



IoT in Action

#IoTinActionMS



Smart Infrastructure Technology Enablers

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Luca Cassani – Technology Strategist

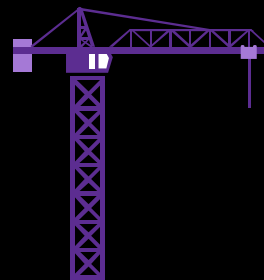
IoT in Action





13%

of world's GDP is related to the Built Environment spending, 9% in the UK



\$57T

\$57 trillion in infrastructure needed by 2030 (globally)



3M+

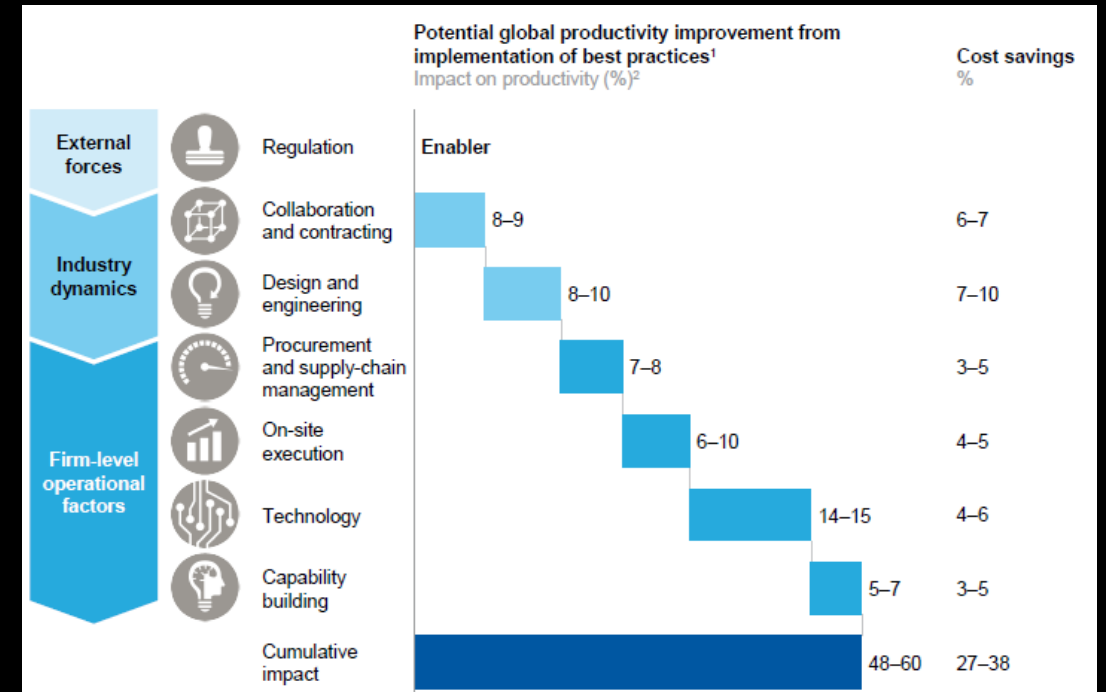
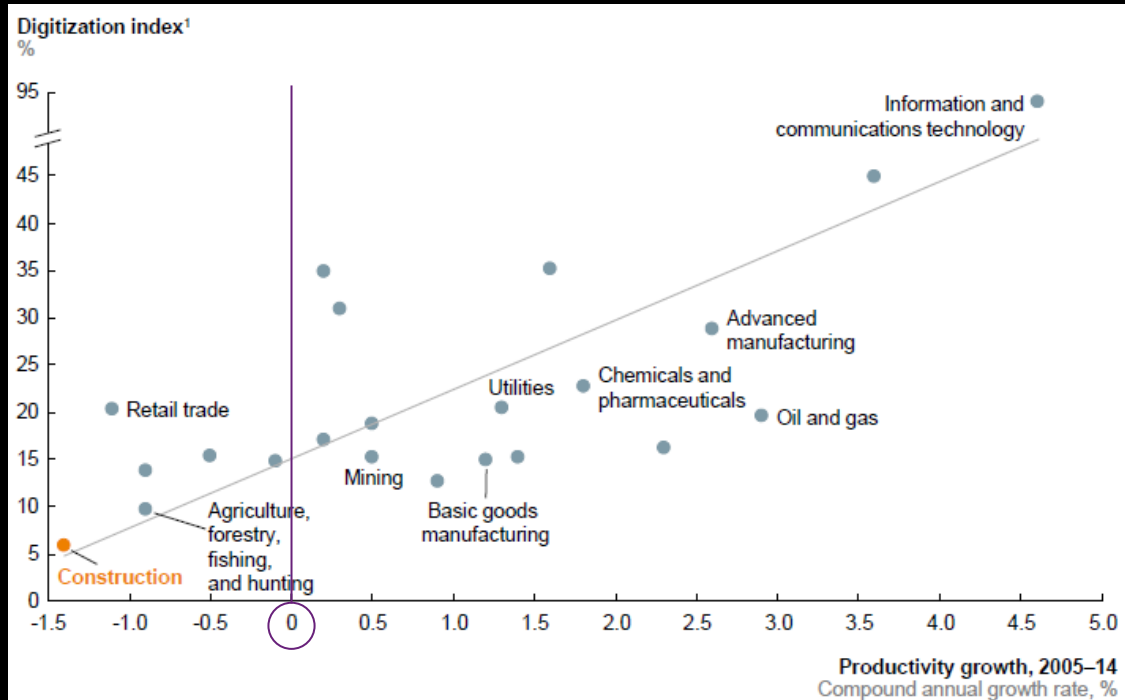
people work in construction in UK in over 280,000 businesses

The state of the nation

1% industry annual productivity growth over the past 20 years

30% of the work performed is rework

35% of construction professionals time spent on non-productive activities



The UK government strategy

Lower costs

33%

reduction in the initial cost of construction and the whole life cost of built assets

Lower emissions

50%

reduction in greenhouse gas emissions in the built environment

Faster delivery

50%

reduction in the overall time, from inception to completion, for newbuild and refurbished assets

Improvement in exports

50%

reduction in the trade gap between total exports and total imports for construction products and materials

The goals



Digital technology

In all the design and construction phases and industry collaboration across the entire lifecycle to improve safety, quality and productivity

