



IBM Consulting

G-Cloud 15 IBM - Building Information Modelling (BIM) and Digital Twin Services

Service Definition Document

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Overview

Focusing on the design, implementation and management of Digital Twins solutions, Common Data Environments and BIM models. Consulting services including data strategy and the development of Digital Twins; process improvement opportunities and supporting compliance to UK BIM Framework. Engineering, Asset Management and Operational Performance solutions underpinned by Automation and AI.

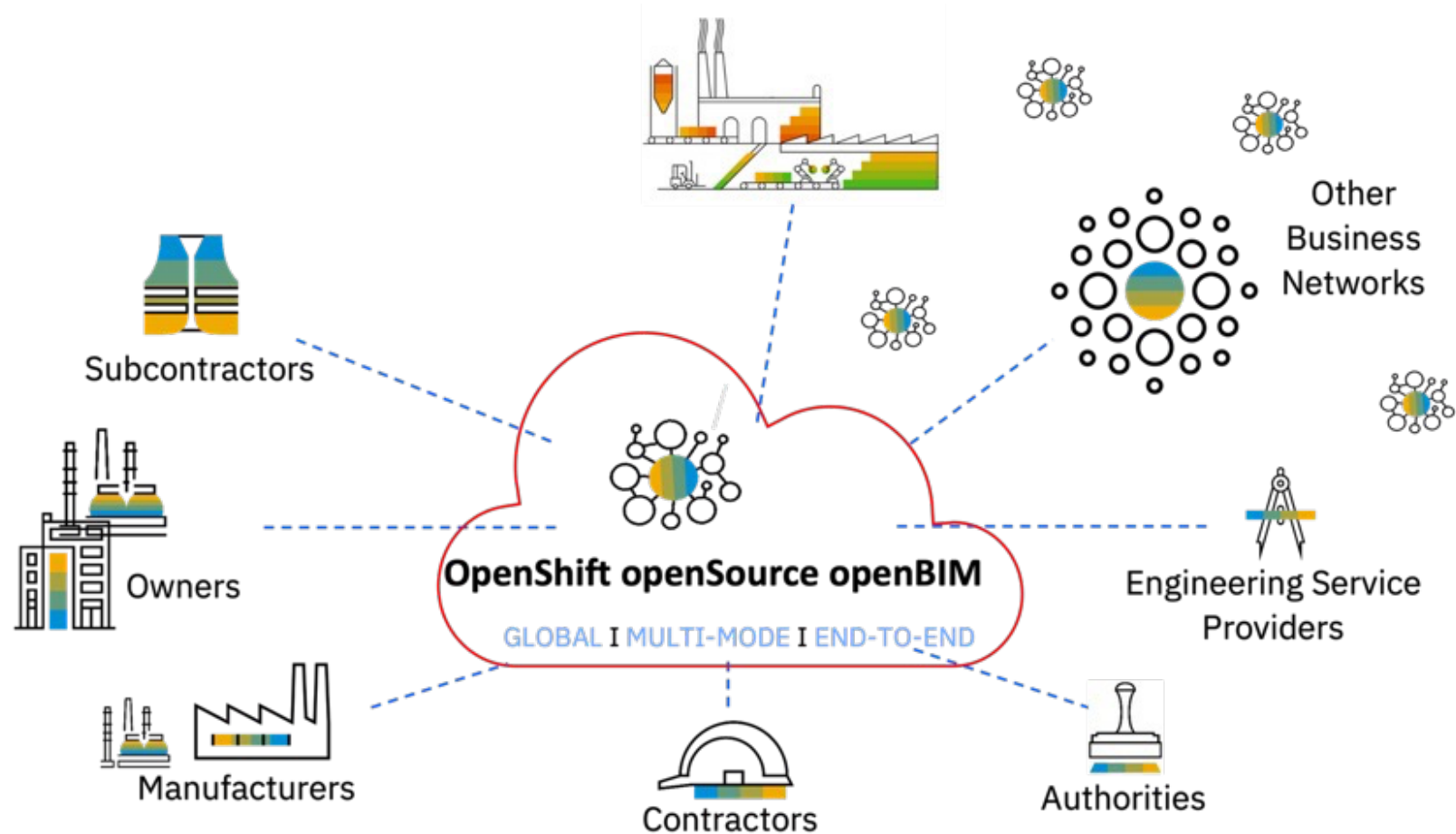
Highlights Include:

- Develop Digital Data Strategy and Information Management
- Business Value Assessment for Digital Platforms and Digital Transformation
- Creation and Support in the development of Digital Twins
- Delivery Big Data, IoT principles, data interoperability and insights
- Alignment UK BIM Framework & compliance to regulations
- Design and Deliver Common Data Environments
- Linking Digital Twins to broader AI strategy and solutions
- Digital link to Enterprise Asset Management Systems
- Integration to horizontal platforms to enable interoperability
- Asset and Facilities management to enable circularity

Overview

Focusing on the design, implementation and management of Digital Twins solutions, Common Data Environments and BIM models. Consulting services including data strategy and the development of Digital Twins; process improvement opportunities and supporting compliance to UK BIM Framework. Engineering, Asset Management and Operational Performance solutions underpinned by Automation and AI.

Unlike different siloed solutions we connect the the whole Built Environment, ensure interoperability across different software, connects diverse workflows and fosters synergy between actors, all based on machine-readable and trusted data through the use of cutting-edge technology such as AI and blockchain.



Overview

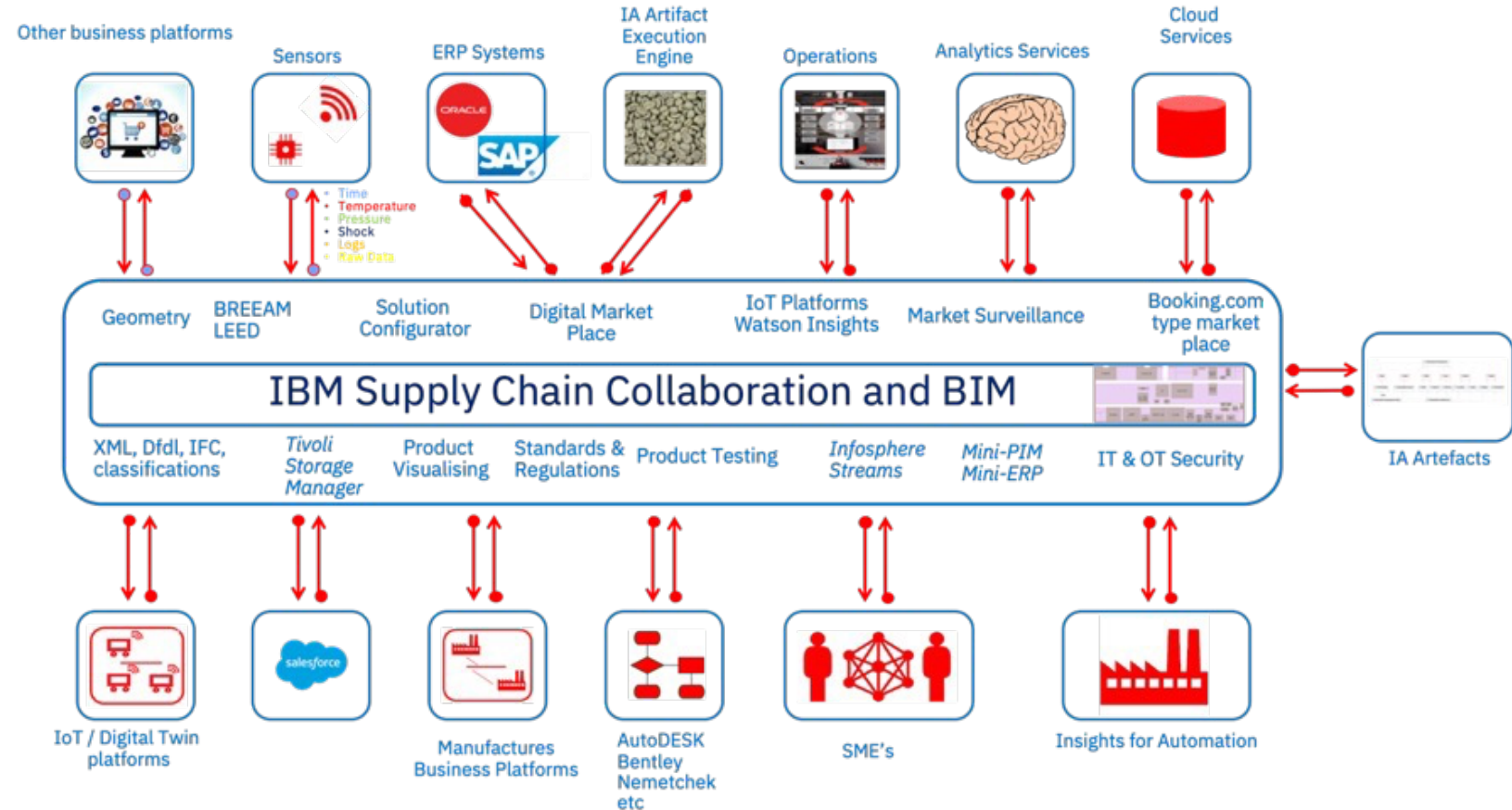
Integrated data & information driven design, engineering, manufacturing, construction, operations and maintenance.

Build on many years work of coaching, working with the industry and platform stakeholders like Digital Supply Chains in Built Environment Group.

Connect other platforms/Cross-industry platforms.

Requirements, Capture and Manage information, Connect Systems securely.

Health & Safety, Building Regulations
Project health (budget monitoring), IT & OT One communication channel.



