



Welcome to Asset Management & the HS2 Digital Twin - Making it Real

We will be starting shortly

HS2

Asset Management & the HS2 Digital Twin - Making it Real

July 13th, 2022

Meet the speakers for today's session!



Christian Bétheuil

Head of Digital Engineering



David White

Head of Asset Management and
Strategic Planning

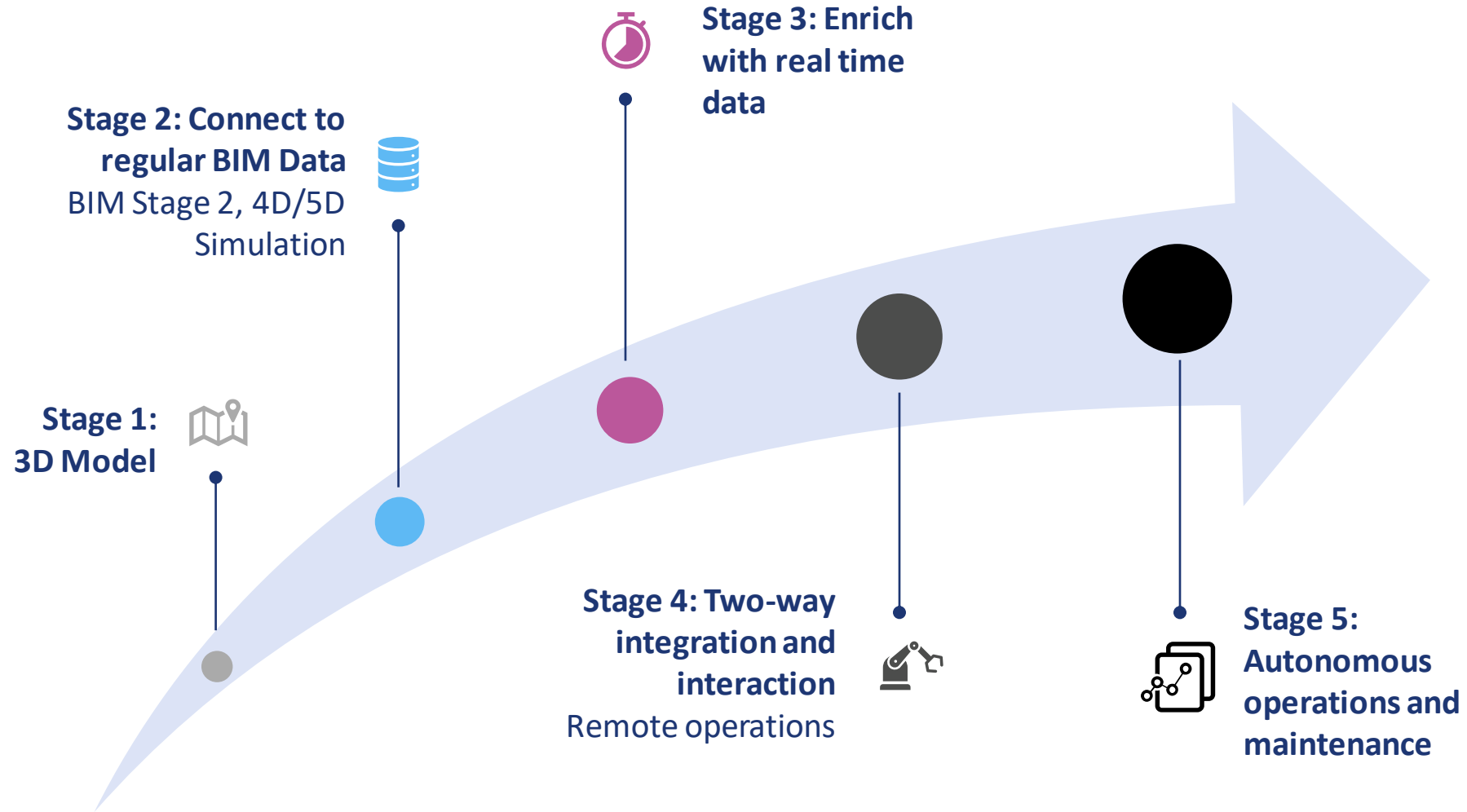
Agenda

Asset Management & the
HS2 Digital Twin
Making it Real

BIM 4 Rail

- 1 Introduction
- 2 HS2 Digital Twin Vision
- 3 Delivering on Our Vision
- 4 What's Next?
- 5 Q&A

BIM is a key part of the Digital Twin journey



“

A digital twin is a virtual representation of a physical thing or process. Digital twins can virtually model, visualise, and predict to help optimise the products we create and how we make, deliver and service them.

What is a Digital Twin?

Rolls-Royce: An Aviation Digital Twin



WHAT?

A **precise virtual copy** of a Rolls-Royce aeroplane **engine**

HOW?

On-board sensors monitor product environment and operating conditions

Satellite connectivity relays data back to digital twin in real-time

Virtual asset operation in as the physical engine would 'on-wing'

WHY?

