

Date: 16 July 2015

Item: Overview of Innovation

This paper will be considered in public

1 Summary

- 1.1 The purpose of this paper and the accompanying presentation is to provide the Panel with an overview of the Rail and Underground Innovation activities.

2 Recommendation

- 2.1 **The Panel is asked to note the paper and presentation.**

3 Building Momentum

- 3.1 The first TfL Innovation conference was held in 2014. Led by the Rail and Underground Engineering and Commercial teams, the purpose of the event was to engage the existing and potential supply chain by setting out TfL's Technology Innovation intentions. A summary of the event can be found in Appendix 1 of this paper. The Independent Investment Programme Advisory Group recommended that similar events are held more often.
- 3.2 The TfL Innovation Portal (www.tfl.gov.uk/innovation) was formally launched at the conference and continues to be a key tool in building internal and external collaborations, ensuring innovation is challenge driven and enabling us to keep pace with the rapidly moving technology and research space.
- 3.3 Rail and Underground now has an established Innovation Team, Innovation Council (chaired by a Rail and Underground Director) and processes for seed funding and developing ideas that relate to our current and future challenges.
- 3.4 Since this structure has been in place, Rail and Underground has become influential in the national transport Innovation field:
- a) Creating the concept of the 'Digital Railway' and initiating an InnovateUK workshop for their 'Digital Railway' competition.
 - b) Winning funding from five UK and European Innovation competitions.
 - c) Winning three national innovation awards for an InnovateUK backed project.

- d) Receiving national press acclaim (including a BBC exclusive) for a demonstrator to aid visually impaired people to navigate the network.
 - e) Kuldeep Gharatya (Head of Technical Strategy, System Performance and Innovation) has returned from his secondment as the Engineering Director of Transport Systems Catapult and has been invited to be a member of the Rail Supply Group's Technology and Innovation Working Group.
- 3.5 Innovation is now a core competency for Senior Managers and the Innovation Team has launched a Graduate 'Think-Tank' in collaboration with the HR Capability Development Scheme to develop innovation methods and access fresh thinking.
- 3.6 Working with Strategy and Service Development, a new assessment tool has been developed in order to promote seed funding to develop ideas into prototypes. The methodology identifies Value Drivers that are missing from a formal business case methodology.

4 Internally Funded Examples

- 4.1 Slides 9 to 14 of the presentation, attached as Appendix 2 give examples of Innovation projects that have been funded internally.

5 Collaborations

- 5.1 In order to develop our capabilities and focus the industry to our challenges, we are undertaking a number of collaborative projects, involving multi-nationals, Small Medium Enterprises (SMEs) and academic institutions.
- 5.2 The Innovation Team is building a portfolio of partners who specialise in key fields (eg. data acquisition and visualisation, Internet of Things, digital design, composite materials) to complement our skill-set and enable delivery of demonstrators and proof of concepts.
- 5.3 An example of the projects undertaken is given on slides 15 to 19 of the presentation.
- 5.4 The collaborative projects have attracted attention and gained funding support from a number of external bodies such as InnovateUK, Department for Transport Technology Research Innovations Grant and National Endowment for Science, Technology and the Arts.

6 Under Development

- 6.1 External Communications are facilitating a City Hall press event to showcase Rail and Underground's capabilities in Virtual Reality. The technology is now mature, low-cost and with sufficient open-source platforms to warrant developing internal expertise. The event will describe a range of potential uses from early stakeholder engagement to supervisory control and data acquisition.
- 6.2 External collaborators with expertise in big-data and learning algorithms are being sought (via forums such as Railway Innovation Association) for a project aimed at moving to a future, sub two-minute, railway service management system. The

concept is supported by Insight and the Innovation Team will be building a simulation to describe how the system could look and be utilised by the Chief Operating Officer.

7 TfL Leadership Team – Key messages

7.1 The Victoria Line Track Circuit Monitoring System was presented as a case study of successful Research and Development to the TfL Leadership Team in order to catalyse thinking around 'Building an Innovation Culture in TfL'. Some key messages which came out of the session are captured on slide 22 of the presentation.

