



◀ CROSSRAIL

Moving London Forward

Constructing Excellence Conference

◀ Andrew Wolstenholme

◀ Chief Executive



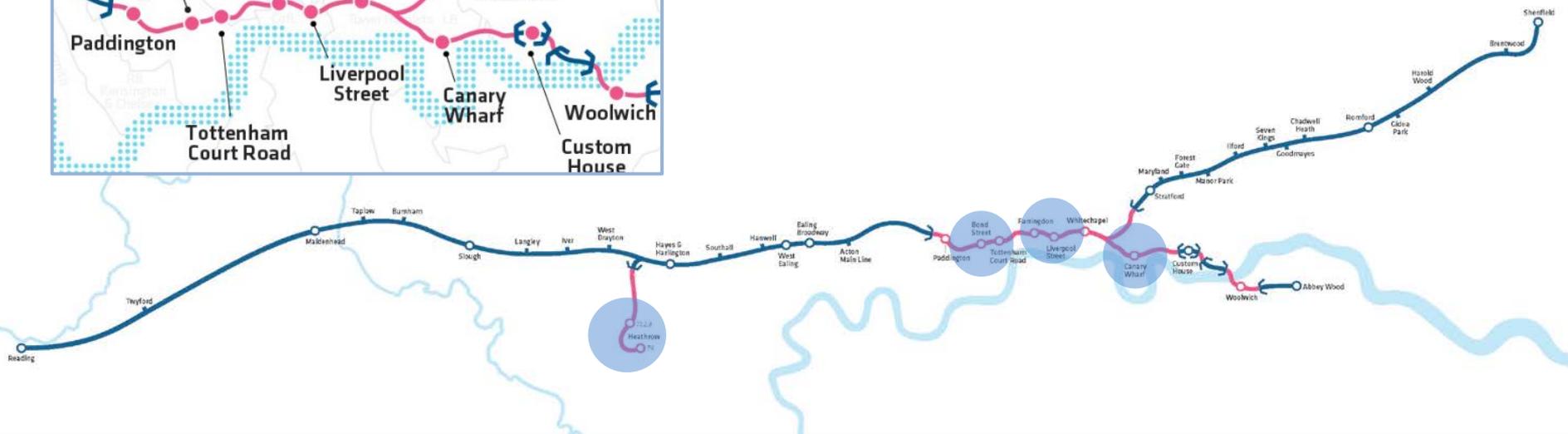
Delivering major programmes



Crossrail – enabling London to grow



► High Capacity Metro Railway



£14.8bn
cost

£42bn
net benefit

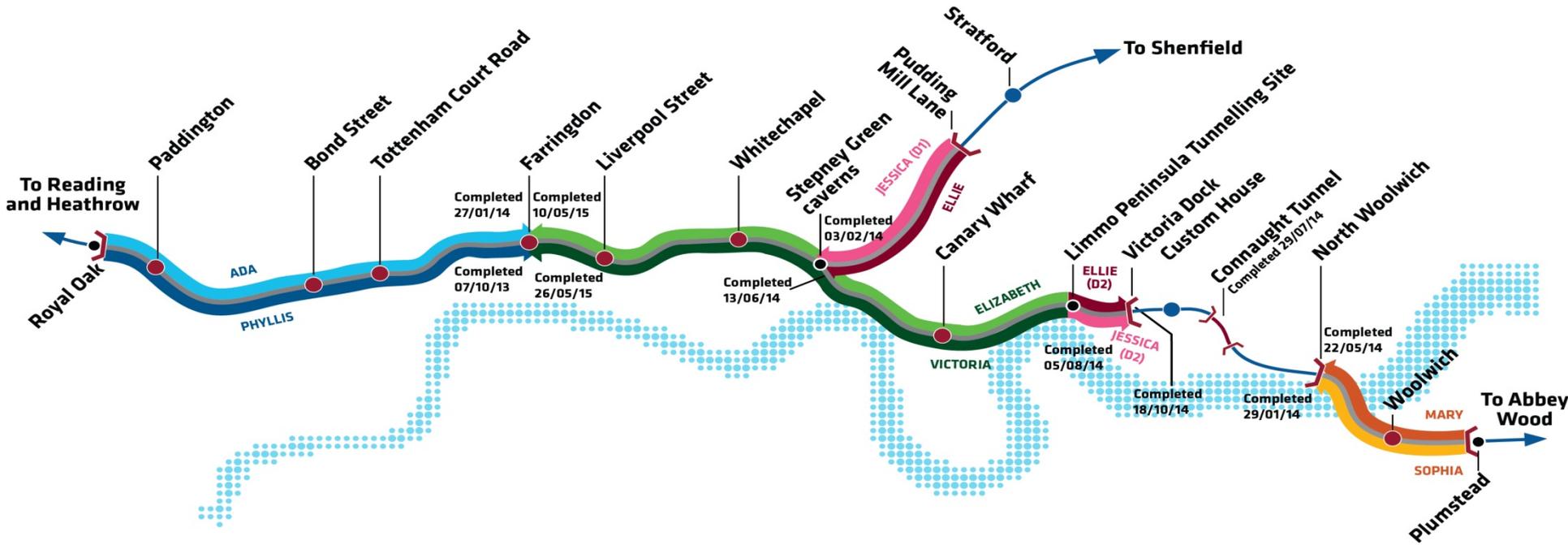
118 km
length

40 (10 new)
stations

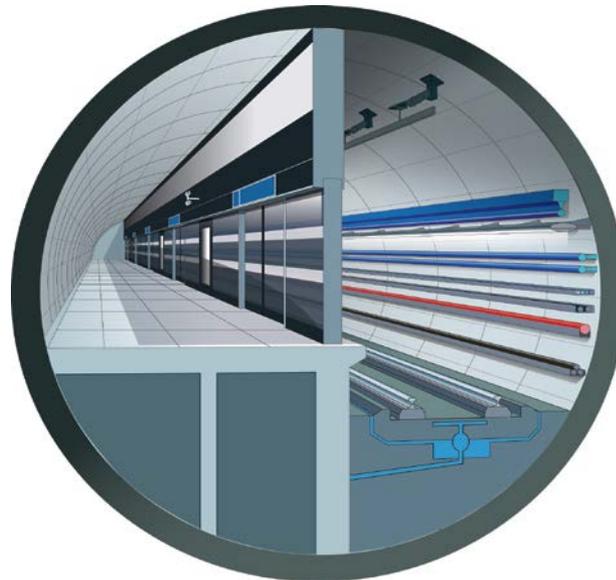
24
Trains/hour

200m
journeys pa

Tunnelling complete



Stations



Railway





Project progress





Operations



- ▶ 1,100 staff to be employed
 - ◇ 850 new posts
 - ◇ 400 drivers
 - ◇ 50 apprenticeships
- ▶ MTR services will start running on the Greater Anglia line in 2015