Enhance reliability via informed preventative maintenance

Improve design by studying engine behaviour in extreme conditions

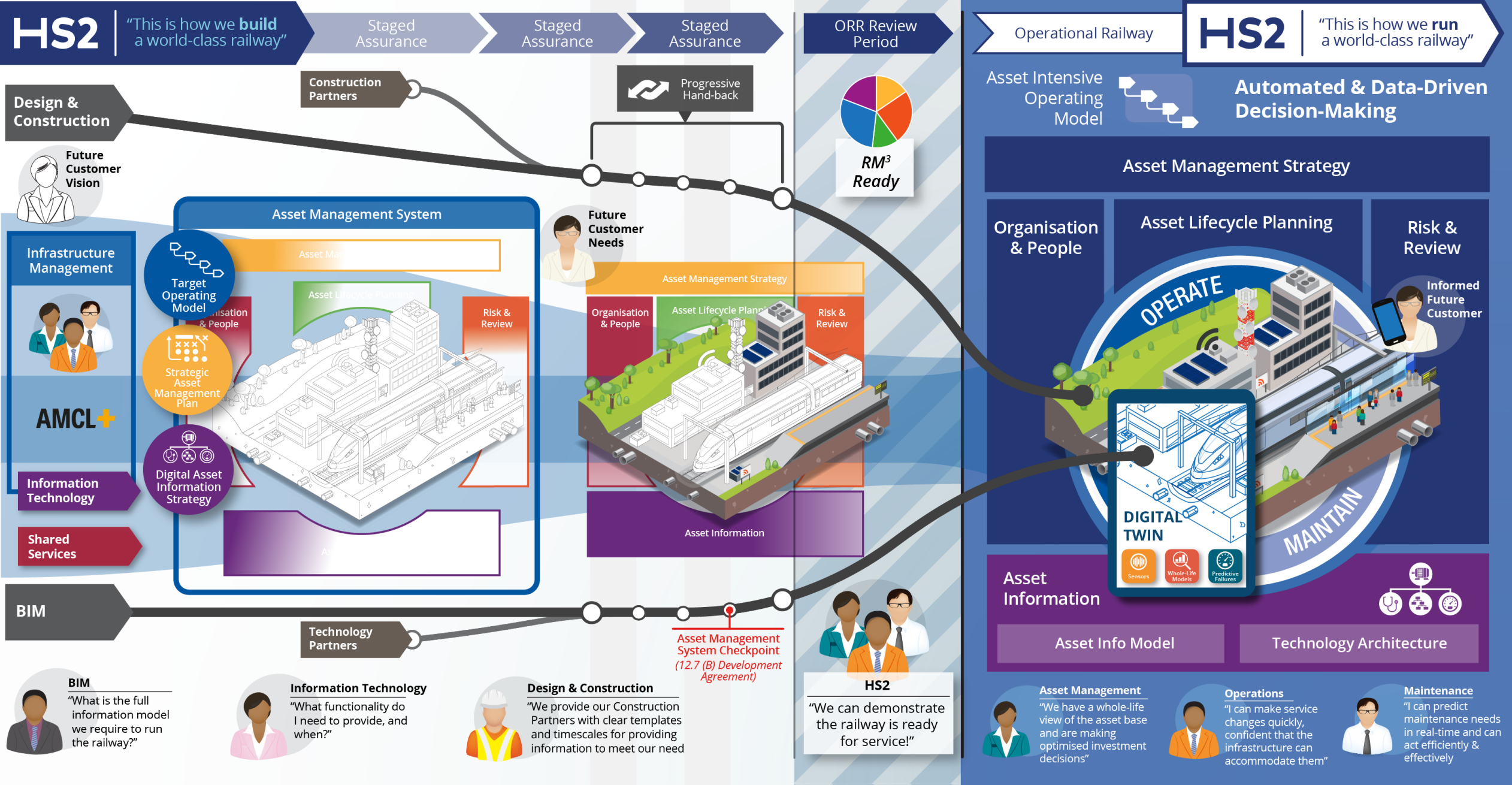
Optimise operations through real-time engine adjustment



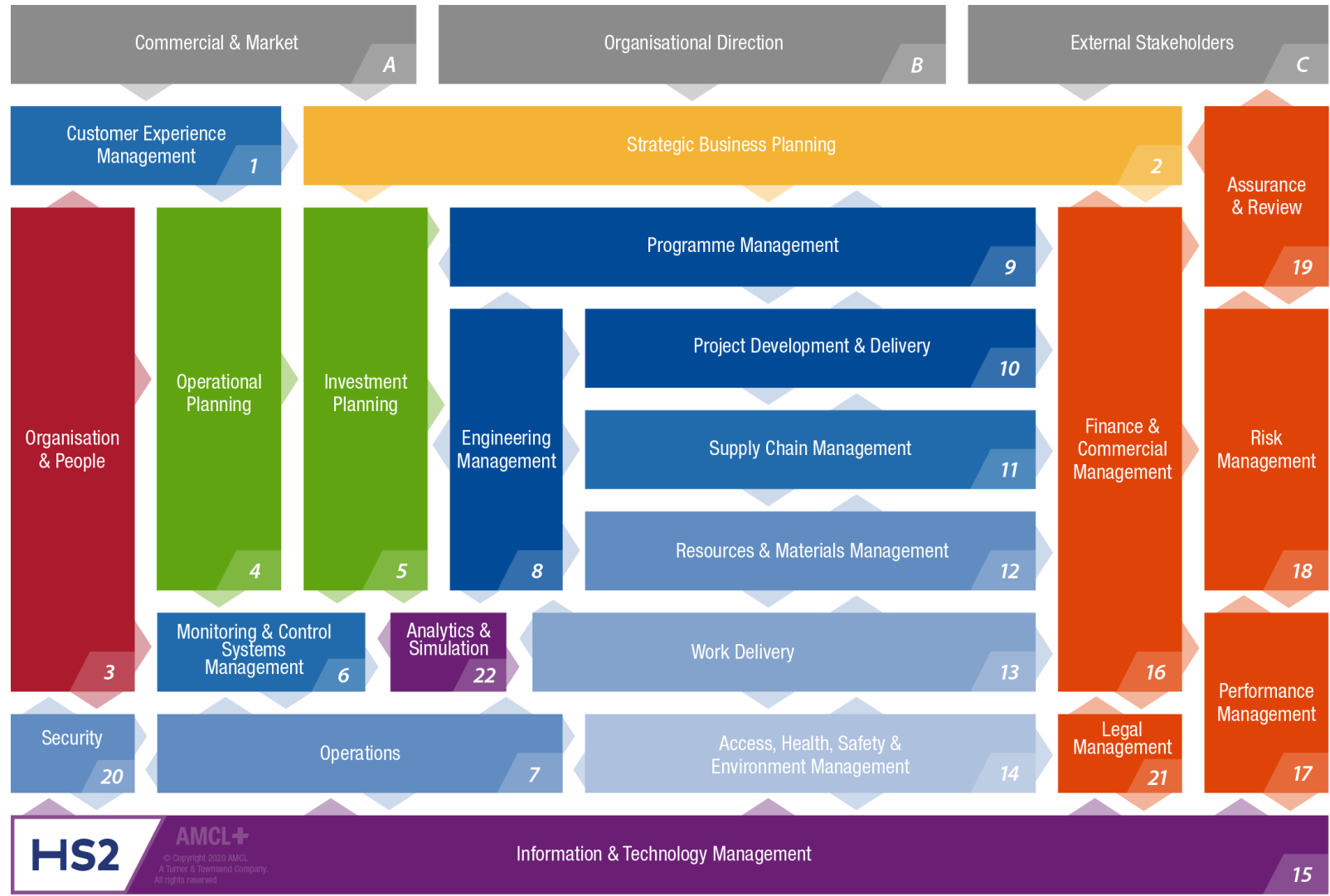
Develop a **Virtual Railway** during **Design** and **Construction**, with a view to hand over a **Digital Twin** of the built asset to **Asset Management**

It is our ambition to be running the railway virtually at least two years before we do physically.

