



# Augmenting the Engineering Workforce Through Technological Innovation



IBM Consulting





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# Industry Landscape

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1



# Industry Landscape for Built Environment & Manufacturing

## Lingering Industry Problems

 Low margins & high cost of failure

 Low productivity for decades, low collaboration and visibility

 Complex ecosystems  
Data silos  
Fragmented solutions

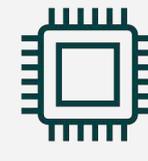
 Low digitization  
Poor construction quality leading to disasters

 Construction & facilities' contribution to global carbon emissions <sup>1</sup>

## Recent Exacerbating Factors

 Talent shortage & skills gap

 Major disruptions to supply chains & building materials

 Remote/hybrid work model is new & challenging

 High market volatility & increased pressure on cost reduction

 Major venture capital inflow did not solve for industry problems

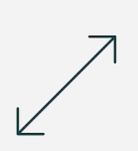
## Emerging Market Demands

 Standardization & productization  
Digitalization of products and processes

 Industrialization. Offsite construction & modularization

 Major government infrastructure funding  
Recovery Fund

 Global push towards sustainability & carbon footprint reduction, circularity

 Expand beyond traditional & create new revenue streams

## Industry's 2022+ Outlook

**1** New operating models powered by end-to-end platforms

- Open hybrid computing models
- Support digital twin, standardization & globalization

**2** Connect ecosystems leveraging interoperable data & AI

- Uniform data structures
- Advanced IoT deployments

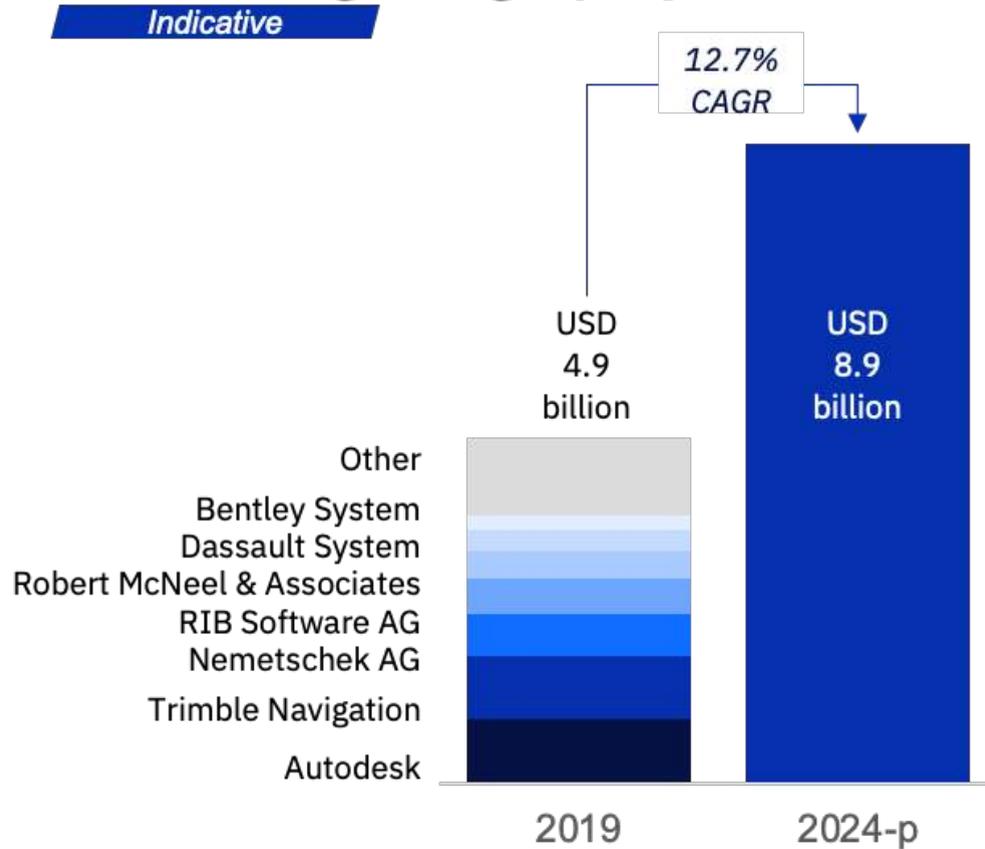
**3** Build capabilities to help reduce and report on operational & embodied carbon