Offsite manufacturing

To minimize wastage, inefficiencies and delays

Asset lifecycle performance

Focus shift from Construction cost to TOTEX

The enablers



New Infrastructure

600Bn

New pipeline for public and private infrastructure for the next 10 years

Apprenticeships

25,000

In the sector

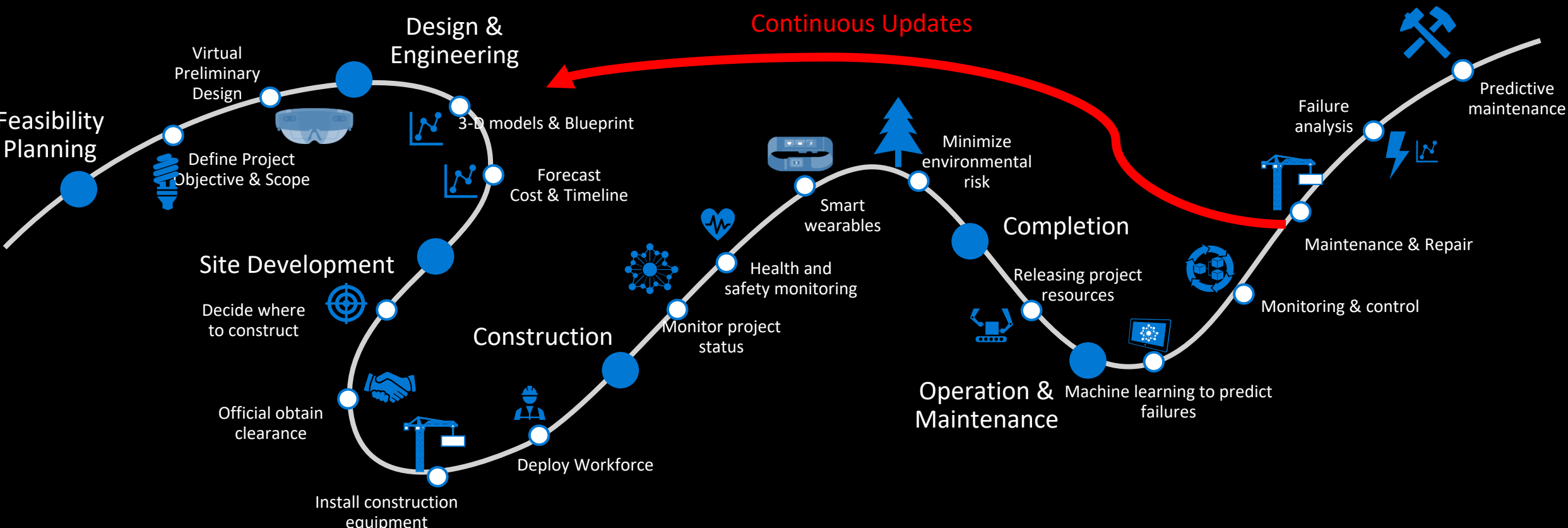
Innovation investment

420M

From tech, sector and government to support innovation in the sector

The opportunity

The end to end Built Environment digital twin



DevOps and software development

- **Benefits**

- Shortened time to deploy changes
- Higher Quality - Less re-work
- Continuous improvement
- Predictability

- **Challenges**

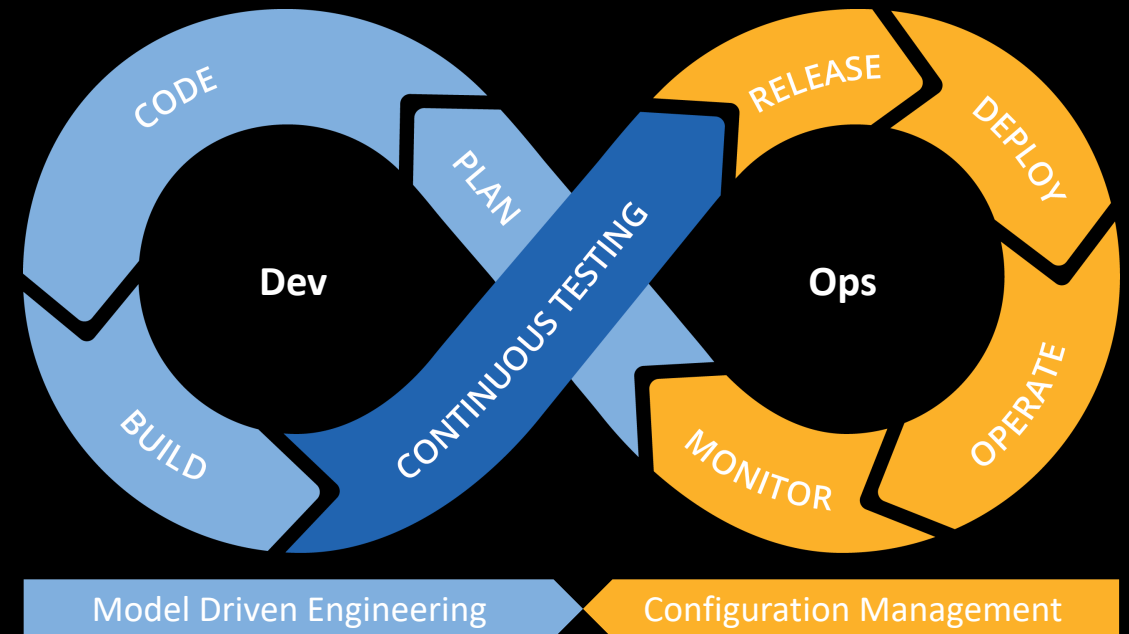
- Integrating teams
- Building trust
- Culture change
- Skills and Training

- **Business/Technology Change**

- Automation – Testing and Deployment
- Integrated ToolChains
- Infrastructure as Code
- Software Defined Networks
- Cloud Services