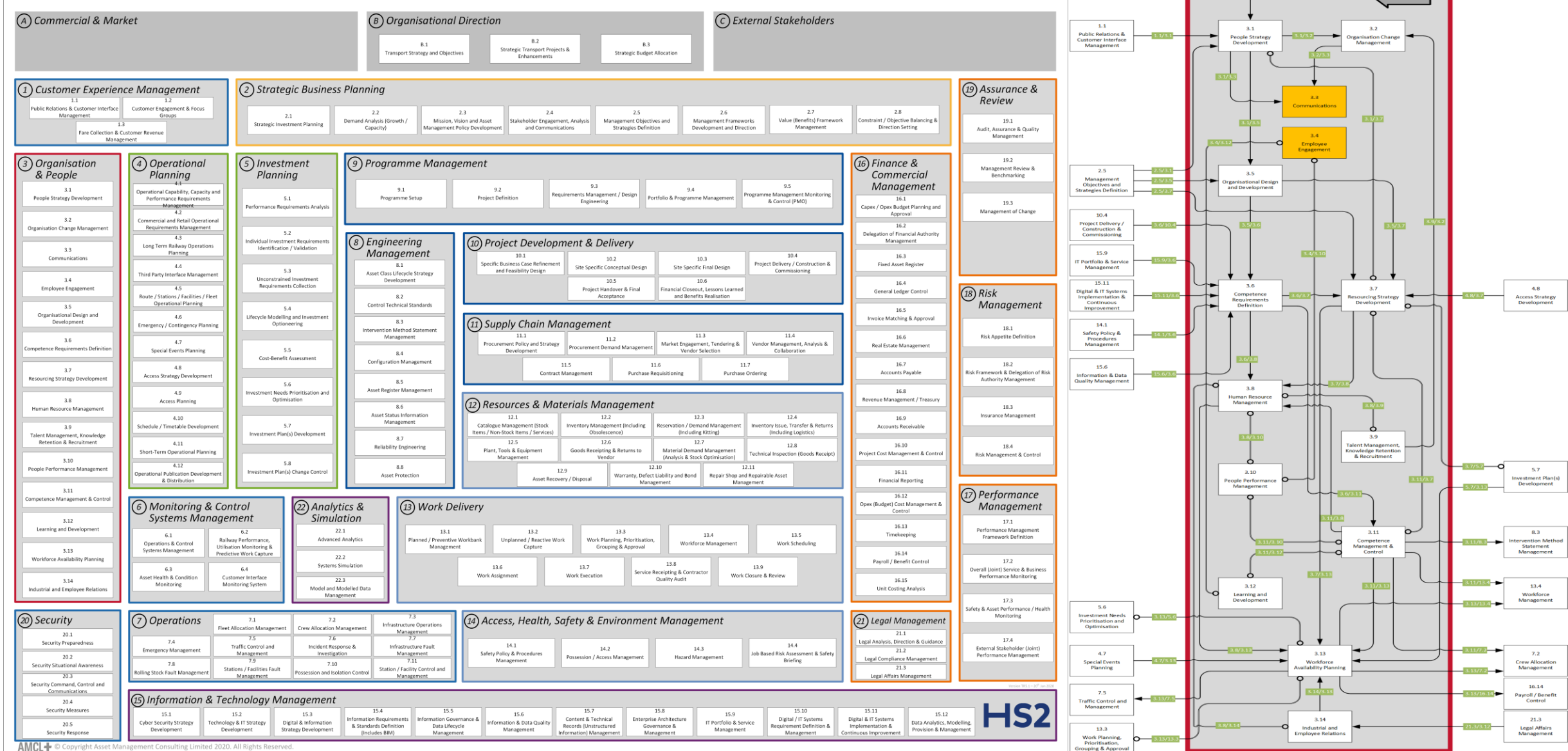
Development of the Asset Management System and Digital Tools for the Asset Lifecycle

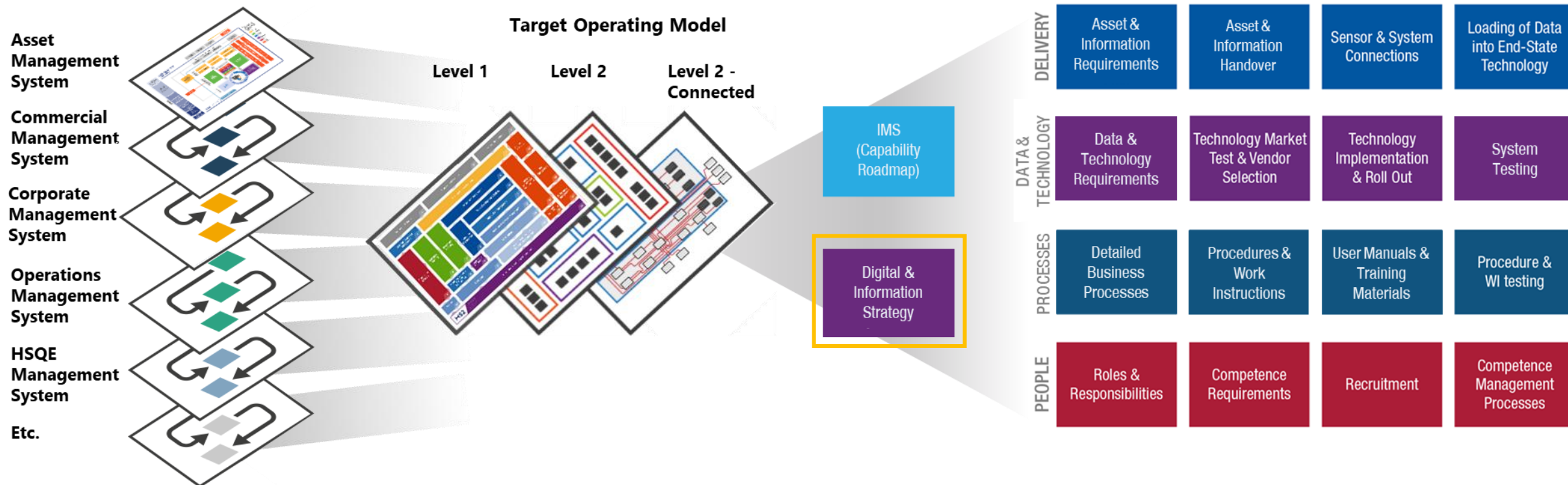


IM Target Operating Model (Level 1)



IM Target Operating Model (L2)





Management Systems

- An Asset Management System ensures vertical alignment through the end-state business

Target Operating Model

- The capabilities, interfaces, document hierarchy, and organisational design for end state operations

Roadmaps

- Roadmap to deliver business capabilities
- Roadmap to deliver the information needs

Processes & Requirements

- Delivery and handover of assets and information
- Development of People, Processes and Technology

HS2 taking steps to “be digital”

HS2

Asset Management | Innovative Approach

HS2 will be a world class 21st century railway service that embraces digital technologies. Creating a digitally enabled railway will help make HS2 one of the most reliable railways in the world.