Methodology and workflows base on UK BIM Framework

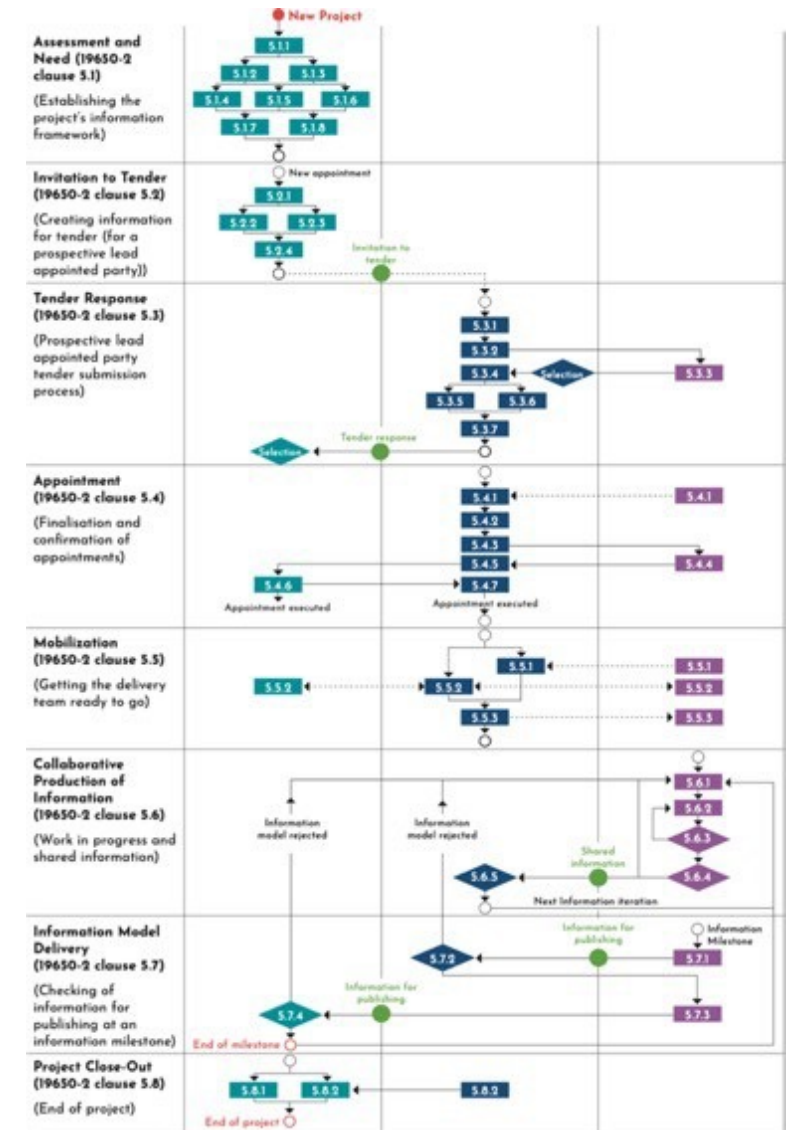
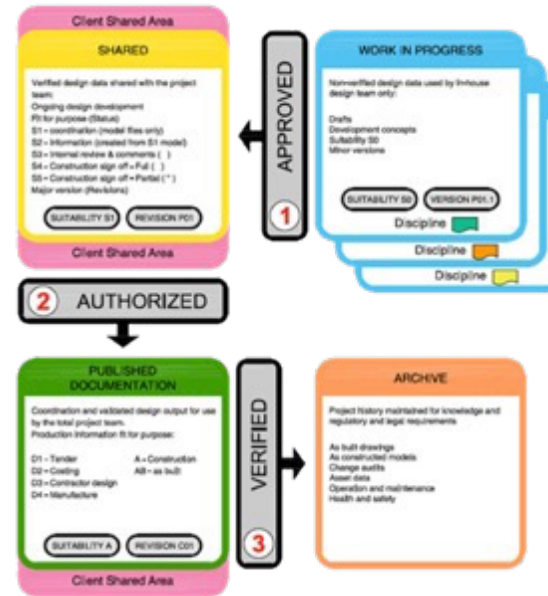
Follows UK BIM Framework methodology for example EN ISO 19650 series.

Standards & Regulations assurances.

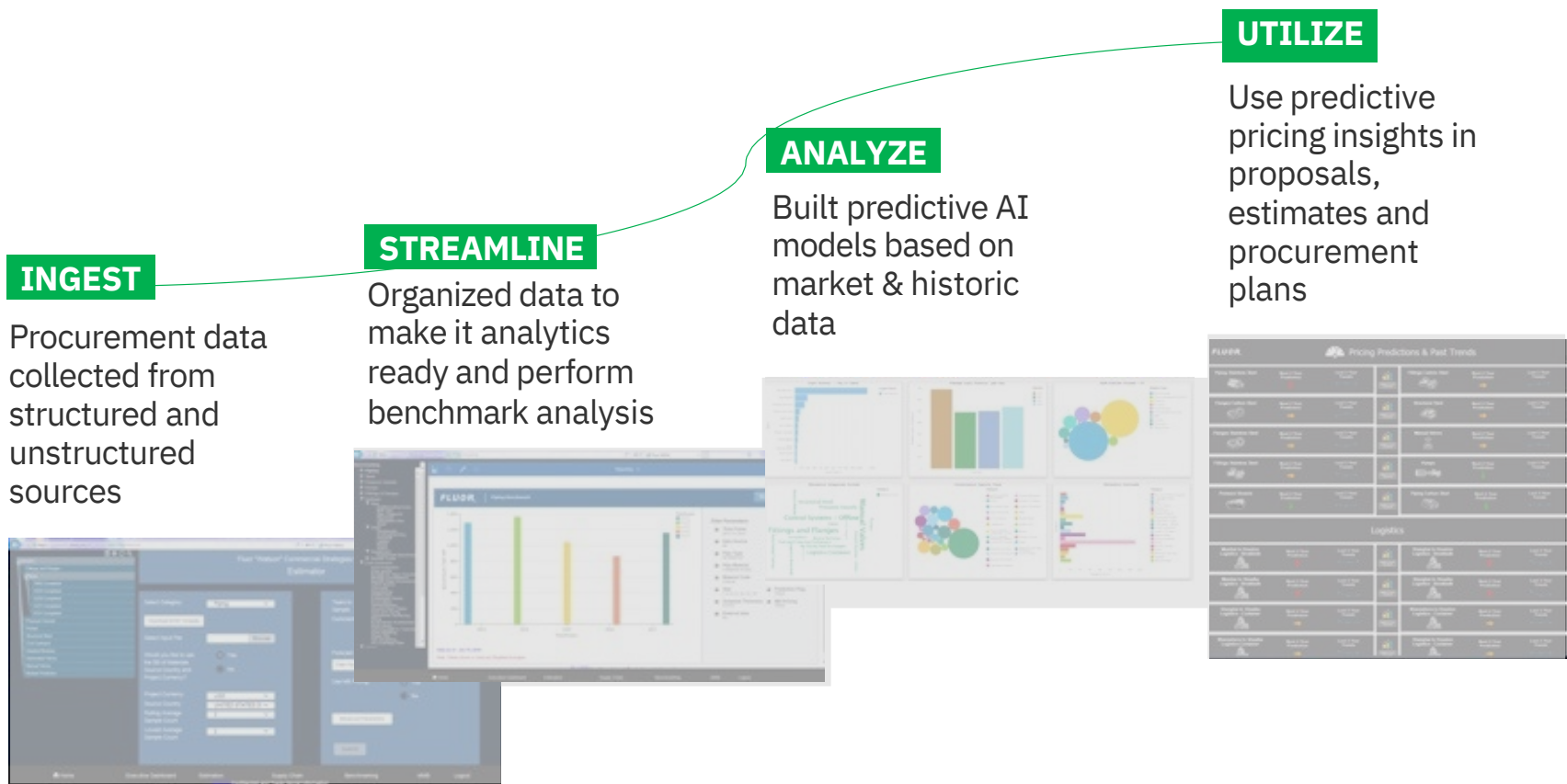
Methodology how to describe, maintain, govern and operate data dictionaries based on EN ISO 23386.

Principles and structure for data templates for construction objects based on EN ISO 23387.

It is developed to support digital processes using machine-readable formats using a standard data structure to exchange information about any type of construction object, e.g. product, system, assembly, space, building etc., used in the inception, brief, design, production, operation and demolition of facilities.



Cognitive Supply Chain Workflows



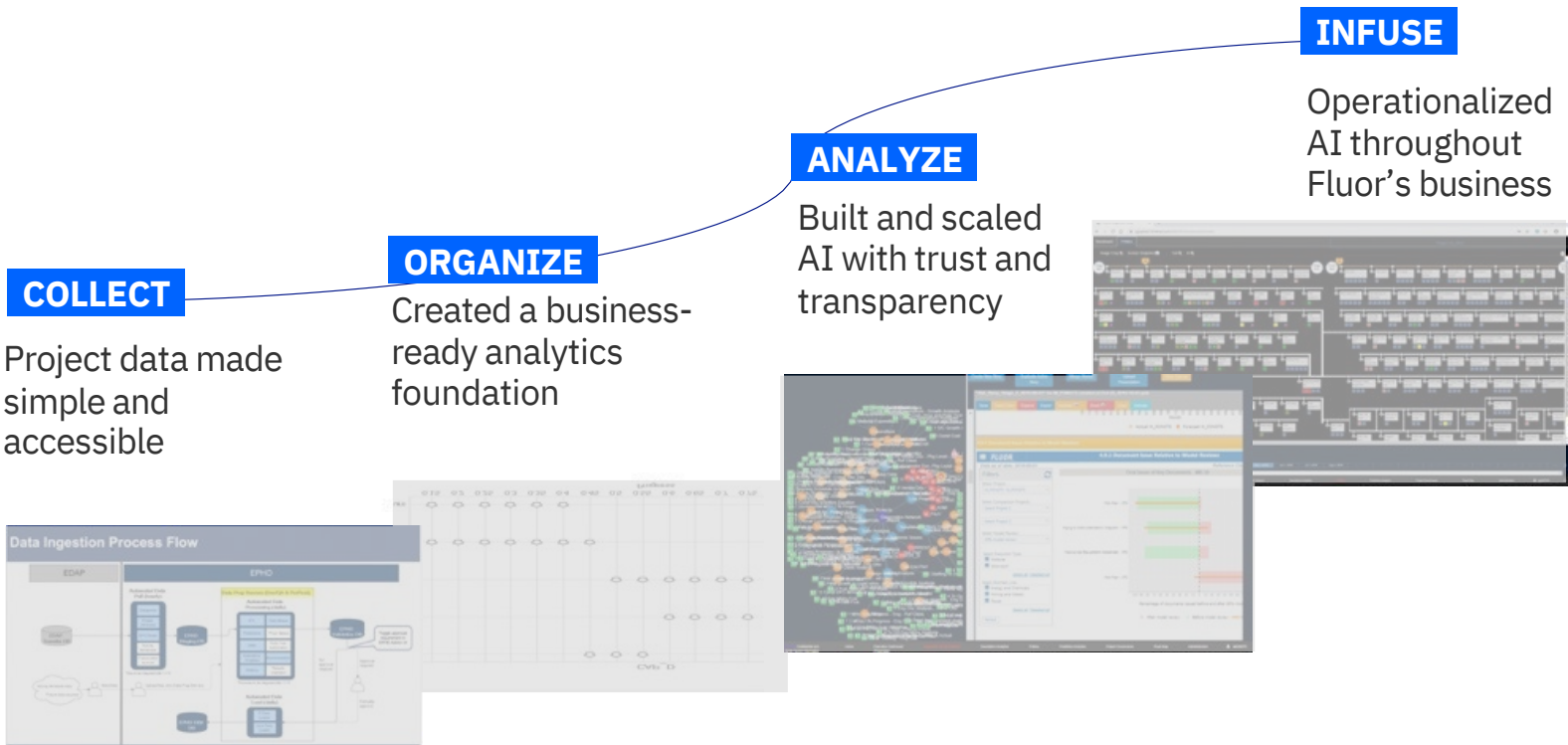
Results

-  Improved project win rate
-  Decreased procurement cost
-  Increased margins from project execution
-  Cognitive market analysis and trends