DevOps Team



DevOps for the Built Environment

- **Benefits**

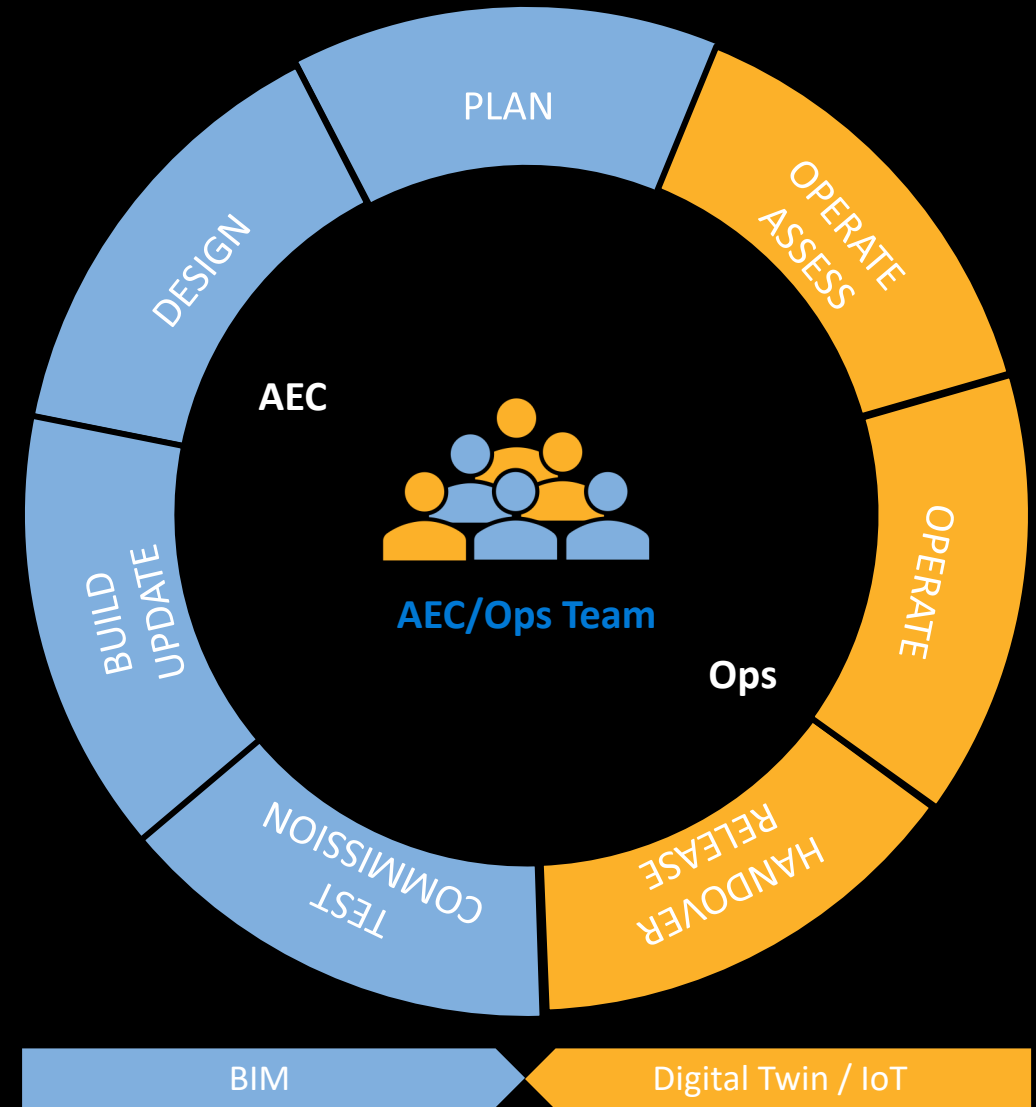
- BIM reflects built Assets
- Shortened time to deploy changes
- Less re-work
- Continuous improvement

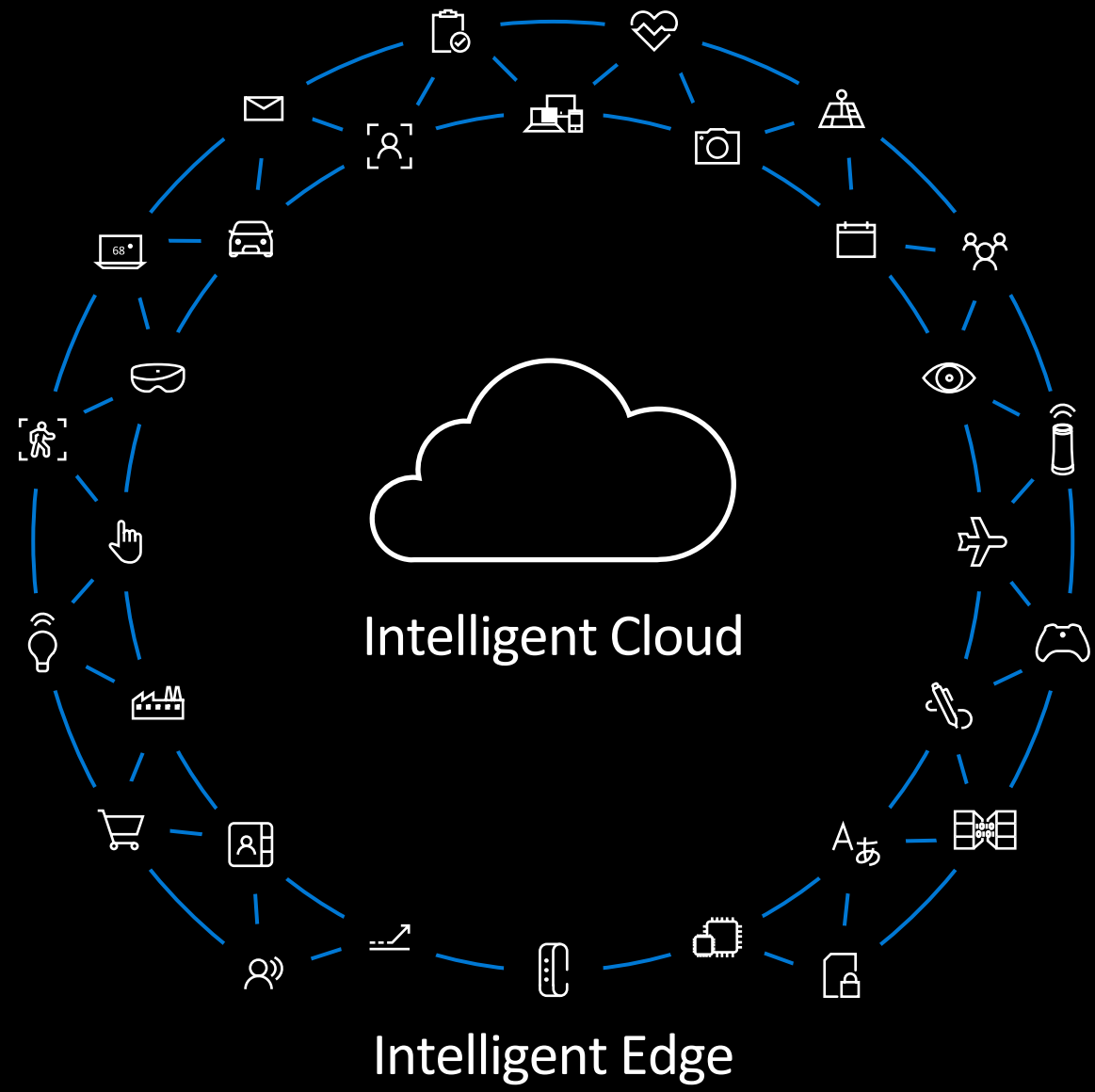
- **Challenges**

- Integrating teams and the supply-chain
- Building trust
- Culture change

- **Business/Technology Change**

- Common Data Environment (CDE)
- Common data formats
- New roles and processes
- Agile approach





A history of physical and digital interaction

R&D & ENGINEERING

MANUFACTURING OPERATIONS, SERVICES

NEW SERVICES DRIVEN BUSINESS MODELS

Information mirroring* model

- Powerful modeling and analysis
- R&D and engineering focus

1985-2002
(18 years)

