

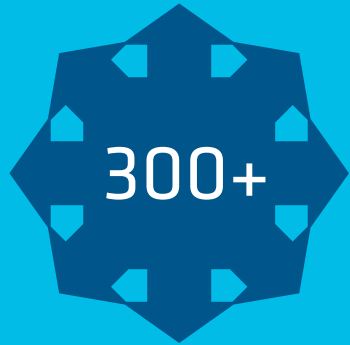


◀ **CROSSRAIL** **INNOVATION** **PROGRAMME**



INNOVATE
8

MOVING LONDON FORWARD



INNOVATIONS



IDEAS SUBMITTED
TO THE PORTAL



MEMBER ORGANISATIONS



INVESTED



SHARED IDEAS ADOPTED
BY OTHER SITES



INDIVIDUAL MEMBERS

INNOVATION AT CROSSRAIL

Crossrail is delivering a new railway for London and the South East.

As Europe's largest infrastructure project, it is building 42km of tunnels, 10 new stations and improving 30 more. The finished railway will be an accessible route of 40 stations from Reading and Heathrow in the west, through central London and to Shenfield and Abbey Wood in the east. Crossrail will change the way people travel – it will add 10% to central London's rail capacity, reduce journey time and increase choice.

As the largest construction project in Europe, Crossrail is uniquely positioned to lead innovation in the construction industry.

The Crossrail innovation programme, Innovate18, provides an opportunity to capture and explore pioneering ideas from all of those involved in the project. The techniques, products and methods used on Crossrail are providing a benchmark for other construction projects.

As the award-winning innovation programme continues to evolve, Crossrail envisages to leave a legacy that inspires and motivates innovation in future infrastructure projects.

“In delivering London's new east to west railway, we hope to raise the bar in the construction industry, now and for future projects. To achieve that, we need to think differently about how we share ideas and implement them.”

Andrew Wolstenholme OBE, CEO Crossrail

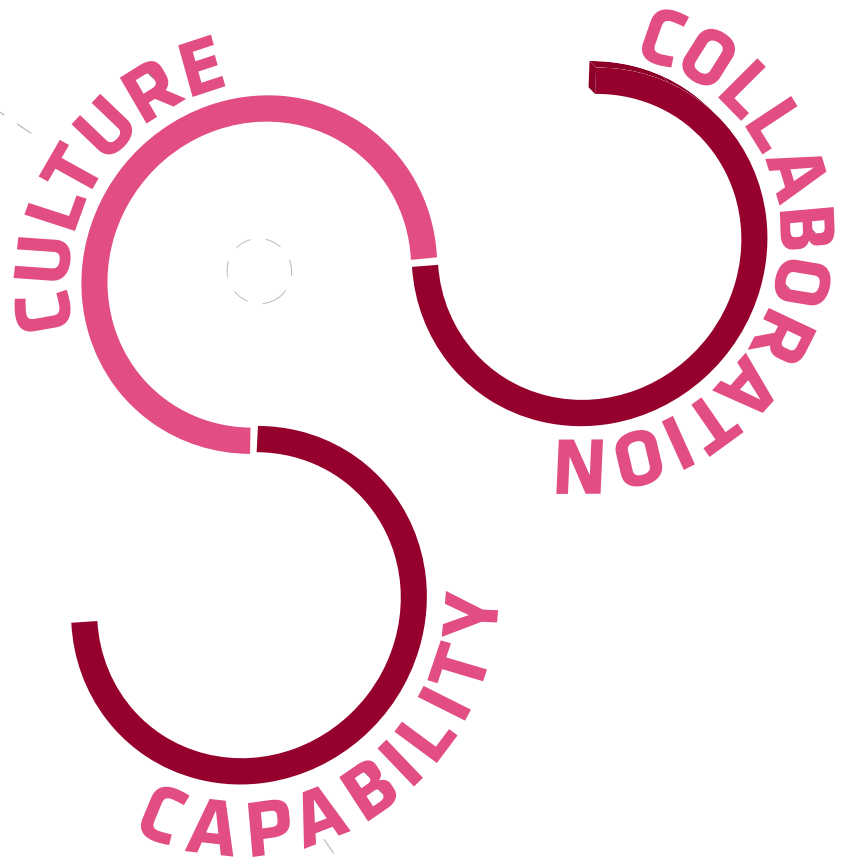


INNOVATE18 OVERVIEW

Crossrail has broken new ground in the UK construction industry by being the first organisation to develop a strategy and process for managing innovation in a major project environment.

Innovate18 has been developed by Crossrail in conjunction with Imperial College. It supports Crossrail's mission to deliver a world-class railway that fast-tracks the progress of London and is designed to systematically identify and deliver improvements based on ideas generated from people across the project.