**4** Increase revenue by offering technology to the industry

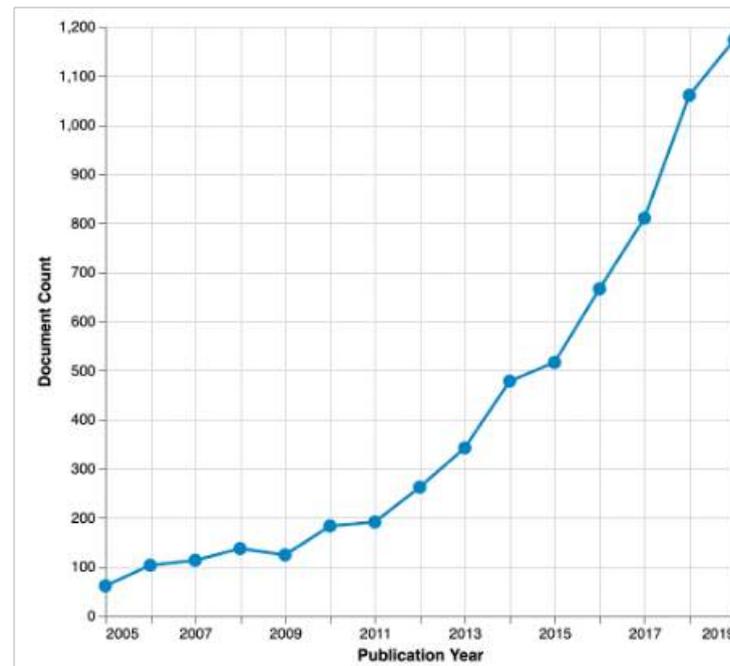
- Be the front mover
- Profitable & reliable

