skills gap
- Many companies re-brand as “Digital Twin” overnight

High stakes

- Once you choose a digital twin path you have to stay on it
- The software world does not apply to the digital twin world
- Digital twin projects require heavy investment of both hard and soft costs
 - Money
 - People
 - Time
 - Equipment
- No defined answers to what to use, when to use it and how to use it
- If you get it right, the payoff is worth the risk

Digital twin market challenges

Limited Interoperability

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Market Confusion

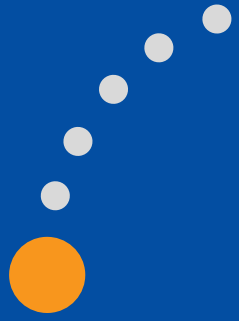
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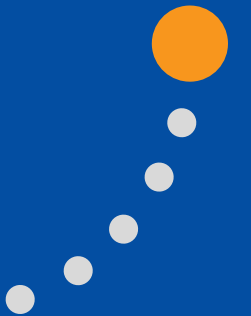
High Stakes

- Once you choose a digital twin path you have to stay on it
- The software world does not apply to the digital twin world
- Digital twin projects require heavy investment of both hard and soft costs: money, people, time, equipment
- No defined answers to what to use, when to use it and how to use it
- If you get it right, the payoff is worth the risk





How does a consortium help
solve those challenges?



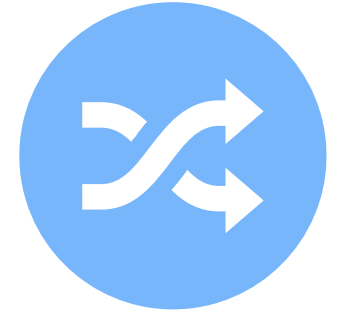
How can a consortium help?



Improve
Interoperability



Accelerate the
Market



Demonstrate the
Value

Improve interoperability

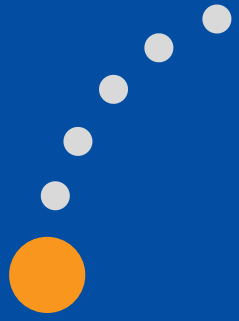
- Ensure digital twin models interoperate throughout your product lifecycle
- Influence the requirements for digital twin standards
- Develop best practices for security, privacy and trustworthiness
- Create library of reference implementations for digital twins
- Better use digital twins with existing systems, equipment and infrastructure
- Provide frameworks to better work across the digital twin technology stack

Accelerate the market

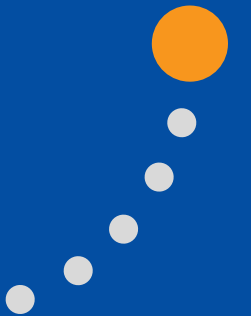
- Benefit from a neutral ecosystem to foster industry collaboration
- Combine your resources, reduce your risk
- Learn from use cases
- Reduce the skills gap and get all your employees involved in the right consortium groups
- Influence the solution roadmaps for digital twin vendors
- Access experts throughout your digital twin journey
- Improve the validation of digital twin products; discern who is digital twin in name only

Demonstrate the value

- Integrate existing source code into your system
- Help develop open source code
- Learn from experts and use cases and apply to your industry
- Accelerate your project investment
- Maximize quantifiable outcomes
- Help influence the direction of the market and get your project online faster



Who are we?



Who are we?

Digital Twin Consortium drives the adoption, use, interoperability and development of digital twin technology. It propels the innovation of digital twin technology through consistent approaches and open source development. It is committed to accelerating the market and guiding outcomes for users.

Improve
Interoperability

Accelerate the
Market

Demonstrate the
Value

Vision and Mission

- **GOAL** - become THE Authority in Digital Twin as it relates to policy, security, interoperability and overall development of digital twins.
- **DEFINE** - ecosystem, standards requirements, architectures, open source code
- **IDENTIFY**- gaps
- **PUBLISH** - publish statements and opinions
- **Partnership** between industry, academia and government in a **collaborative open environment**
- **DRIVE** - adoption, use, interoperability and development of digital twin technology.
- **PROPEL** - innovation of digital twin technology through consistent approaches and open source development.
- **COMMIT** - to accelerating the market and guiding outcomes for users

First-year Priorities

Develop use case library

Define open source implementation

Define terminology & taxonomy

Identify Types of Digital Twins: Process, Simulation, etc.