Market Dynamics / Spend Analytics

A cognitive solution that provides insights on market trends and material pricing. It helps make smart procurement and supply chain choices improving project win rate and overall project execution outcomes

Cognitive Engineering & Construction



Results



Industry Leading Innovation
predicting key engineering, procurement and construction metrics - headlights for performance excellence



Drives cost and schedule certainty
more margin certainty



Advanced Big Data Analytics
intuitive project controls capabilities and tools



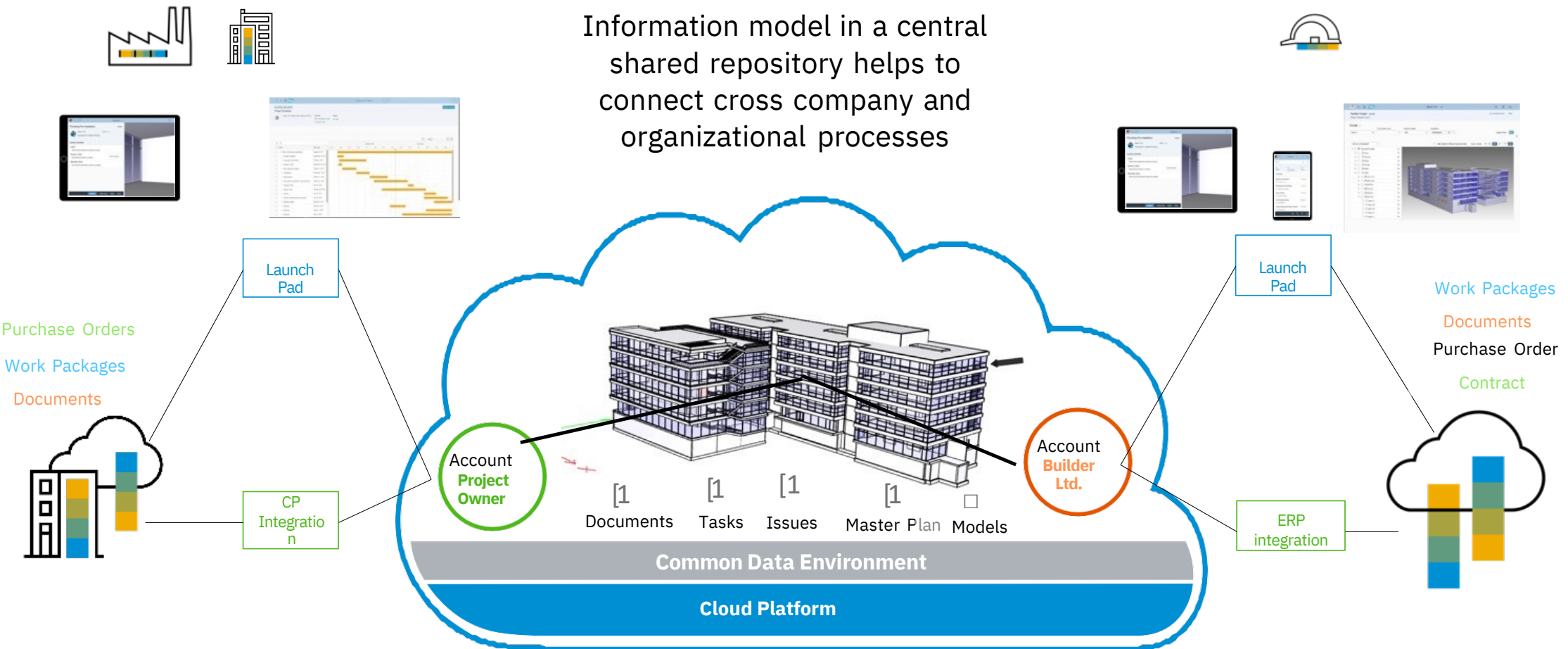
Visibility and depth of control over project execution KPIs

Project Health Diagnostics

Cognitive solution that predicts project health status via AI insights from structured and unstructured data. It helps construction companies improve overall cost and schedule performance.

Project Intelligence

Multiple Players Collaborating in One Integrated Network



Key to Decision Support via use of Technology and Analytics

Analytics Use Cases - Some highlighted features

- Project health diagnostics
 - Find patterns in the data that could potentially predict project problems.
 - Project sentiment analysis.
- Project Delays and Margin erosion
 - Identify patterns associated with project delays and margin erosion.
- Understanding project complexity and risk
 - Define attributes of complexity and correlate these attributes to project dataset.
 - Estimate the variability in the subcomponents of a project using historical data.
- Managing Fabrication and Work phase
 - With increased lump sum and construction project fab ops needs to be optimized.
- Portfolio Modeling
 - Core commodities analysis (price trends, supply quality problems, etc..).
 - Disruptions in the supply chain.
- Increase modularization
 - Find design patterns that can help identify opportunities to increase modularization.
 - Understand variations of what suppose to be a similar design pattern.
- OCP resource productivity, resourcing benchmarks
 - Understand historical resource productivity and actual resource usage for key work packages.
- Assumption migration
 - Pattern recognition for assumptions – which one holds, correlation with (project duration, failure, success, etc..).
- Cross program / project performance
 - Identify patterns that makes one program or project better than others.
- Analytics for the supply chain
 - Core commodities analysis (price trends, supply quality problems, etc..).
 - Disruptions in the supply chain.

Structure and interoperable data

Read once, use many times.

New data always goes through a **provisioning process**. (metadata, glossary, data models).

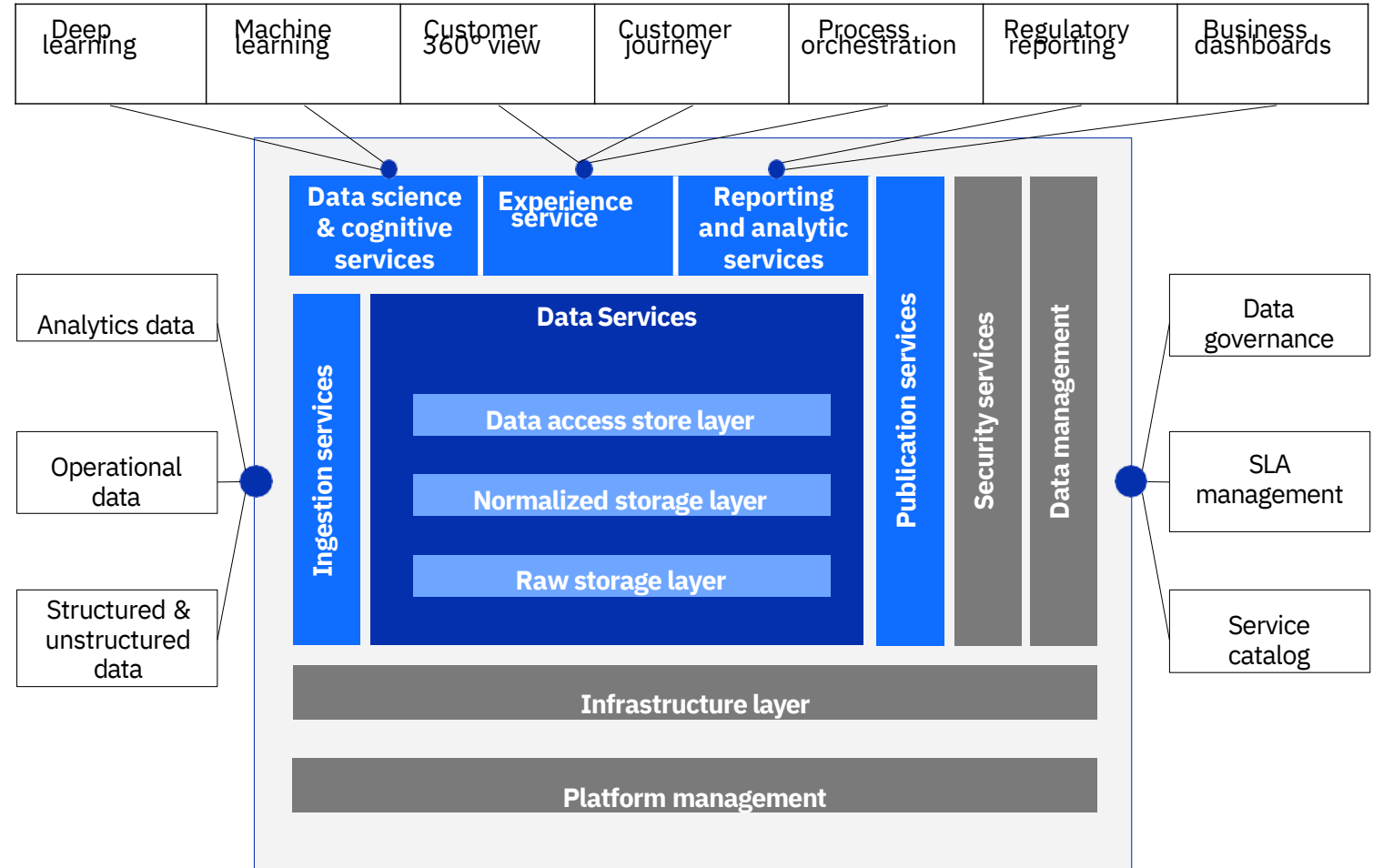
Standardize data and data templates based on **EN ISO 23386** and **EN ISO 23387** enabling interoperability.