Mark Thurston using Augmented Reality at Old Oak Common



HS2's end state vision for digital asset information

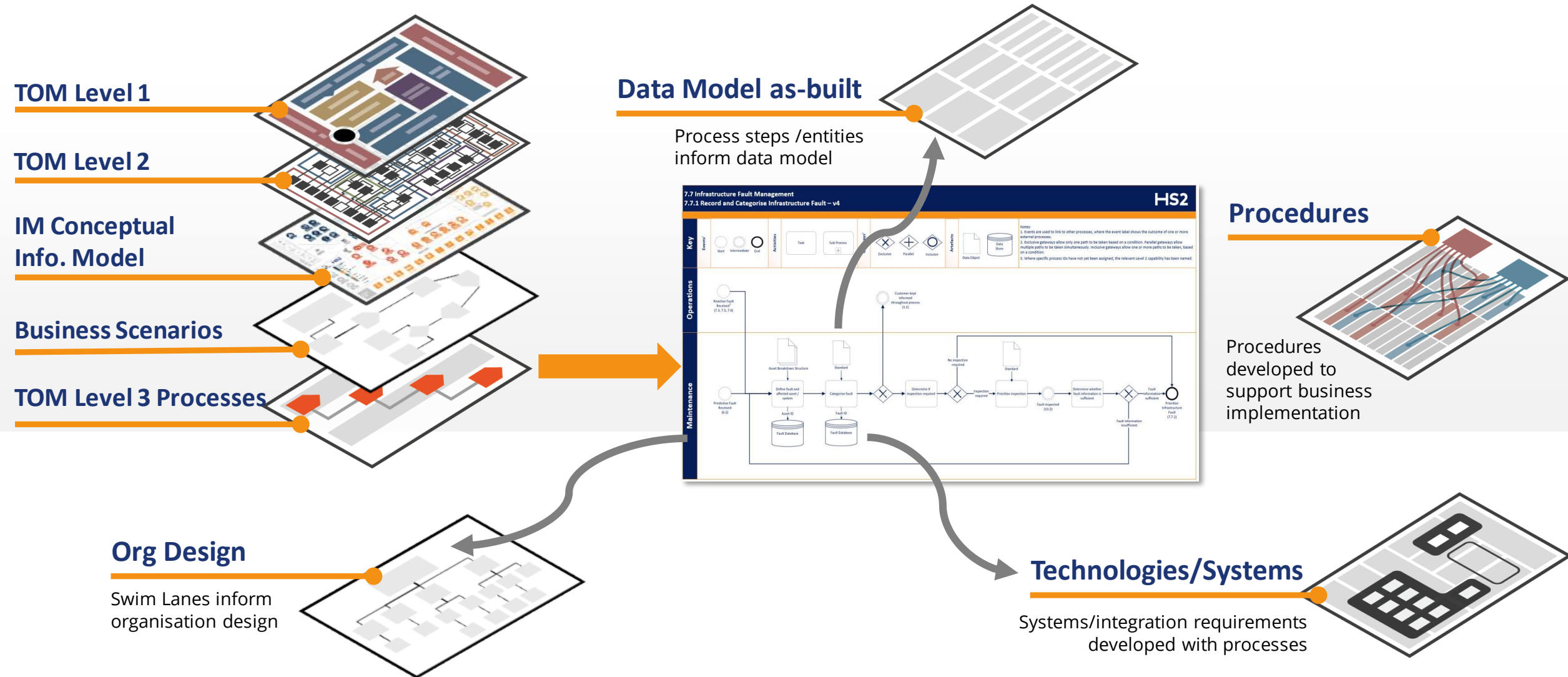
“As we are delivering the largest capital project in Europe, we have a responsibility to lead transformation in our industry and ensure that we use the very best approaches.”

Emma Head
Technical Services Delivery Director, HS2

“We will be a digitally enabled organisation with information at the core of our business, enabling quick, robust, and correct decision making.”

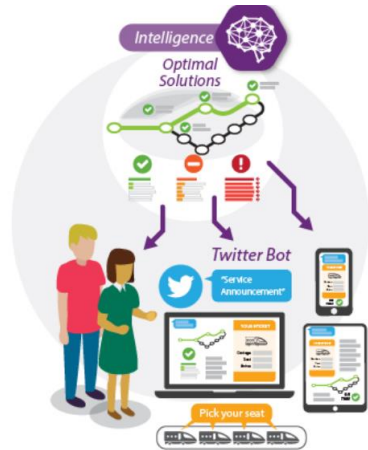
Ben Rule
Infrastructure Management Director, HS2

Asset Management Target Operating Model



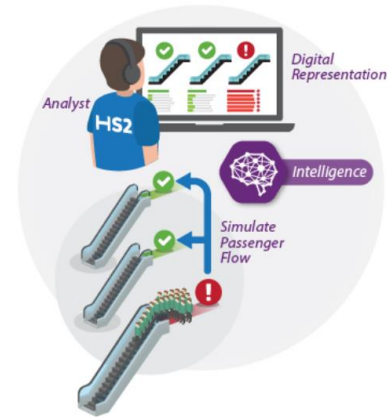
Asset Information Capability Updates | AI Systems

To develop requirements for the End State Infrastructure Management, and to support the development of the Digital Twin HS2 have created high-level use cases aligned to the Target Operating Model and HS2's Strategic Goals.