Identify Product Lifecycle: Design, As Built, As Manufactured, As Maintained

Common Challenges vs. Industry Specific Vertical

Establish Global Digital Twin Conference



Initial Working Groups



Technology, Taxonomy,
& Terminology



Infrastructure



Manufacturing



Natural Resources



Defense & Aerospace



Marketing

Our working groups

Technology, Terminology, Taxonomy

Security & Trustworthiness

Definition, Common
Characteristics, Taxonomy

Platform Stacks

Aerospace &
Defense

Infrastructure

Manufacturing

Natural
Resources

Marketing

Why join?

1

Pool resources and increase your R&D

2

Help shape what you need

3

Visibility into what other companies are working on

4

Collaborative outreach and messaging to amplify our mutual market goals

5

Gain early access to simulations, standards, best practices, and code

6

Shape your project plans with insights from fellow members

7

Identify fellow members who are the best partners, and collaborators

8

Gain market presence as part of the ecosystem

Founders



Groundbreakers – members since day 1

Air Force Research Laboratory
Animated Insights
Asset Management Lab, LLC
Association of Asset
Management Professionals
Autiosalo Ltd
BEC - Blockchain Engineering
Council
BIM6D Consulting
Bandora Systems
Bentley Systems
Building 4.0 CRC
Chain Technology Development
Co. Limited
CodeData

Connector Geek Ltd
ConstruWise, Inc.
CumuloCogitus Inc.
Cybertwin
DIGIOTAI
DataCities
e-Magic Inc.
Executive Development
Gafcon, Inc.
Geminus.AI
Healthskouts
IIMBE
IOTA Foundation
IOTIFY
Idun Real Estate Solutions AB

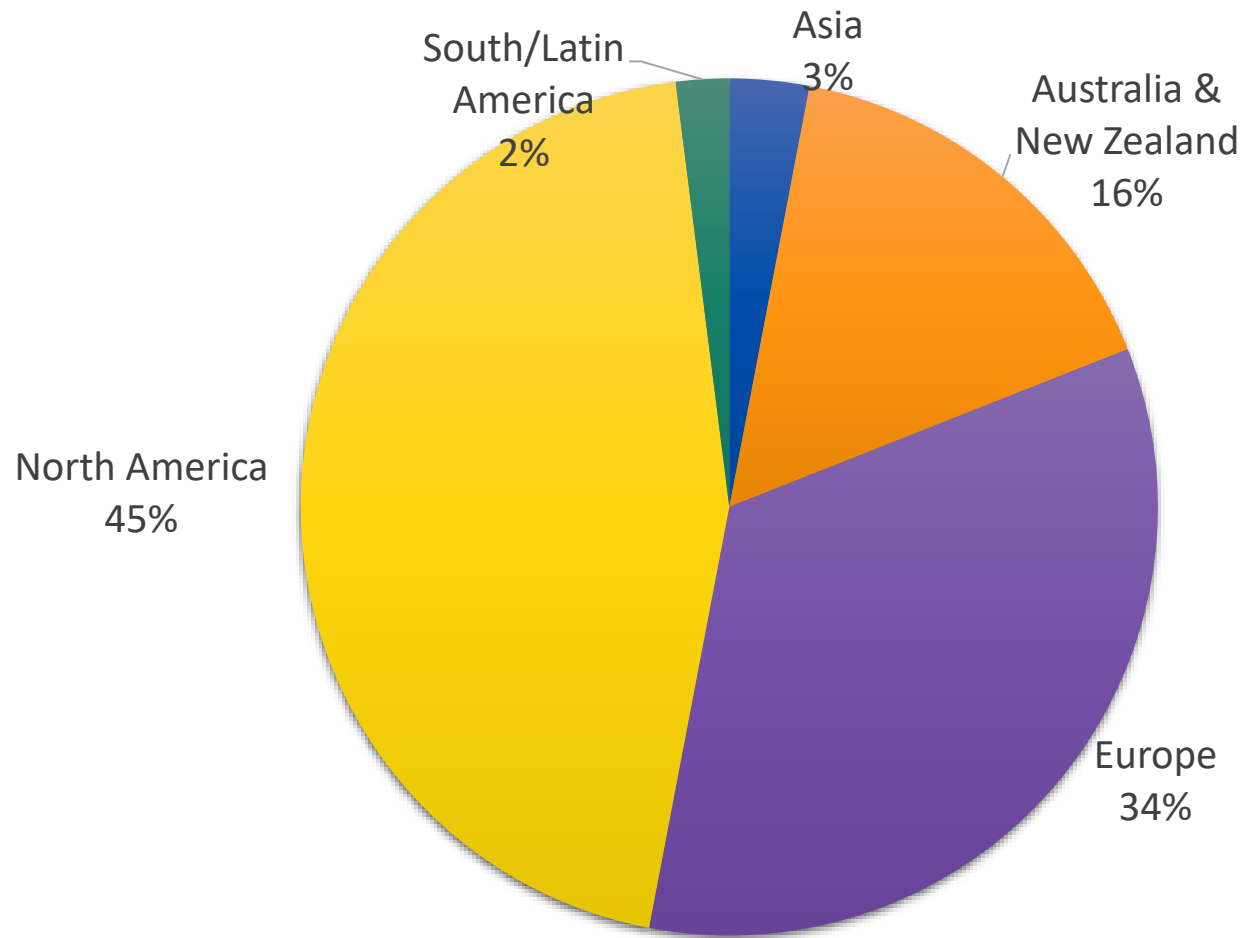
ieLabs
IoT Management
imec
Itus Digital
Jitsuin, Inc.
LINQ Ltd.
LUNO UAB
Lux Modus Ltd.
Monash University
NSW State Government
Neural Concept
Padi LLC
Pirate
PropTechNL
Resonai