# Ecosystem of providers emerging around Built Environment

The global digital (and BIM) market is growing rapidly

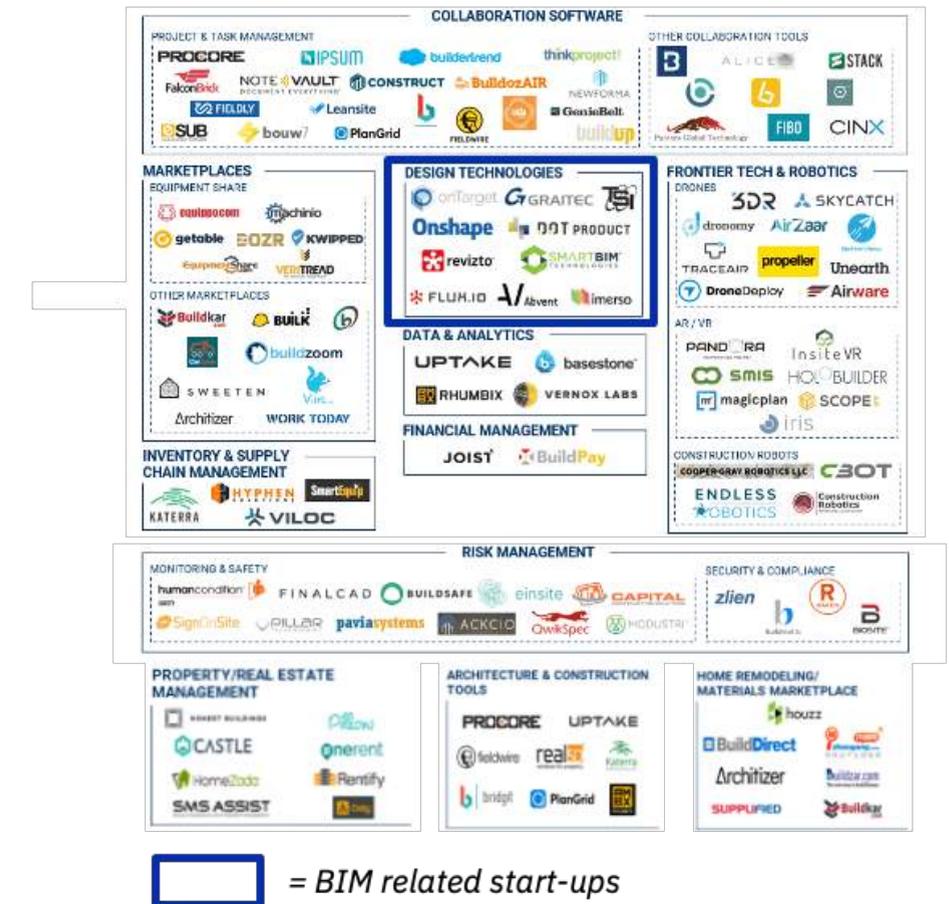


New IP is created



BIM Patent applications & grants

Start-ups are crowding the market



Data is becoming the new oil of the industry

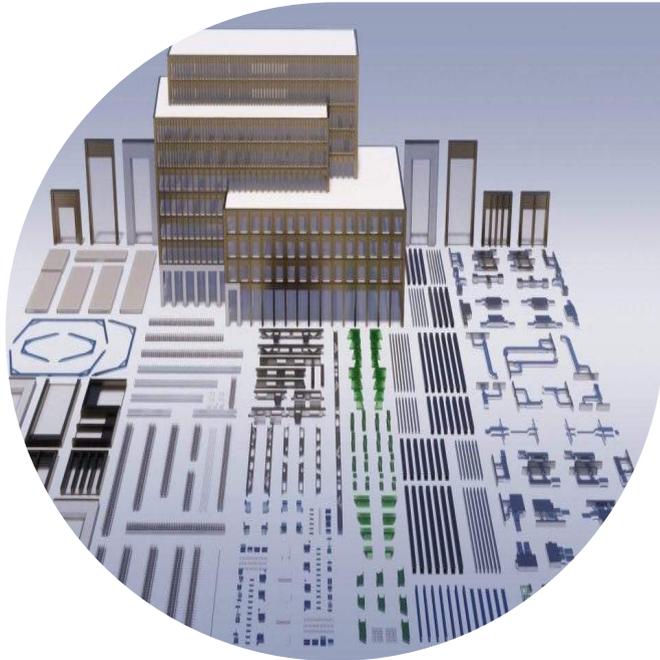
Source: Market & Markets, lens.org, CB Insights, Desk Research