Simulation and 3D printing

- Digital design, virtual assembly, and simulation
- 3D printing mainstream

2003-2014
(12 years)

Connected IoT services

- Unified physical and virtual data
- Rapid feedback across design, manufacturing, and operations

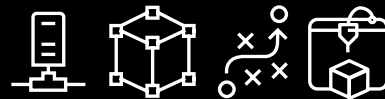
2015-2017
(3 years)

End-to-end innovation

- Humans and device collaboration
- Spatial awareness and intelligence
- Mixed Reality experience

2018 - ...
(the future is now)

Digital Twin evolution



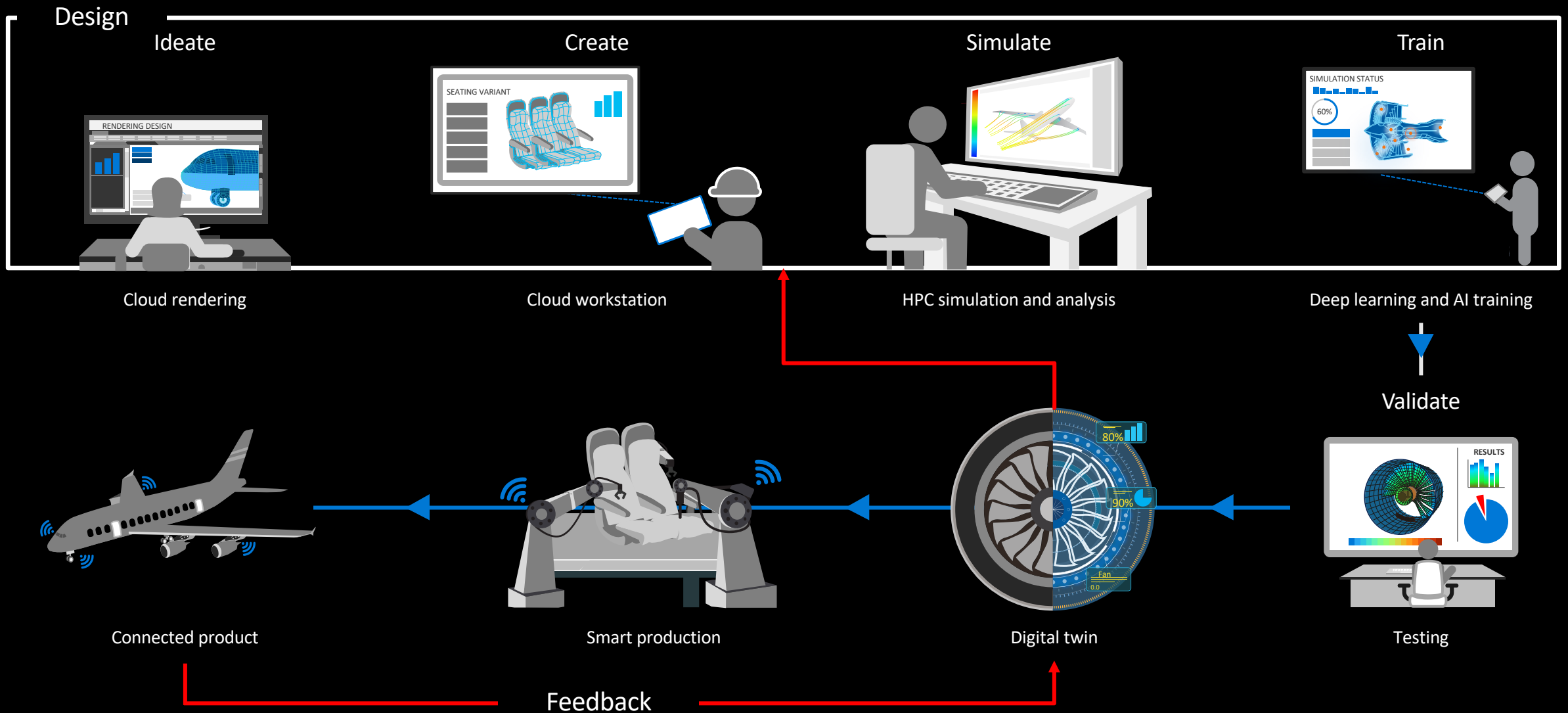
Remote Monitoring
Predictive Maintenance



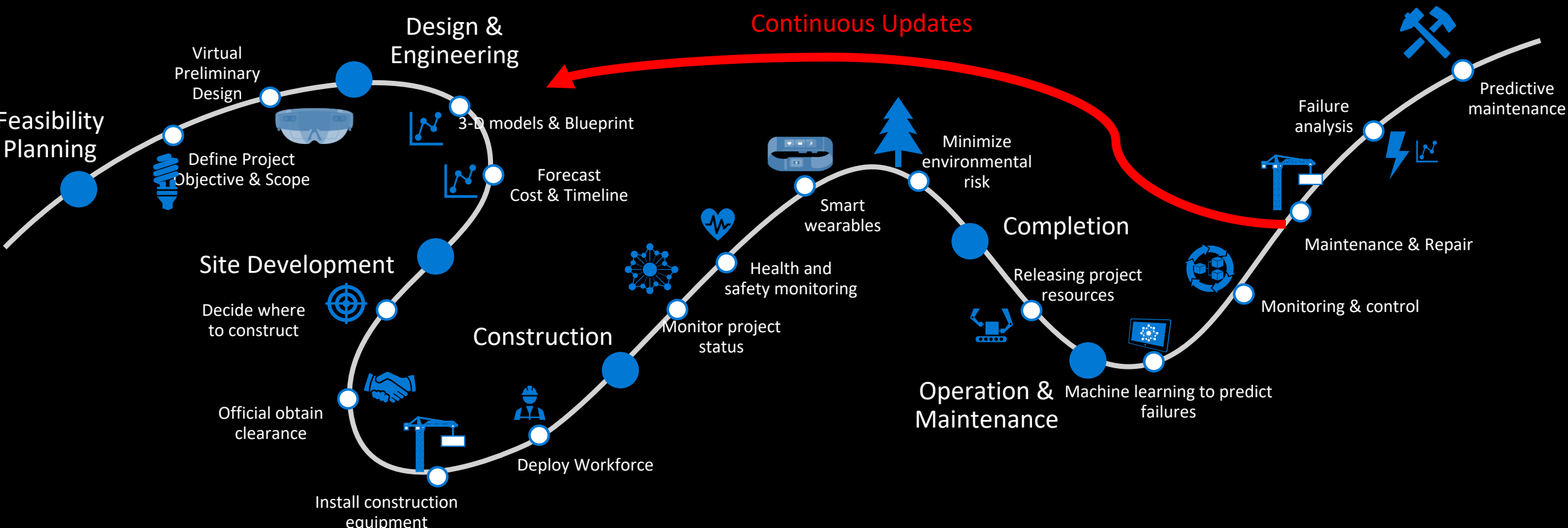
Enable any organization to create digital feedback loops for all aspects of their business