Ricardo
Slingshot Simulations
Systems Analytics Solutions
Transforma Insights
Trendspek
Twin Building GmbH
University of Melbourne
UrsaLeo Inc.
WSC Technology
Willow Technology Corporation
Pty Ltd
Ynomia
YoGeo, Inc.

Our members



Membership by region



22 Countries Represented

- Australia
- Belgium
- Brazil
- Canada
- Chile
- France
- Germany
- Hong Kong
- India
- Ireland
- Israel
- Lithuania
- Netherlands
- New Zealand
- Portugal
- Russia
- Spain
- Sweden
- Switzerland
- Turkey
- U.S.A.
- United Kingdom

Our Steering Committee



Bill Ruh



Ron Zahavi



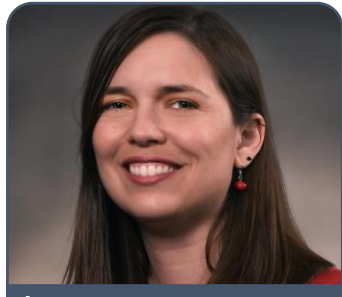
Prith Banarjee



Said Tabet



Colin Parris



Laura Szypulski



Nicolas Mangon



Richard Soley



Richard Ferris



Sameer Kher



Jon Dunsdon



Greg Fallon



Bill Hoffman



Our family

Object Management Group



Standards

Digital
Transformation

Software
Quality

Digital Twin

Member benefits

Influence

- Participation in Digital Twin Consortium working groups
- Eligibility to chair working groups
- Influence requirements and future standards for digital twins

Collaboration/Thought Leadership

- Collaborate with industry peers
- Access to Membership Portal and all working group work in progress
- Membership in Digital Twin Consortium speaker bureau

Marketing

- Listing in member directory on Digital Twin Consortium website
- Industry recognition as a leader in digital twins
- Usage of Digital Twin Consortium Membership badge in your personal and corporate marketing materials

Membership



Pricing

Annual Revenue	Membership Fee
Contributing membership	\$150,000
<ul style="list-style-type: none">• 4-year commitment• Includes a Steering Committee seat	
\$200 Million+	\$50,000
\$50 Million - \$200 Million	\$25,000
\$5 Million - \$50 Million	\$10,000
Up to \$5 Million revenue	\$5,000
\$0 startup (under three years)	\$0 for 1 year
Government	\$7,500
University/Non Profit	\$2,500

Resource requirements

Beyond money, what resources are needed to join?