- ▶ New rolling stock will be introduced in 2017



- ▶ 74% of the value of the contract will be spent in the UK
- ▶ Target of at least 25% of the value of the contract to go to SMEs.
- ▶ Support 840 UK manufacturing jobs building the trains in Derby
 - ◇ 500 safeguarded
 - ◇ 230 new job starts
 - ◇ 30 graduates
 - ◇ 80 apprentices



Skills development



Crossrail skills strategy

Maintaining safety

Inspiring future talent

Supporting local labour

Revitalising the skills base



October 2015

485 Apprentices

Over 12,000 enrolled at
TUCA

c. 14,000 employed on the
project

4,312 jobs for local people

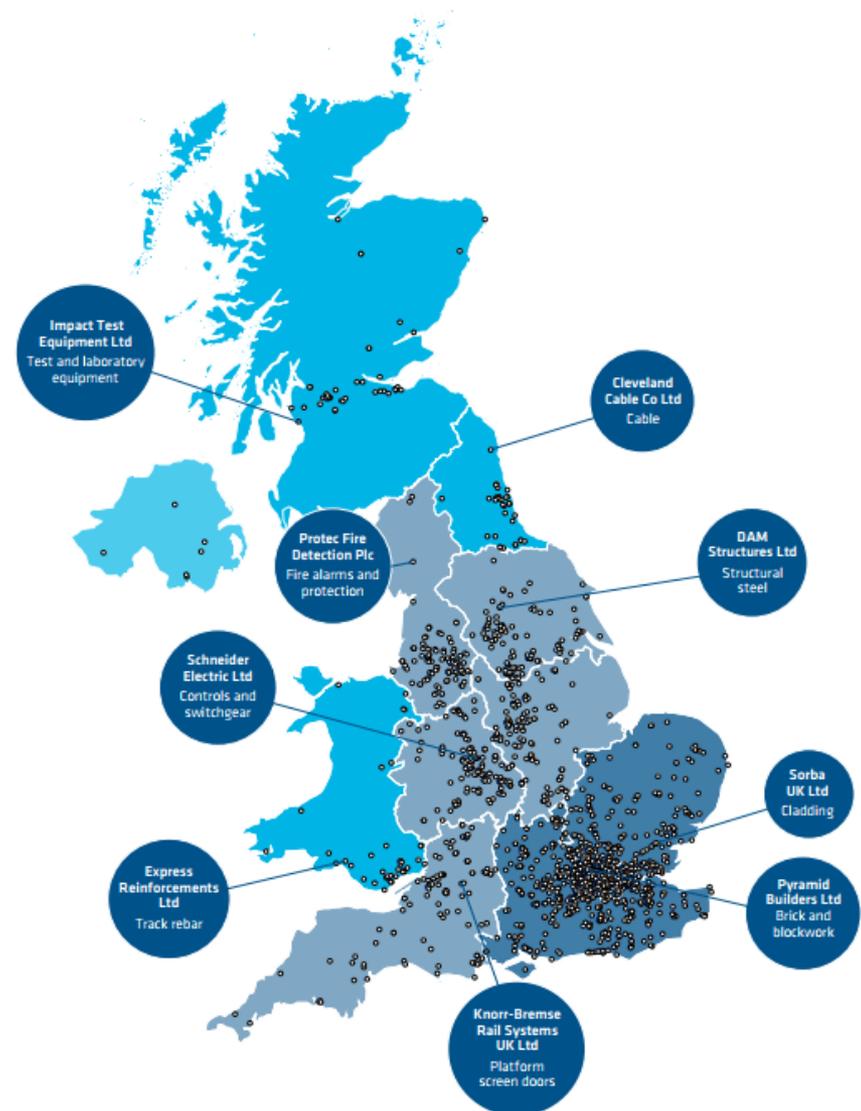
All figures are running totals bar 'employed on project'