People are central to Innovate18. The network of innovation champions and innovators, drawn from Crossrail, its supply chain and its partners, provides energy and inspiration.



PROGRAMME MEMBERS AND CONTRIBUTORS

Crossrail's innovation programme provides a platform to exchange ideas and share knowledge across a diverse community.

Innovate18 connects directly with members, Tier 1 contractors and academia.

Innovate18 connects indirectly with representative bodies (such as the Institution of Civil Engineers and the Construction Leadership Council), government bodies (such as Catapult, and Innovate UK), industry bodies, start-ups, and large multinational businesses and organisations from other industries.

CROSSRAIL

TfL
CROSSRAIL SPONSOR

INNOVATION PROGRAMME

**DIRECT CONNECTIONS
INNOVATE18 MEMBERS**

Tier 1 Suppliers Academic Institutions
Industry Interest Groups

INDIRECT CONNECTIONS

Industry bodies Businesses Start ups
Government Others

ROADMAP FOR TRANSITION

High Speed 2 Start ups Crossrail 2
Network Rail Other

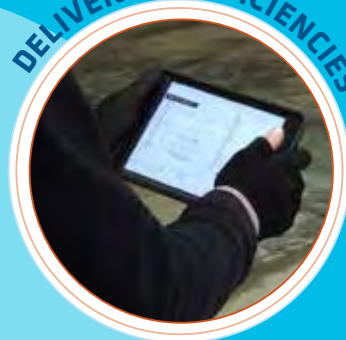
KEY INNOVATION THEMES

Innovate18 has set four themes to guide innovators and help generate ideas.

HEALTH AND SAFETY



DELIVERING EFFICIENCIES



DIGITAL-PHYSICAL INTEGRATION



SUSTAINABLE SOLUTIONS



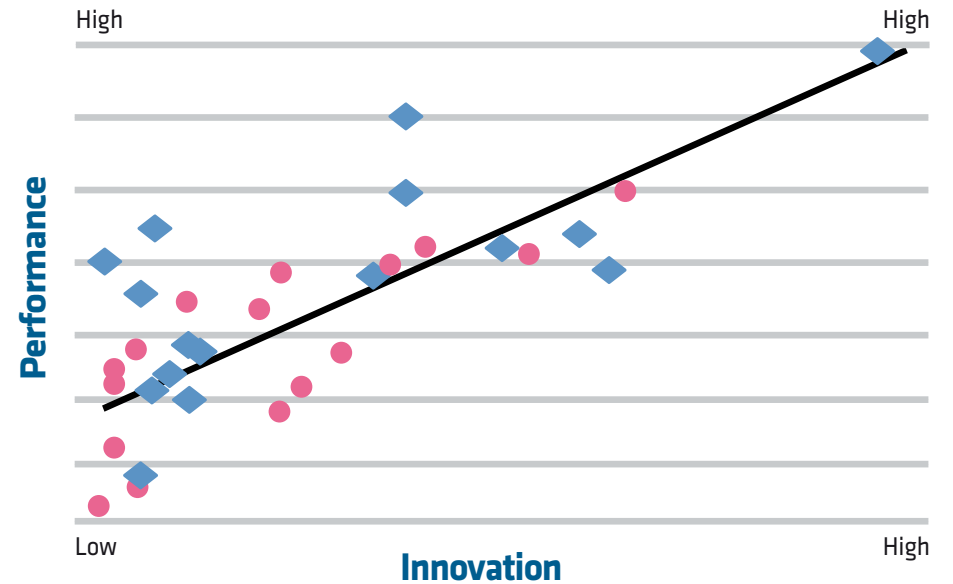
PROGRAMME PURPOSE

The ability to innovate is fundamental to a world class organisation. Innovate18 provides a mechanism for exploring market leading technology, trialling new systems and designing process improvements. It supports Crossrail to improve safety, increase efficiency, develop digital capability and provide more sustainable solutions.

At the heart of Innovate18 is a commitment to deliver capability, collaboration and culture. Where collaboration, in particular, is strong, Crossrail has shown that there is a direct correlation between performance and innovation. Innovate18 encourages ideas from across its supply chain.

It provides a focal point for collaboration which supports an integrated approach to delivery. It allows the supply chain to collaborate to overcome challenges and deliver more efficiently by tapping into the wealth of experience from across the programme.