# BIM, Data and Standards

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## 2





## Digital Transformation

Creating new  
business  
applications for your  
data

Inventing new  
business models



## Digitalisation

Making digitised  
information work for  
your current  
business model



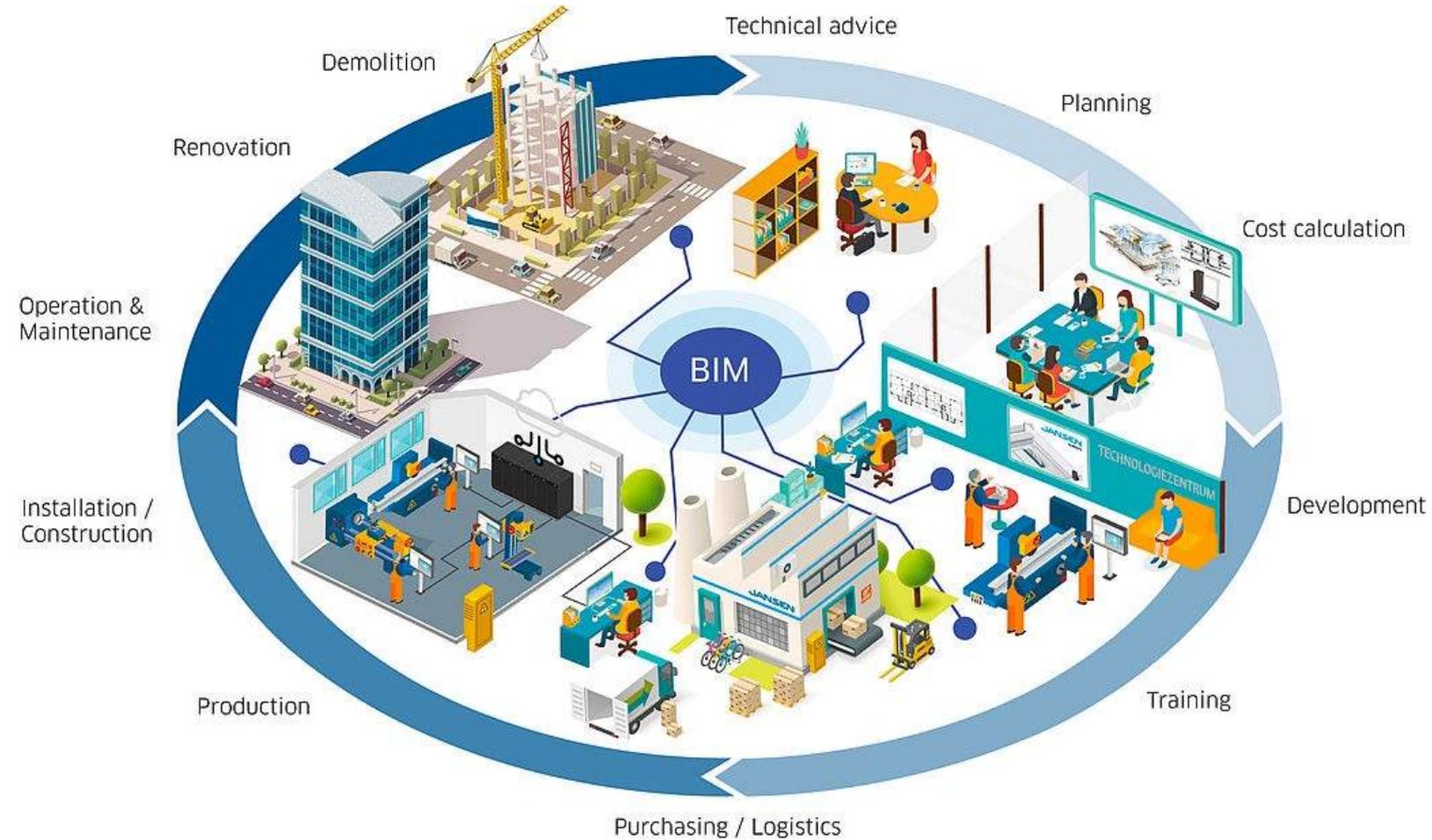
## Digitisation

Moving from  
analogue systems to  
[connected] digital  
ones

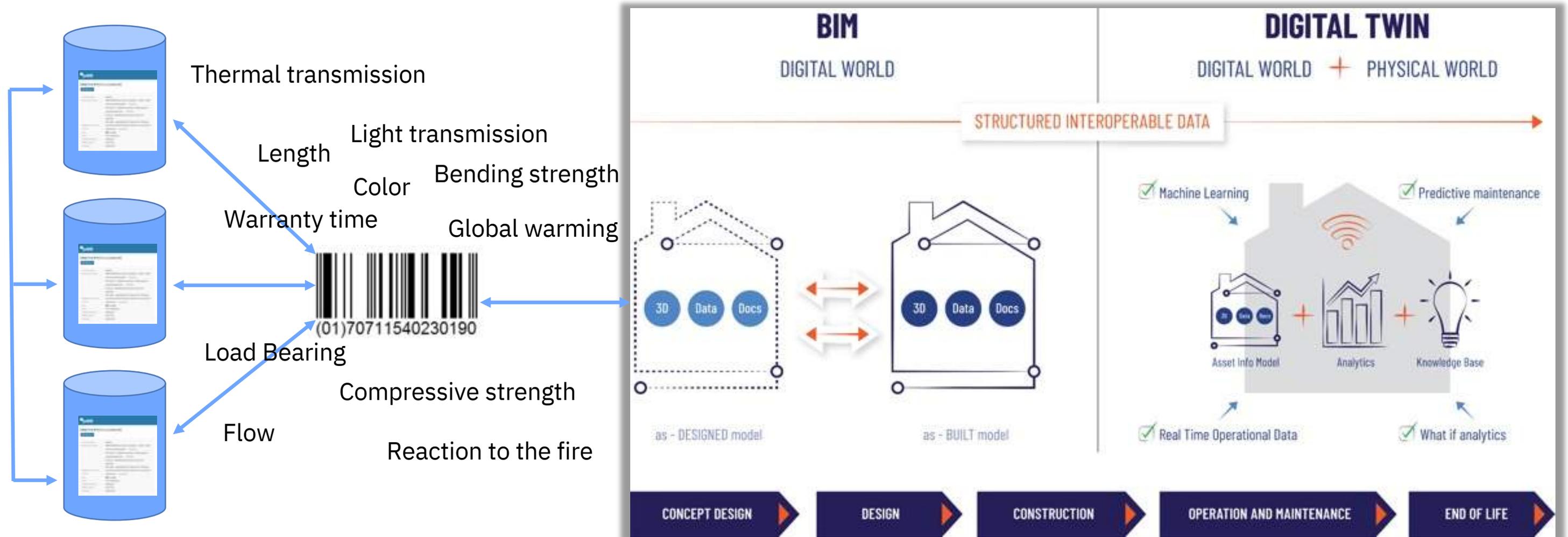
# BIM is relevant for every stakeholder

- Building Information Model – **What** thing is produced
- Building Information Modelling – **How** the thing is produced
- Building Information Management – **Who** produces **What** thing and **When**