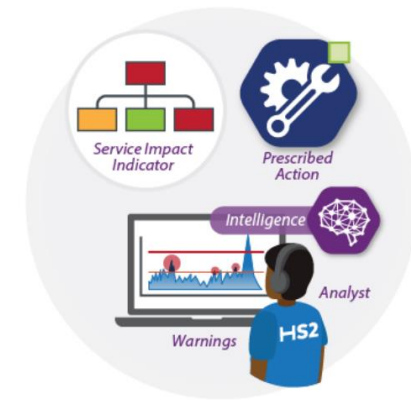
Customer Advisory

The provision of digital customer services and experience to ensure the customer is informed and to support their journey planning



Operational Response

The ability to operate the railway to meet customer demand and the timetable, and the ability for an agile response in partnership with other departments to operational demands and challenges

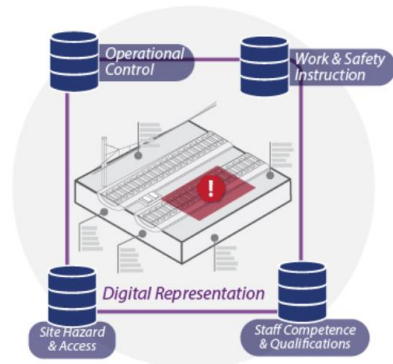


Predict / Prevent Service Disruption

The ability to predict impending asset or service failure and respond effectively.

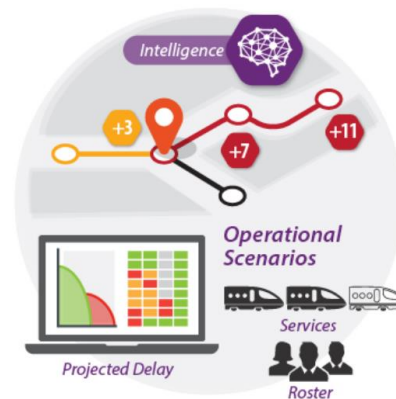
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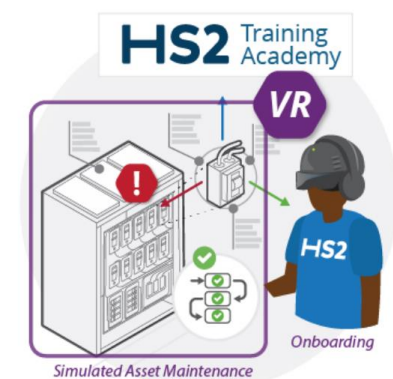
Customer & Worker Safety

The provision of technology and monitoring to ensure staff working on the operational railway have inherent safety assured.



Operations Planning & Simulation

The ability to optimise the planning of operations, customer service and retail using simulation, historical network/facility performance.



Digital Staff Enablement

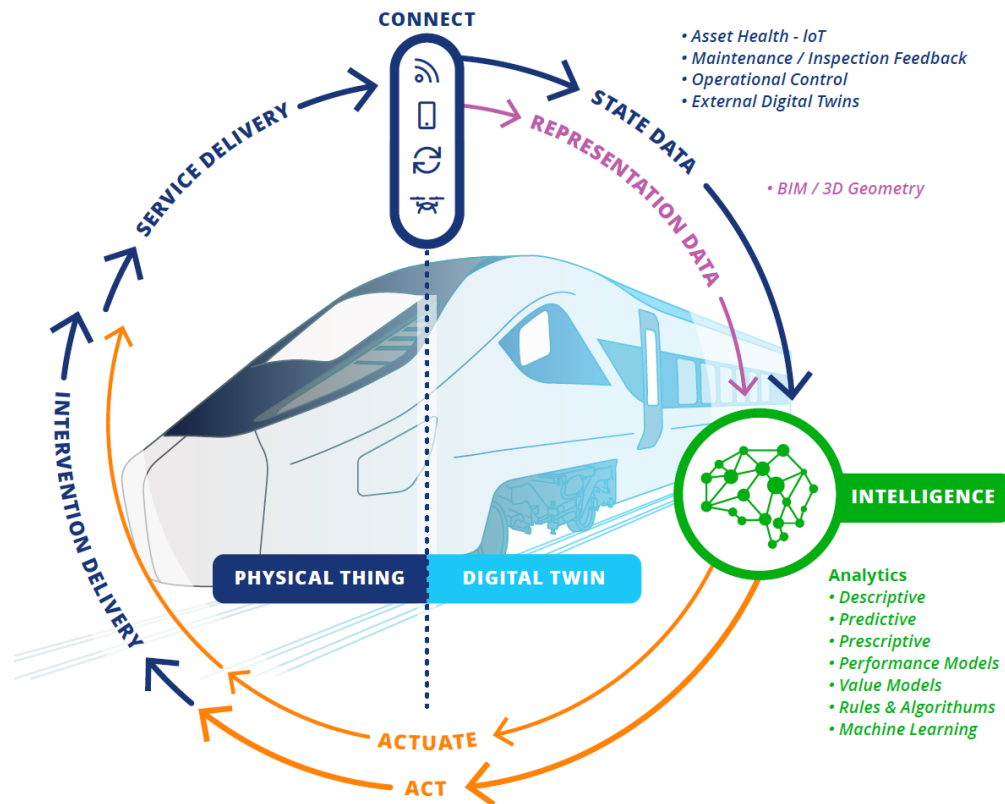
The provision of virtual and augmented reality and visualisation of the railway assets and assets systems to support onboarding of staff and the sharing of knowledge.