Performance vs Innovation



◆ Round 3: Sept 2013
● Round 4: Sept 2014

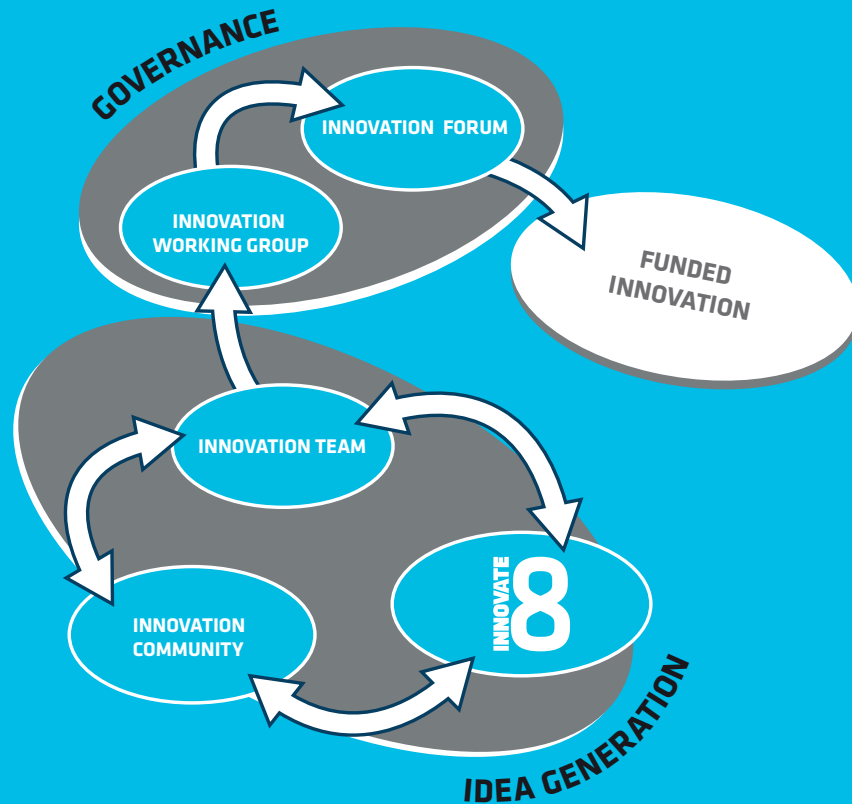
TEAM STRUCTURE AND GOVERNANCE

At the heart of this community is a small team of specialists who act as catalysts; coordinating ideas and brokering relationships to encourage deeper collaboration across the community and nurture a culture of innovation.

The central team is supported by a working group chaired by Crossrail's Strategic Projects Director.

The working group is made up of innovation experts from industry members. Collectively, the team and working group are responsible for evaluating competition entries and recommending category winners to the Crossrail Innovation Forum.

The Crossrail Innovation Forum is the executive level group that provides strategic direction to Innovate18 on governance and funding of the programme. It is chaired by one of the Crossrail Non-Executive Directors and is attended by the CEO, Programme Director and Technical Director.



INNOVATION MANAGEMENT PROCESS



SUBMISSION

An innovation idea is submitted via the Innovate18 portal. The innovation team work with the site based Project Champion to agree whether the idea should be developed.

DISCOVERY

The Project Champion builds up a detailed understanding of the idea through direct discussions with the innovator and through engaging with the wider innovation community. The idea can be implemented immediately and shared with the community, parked for future consideration, or submitted for competition for funding.

COMPETITION

The innovation team runs a competition for funding twice a year. Ideas submitted by Project Champions are evaluated, and shortlisted for consideration by the Crossrail Innovation Working Group (CIWG).

CHALLENGE

The Crossrail Innovation Working Group (CIWG) review and challenges ideas to ensure they are innovative, deliverable and provide clear benefits. The CIWG can also challenge some of the ideas not recommended by the innovation team, requesting that they be included in the shortlist.

COMPETITION AND DELIVERY

Shortlisted ideas are presented to the Crossrail Innovation Forum (CIF), which ultimately approves the innovations that are to be funded. On CIF approval, the Innovation Team work with the Project Champions and innovators to deliver the invested ideas.

INNOVATE18 TIMELINE

2011

Andrew Wolstenholme joins Crossrail as CEO and commissions innovation strategy research

2012

Strategic projects team given ownership of innovation programme

Imperial College become involved

Imperial College and University College London initiate an active research programme

First Crossrail Innovation Forum (CIF)

Innovation strategy published

Pilot programme begins

2013

Pilot programme ends

Innovate18 online platform launched

CEO forum-funding requested and supply chain engaged

Governance structure ratified, team recruited, launch of Innovate18

Investment round one

2014

Investment round two

Investment round three

Project Management Institute journal paper issued

New Engineering Foundation award won

2015

Investment round four

Health & Safety competition launch

Investment round five



Innovate18 Transition Strategy

INNOVATION TOOLBOX

Although the people who generate ideas are at the heart of the innovation system, the innovation team have access to digital tools to help manage the innovation process. The tools used to support the programme will evolve as improvements to streamline the process continue to be identified.