Business opportunities on Crossrail



£1 For every £1 spent Crossrail will bring £1.97 of transport benefit
£1.97





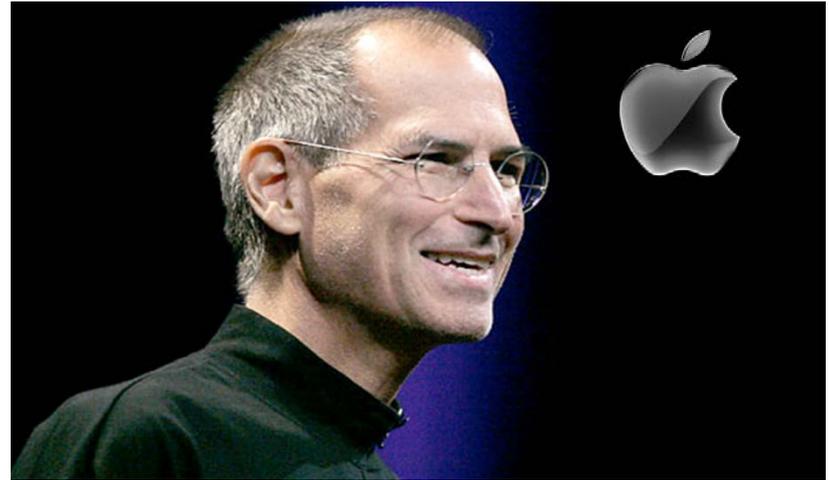
Environmental footprint



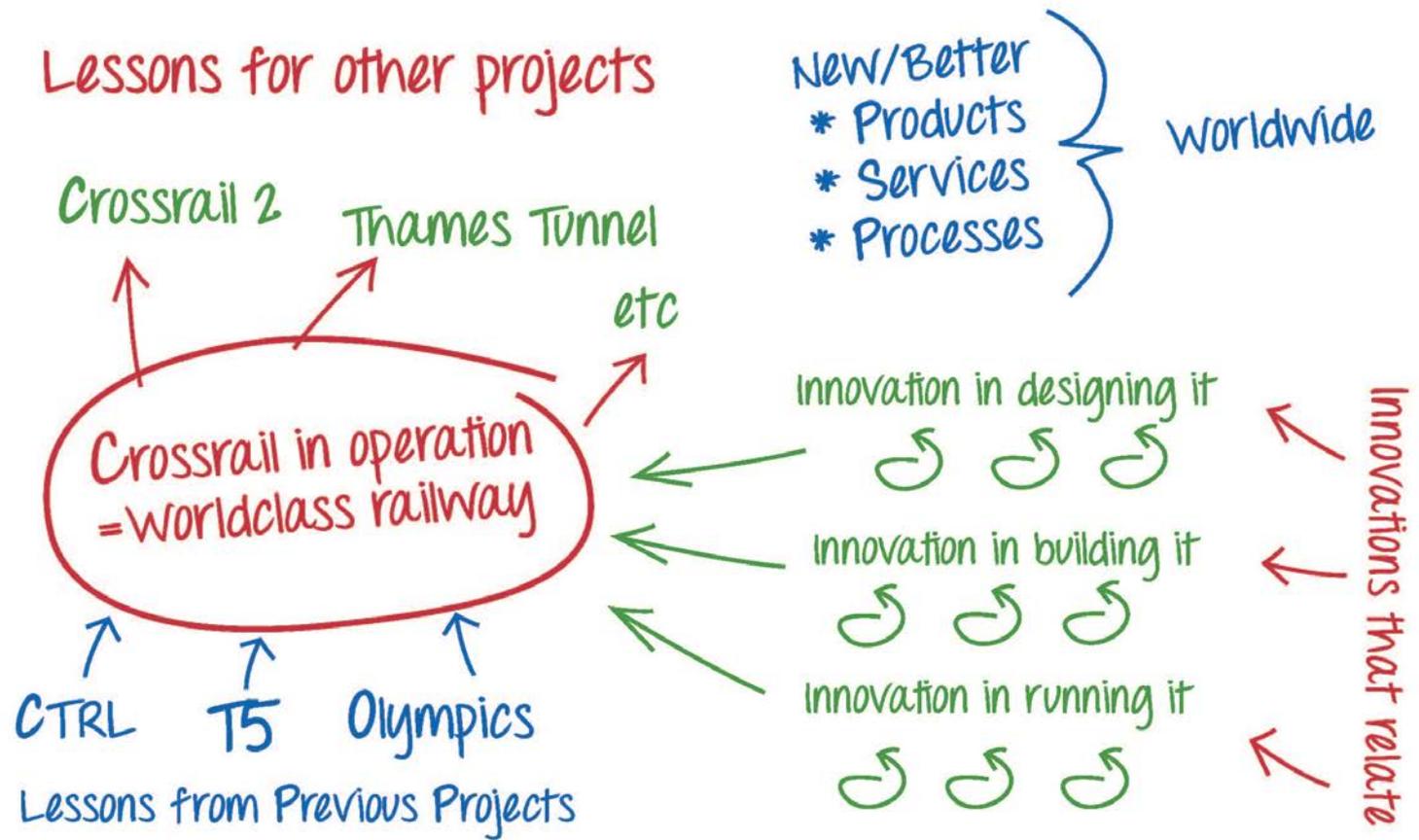
Recording the past..