*Dr. Michael Grieves and John Vickers – University of Michigan

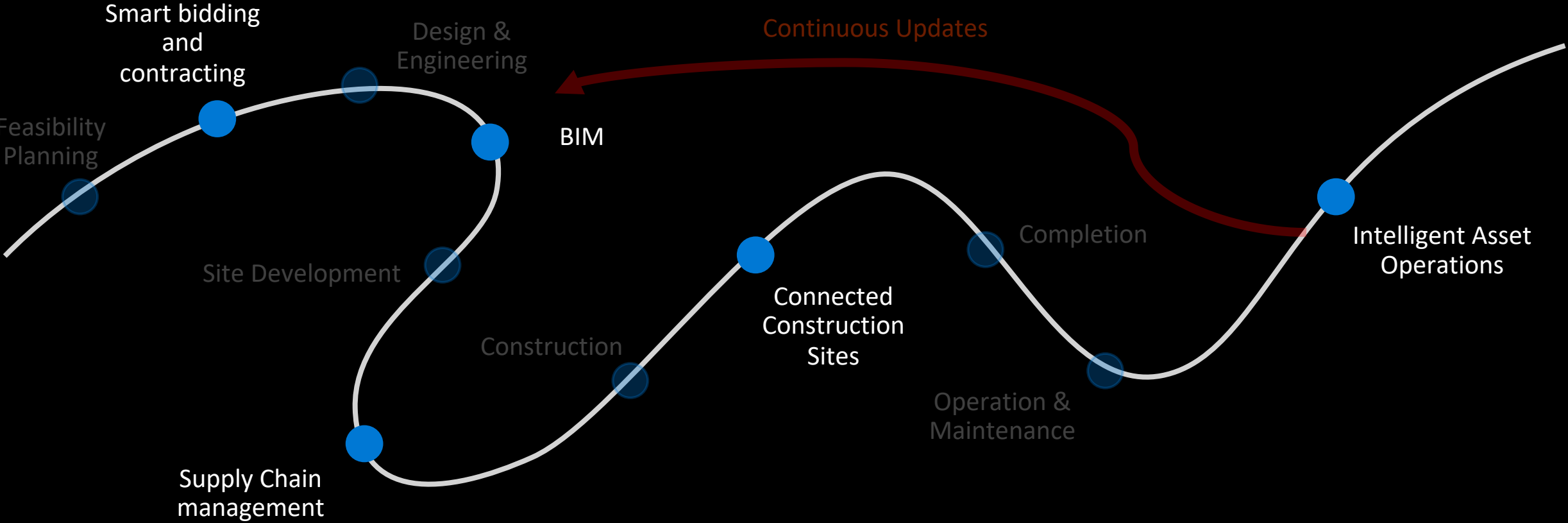
The digital twin pioneers - Aerospace



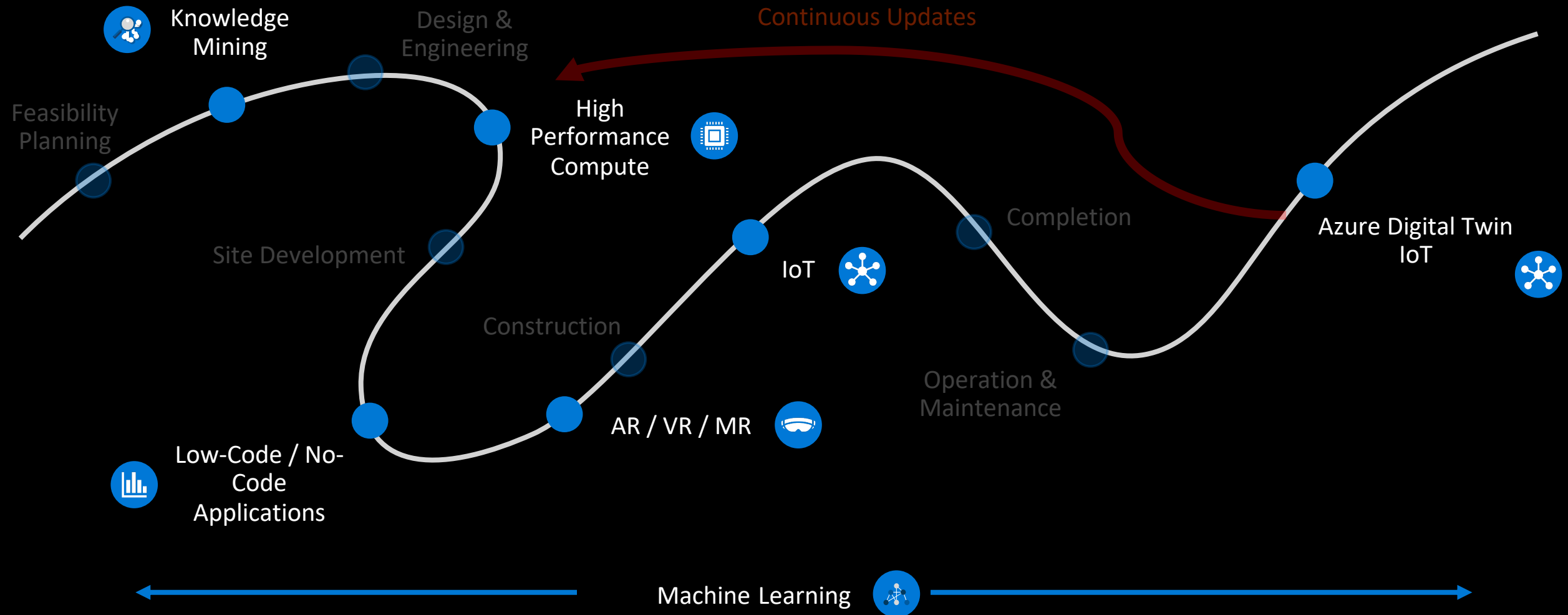
The end to end Built Environment digital twin



The technology enablers



The technology enablers



What is knowledge mining?



Your business data



Unlock valuable
information lying latent in
all your content

Knowledge mining with Azure Search

CONTENT

COGNITIVE SKILLS

SEARCHABLE INDEX



Key Phrase extraction



Organization entity extraction



Face detection



Custom skills



Location entity extraction



Persons entity extraction



Celebrity recognition



Landmark detection



Sentiment analysis



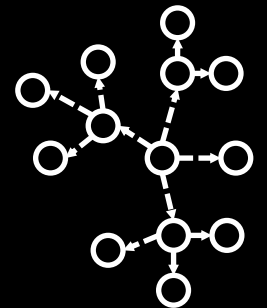
Language detection



Tag extraction



Printed text recognition



How knowledge mining works

Ingest

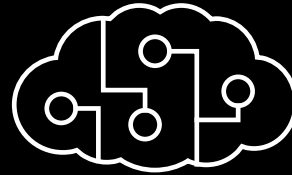
101010
010101
101010

Document cracking

Customer data

.pdf
.doc
.jpeg
...