- ▶ The **Innovate18 web portal** offers a platform to share idea and knowledge with all members. The portal can be accessed by all staff of member organisations.
- ▶ The **Innovation Management System (IMS)** is used to manage ideas from when they are first submitted to the portal. Once an idea has been explored it is either developed further and released from the IMS, to be shared with the innovation community, or parked to be visited at a later stage. The IMS also provides secure user administration access.
- ▶ The development of a new **Innovate18 mobile application** is being explored. It is envisaged that when available, it will offer members enhanced access to forum discussions and idea submission.

Innovation Management System

Innovate18 Web Portal

Innovate18 Mobile Application



Field operatives using BaseStone's digital redline review application.

INNOVATION ACHIEVEMENTS

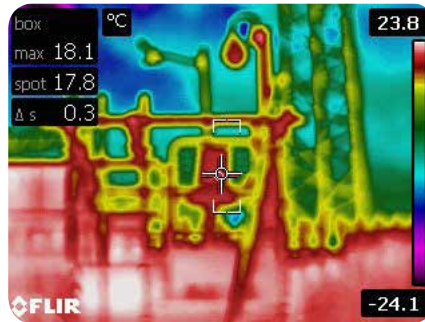
Thermal imaging for monitoring concrete

Scope

Investigate the use of thermal heat camera technology to understand the curing characteristics of sprayed concrete lining works so that advancement rates can be reviewed and risk of falling concrete from under-strength concrete mitigated through early identification.

Progress

Cameras were procured at BFKJV (C410) and trials conducted on behalf of Crossrail's Chief Engineers Group. Trials demonstrated that the cameras could be effective in monitoring concrete behaviour while curing. An initial report was published. Further trials will be conducted with a more compact product that attaches to mobile phones.



Thermal image showing the potential for diagnostic data capture in a construction environment.

Reuse of groutshaft Tubes a Manchette (TAMs)

Scope

Investigate the feasibility of reusing TAMs and grout shafts to create a source of energy by heat exchange through the TAMs and energy storage at the grout shafts, supporting the decarbonisation of London.

Progress

Tests confirmed conductivity capability of the TAMs at Whitechapel grout shaft and a report was produced outlining potential energy available from this scheme. A future-proofing strategy has been proposed with contractors to ensure schemes to utilise grout shafts and TAMs can be developed further. Crossrail will support the developer to explore commercialisation opportunities which will depend on the engagement outcome with landowners and tenants.



Proof of concept demonstrating heat conductivity in underground network of compensation grout pipes.

Use of drones on a construction project

Scope

Procure drones to develop a protocol for construction use and to understand the potential future benefits of this technology in a construction environment.

Progress

Two drones have been procured and a team of staff from different project disciplines, including a site supervisor and a health and safety representative, have been trained to safely operate them. The team has produced a working procedure for flight use, reflecting industry regulations and good practice guidelines. A working group has been established to assess applications including safety briefings, inspections in inaccessible spaces and site inspections. The team will operate the drone and report on findings to the industry.

Field trial of BaseStone digital redline review application

Scope

Undertake a field trial of the Basestone application which digitalises the works review processes using cloud based technology. The trial compared performance of the digitalised system against the manual process. It also reported on compliance with the Crossrail works information and quantifiable benefits of the system to the project team.

Progress

Field trials were completed and an estimated saving of over 60% was noted against the standard process. Works will be undertaken to identify further trials by other contractors and develop a more thorough Six Sigma analysis of benefits. An automatic protocol interface with eB for uploading and downloading reports and redlined PDF drawings will be developed to enable wide scale rollout on Crossrail.



The use of drones has been trialled on Crossrail construction sites.



OUTCOMES AND BENEFITS

- ▶ A funding mechanism to support ideas
- ▶ A safe environment to explore ideas
- ▶ A library of best practice available to industry
- ▶ Access to a wider community of technical experts
- ▶ More sustainable solutions to environmental challenges
- ▶ Digital solutions and integration
- ▶ Greater efficiency through the delivery lifecycle
- ▶ Innovation skills and capabilities
- ▶ Collaboration opportunities
- ▶ Improved construction safety
- ▶ Conversion of ideas into practical solutions

WHAT NEXT?

There's still a long way to go to realise the full benefits of Crossrail's Innovate18 programme, however, its achievements are already impressive. Innovate18 is realising the vision of bringing the Crossrail community together to deliver greater value. It has set the bar for other infrastructure projects by demonstrating the potential of an innovation programme.

As Innovate18 evolves, Crossrail hopes to leave a legacy that the industry can build on in the future.





The Innovate18 Team would like to thank our contributing member organisations:

Alstom
Balfour Beatty
Bam Nuttal
Comit
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Dragados
Ferrovial
Hochtief
Kier
Lafarge Tarmac
Laing O'Rourke
Morgan Sindall
Murphy
Skanska
Vinci

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