- We recommend that members dedicate approximately 2-3 hours per week to consortium activities.
- Most of our members involve multiple employees to maximize their coverage.
- The more you put in to the consortium, the more you will get out.

Attendance at quarterly face-to-face meetings

Contributing to a working group deliverable

Working group meetings

Marketing and PR opportunities



Working Group Activities

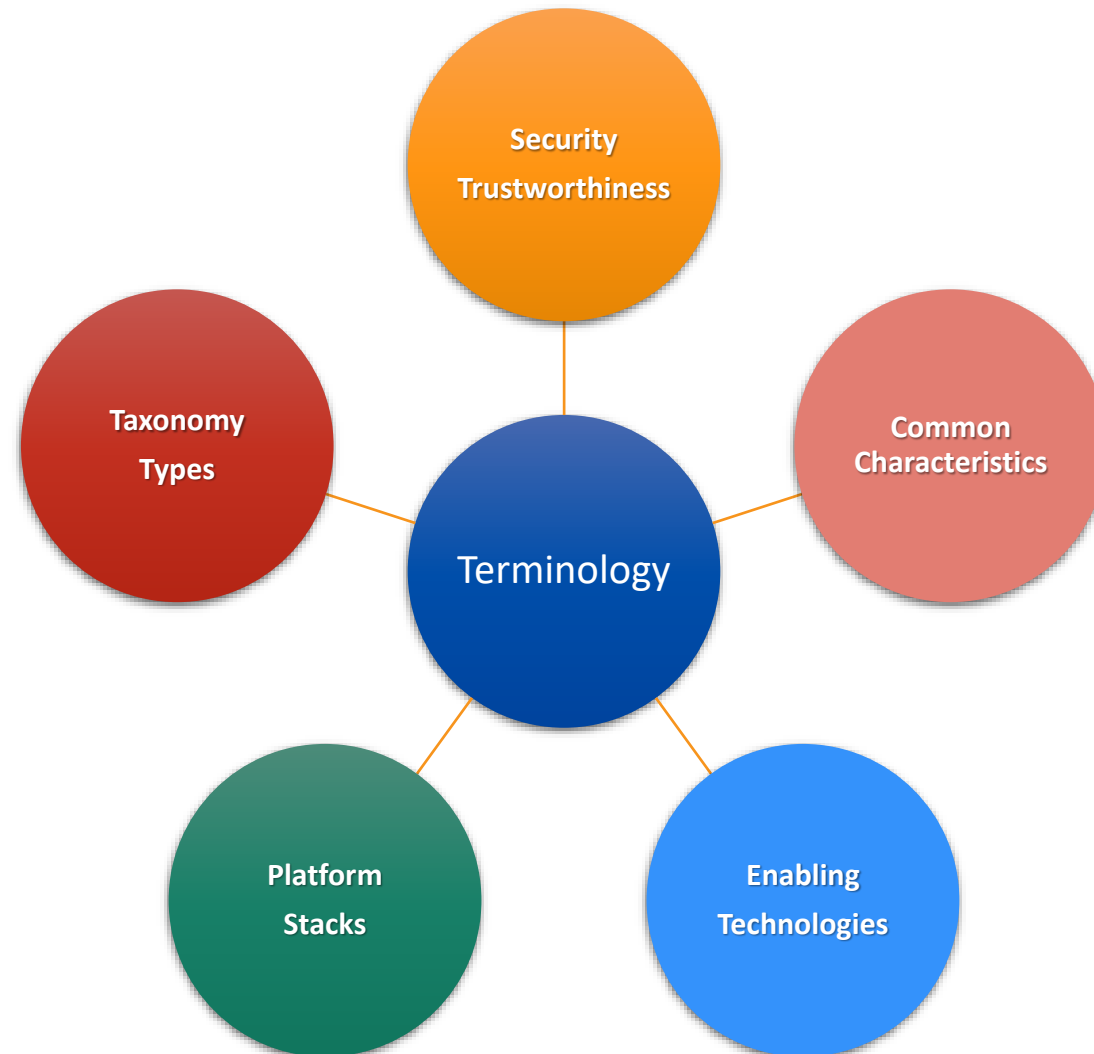


Technology, Terminology & Taxonomy WG



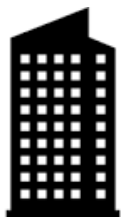
- The Digital Twin Technology, Terminology & Taxonomy Working Group will recommend a preferred definition, taxonomy, and, ultimately, hierarchy of “Digital Twins” to enable the industry to speak with a common vocabulary on this concept – enabling better understanding through shared definition and vernacular.
- Chair: Said Tabet (Dell)

Technology, Terminology & Taxonomy



Infrastructure Working Group

- Co-Chairs – Richard Ferris (Lendlease)
- Salla Eckhardt (Microsoft)
- John Turner – (Gafcon)
- Create more liveable, workable, and sustainable communities
 - Reduce cost – efficiency in how we design, build and operate infrastructure
 - Use data to deliver improved services
 - Sustainable promoting circular economy - the way we produce, assemble, sell and use products to minimise waste, and to reduce our environmental impact.
 - Socially inclusive



Workgroup Activities \ Volunteers

- Teams working adapting the Digital Twin Lifecycle to Identify/Design, Delivery, and Operations.
- Use Cases being prepared
- Great Cadence on Use Case Presentations
 - Digital Twin for the Sydney Harbour crossing for the Metro
 - Digital twin for transmission pipelines and how they are used during construction
 - Centre for Spatial Data Infrastructures and Land Administration (CSDILA) at the University of Melbourne
 - Simulating occupancy sensors in a large multi-story building and modelling the flow of people in a pseudo-realistic environment
 - NSW State Government - Spatial Digital Twin

Natural Resources WG



Natural Resources

- Natural resources related sectors, including Oil & Gas and mining, and utilities sectors are becoming increasingly digital.