Analyze **all data** and as-is.

Analyze both data in-motion as well as data at-rest.

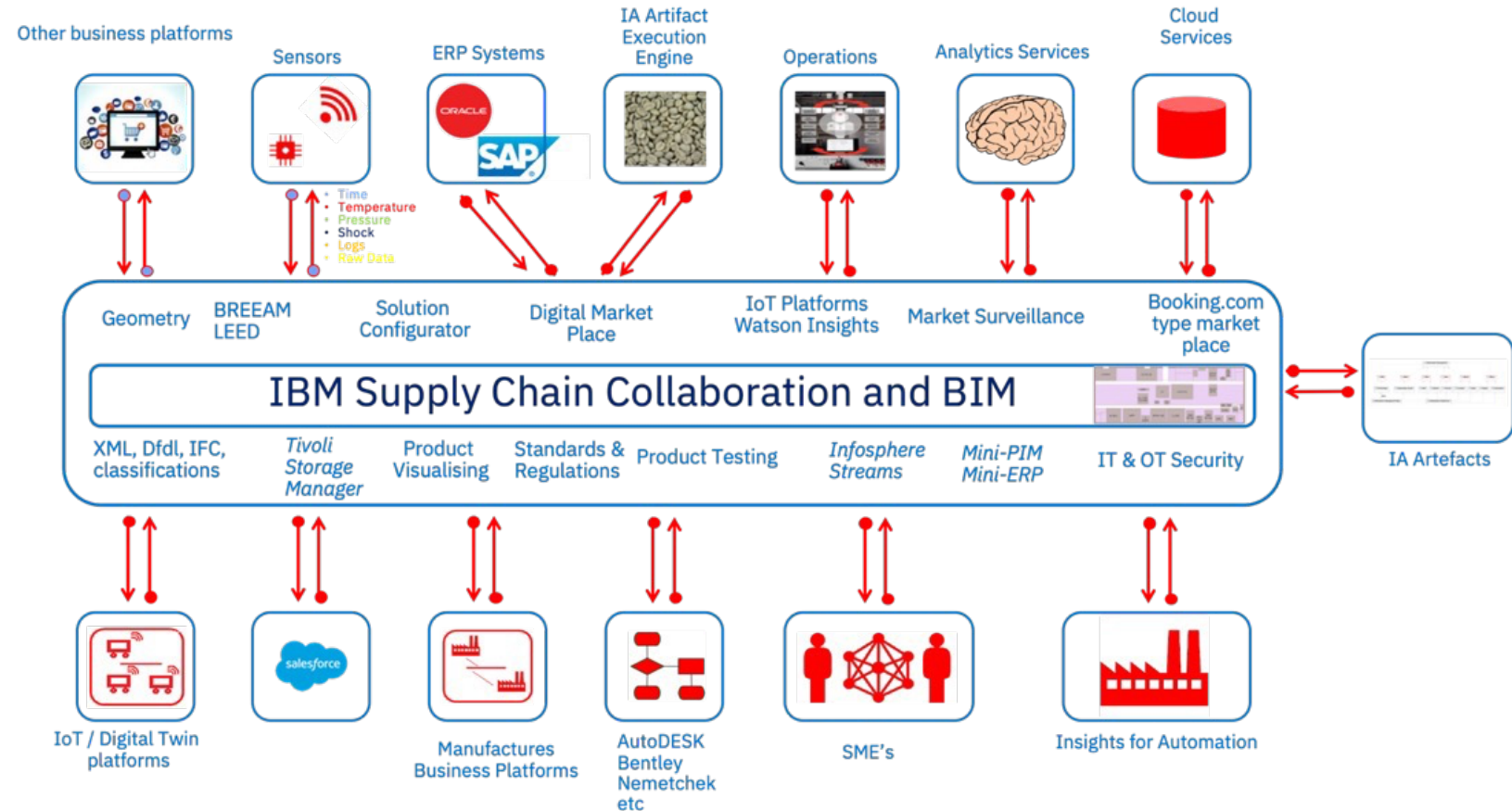
Move data **close to business**, so that analytics is not only in the realm of data specialists.

No replacement for systems that work well locally but for **combining data across systems and across geographies and organization structure**.



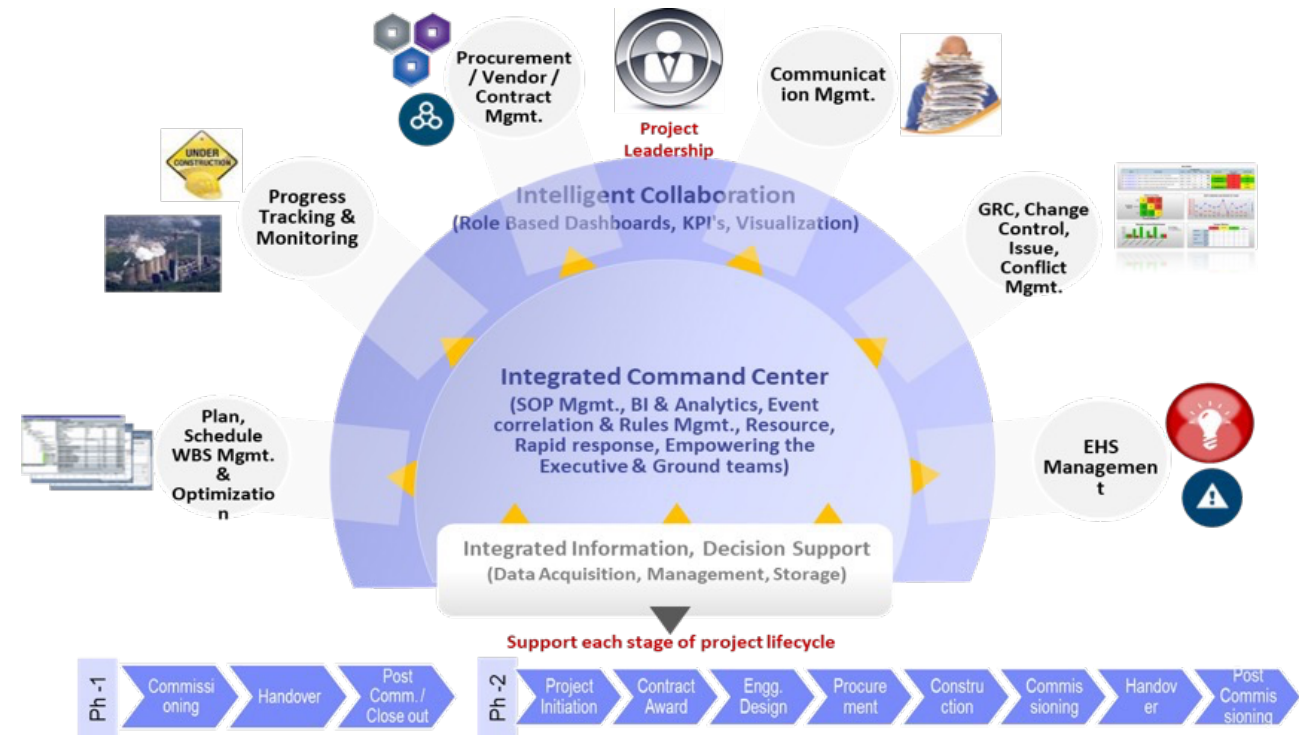
The benefits delivered by Cognitive Customer Care

- One communication channel
- Take better control of project schedule, budget and quality
- More transparent risk management
- Gain operational insights through centrally managed information
- Improve construction productivity
- Owners benefit from lower asset lifecycle costs
- Connect other platforms