*‘BIM expands from 3D modelling to genuine collaboration; **from design and construction into operations; from individual buildings to cities** and their systems; and onto wherever digitizing the built environment may take us.*



# Standards and regulations combined with digital technologies



The as-designed model is based on input from the design teams which ultimately forms the basis for the as-built model that contains all the characteristics of a building.

Cognitive Enterprise enables to provide data to create Digital Twins. This opens a new digital market on planned development, where assets are sold. It also enables maintenance, energy optimization, machine learning, real time data = lower OPEX

Source: coBuilder, GS1, IBM

**Industry Digitalization** has benefited from the emergence of new **digital technologies** that are completely redefining the possibilities in construction, operations and manufacturing

## APIs & Microservices

Rapidly creates new applications. Enables ecosystem partners to collectively innovate.

## Blockchain

Improves identity management and distribution. Enables transformational business model innovations.

## Internet of Things

Equips physical assets with digital data. Optimizes existing operational processes.

## Automation & Advanced Robotics

Enhances productivity by working autonomously or in conjunction with staff. Increases worker safety.

## Cloud

Allows data and applications to be stored and accessed from anywhere. Delivers cost-effective innovation quickly.

## Mobile

Connects people with insights where they are. Enables on-going status and decisions.

## Additive Manufacturing

Creates new and more efficient products. Slashes manufacturing processes.

## AI & Analytics

Supports staff to make decisions. Identifies business-critical operational improvements.

## Cybersecurity

Embeds safeguards into systems. Surfaces threats.

# Case Studies

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## 3



# Cognitive Engineering & Construction Management

In 2015, Fluor and IBM embarked on a digital transformation journey to transform Fluor into a data-driven company. Fluor aimed to better control project execution outcomes and contain profit margin erosion.

## Fluor's Journey to AI

### COLLECT

Project data made simple and accessible

### ORGANIZE

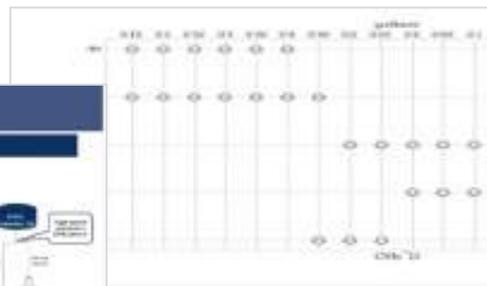
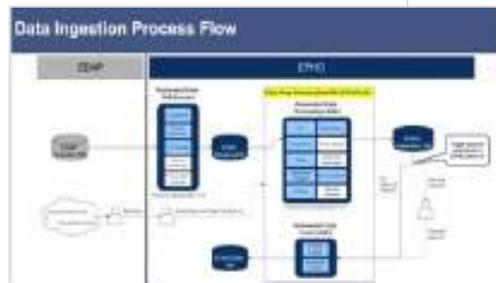
Created a business-ready analytics foundation

### ANALYZE

Built and scaled AI with trust and transparency

### INFUSE

Operationalized AI throughout Fluor's business



## EPC Project Health Diagnostics (EPHDSM)

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.