Changing the way we think

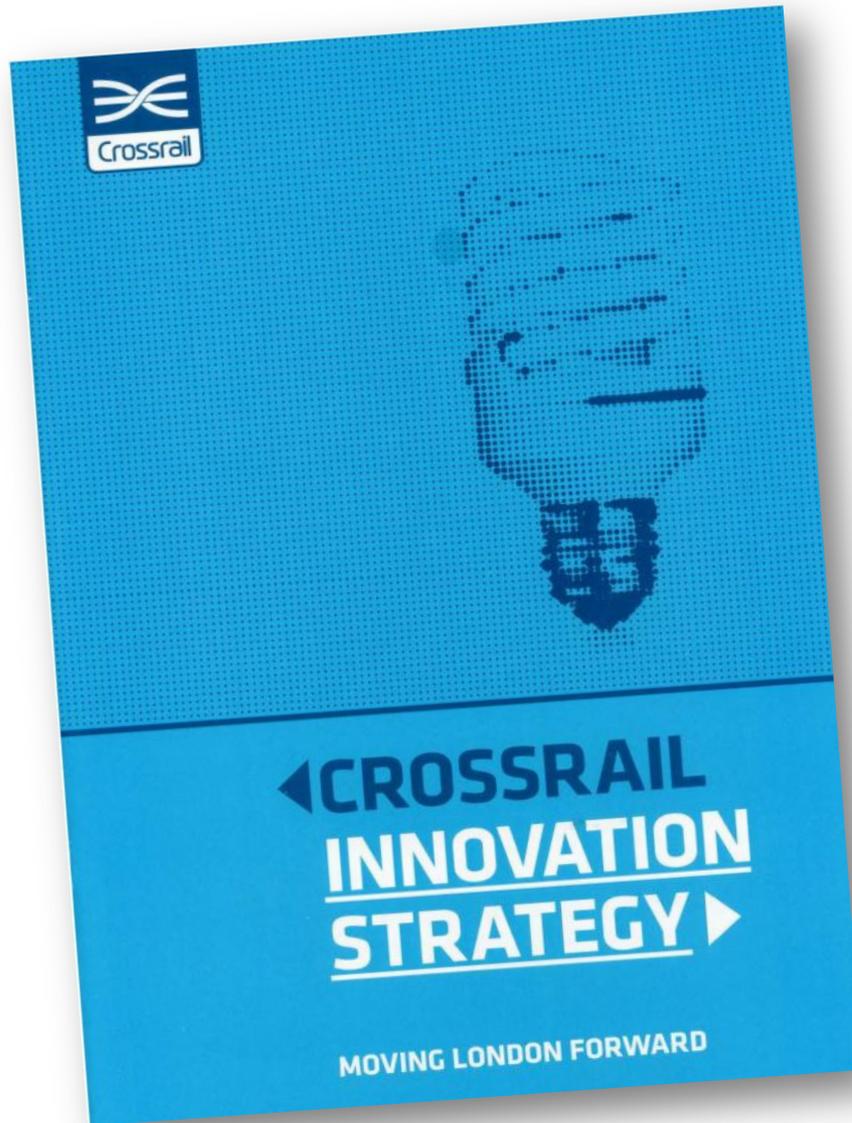


The Crossrail Innovation Vision





◀ Innovation Strategy



INNOVATION READINESS LEVELS

Novel ideas, practices and technologies generated during the Crossrail programme are associated with varying degrees of innovation readiness. As shown in Figure 4, all have developed a classification based on five innovation readiness levels (IRLs)

The maturity of any potential innovation at Crossrail, and the resulting readiness, can be assessed using Crossrail's IRLs of innovation (see Figure 5). For example, innovation in 'lorry drivers' safety training' is now an industry norm and has achieved its highest readiness level. Progress from one level to the next is a clear indication of Crossrail's maturity in:

► Collaboration:

to implement. In Crossrail, as maturity of the IRLs increases and innovations progress to implementation, they may become an industry norm and leave a legacy for future projects. BIM for operations is a standard practice in adjacent industries such as automobile and aerospace but relatively new for the rail industry. These repeatable innovations are characterised by a medium level of maturity. These

Level 1 Radical Innovation

An idea for a new process, service or product that drastically redefines possible performance.

Level 2 Localised Innovation

Focused on a solution for a specific problem but not necessarily consistently performed or spread throughout the organisation.

Level 3 Reapplied Innovation

Where an idea or solution in one area might be radical but is brought into a new area. Not reinvention but taking something to a new context.

Level 4 Incremental Innovation

Progress to an existing process, service or product that improves performance.

Level 5 Industry Norm

Adopted as best practice in the industry. (Becomes a legacy)

Figure 4. Innovation readiness levels

METHODS

Figure 7 shows three connected and mutually reinforcing methods or processes to promote innovation in the Crossrail programme. The three methods are sequential.