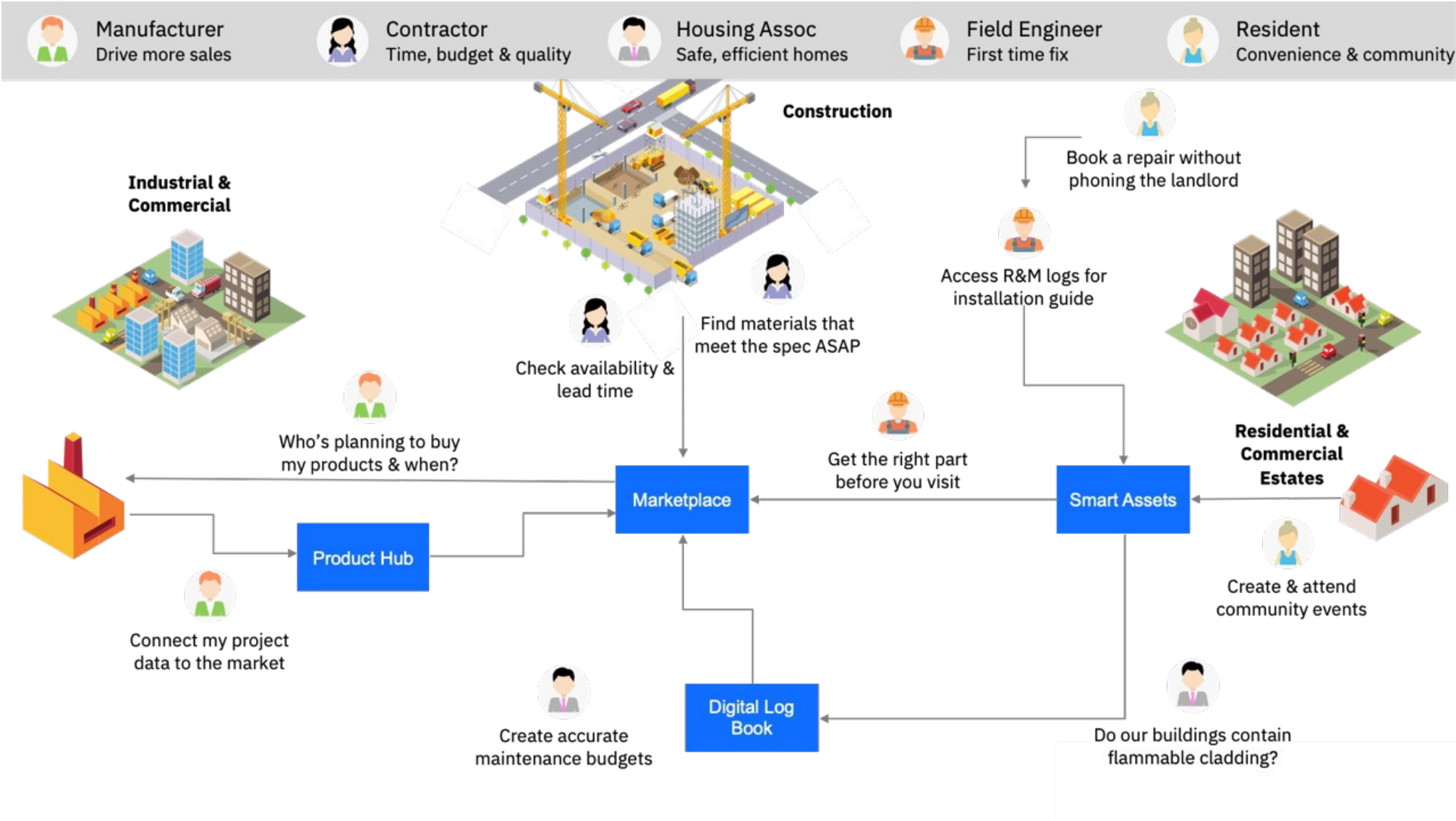


Control Tower

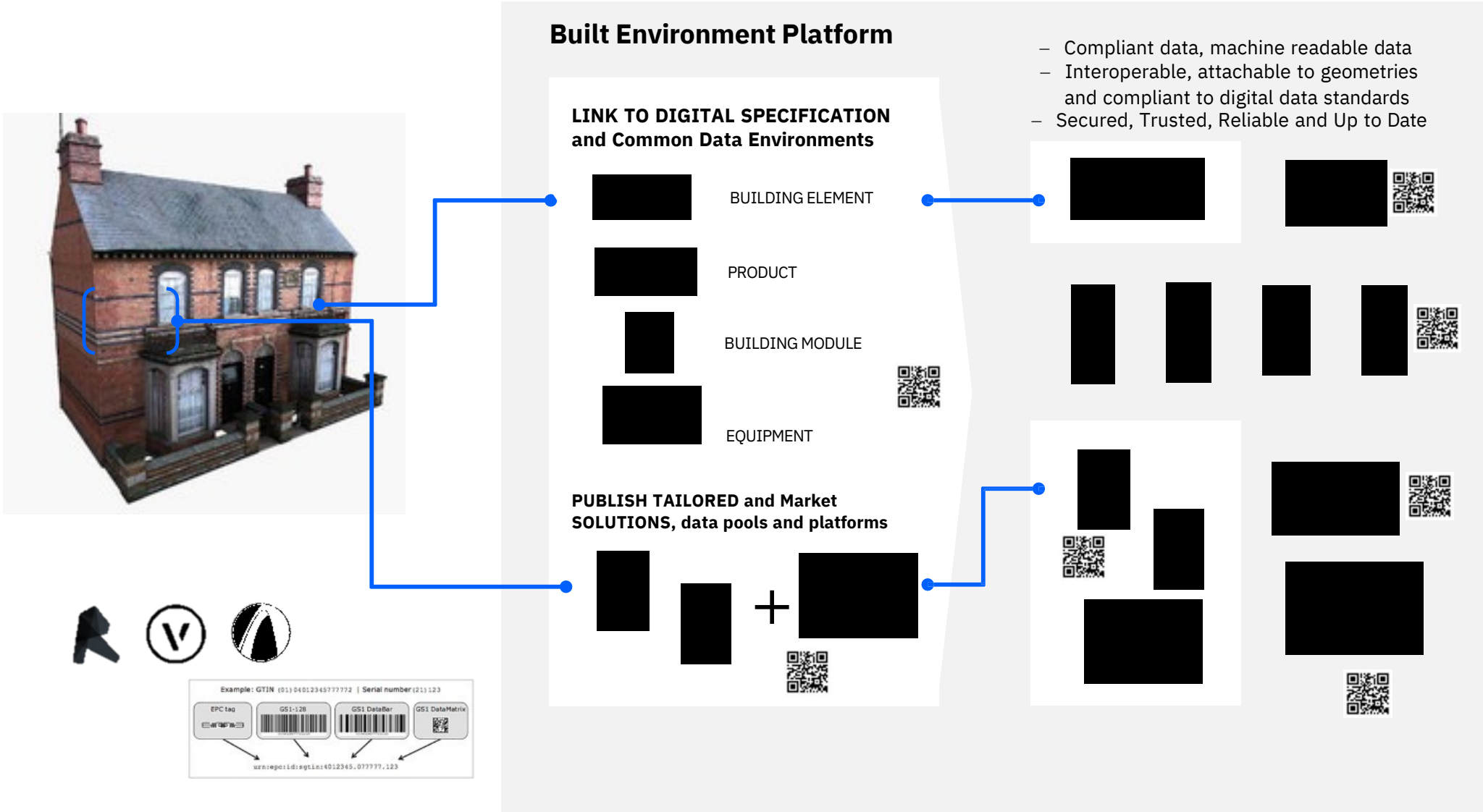
- Centralized team responsible for
 - Program Lifecycle & Performance Mgmt.
 - Governance, Risk & Compliance (GRC)
 - Program and Change Control,
 - Policy, SOP, Productivity management
- Support Projects Governance
- Supported by digital in the areas of
 - Analytics for right and timely decision making
 - Advanced and integrated tools for better plan, schedule and cash flow management
- Includes continuous working with other teams including master program planning, contracts, finance, etc..
- Reduction in claims
- Faster and accurate concurrence view
- Faster response time for critical decisions
- Reduced cost of capital via better cash flow mgmt.
- Savings on time of key project personnel, with better decisions



User journey examples

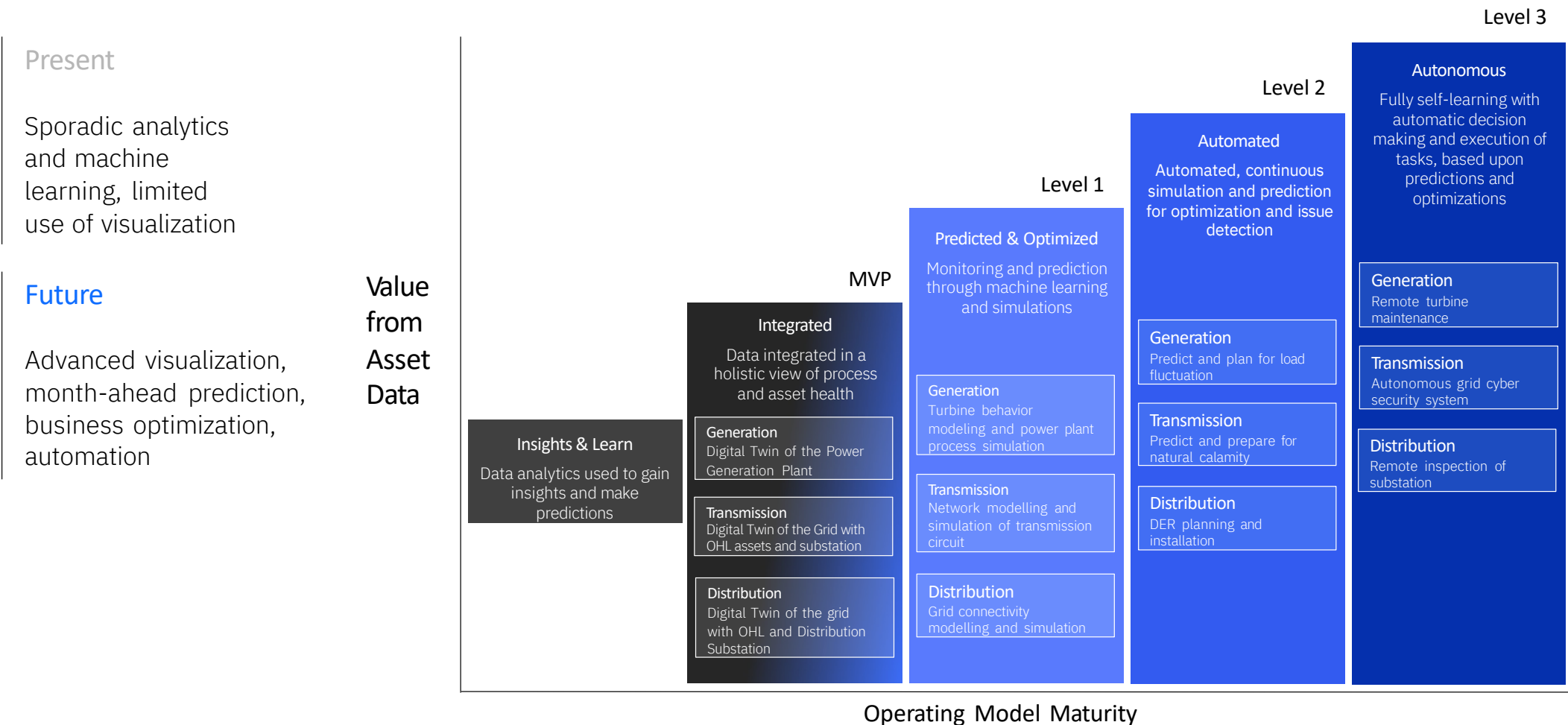


Platform in Action



Your Digital Twin journey to value

Develop a future-proof asset strategy by integrating IT and OT, as well as extracting value from asset data.