8 Next steps

- 8.1 Emphasise innovation and technology expectations during early supplier engagement via Commercial (Supplier a Market Development).
- 8.2 Recommend the establishment of a Framework of technology SMEs to accelerate rapid-prototypes.
- 8.3 Explore Innovation Partnerships (new EU directive).
- 8.4 Establish potential Innovation Award to incentivise Staff.
- 8.5 Develop an Innovation competency framework.
- 8.6 Next Innovation Conference.

List of appendices to this report:

Appendix 1 – Report: TfL Technology Innovation Conference (February 2014)
Appendix 2 – Presentation – Overview of Innovation

List of Background Papers:

None

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Report: TfL Technology Innovation Conference (February 2014)

Summary of event

- TfL hosted its first Technology Innovation Conference on 26 February 2014
- The Conference was opened by David Waboso (Capital Programmes Director)
- Keynote presentations of the day were given by:
 - Mike Brown (MD – London Underground and London Rail),
 - Dana Skelley (Director of Roads)
 - Sarah Atkins (Commercial Director – Rail and Underground)
- One of the primary objectives of the event was to formally launch TfL's Technology Innovation Portal (www.TfL.gov.uk/innovation) to 'Key Suppliers', universities and SMEs from across the UK
- Over 100 TfL employees were engaged and contributed to the success of the event through the giving of presentations, sitting on panels, and/or discussing TfL's innovation challenges in one-to-one 'speed dating' sessions with potential suppliers
- On the day - SMEs and Key Suppliers openly welcomed the opportunity to engage TfL staff directly on innovation
- Over 200 delegates from more than 150 different SMEs, universities and Key Suppliers attended the event, including Siemens, Bombardier and IBM
- Key Suppliers that accepted an invite but did not register on the day were British Telecom, Giffen Group, Hitachi and Otis
- 15 exhibits were also included in the day with a mixture of technologies currently being developed and investigated in house as well as some collaborative partners currently working with TfL. Some examples of which are given below
 - Remote track circuit monitoring system – Developed in house within LU and being trialled on the Victoria Line
 - Lighting Studies – Developed in house within LU with assistance from Harvard Engineering.

- Energy and Carbon Efficiency – Work being carried out by LU with the Sustain Autonomous Pods as currently used at Heathrow Terminal 5 produced by Ultra PRT
- Live Bus and River Bus arrival – showcasing some technologies currently being trialled within TfL/Surface
- Asset Management Infrastructure - showcasing some technologies currently being trialled within TfL/Surface

Post event

- The [Innovation Conference event website](#) has now been updated with the three plenary presentations given by Mike Brown, Dana Skelley and Sarah Atkins
- An email has been sent to the 50+ ‘Key Supplier’ that attended the event – meaning they have access to all post event material and literature
- The ‘Innovation Challenges’ presented by TfL staff during the conference are being added to [TfL’s Challenges web-page](#)

Post event update on Technology Innovation Portal

- Since the Innovation Conference – over 60 new ideas have been submitted through the portal (130 per cent more than past averages). These ideas are being reviewed by ‘domain experts’ across the business and include ideas covering the breadth of challenges outlined by TfL staff at the conference.
- Due to the conference TfL is now receiving ideas from some of our current/key suppliers (e.g. Thales and Philips) as well as a range of new SMEs
- The Innovation Office (Capital Programmes Directorate, London Underground) is working with Commercial (CoE) and others to develop a robust commercial process(es) to procure some of the innovations suggested through the portal as well as ‘iron out’ the common barriers the business will need to overcome in order to continue to procure innovation successfully.
- The conference opened up communication channels within the business and as a result we have now identified a number of ‘domain experts’ within the surface transport community and are going through the process of incorporating them into the formal review process.
- Further work to align the Rail and Underground challenges currently listed on the portal to reflect the TfL pillars is being carried out.
- The Innovation Office is identifying funding streams to drive forward a number of the ideas/innovations that have been given the ‘green flag’ by subject matter experts.

- Some of the ideas we are exploring as a result of the conference are detailed below
 - **Liquid Detection – Water/Oil/Chemicals (TTK UK)** – Favourable reviews received from domain experts. Investigating next steps with the supplier
 - **Secure Asset Tagging and Information access based on tags, smart phones and server (Crisp Telecom)** – Contact established with Digital team at the conference and applicability currently being investigated within the business
 - **Portable Audio Demonstrator Tool (Temple Group)** – Initial contact at the conference. Positive reviews received from domain experts. Feasibility being investigated for trialling.
 - **Pavegen (Pavegen)** – Further information being sought from the supplier
 - **Metal Theft Protection (Cresatech)** – Under domain expert review.