HS2 Digital Twin Vision

Christian Bétheuil | Head of Digital Engineering



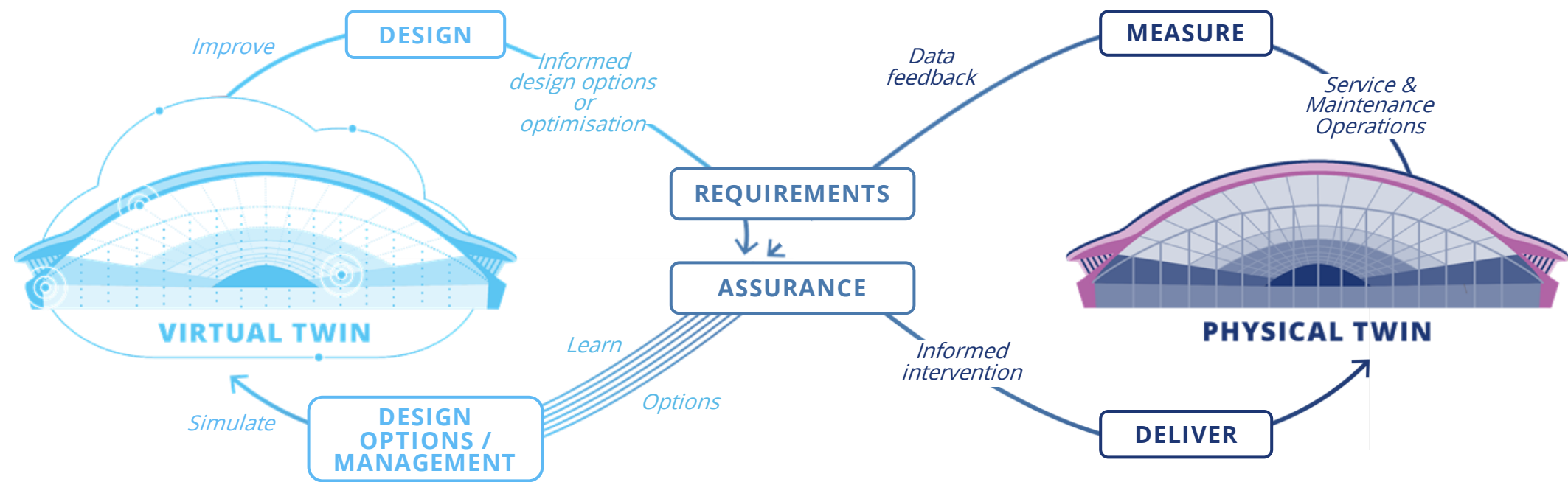
Asset Information Overview | Digital Twin



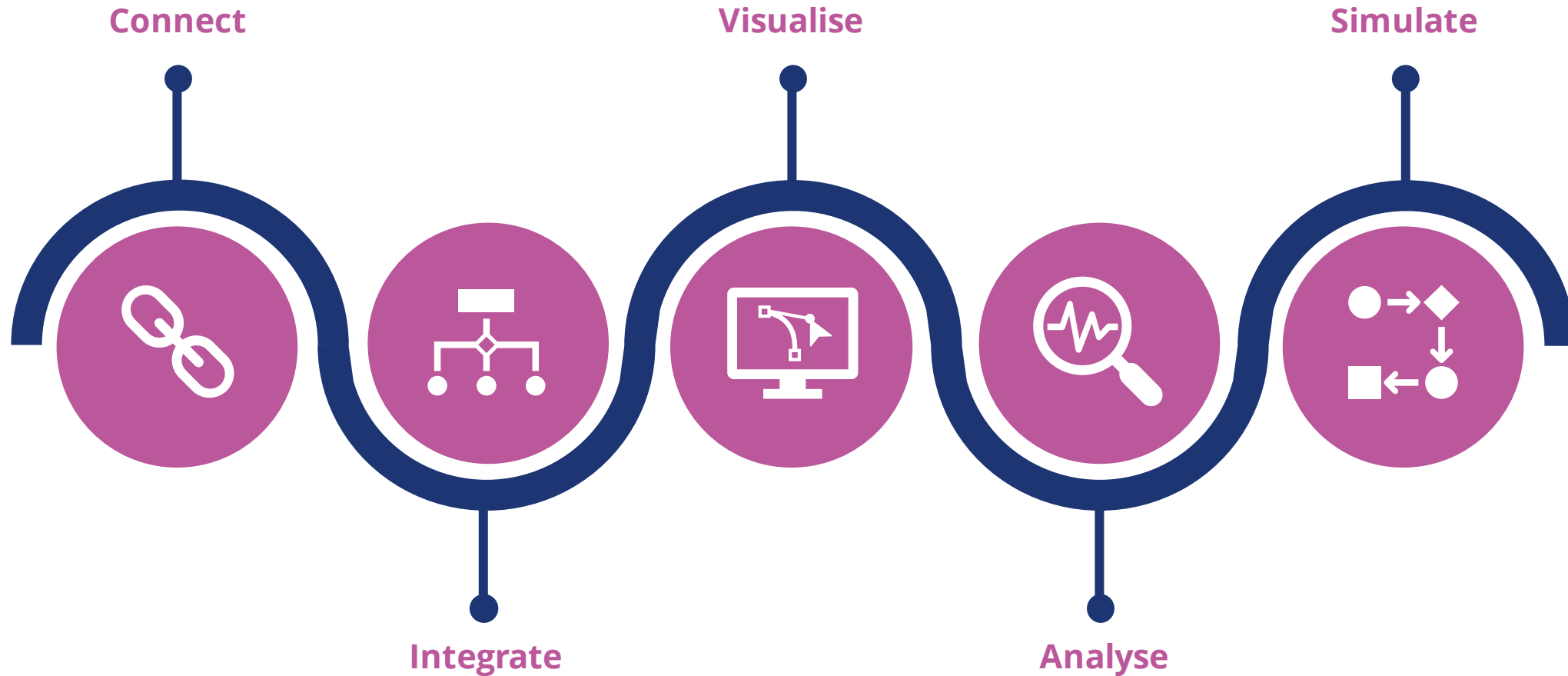
- A digital twin is a realistic digital version of a physical asset or network
- The HS2 Digital Twin will be able to mimic, simulate, and predict how HS2's assets and network will perform in real life
- The Digital Twin will provide a cross-business data integrity and integration capability
- This high quality integrated data will provide the basis for the Digital Twin and its powerful analytic, presentation, and visualisation capability

A representation of how the Digital Twin leads and informs the delivery and operation of the physical twin.

How does a Digital Twin work?



What are the capabilities of the HS2 Digital Twin?