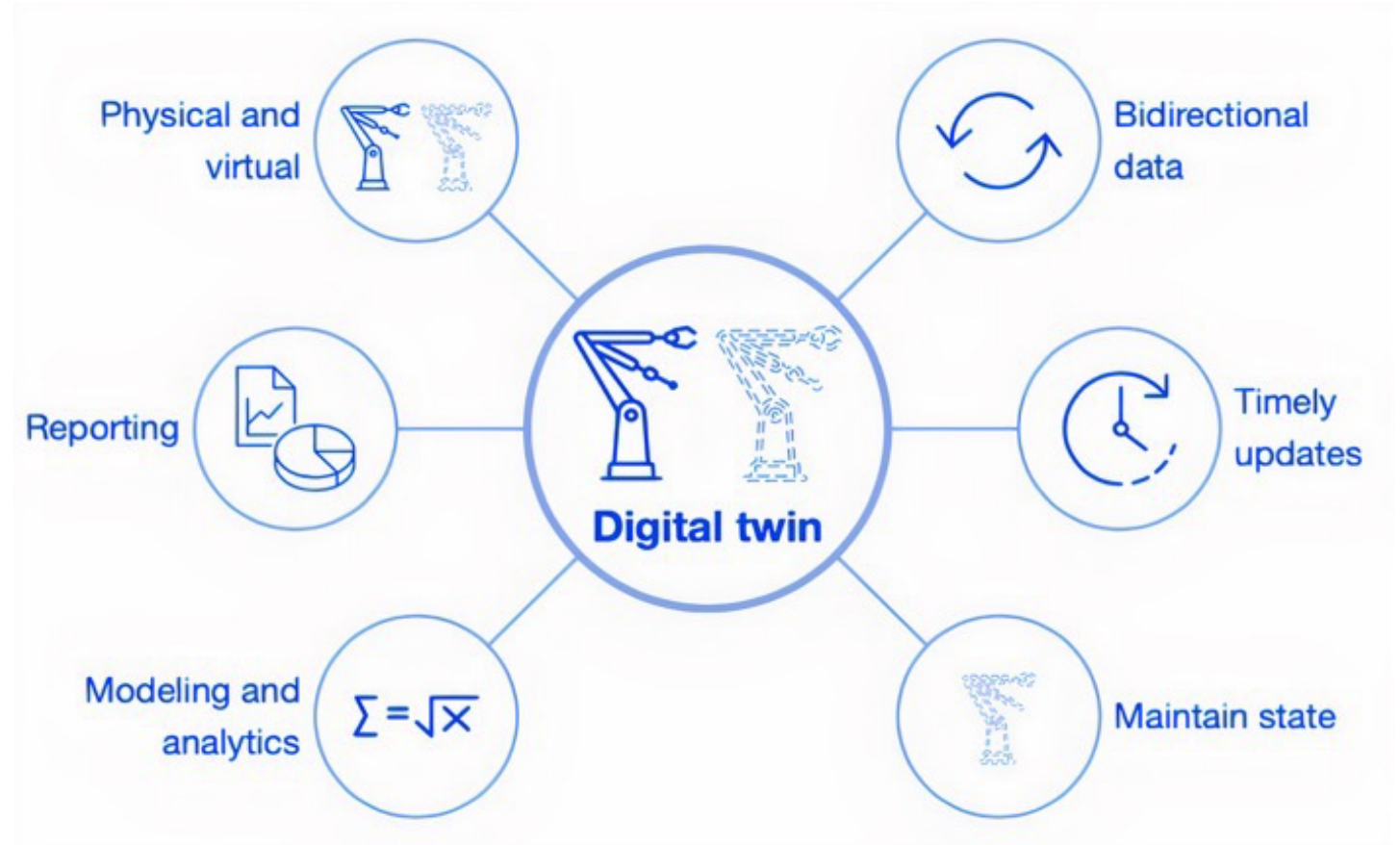


6 Core Capabilities

A Digital Twin is a **dynamic, virtual representation of an asset** and / or process, usually across multiple stages of its lifecycle.

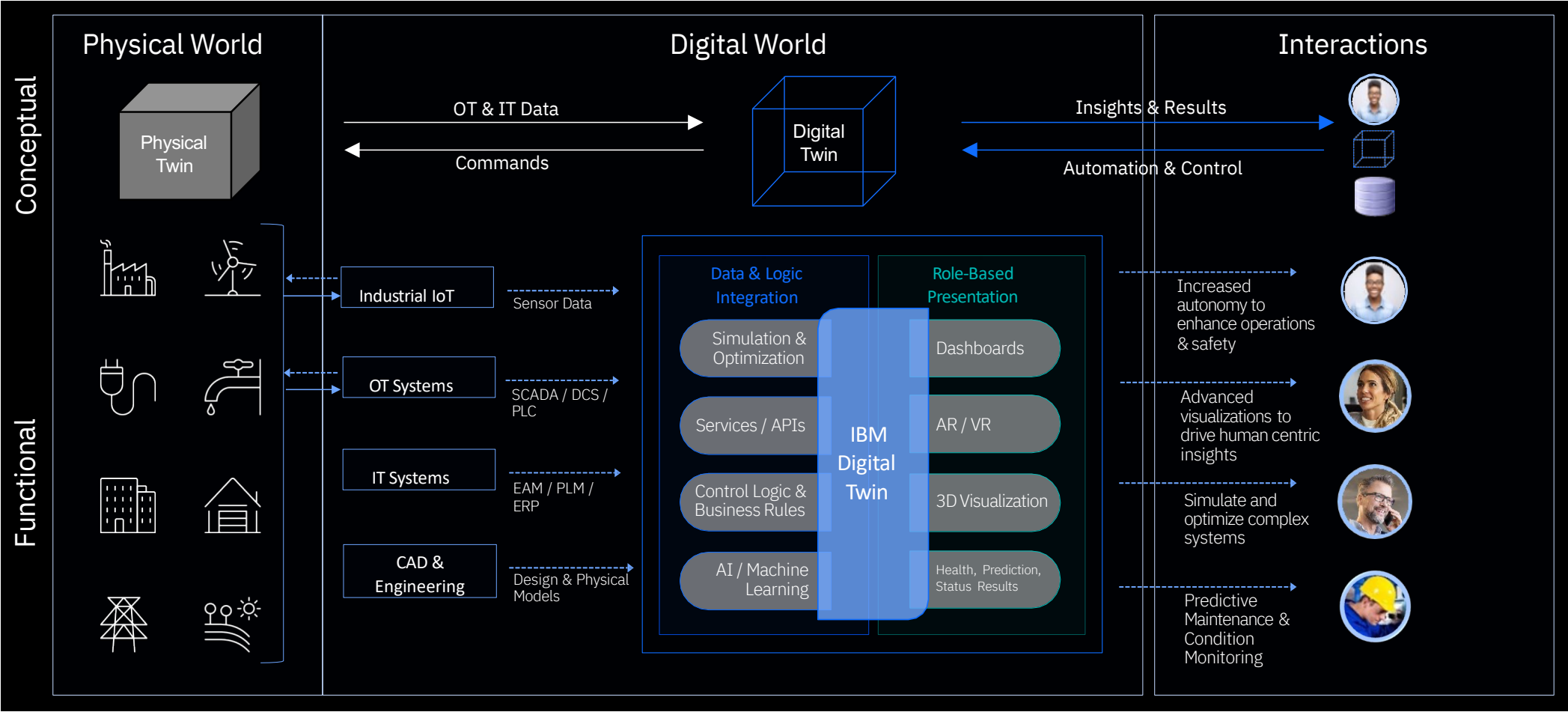
It uses **real-world data combined with engineering, simulation or machine learning** models to enhance operations and support human decision making.

Digital twins can be used to **answer what-if questions, present insights in an intuitive way and provide a way to interact with the asset.**



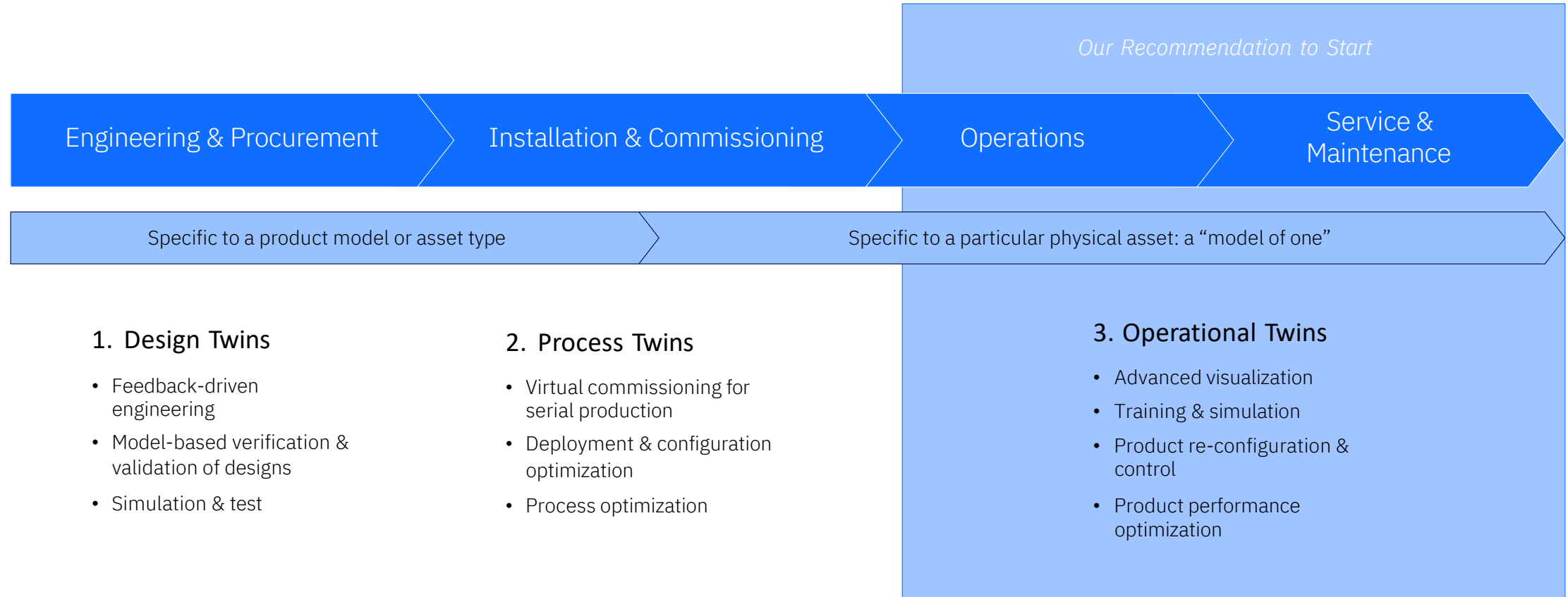
Connect Twins on a Powerful, Flexible Platform