- 1. Open Innovation: to connect and develop novel ideas with external communities
- 2. Brokering Innovation: to capture, coordinate and replicate innovation within and across the programme
- 3. Innovation legacy: to articulate and codify lessons for future projects



Figure 7. Methods of innovation

THEMES

Crossrail has identified three fundamental themes to provide direction. These are:

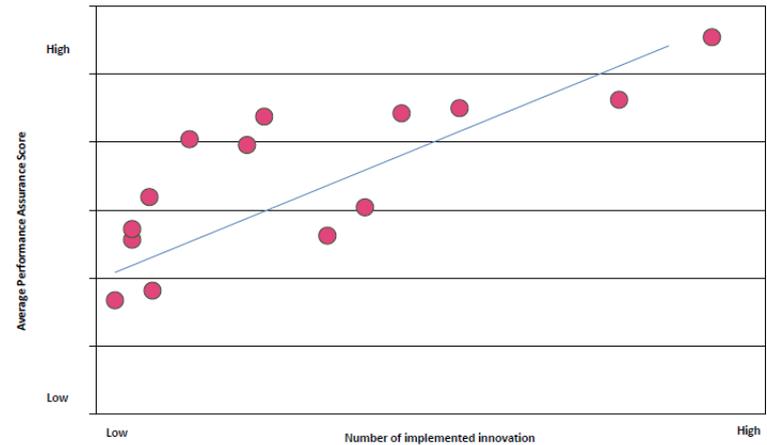
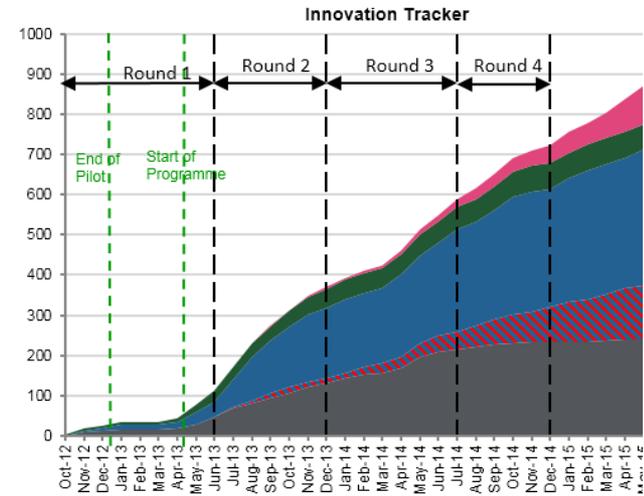
- Delivering efficiency through the life cycle
- Safety
- Design for manufacturing, assembly and operations
- Integrated systems
- Asset management

- Digital-physical integration
- BIM
- Smart Technology

- Sustainable solutions
- Economic
- Social
- Environment

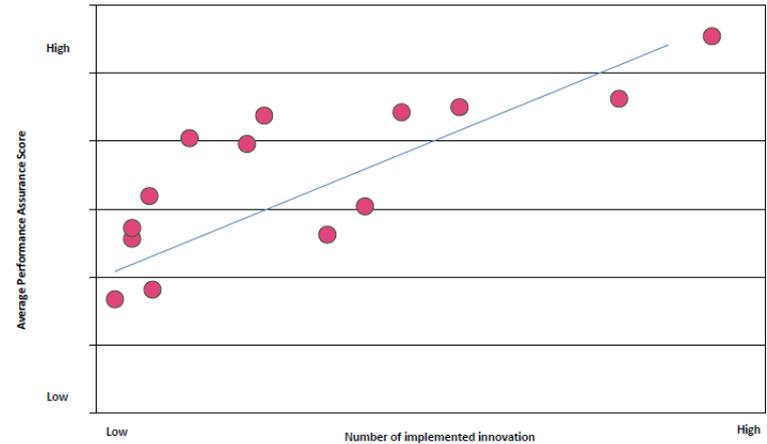
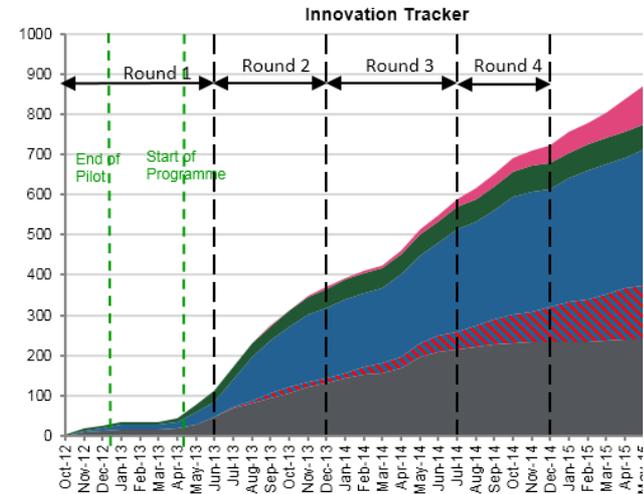