- Some Images from the Day



Appendix 2



**London
Underground**

R&U Panel Meeting – 16 July 2015

OVERVIEW OF INNOVATION



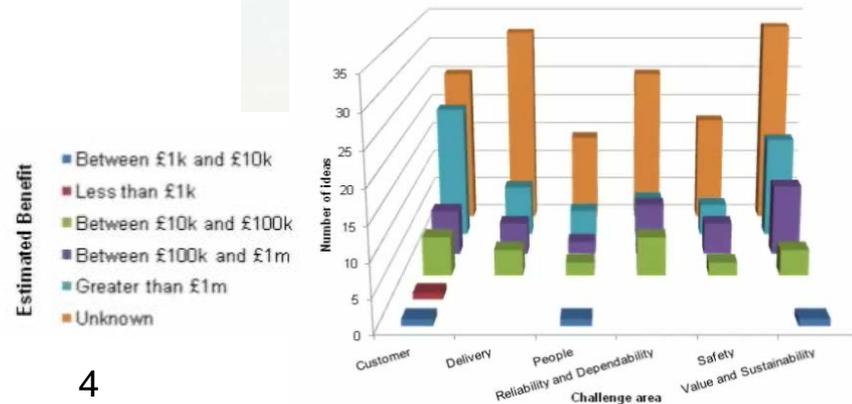
Building Momentum

- **From an idea to:**
 - **First Innovation Conference held with Commercial**
 - **Innovation Portal launched**
 - **Hosted TSB “Digital Railway Competition” workshop**
 - **Formed Innovation Council**
 - **Won funding from five UK and European innovation competitions**
 - **Won three industry innovation awards**
 - **Formalised team in organisation**
- **Innovation is now in the Director lexicon and R&U are in the vanguard**

Building Momentum

- Innovation Portal continues to:
 - Build internal and external collaborations
 - Engage virtual pan-TfL expert network
 - Promote challenges

www.tfl.gov.uk/innovation



Building Momentum

• Innovation Team

- Co-ordinate and facilitate activity
- Demonstrator / Proof of Concept delivery
- Central communications/ liaison point
- Link into external stakeholders and networks
- Develop and support business case

• Technical Expert Network

- Review and advise on technical feasibility
- Identify and/ or advise on implementation

• Innovation Council (IC)

- Chaired by R&U Director(s) with representation from key business areas
- Provide strategic direction within business units
- High level governance function
- Act as a champion for innovation
- Contribute to pan-TfL Innovation Hub

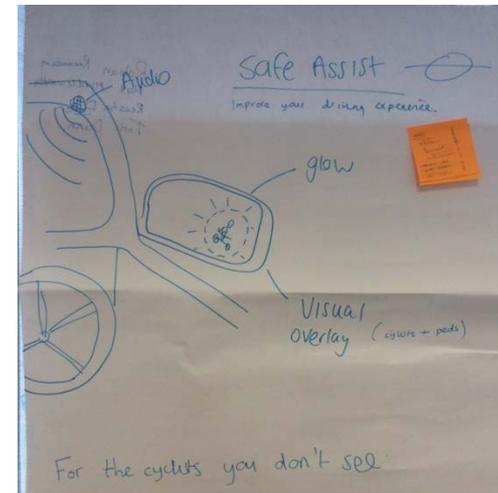
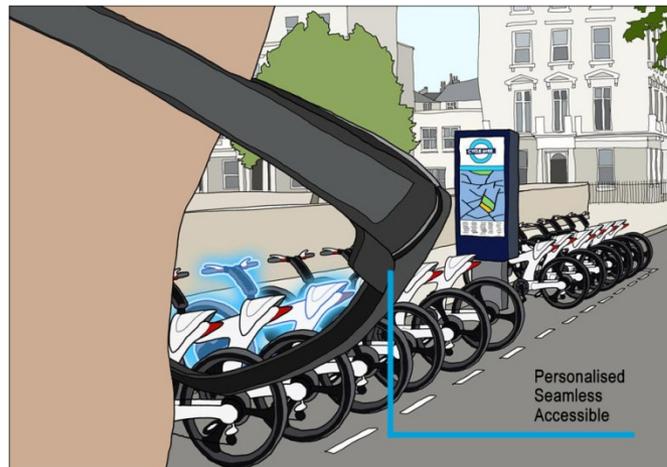