Implement a powerful and flexible digital twin platform in the cloud that will help connect, monitor, and simulate many assets



Three Types of Digital Twins

Different information systems provide different capabilities across the lifetime of a grid or plant



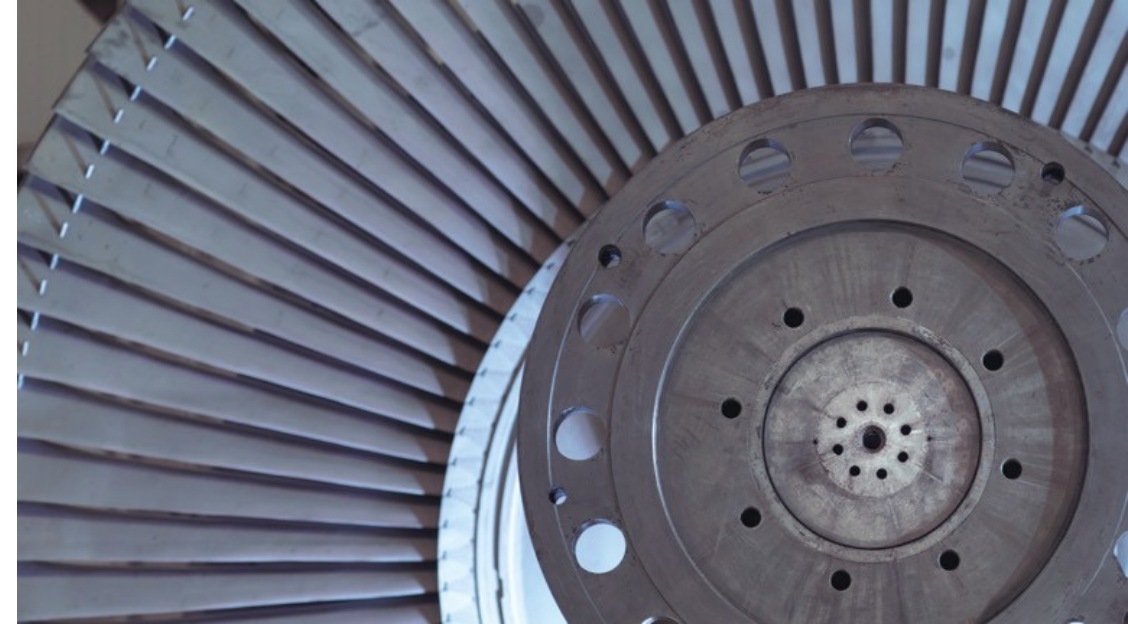
Harness the power of Digital Twin

Apply and tailor our **IBM, Microsoft and Unity** Digital Twin solution to your specific networks and stations.

Leverage **KITT**, our unique IBM Research asset, to integrate and normalize complex datasets (incl. IBM Maximo) to apply proven, pre-existing engineering models.

Empower your teams to learn, acquire applied skills, and deliver outcomes in a modern and accelerated way, by following our market-leading **IBM Garage** method.

Accelerate time-to-value while increasing flexibility with IBM's leading hybrid cloud platform **Red Hat OpenShift**.



IBM's Digital Twin will help you:

0.5 - 1%

TotEx Reduction

15%

Increase in asset life

20-25%

Reduction in safety incidents

3 months

To increased employee
satisfaction

A toolkit for accelerated value realization

Co-create a digital twin strategy for operational excellence collaborating across business functions.

Benchmark your **status quo** and arrive at a **shared vision** for Operational Excellence leveraging Digital Twins.

Accelerate delivery through a **catalogue of operational excellence use cases**.

Realize value in **as little as 6 weeks**.



Use Case Catalogue

Access an industry-specific use case catalog, pre-defined by our digital twin SMEs and industry experts, to gain a running start advantage



Find Your Path to Value

Using IBM's Digital Twin Maturity Model, Prioritization Framework and rapid User Research, we'll help you identify your current Digital Twin maturity, and what success looks like



Rapid Visualization for Rapid Results

Leverage IBM's spatial guidelines, design patterns and UI assets to accelerate the design and ensure adoption and scalability to full twin



A Roadmap for Empowering Users

Co-create a journey to accelerated Digital Twin Value based on your users' specific challenges and goals – empowering them every step of the way

Use Cases

Pre-defined to accelerate time-to-results

Access a use case catalog, pre-defined by our digital twin SMEs and industry experts, to gain a running start advantage.

Defined with you in mind

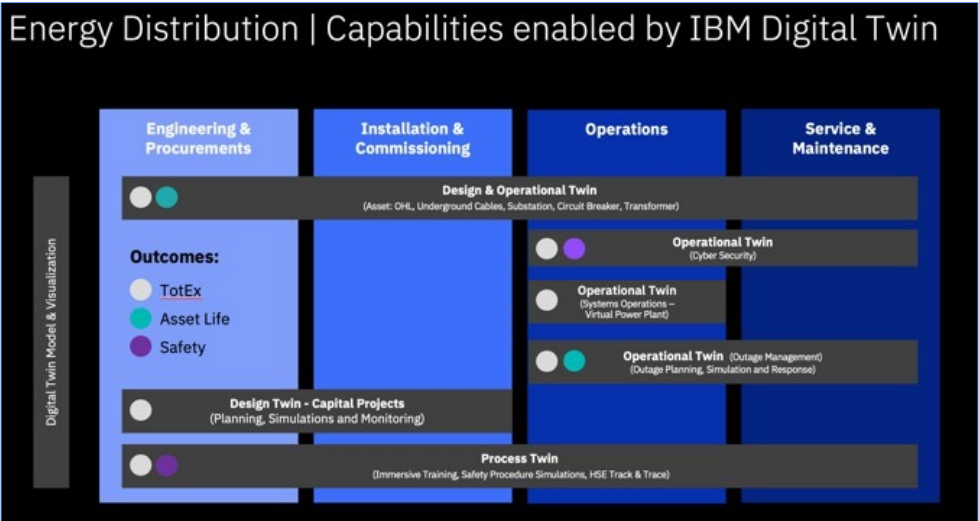
Use cases defined specifically for Electrical industry assets to work for industry employees, based upon our proven experience and wealth of research

Ready to Tailor

Flexible, diverse, and open-ended use cases can easily be customized to your specific operation and user base, while still retaining their powerful structure

Pinpointed Value

Each use case targeted at specific, valuable KPIs in your business, to ensure meaningful impact in the areas that matter most to operate with excellence and grow



Ensure Impact

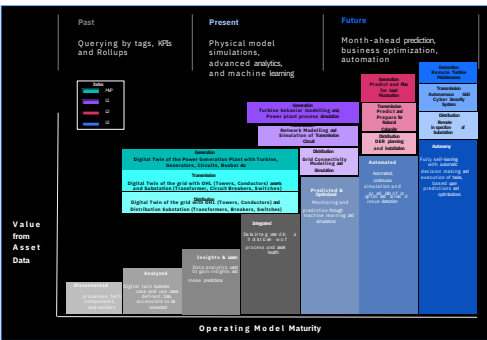
By targeting Value to Business and Users

Identify and prioritize the right Use Cases to tailor to your operations, through a proven blend of Assessment and User Research:

Digital Twin Maturity Assessment

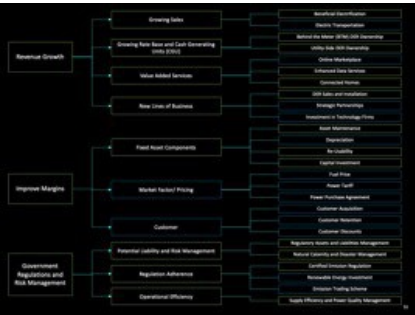
Using IBM’s Digital Twin Maturity Model, we’ll help you locate where you stand along the journey to Digital Twin maturity, in order to plan the best path to success.

Level	Process	Technical	Organizational
0	Disconnected Processes: Processes may exist for individual life-cycle tasks and independent data collection, but they do not span or share data across tasks that require collaboration. “What knowledge?”	Components: Individual technical solutions exist but are not connected across the life cycle and no model is readily available for the Digital Twin DT.	Manual, Disconnected Workers: Workers operate in isolation and are specialized on specific tasks. They have no insight into the impact of their decisions on other life-cycle stages and have no full insights and understanding in the impact of their decisions.
1	Back-to-Bid Processes: Processes have been designed on an end-to-end basis centered on the DT to connect the needs of design, manufacturing, and operation of the DT. Data and experience is partially shared. Flow of information is equipped with some measure of visibility across the disparate processes.	Business Case & System Analysis: The use and business case for DT is defined and the system of interest is analyzed. Potential gain from using digital experiments is highlighted.	Connected Workers: Integration of data and end-to-end processes allow workers to manually get more insights about their decisions and potential impacts. Cross-disciplinary collaborations are being formed.
2	Integrated Digital Processes: Processes are digitized and all relevant data is collected in the DT across its life-cycle. This enables new DT-centric views on processes.	Integrate: Relevant technical components across the DT life cycle are identified and the data is integrated and stored in the Digital Twin. This provides a more holistic view of the DT. An abstraction layer is introduced to enhance communication.	Informal Workers: New insights from the DT allow the workers to better analyze and diagnose problems, understand the impact of decisions across the life cycle and underlie their own decisions with data from the DT. Digital experiments provide workers with confidence in operational changes.
3	Informed Processes: Processes include predictions having to internal decision making steps that rely on data and insights from the DT.	Insights & Learn: Uses data analysis to gain new insights from the connected data about the DT across its life cycle enabling identification, diagnosis and tracing of issues to root causes to accelerate life cycle stages.	Proactive Workers: The DT enables the workers to run what-if scenarios for design, manufacturing, and operation. This allows them to predict the impact of decisions taken and enables mitigation of potential conflicts in operational changes.
4	Optimized Processes: The DT is used to automatically monitor the performance of all processes across the DT life-cycle in order to optimize enterprise performance.	Predict & Optimize: Use machine learning and simulations to predict DT behavior allowing what-if analysis and insight-driven predictions for optimization of operational scenarios, production efficiency, risk, assessment and improved design processes.	Augmented Workers: The automated DT and processes enable workers to include the DT in their daily tasks. The DT will automatically analyze data and decisions, highlight identified issues and provide the worker with decision support. Operational steps are being introduced as a result of in-depth analyses.
5	Autonomous Processes: Processes can be executed autonomously with other DT in the context of the business/corporate processes to optimize inter-enterprise performance. These processes are monitored by practitioners on a high level of abstraction.	Automate: Fully integrate tools and data pipeline to automate the previous steps to enable the DT to continuously learn from new data. ML models and simulation models are continuously updated and form an integrate learn-optimize cycle. The automatic detection of issues and the monitoring of confidence levels becomes important.	Self-driving Workers: The workers are able to delegate re-occurring tasks to the autonomous DT, such as generating design variants, running detailed maintenance tasks, etc. They monitor operation, investigate issues reported by the DT and set strategic guidelines for the DT. In addition, the workers can trigger technological improvements to the DT based on specific data to further improve its adaptability to a given task.
6		Autonomy: The DT is now capable of automatically learning from new data and can predict and optimize on its own. This enables a worker to interact with the DT with limited manual intervention or at all. In addition, the DT is able to quantify its own accuracy in approximating real-life systems.	