Innovate UK





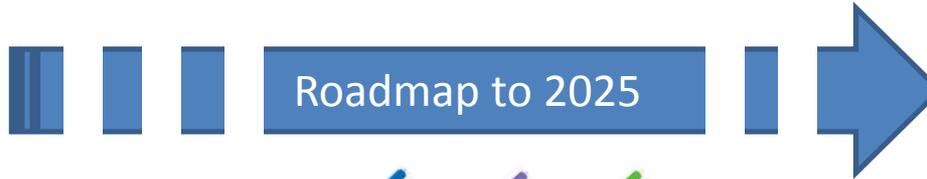
Innovate UK



2025 Construction Strategy

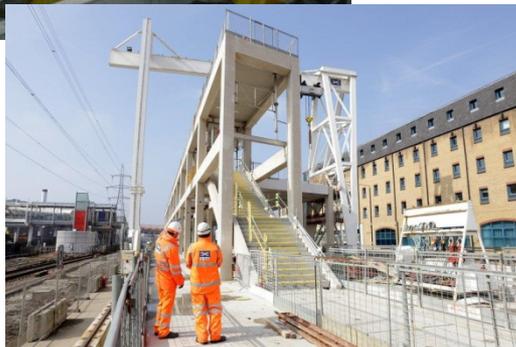


**Construction
Leadership
Council**

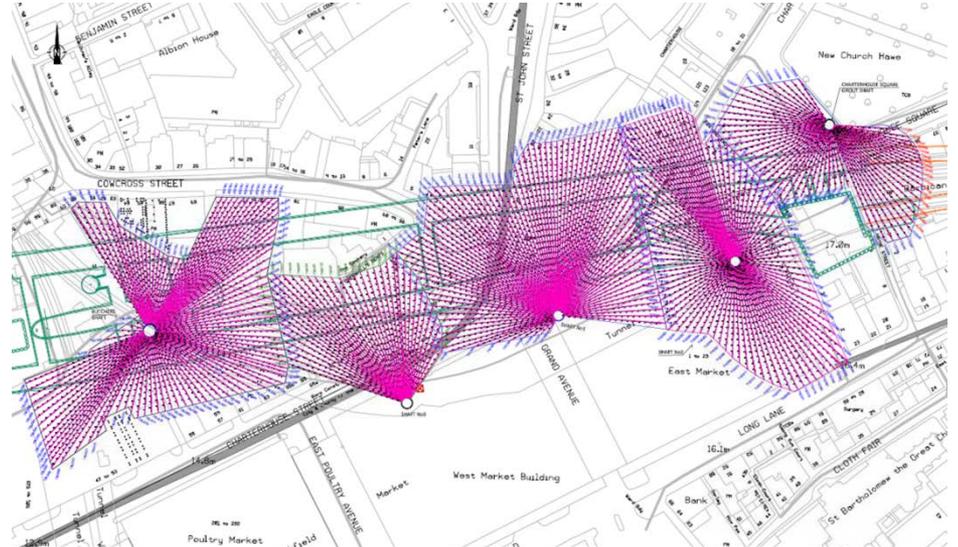




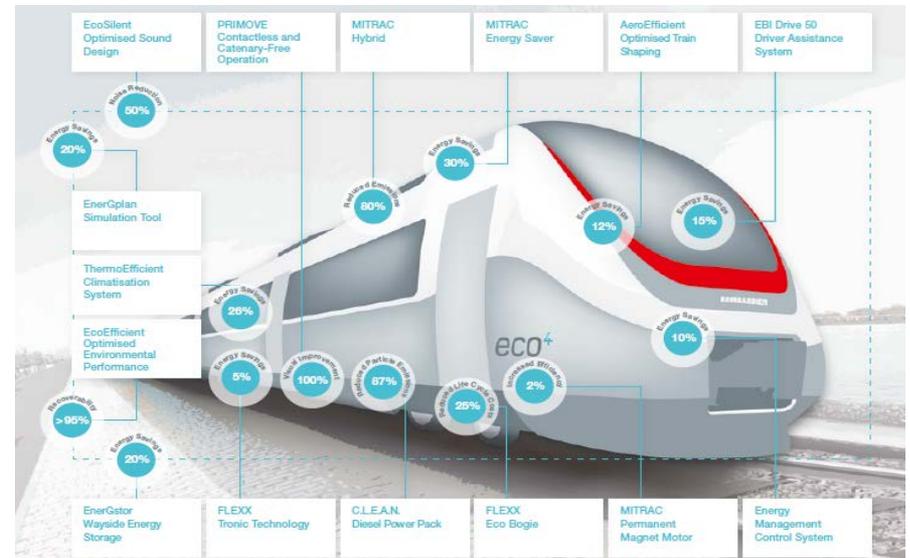
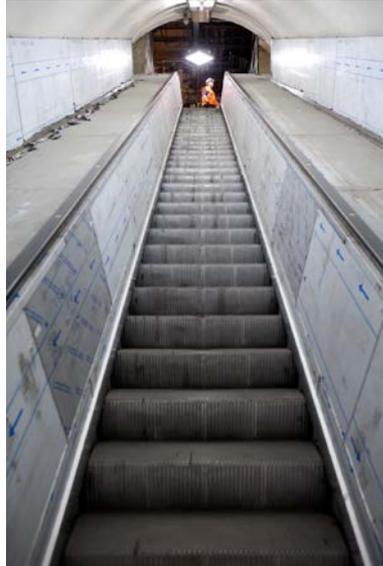
'Smart Delivery'