- Digital twins can be applied during the engineering, design, construction and deployment, and operations phases of the lifecycle to improve production and predict or detect problems as well as improve safety.
- The natural resources digital twin working group will address the applicability of digital twin to the upstream Oil & Gas processes, Minerals and Mining, Energy (Power and Renewables) and Utilities (water and gas).

Use Case List (example)

Oil & Gas

- Offshore Well Integrity Digital Twin (operate)
- EPC Digital Twin manage classified EEHA equipment plus Vessels and PSV's (Design and Construction)
- Simulation Twin to lower risk with virtual commissioning, training, and startup prior to launch (commissioning – refinery)
- Digital Twin to Optimize over- and underwater systems (Operate)
- Simulation Twin to reduce the time needed to estimate project parameters by using digital simulators (design)
- Simulation twin to increase the accuracy of cost-weight estimations by using integrated error-proof solutions (design)
- Gas Turbine Twin for Predictive Maintenance (maintain)

Mining

- Digital Twin for Coal Handling and Processing Plant (CHPP) during Operations
- Autoclave Digital Twin for Gold Processing (Operate)
- Long Conveyor Predictive Maintenance Digital Twin (Maintain)

Manufacturing WG



Manufacturing

- Manufacturing is becoming increasingly digital and digital twins can be applied during the engineering, design, production and operations phases of a product lifecycle to improve products and predict or detect problems. The manufacturing digital twin working group will focus on the applicability of digital twin to the manufacturing process in various industries.
- Co-chairs:
 - Sameer Kher (Ansys)
 - Todd Edmunds (Dell)
 - Lee Johnson (Geminus)

Defense & Aerospace WG



Defense & Aerospace

- Defense and Aerospace companies and Government Agencies have been early adopters of Digital Twins with significant usage already in the operation phase. As an example, the USAF has significant Condition Based Monitoring (CBM+) initiatives.
- The Defense and Aerospace Digital Twin working group will focus on the applicability of Digital Twins across the lifecycle in various industries.
- Co-chairs
 - Jordan Garrett (Dell)
 - James Sumpter (US Air Force)

Working Group Deliverables Approach