**FLUOR**

## 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

In the news

**FLUOR**

+

**IBM**

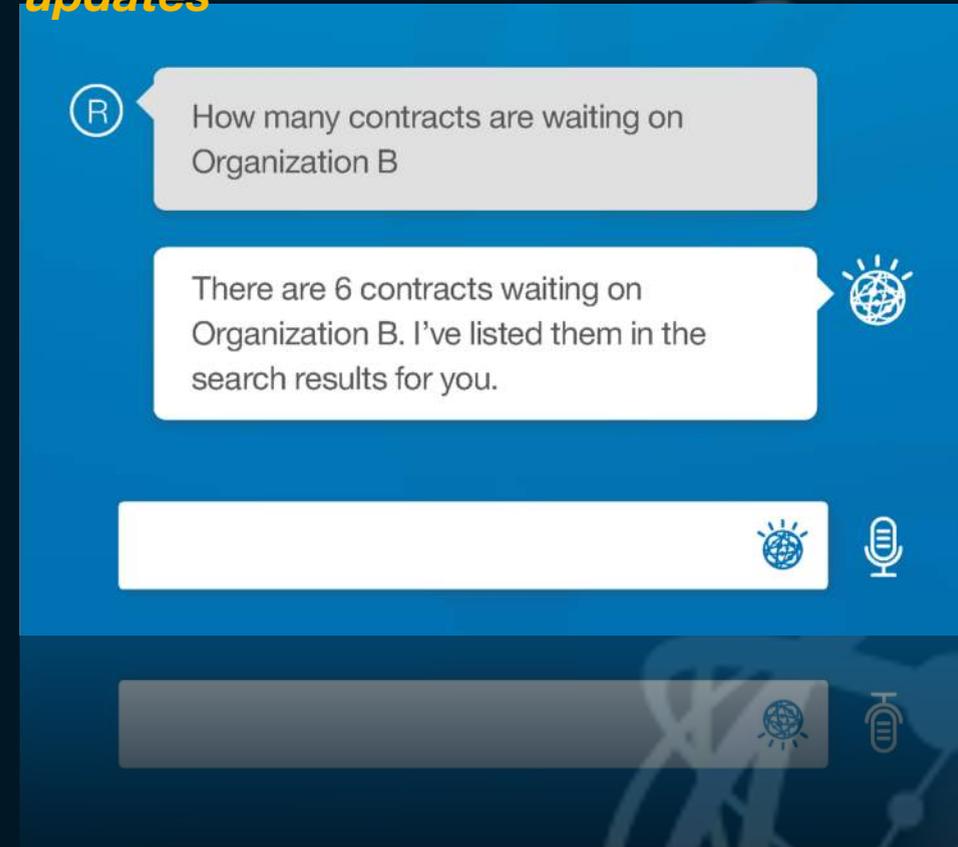


# Cognitive Procurement Advisor

A platform to extend your purchasers' expertise, increase their efficiency and reduce time-to-action. It automatically aggregates data from a host of sources (internal and external, structured and unstructured) about products they are buying (construction material, mechanical parts, equipment, etc), suppliers they engage with, and their industry news.

This data is analysed to extract trends, identify risks, and present insights for better decision making. Also, it allows for products benchmarking and regulatory adherence checks.

## A chat with a Cognitive Procurement bot asking about contract progress updates



## asking for facts

"Who is our largest suppliers of steel in the UK?"

R

ABC Steel AG, \$125M in 2016  
Here's a [top 10 report](#)

## checking regulation compliance

"Can I order from supplier ABC Steel AG for a site in Sweden?"

R

Yes. Don't forget, orders over \$1M require a public sourcing event.

## finding processes

"How do I create a public sourcing event?"

R

You will have to create a 24d RFQ in [Emptoris Sourcing](#). sourcing event.

## Business Drivers

- Global intelligence derived from numerous data silos and consolidated in one dashboard
- Deep supplier insights
- Instant contract analysis and comparison against standards, policies and regulations
- Compliance and risk mitigation
- Spend analytics and optimisation
- Eliminate manual data gathering from internal and external sources
- Allow purchasers to focus more on analysing opportunities and trends for their organisation, rather than spending time finding, filing, and informing

## Enablers

- ▶ Watson services
- ▶ Conversational interface (text or voice)
- ▶ Integrations with internal and external data sources (e.g. external sites, component due diligence pricing, commodity information, supplier track records, etc)

# Client Use Case – Australian Metro Tunnel – Requirements Quality Assistant

## Overview

- Rail Projects Victoria (RPV) is the Australian Government body responsible to deliver the Metro Tunnel
- RPV oversees all aspects of the project that involves four work packages, each delivered by multi-company consortia

## Requirements Quality Assistant Implementation

- Single, collaborative and secure environment to capture, trace, analyze and manage project requirements in real-time
- Integration of hazard logs and interface registers. Controls and requirements are clearly captured by different parties

## Benefits

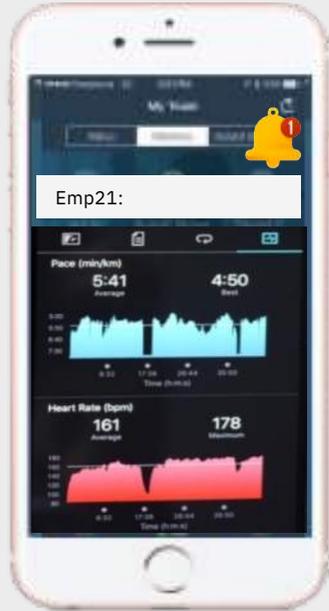
- Real-time single source of truth
- Improved project agility
- Minimize rework
- Increase re-usability