Enrich



Extensible enriching pipeline

Pre-built enrichers

OCR
Sentiment analyzer
Caption
Key Phrase Extraction, People Names, Company Names, Computer Vision

Custom enrichers

Custom classification models,
Custom entity extraction

...

Explore



Indexing for search

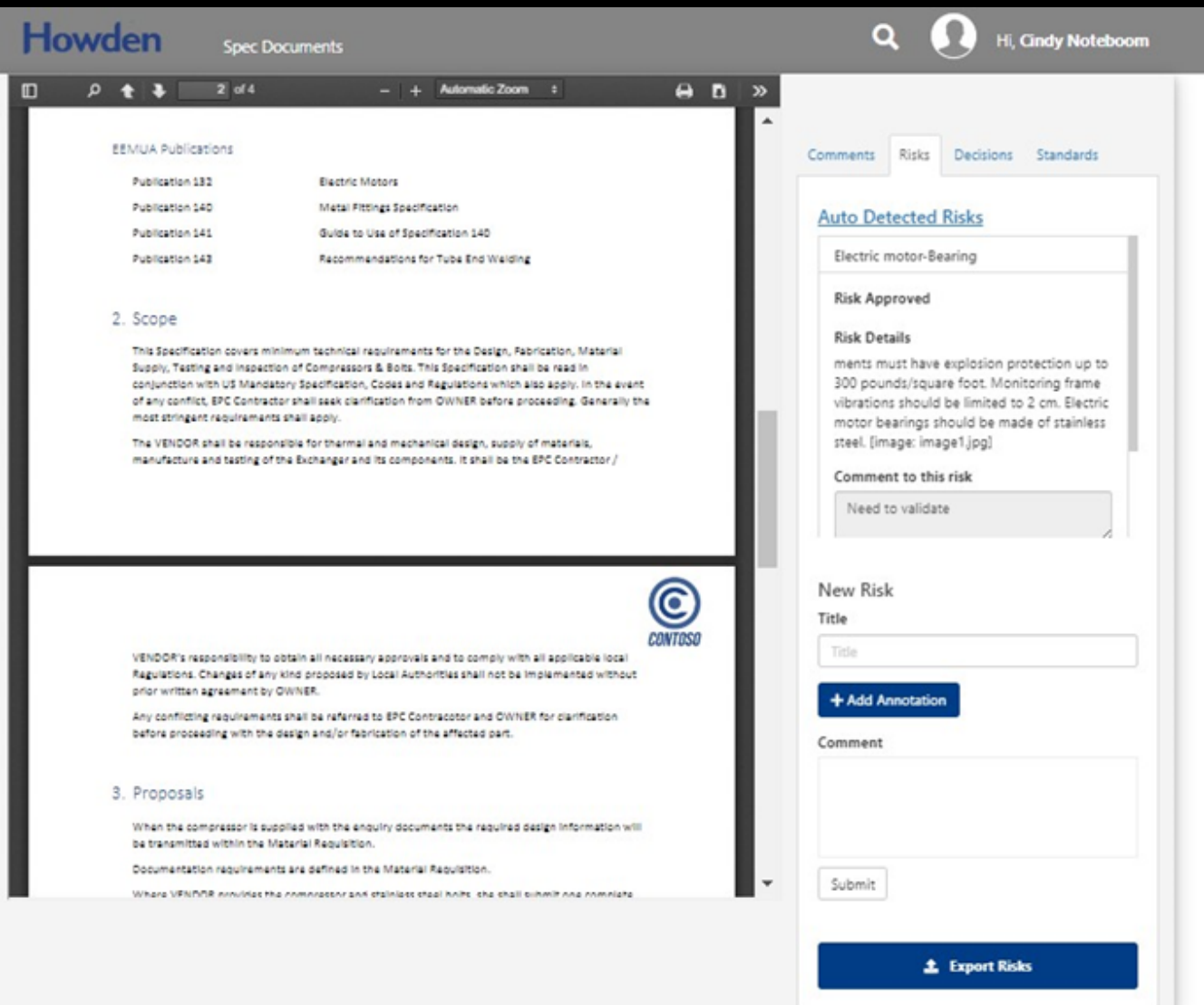
Annotation

Documents annotated before indexing

Search Index

Accurate indexing for easy retrieval

Knowledge mining – customer story



The screenshot displays the Howden Spec Documents application. The main window shows a document with sections for EEMUA Publications, 2. Scope, and 3. Proposals. The right sidebar is titled 'Auto Detected Risks' and contains a risk entry for 'Electric motor-Bearing'. The risk is marked as 'Risk Approved' and includes details about explosion protection and vibration limits. A comment 'Need to validate' is attached to the risk. Below the risk entry is a 'New Risk' form with fields for Title and Comment, and buttons for '+ Add Annotation', 'Submit', and 'Export Risks'.

Howden Spec Documents

Hi, Cindy Noteboom

EEMUA Publications

Publication 132	Electric Motors
Publication 140	Metal Fittings Specification
Publication 141	Guide to Use of Specification 140
Publication 143	Recommendations for Tube End Welding

2. Scope

This Specification covers minimum technical requirements for the Design, Fabrication, Material Supply, Testing and Inspection of Compressors & Bots. This Specification shall be read in conjunction with US Mandatory Specification, Codes and Regulations which also apply. In the event of any conflict, EPC Contractor shall seek clarification from OWNER before proceeding. Generally the most stringent requirements shall apply.

The VENDOR shall be responsible for thermal and mechanical design, supply of materials, manufacture and testing of the Exchanger and its components. It shall be the EPC Contractor /

VENDOR's responsibility to obtain all necessary approvals and to comply with all applicable local Regulations. Changes of any kind proposed by Local Authorities shall not be implemented without prior written agreement by OWNER.

Any conflicting requirements shall be referred to EPC Contractor and OWNER for clarification before proceeding with the design and/or fabrication of the affected part.

3. Proposals

When the compressor is supplied with the enquiry documents the required design information will be transmitted within the Material Requisition.

Documentation requirements are defined in the Material Requisition.