INNOVATION
SUCCESS
EVALUATION
DEVELOPMENT
GROWTH
SOLUTION
PROGRESS
MARKETING

Building Momentum

- **Top to bottom**
 - Innovation is now a core competency for Senior Managers
 - Innovation Team have launched a Graduate Think-Tank to train innovation processes (eg. ideation, rapid-prototyping) and access fresh thinking

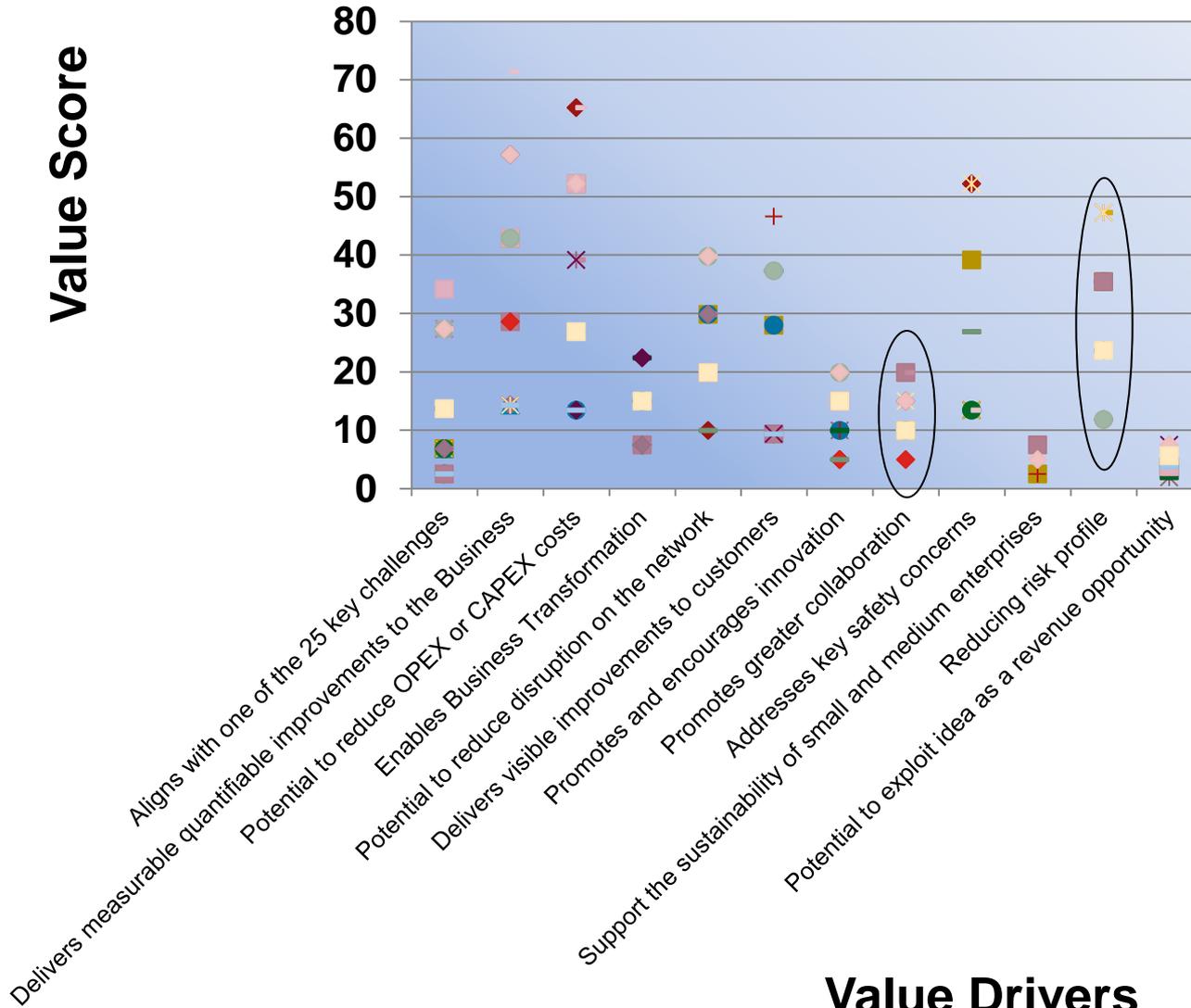
Example outputs from first Graduate Think Tank