*“Leveraging IBM technology and this approach for the Metro Tunnel Project has provided us with capability and learnings which we are introducing into the entire RPV portfolio of projects, including the Regional Rail Revival program”*

**Marc Chadwick, Manager, System Architecture, Rail Projects Victoria**



# Health, Safety and Wellbeing



Enhanced insights into workplace environments\* for the health, safety and wellbeing of employees.

- **Protect** the workforce
- **Resume** normal operations as quickly and safely as possible
- **Monitor** asymptomatic workers

*\*Not suitable for public spaces, retail stores, hospitals*

## 1. Fever Monitoring

Identify elevated body temperature of individuals as an indicator of fever condition and unsuitability for work

## 2. Crowd Density Management

Monitoring of the density and average proximity of people in a specific space, based on people counting in the camera's field of view

## 3. Health Monitoring

Monitoring health and biometric data of individuals, to identify body stress and low energy indicators. Provides alerting based on thresholds and rules

Keeping occupancy levels in a defined space (entire premises) or specific zone (defined room) to a logical maximum (i.e. 10)

## 5. No-Go Zone Monitoring & Alerting

Designate certain areas as no-go zones and alert supervisors when individuals are detected

## 6. Social Distancing

Monitoring the distance between one individual and surrounding individuals based on relative Bluetooth signal strength.



# Ferrovial and IBM

Investigating the case for lifecycle asset information integration for infrastructure and buildings  
As a project moves from design and build to operation, maintenance and disposal, managing the interface between participants creates effort and cost. Ferrovia's Centre for Asset Management (CAM) decided to investigate a collaborative way of working by linking building information modelling (BIM) processes with enterprise asset management systems.

## Business Challenge Story

The lifecycle of assets can span many years and involve many stakeholders. Without consistent enterprise asset management, the total cost of ownership can rise significantly.

## Transformation

Ferrovia's CAM community worked with IBM on a business value assessment and proof-of-concept at Heathrow Airport to test the value and feasibility of integrating data across the asset lifecycle.

## Benefits

- **3% to 7%** saving in lifecycle costs for new infrastructure
- **End-to-end** flow of asset information enables stakeholders to collaborate efficiently
- **100s of hours** of manual work eliminated by automating asset data management processes



ferrovial





# Welcome to the Wienerberger E4 home



Home



Optimise



Upgrade

Your e4 home is a truly smart home, powered by IBM Watson.

It senses when something is wrong with its normal functioning and lets you know. It gives you advice on how to save energy bills and maintain a comfortable and healthy environment. And because it was built to e4 standards, upgrading your home is easy and low cost.



Tap to Close



your questions.

I will ask for your feedback at the end of the demo. Anything you say will be submitted anonymously.

So lets get started. What would you like to do first?

Watch the e4 video

Start exploring

# AR Maintenance

Referring to manuals of mechanical and electrical equipment while repairing them, or going through step-by-step instructions to service utility pipes in a facility, or even maintaining critical assets like rail bridges from its design documents may not always be the most efficient method. People generally are not good at visualising documented 2D designs in a real 3D world. They lose context at times when switching between manuals and actual objects they are attending to. This wastes time and may require more people to inspect the same job or even call escalation.

AR Maintenance offers a cutting-edge solution that gives field engineers the ability to look at a physical object and have assembly guides or maintenance notes superimposed on top. And with voice commands and a head mounted display, engineers can seamlessly interact with the solution leaving both hands free to perform the job with minimal interruptions.



## Business Drivers

- Constant focus on the object being maintained, removing the need to fiddle with documents
- Accurate and real-time information mapping on the physical world
- Hands free
- Ability to record the work being done for future reference and training
- Can be integrated with the perviously covered Watson Field Service Advisor to introduce a more effective and all-round issue resolution service

## Enablers

- ▶ AR SDKs
- ▶ Smart glasses / headsets
- ▶ Mobile devices / apps
- ▶ Conversation interface (voice)
- ▶ Watson Field Service Advisor (optional)

# Thank you !!

## Contact us if you need help/support or an advice



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