Where VENDOR provides the information and stainless steel parts, the shall submit and complete

Comments Risks Decisions Standards

Auto Detected Risks

Electric motor-Bearing

Risk Approved

Risk Details

ments must have explosion protection up to 300 pounds/square foot. Monitoring frame vibrations should be limited to 2 cm. Electric motor bearings should be made of stainless steel. [image: image1.jpg]

Comment to this risk

Need to validate

New Risk

Title

Title

+ Add Annotation

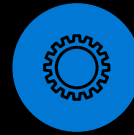
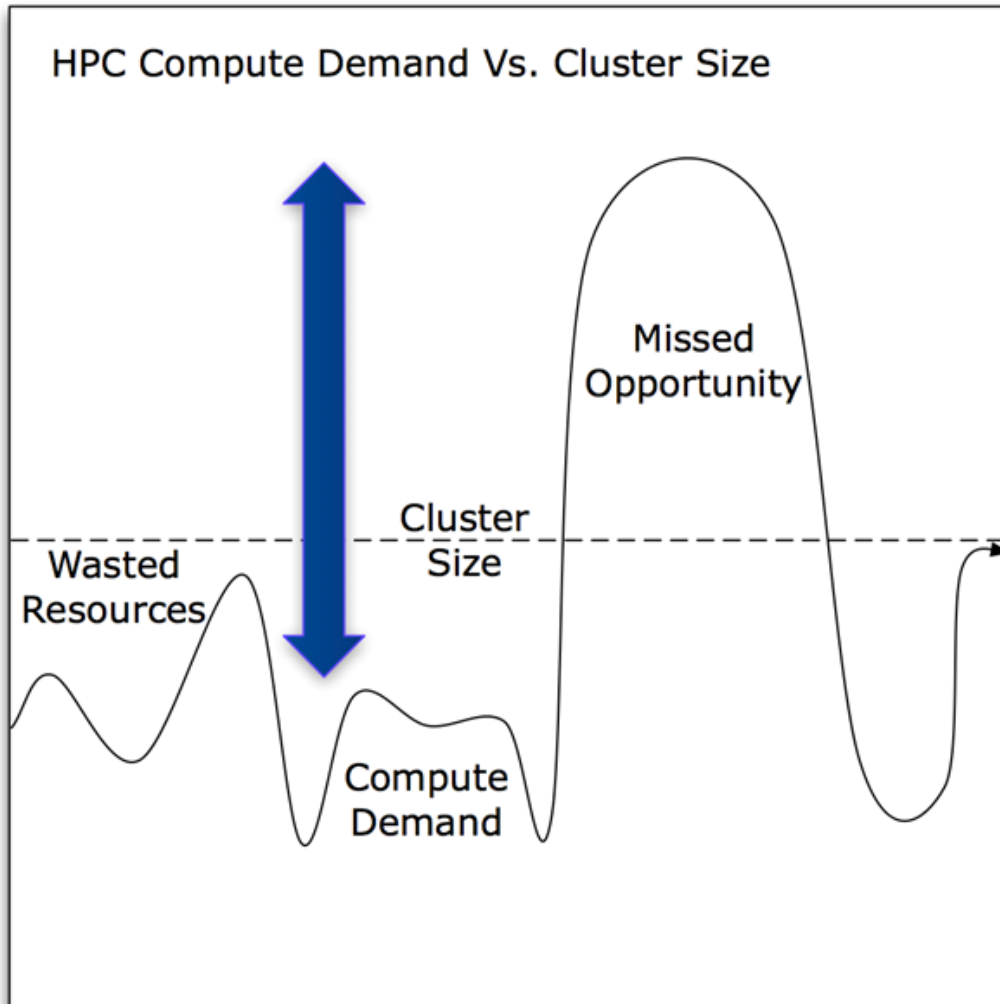
Comment

Submit

Export Risks

- Howden, a global engineering company, focuses on providing quality solutions for air and gas handling, from mine ventilation and waste water treatment to heating and cooling.
- Every new project requires the creation of a bid proposal, typically of thousands of pages in PDF format to be scoured to identify key areas of design and specialized components in order to produce accurate bids.
- If they miss key or critical details, they can bid too low and lose money, or bid too high and lose the customer opportunity.

HPC simulations and design cycle times



Inflexible Software Contracts

Not enough licenses for scaling simulation



Fixed Resources

Competition for resources causes delays



Storage Management

Result files are too large to move around



Orchestration Obstacles

Managing simulation work is complex



Geographical Disparity

Globally dispersed engineering teams

A comprehensive HPC strategy on Azure

On-demand

Access on-demand compute resources that enable you to run large parallel and batch compute jobs in the cloud, right when you need to



Native Linux & Windows support

Extensible

Extend on-premises HPC cluster to the cloud when you need more capacity, or choose to run simulations entirely in the cloud



RDMA support



VPN & Express Route (MPLS) networking

Scalable

Scale up and down easily, and take advantage of advanced networking features such as RDMA to run true HPC applications using MPI



Broad partner ecosystem

Azure HPC Attributes

Azure HPC specialized infrastructure



Entry Level VMs
Dev/Test
Workloads



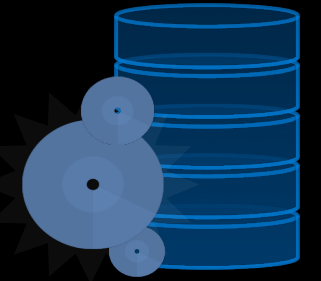
General Purpose VMs
Common Applications,
Web servers etc



Compute Optimized VMs
Gaming, Analytics



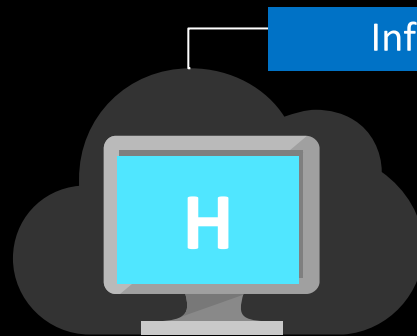
Large Memory VMs
Large Databases



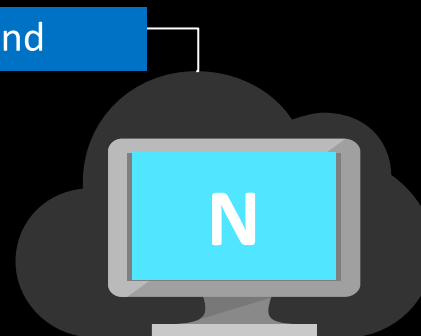
>80,000 IOPs
Premium Storage
Low latency, high
throughput apps