Building Momentum

- **New Assessment Tool developed by Innovation Team and Strategy and Service Development to:**
 - Promote ideas in early Technology Readiness
 - Identify Value Drivers missing from formal business case
 - Promote seed-funding to get ideas off the ground
 - First funding call resulted in 11 internally funded projects, aimed at Proof of Concept, totalling approximately £680k (ie. approx. £62k per idea)

Building Momentum



New Assessment Tool values '*Promoting Collaboration*' and '*Reducing Risk*'



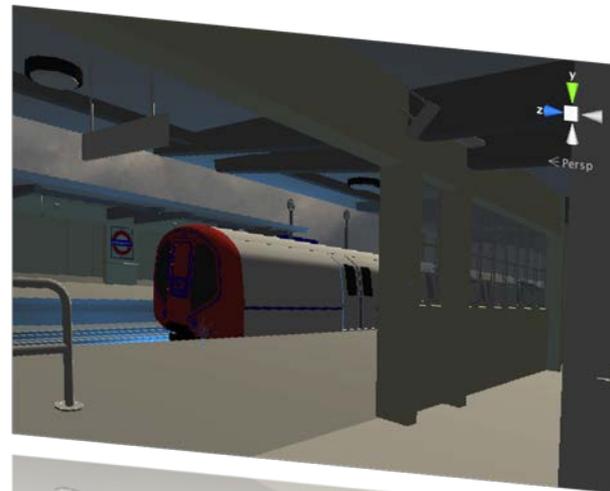
Internally Funded Examples

- **Platform Crowding Indicators**
 - **Concept:** use loading data to better distribute passengers along the platform
 - **Benefits:** reduced dwell time, better carriage utilisation, reduce risk of future 36 trains per hour



Internally Funded Examples

- **3D Railway Engineering Modelling**
 - **Concept:** use crossover from Gaming industry to visualise our performance modelling
 - **Benefits:** improved stakeholder interaction and ability to visualise complex, dynamic systems



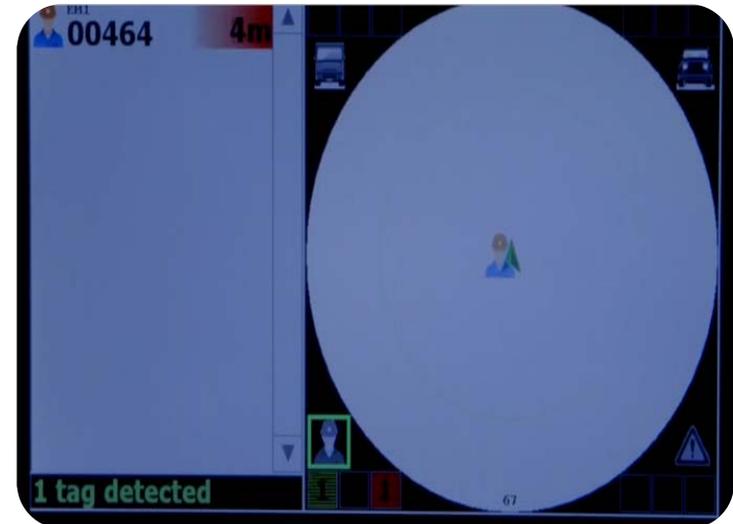
Internally Funded Examples

- **Drone Inspections**
 - **Concept:** use growing Drone technology to inspect civil structures
 - **Benefits:** reduce time and improve safety



Internally Funded Examples

- **Electronic Exclusion Zones**
 - **Concept:** borrow from mining industry to detect unauthorised personnel straying into worksites
 - **Benefits:** improve workforce safety



Internally Funded Examples

- **Access Permissioning App**
 - **Concept:** digitise station and track access
 - **Benefits:** improve safety and utilisation of engineering hours