ASSETS



WELL VIEW



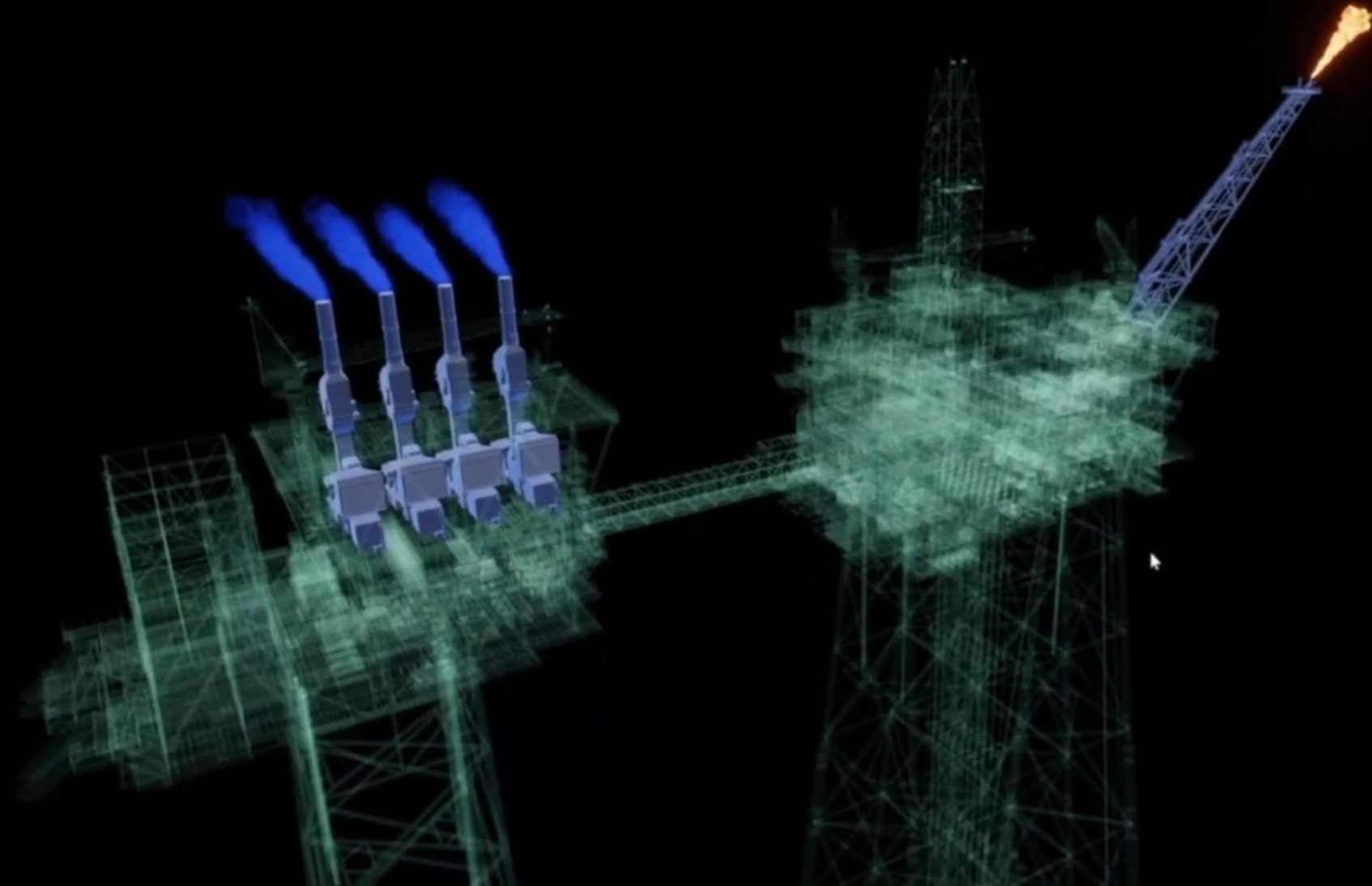
SLIP & CUT



LIVE



REPORTS



What has happened so far?



Vis Hub Developed

Creation of a cloud-based platform to integrate and visualise programme wide data

“The virtual railway exists to deliver the Vis Hub, support the consuming data from eB, GIS, and the Digital Twin.”

HS2 Visualisation Hub

The Digital Twin
A Vision for HS2

accenture

Unreviewed List (~120)
“Long” List (~100)
“Medium” List (~20)
“Short” List (12)
Priority use cases selected (3)
Approved Use Cases

Immersive & Pervasive
Easy, inclusive & intuitive

The Digital Twin: A Vision for HS2 | 2021

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The screenshot displays the HS2 Visualisation Hub interface. It includes a top navigation bar with the HS2 logo and 'Visualisation Hub' text. Below this is a 'Links' section with icons for Virtual Reality, Assets, Incidents, Virtual Construction Operations Room, Cost, and Schedule. A search bar is present with 'Advanced Search' and 'Search Tips' options. The 'My Recent Spaces' section lists various project locations and identifiers, such as 'HS2-000021GKY - High Speed Two Ltd (Programme)' and 'HS2-00001246 - Duddleston Junction Viaduct'. The interface also features a map at the bottom right and a list of use cases on the right side, categorized by review status and priority.

What is our Vision?

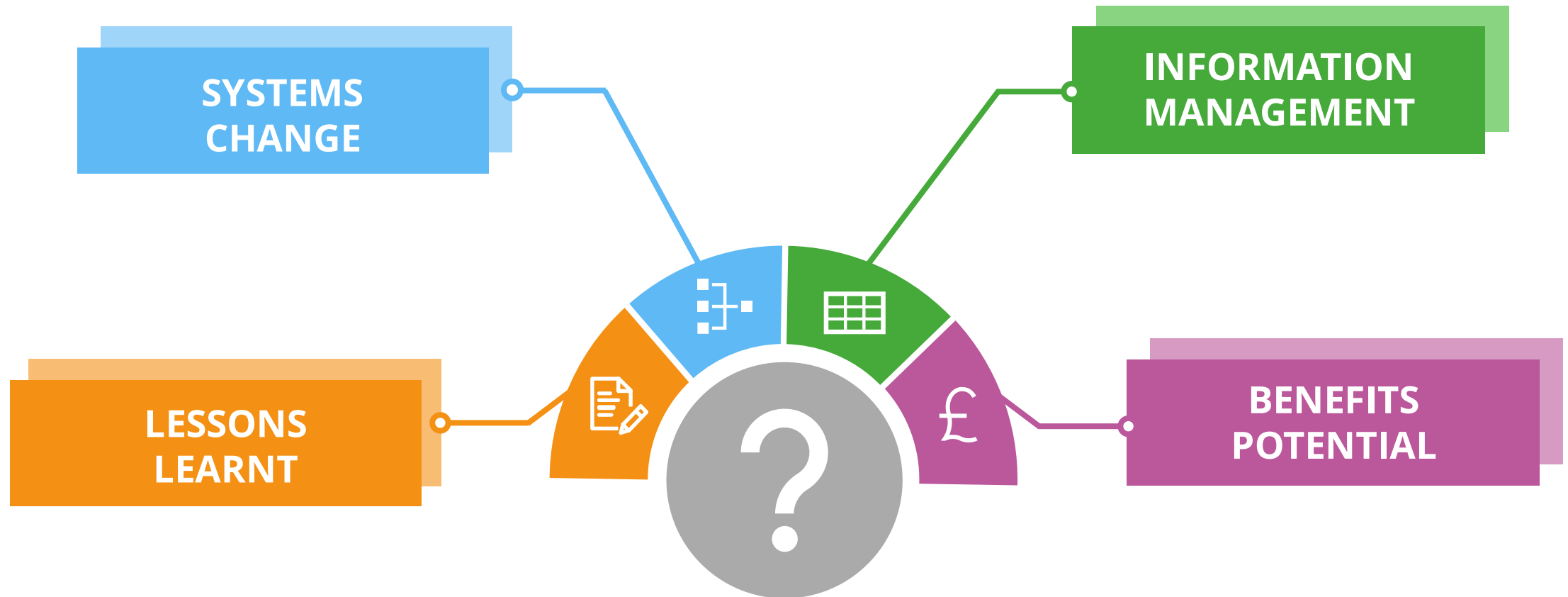
It is our ambition to be running the HS2 railway and any critical processes virtually at least two years before we do so physically