Storage optimized VMs
No SQL Databases
(Cassandra, MongoDB),
Data warehousing



High Performance VMs
Batch processing, fluid
dynamics, monte
carlo simulation



GPU-enabled VMs
NV -Graphic based applications
NC – Advanced Simulation
ND – AI



FPGA*
Virtual Machines – HPC
FPGA Microservices –
AI/Edge



Cray Services in Azure
IB Connected
CPU/GPU/Storage
available in cloud

Challenges in transforming your business processes



Budget
constraints



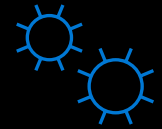
Time & Resource
constraints



Business
expectations



Paper
processes



Complex
processes



IT/Business
partnership



Legacy system
maintenance



“Shadow IT”
governance

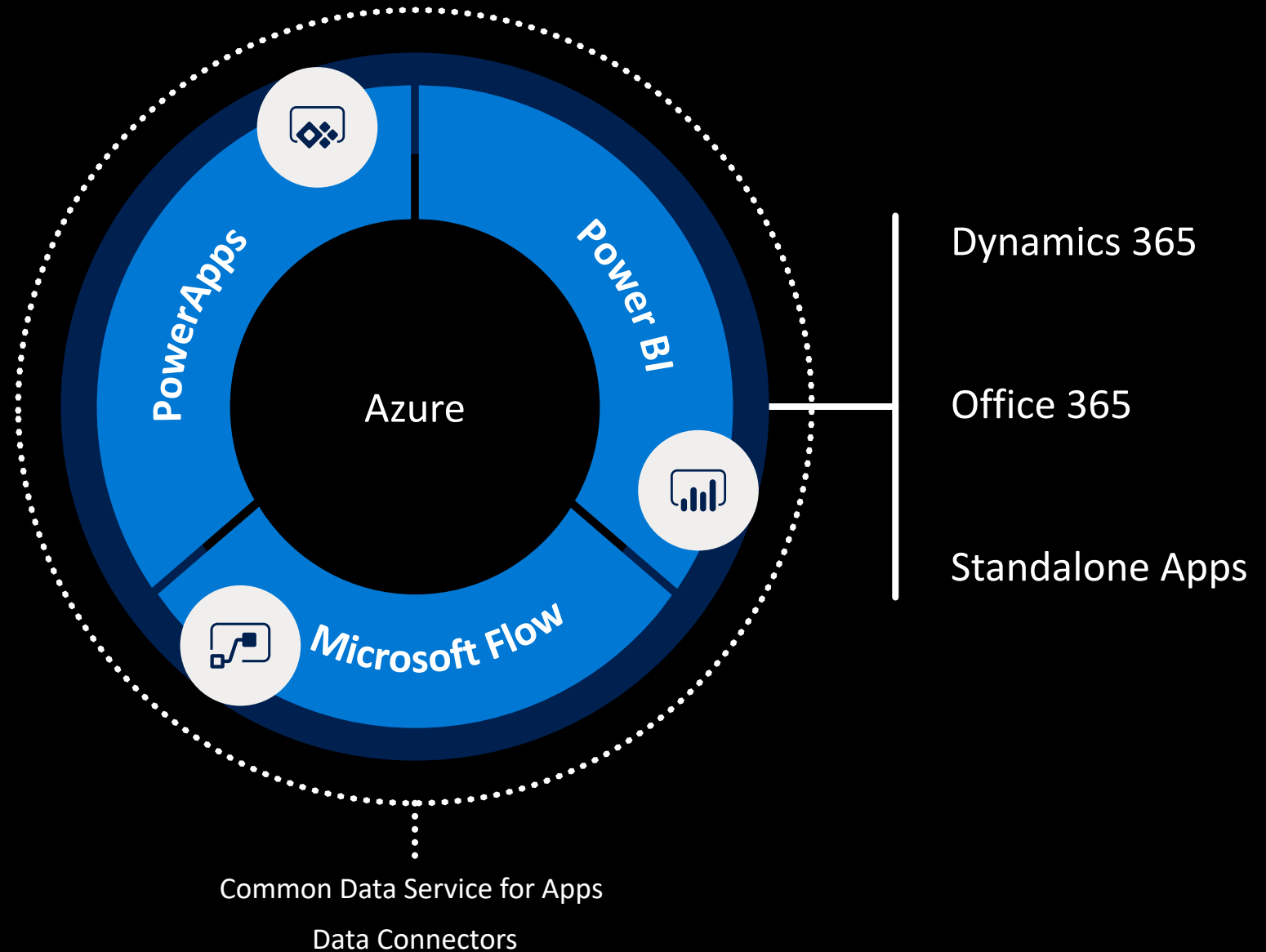


Leverage existing
technology



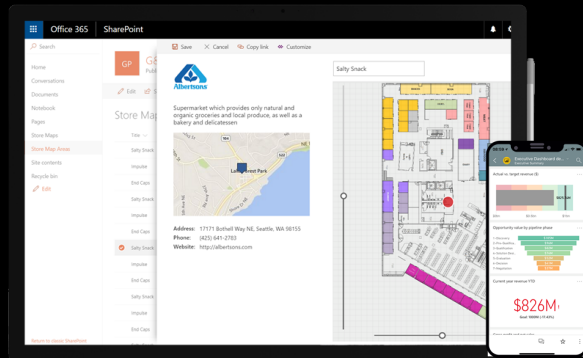
Security &
Compliance

Microsoft Power Platform

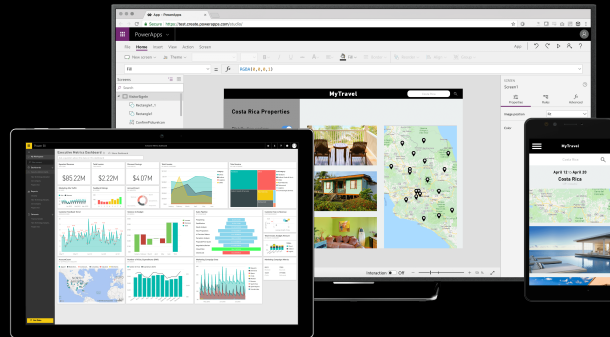


Low-code / No-code app dev experiences

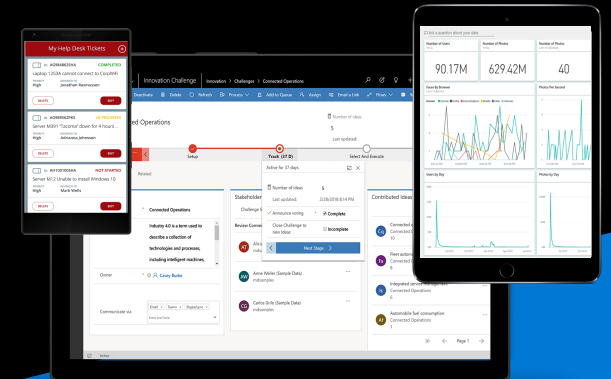
Tailor out-of-the-box solutions, embedded forms and dashboards




Highly customized task- and role-based apps



Immersive, end-to-end solutions



SOPHISTICATION

A man in a dark suit, white shirt, and dark tie is walking through a crowded public space, possibly a transit station or a busy street. He is holding a mobile phone to his ear with his right hand. He has a lanyard with an ID badge around his neck. In the background, there are many other people, some blurred, and bright lights, suggesting an indoor or well-lit outdoor environment. A woman with a white cap and a backpack is walking away from the camera in the foreground to the right.

and saved around 288 hours
of manual input data.



Microsoft