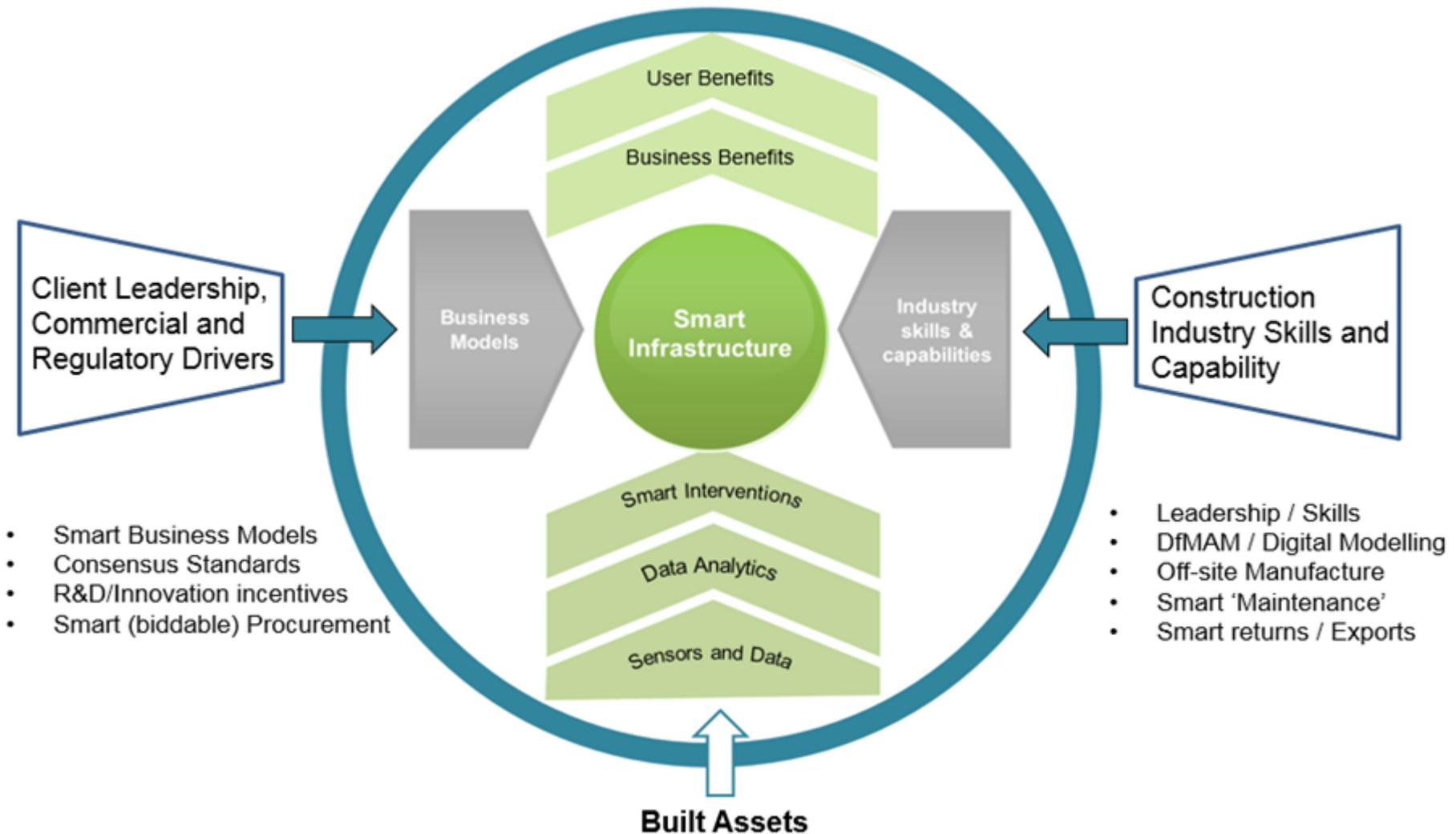
Smart Delivery



Smart Life Cycle



Smart Infrastructure



Smart Infrastructure



Heathrow Time Based Separation:

- Digitisation, business and user benefits
- Increased aircraft landing rate of 4 aircraft per hour (~12% increase).
- Live data capture and processing allows for

EDF Smart Meters:

- Sensor based, data analytics, user focussed.
- A better understanding of energy consumption, reduced bills and improved comfort.
- Energy efficiency gains through optimisation of user energy usage.
- Consistent industry wide measure

Transport for London Smart Step:

- Data analytics.
- Improve understanding of root cause failure and implement genuine preventative maintenance.
- Potential escalator maintenance savings of circa £16m pa.

Staffordshire Alliance:

- BIM, sensors, alliancing, DfMA, off-site manufacture.
- Reduced programme schedule by 12 months.
- Significant increase in sustainability

Cambridge CSIC Smart Foundations

- Sensors, business benefits
- Ability to utilise full capacity of pile strength, saving time and money.
- Assess pile capacity strength using in-situ data, allowing for future building enhancements.

Highways England Smart Motorways:

- Sensors, data analytics, intervention, business & user benefit
- Reported increases in traffic volumes caused by increase in capacity.
- Prevention of severe congestion.
- Indications are that the number of incidents have fallen and casualties reduced by 50%.

Digital Railway:

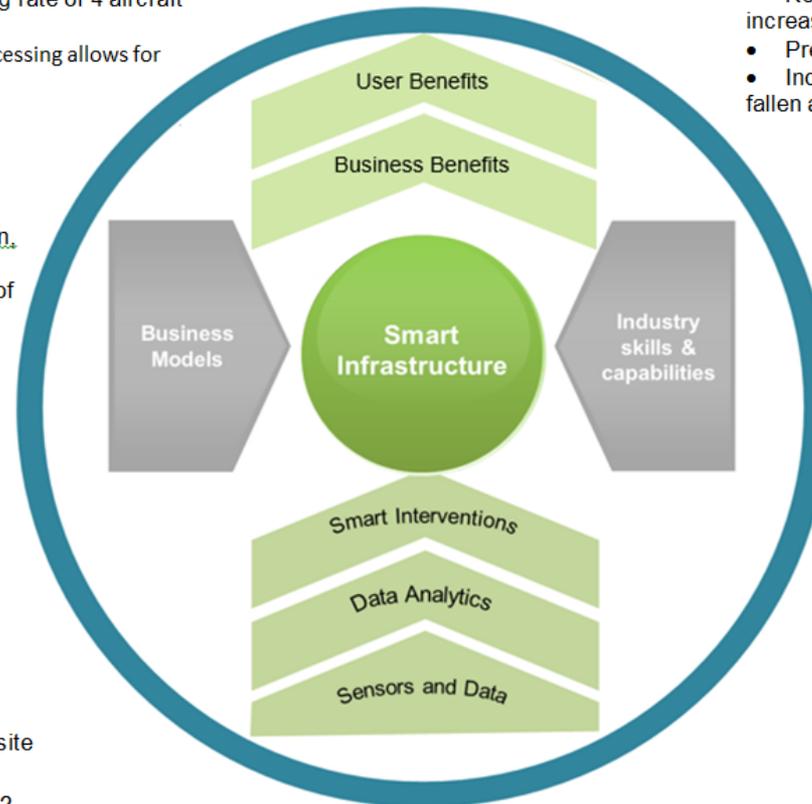
- Maximise railway capacity.
- Integrated and open data across maintainer, operator and end-user.