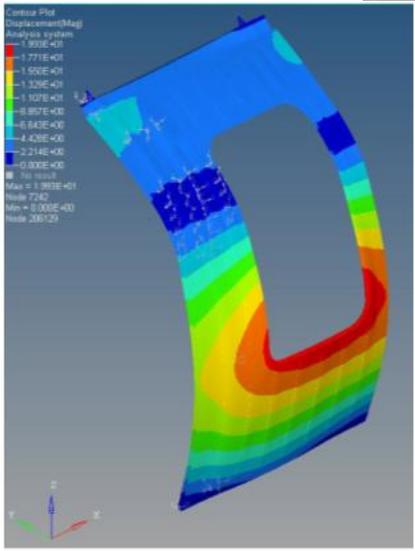
Internally Funded Examples

- **Victoria Line Remote Track Circuit Monitoring**
 - System has delivered 50,000+ LCHs per annum benefit
 - Trial is being designed for roll-out on Central Line



Collaborations

- **Lightweight Door – agreement with National Composite Centre for production of a door for service trials**



London Underground
Atkins Aerospace
National Composite Centre
University College London
Wabtec

Collaborations



BBC Health Editor,
Hugh Pym, trialling the
system



Collaborations

- DfT funded an extension of the Pimlico demonstrator to include transfer from Bus routes to Underground station



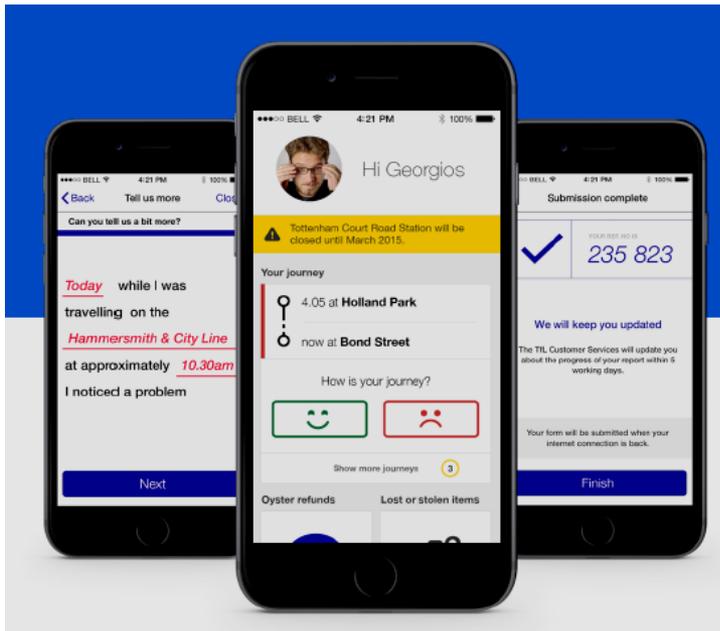
Collaborations

- **InnovateUK competition: Enhancing Customer Experience in Rail Travel**
 - Designed to overcome innovation barriers in rail industry and foster trust with digital businesses
 - We have formed a consortium with a digital design company and an open data platform host
 - Total project value is circa. £1M with a 50% reimbursement for R&U



Collaborations

- **Vision: We intend to build a meaningful relationship that engenders the sense of ownership...**



Rapid prototype developed and key assumptions tested beforehand in a two week design sprint. We now plan to move to a 200 person trial.

Under development

- **Following launch at internal events, we are working with City Hall and External Communications for a Press Event to showcase our capabilities and plans for Virtual Reality technologies**



Under development

- **Seeking external collaborators for a concept to allow sub two minute service management**
 - **Concept supported by Insight**



TfL Directors Meeting – Key messages

- Innovation must focus on *People* not *Roles*
- Be open with things that did not work, as well as those which succeed, to improve learning
- We need to identify when we are in an *Innovation* cycle, rather than *Operational* or *Programme* cycles
- We are innovative, but consistency across the business should improve

Next steps

- **Emphasise innovation and technology expectations during early supplier engagement via Commercial (Supplier and Market Development)**
- **Commercial Framework of technology SMEs to accelerate rapid-prototypes**
- **Explore Innovation Partnerships (new EU directive)**
- **Establish potential Innovation Award**
- **Develop an Innovation competency framework**
- **Next Innovation Conference**