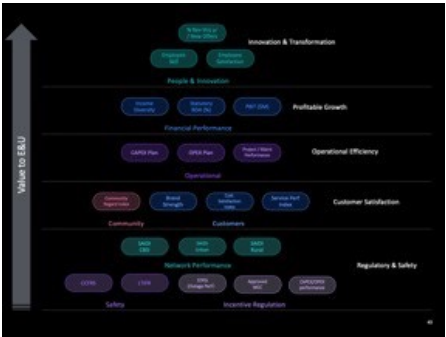


Digital Twin Value Tree

Our established hierarchy of Electrical KPIs have been rigorously mapped to Use Cases, so you’ll quickly understand how each Use Case will boost your business results.



Digital Twin Value Tree for Energy



Value Pyramid Impact per Use Case

Accelerated User Research

By taking a fast and accurate pulse on your users’ pain points, and enhancing it with our pre-existing Industry research, we’ll identify the Use Cases that will help users get their jobs done faster and more efficiently.

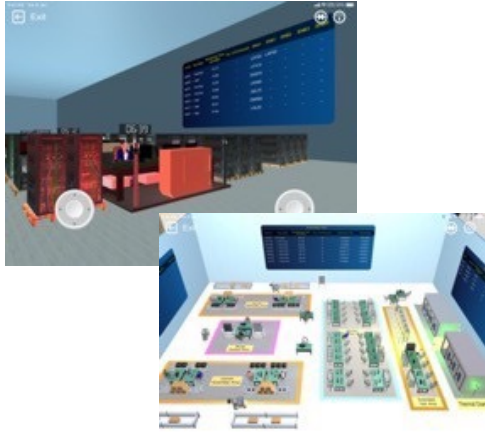


Accelerated User Research



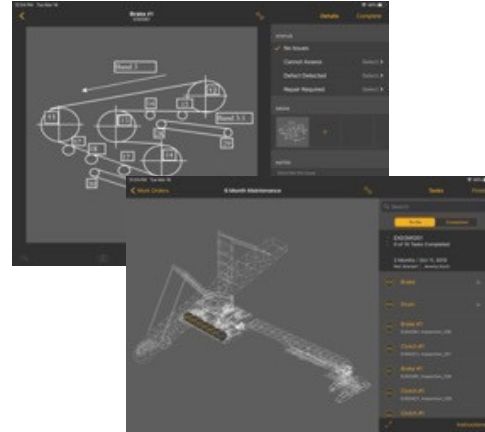
Visualize the twin in the most meaningful way for your users

Leverage IBM's spatial guidelines, design patterns and UI assets to accelerate the design and ensure adoption and scalability to full twin



Making Visualization look easy

Allow our visualization and industry experts to create meaningful visualizations of complex and large volumes of data, using our asset kits to accelerate the process.



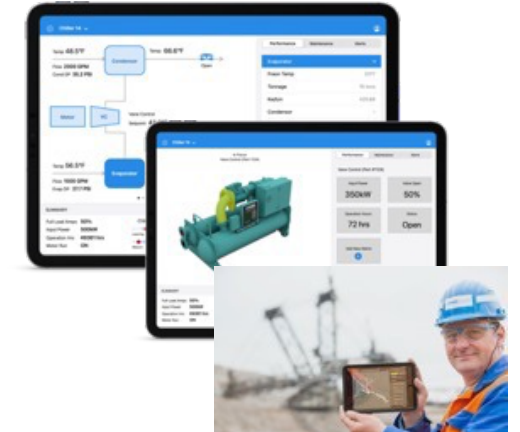
3D in a 2D world

The right solution is likely to include a mix of 2D and 3D. Let our experts craft a solution for seamless navigation between spatial orientations, presenting the right visualization for the right moment.



Enterprise level AR and VR

Allow us to bring AR or VR to your employees to expand the way the interact with data. We will lay the foundation to ensure your twin can gracefully grow from MVP to mature twin.



Insights at the point of need

Your digital twin may be used in a control room on a desktop, or out in the field on a mobile device. Crafting a design and architecture to support all use cases needs to be established in the vision.

Accelerated Value

Delivery with an Experience Roadmap

Co-create a journey to accelerated Digital Twin Value based on your users’ specific challenges and goals.

For You, With You

Co-create a roadmap alongside our experience experts that solves your users’ most pressing problems.

Industry Perspective Expertise

Leverage IBM’s deep Energy & Utilities industry perspective combined with Digital Twin expertise to chart a path that is realistic and valuable

Enabling Users through the full Journey

Emphasis on empowering your users every step of the way, so they’ll be enabled with insights and capabilities as the work progresses, not just at the end.



User Capability Enabled

Data Integration

Connected views of substation and plant equipment data, along with historic lifecycle data, allows Steve to more easily see what’s happening at his station and along the grid, and make better, more holistic decisions



Simulation & Optimization

Simulations of live assets into the future, based upon historical occurrences, allow Steve to “peer into the future” to understand how loads can be optimized, or repaired before there are faults



Virtual Interaction

Interaction with virtual models of assets allows Steve to inspect far away stations, as well as train engineers on electrical circuitries overlaid on network grids without incurring the cost or risk involved in accessing them directly



Analytics

Descriptive analytics for connected assets enhances Steve’s ability to monitor for faults and load imbalances



Advanced Visualization

Real-time 2D/3D models of the substation provides Steve with a “sixth sense” view that is more intuitive and easier to understand, allowing Steve to make faster, better-informed decisions



Automated & Remote Control

Steve can control and commission the network grid and substation equipment remotely through a virtual representation of a digital twin. Integrated AI and machine learning assists Steve in deciding and executing upon time-sensitive, routine tasks

Client Success Story

Port of Rotterdam

Client Challenge

The Port of Rotterdam were looking for a strategic partner and a platform on which to build a Digital Twin of the entire port. They went through a lengthy process of evaluation to select a partner for 20+ years of scalability.

A port is a large-scale system of systems and has many dynamic tasks that require short-term planning in response to local weather, traffic, ongoing operational activities, personnel as well as accounting for financial and contractual considerations.

Decisions require to consider data from different information systems including geospatial, simulation and IoT systems.

Our Solution

The Digital Twin of the port optimizes real time operations and increases capacity. It was built using IBM Cloud and Watson IoT technology along with partners such as Cisco and ESRI.

Drones and edge technologies drive intelligence into the physical port IBM use Watson IoT platform to build a predictive maintenance solution that enables optimized Port Call services and provides a digital lab for autonomous ship movements in the future.



Up to **\$1.9M**

Cost savings per day

140k

Vessels per year

Why IBM?

The IBM Approach

Deep and versatile AI deployment expertise and delivery

- Multiple global deployments with proven break even within ~six months*
- Unmatched ability to integrate within existing infrastructure**
- Hosting environment agnostic leader in deploying, integrating and operating virtual agent technology

Truly at the forefront of AI technology development

- Applied Deep learning, Machine Learning, Conversational AI research
- Leading-edge design accelerators, methods, pre-built industry assets, and mastery in AI and data science
- World leader in Ethical AI

Mature commercial models and comprehensive Partner Ecosystem

- Traditional (T&M, FP) and Outcome based commercial models
- Flexible, rich, and comprehensive partner ecosystem for range of choices and fluidity in project delivery
- Industry-leading overall ROI of 337%*

Sources: *: Total Economic Impact of IBM Watson Assistant, Forrester, 2020

** (IBM MD&I, 2020)

Why IBM?

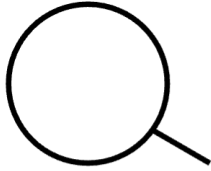
IBM expertise

- Engineering, construction, operations, infrastructure.
- Manufacturing – industry 4.0, plant automation & operational excellence.
- Journey to cloud, cognitive technologies, IoT, Maximo.
- AI, Blockchain, Cloud, Analytics and data science.
- Enterprise architecture – from ERP to projects, operations.
- Main information contracting.
- Business and digital strategies, change management.
- Large capital projects expertise.
- Deep construction, manufacturing and operations knowledge.
- BIM and Digital Built Environment.
- Information and Task management.
- Chair of Digitalization Task group of Construction Products Europe.
- Advisory Board member of EU BIM Task Group.
- Technical expertise for British Standards, European Commission & CEN/ISO.

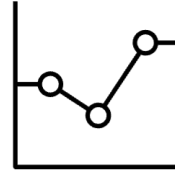


Why IBM?

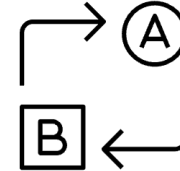
Drive Higher Business Outcomes



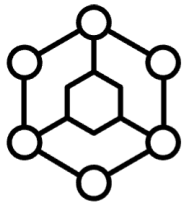
Detailed intent analysis and extensive library of pre-built industry-specific intents



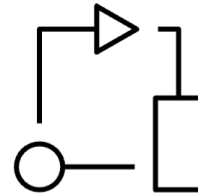
Omni-channel with interaction history and closed loop engagement analytics



Pre-built connectors and standard integrations



An interaction model that learns from and engages with the customer



Seamless handoffs between virtual and human agents



Lean process optimization integrated with cognitive