Housing Energy Efficiency:

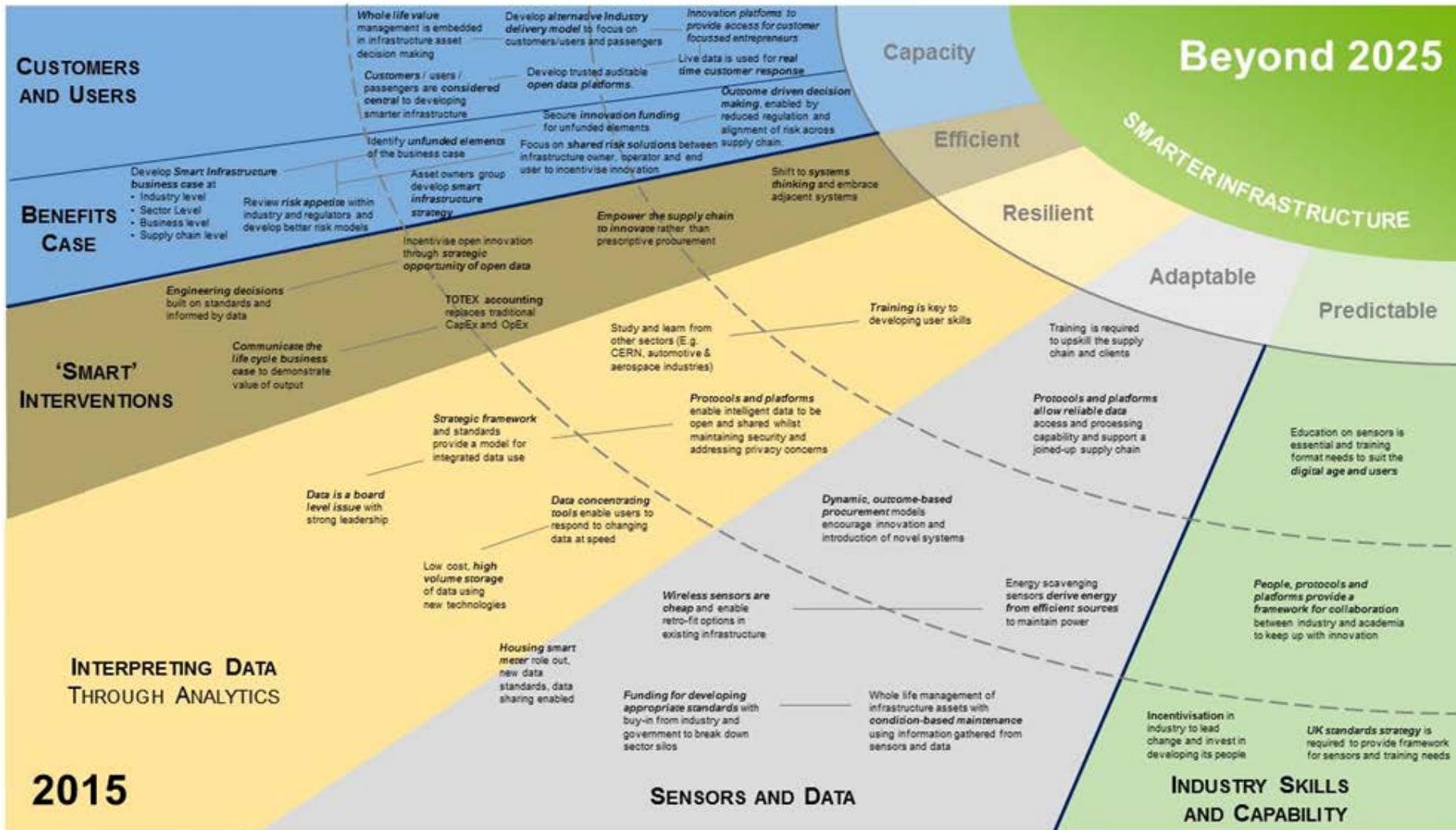
- Sensors, standards, data sharing, efficiency.
- Smart meter role out.
- New data standards.
- Improved interoperability.
- Contract enabled data sharing.

HS2 Skills Study:

- By forecasting skills gaps, the industry has the opportunity to implement initiatives to address this skills shortage in the areas that are most critical.
- Clarity in future resource levels will inform and advise future capital portfolio and programme risk profiles.



Beyond Infrastructure



The £411bn opportunity



...the final Digital Dimension