– HS2 Digital Twin Vision

The HS2 Digital Twin will create a complete digital copy of the entire network that will allow us to:

- 1 Model & Simulate** scenarios throughout the project lifecycle
- 2 View** our assets, network and related information in a virtual digital environment
- 3 Process** large datasets to uncover insight and drive intelligent decision making

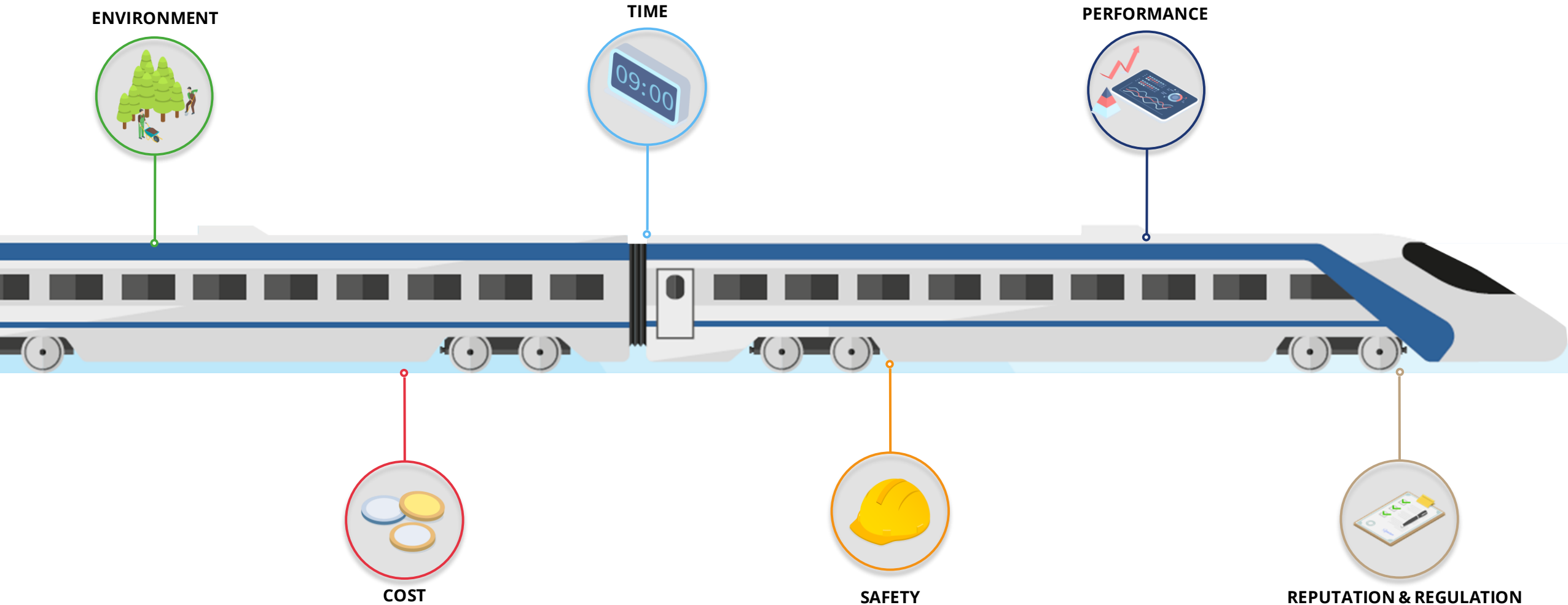
Why do we need a Digital Twin?



What are some of the objectives of the HS2 Digital Twin?



What are the benefits of developing a Digital Twin?





Available Infrastructure

Aware & Alert assets proactively managing a high-quality service

- Self-healing
- Sensing
- Predictive
- Resilient
- Robotics
- Preventative
- Wireless signals

Operational Response & Disaster Recovery

- Incident planning
- Response management
- Whole life decision support
- Scenario analysis
- Cyber security
- Optimised strategy, finance & investment planning

Autonomous maintenance and repair

- Automated service requests
- IoT monitoring
- Digital inspection and interpretation
- Optimised works delivery
- Engineering advisory & reliability action

Safety

- Passengers
- Maintenance crews
- Operating staff
- Members of public

Owners & Operators

Open, transparent relations with operators and staff

- Train Operating Company (West Coast Partnership Ltd)
- Unions
- Shareholders
- Multi-mode
- Digital staff enablement

Stakeholders

Keeping our people and stakeholders connected and safe

- HS2 (High Speed 2)
- DfT (Department for Transport)
- ORR (Office of Rail & Road)
- TfL (Transport for London)
- HMT (HM Treasury)
- LEP (Local Enterprise Partnerships)
- RAIB (Rail Accident Investigation Branch)
- RSSB (Rail Safety and Standards Board)
- Local Government (particularly Mayors of London, Birmingham, Manchester, Leeds, and Sheffield)

HS2 DIGITAL TWIN

Rolling Stock

- Aware
- Experience
- Attractive
- Predictive
- Secure

Manufacturing

- Rolling stock
- Signals
- DfMA civil assets

Delivery Supply Chain

Contractors & Utilities providing high-quality, green services we need

- Design
- Supply chain simulation
- Measurement
- DfMA
- Robotics
- Test & commission
- Logistics

Multi-modal Concerns (at stations)

- Walking
- Buses
- Metro/Underground
- Cycling
- Light rail
- Taxis

Customer / Passenger

- Green miles
- Cost & value
- Connectivity
- Aware & informed
- Mobility as a service
- Predictable performance
- Experience

Energy

- Clean
- Reliable
- Green
- Optimised

