CATAPULTS
A NEW FORCE FOR INNOVATION & GROWTH

11 Catapults

£1.4BN Private and Public Sector Investment

- Precision Medicine
- Transport Systems
- Future Cities
- Cell Therapy
- High Value Manufacturing
- Off-shore Renewable Energy
- Digital
- Energy Systems
- Compound Semiconductor Applications
- Satellite Applications
- Medicines Technologies
Drive UK global leadership in Intelligent mobility, promoting sustained economic growth and wellbeing, through integrated, efficient and sustainable transport systems.

Create an environment that will make the UK a World leader in Transport Innovation.
TAKING A TARGETED APPROACH TO EXPLOITING IM OPPORTUNITIES

GLOBAL INTELLIGENT MOBILITY MARKET BY SEGMENT IN 2025

- DATA COLLECTION & COMMUNICATION PLATFORMS: £77.8bn | 19%
- DATA MANAGEMENT & ANALYSIS: £76.8bn | 19%
- IOT ASSET MANAGEMENT (ROAD): £47.1bn | 9%
- SECURITY, RESILIENCE, SAFETY & CYBER SECURITY: £32.8bn | 10%
- MONITORING & MANAGEMENT SYSTEMS FOR ROAD INFRASTRUCTURE: £44.7bn | 23%
- INTERMODAL SMART TICKETING: £10.1bn | 8%
- AUTONOMOUS VEHICLES: £4.8bn | 58%

THE DIAMETER OF THE BUBBLES REPRESENTS CAGR

UK CAPABILITY STRENGTH RELATIVE TO THE REST OF THE WORLD (FROM LOW TO HIGH)
A CATALYST FOR ACCELERATING INTELLIGENT MOBILITY GROWTH
A TRANSLATIONAL INFRASTRUCTURE

INDUSTRY
Target areas of UK industrial potential

CATAPULTS
Develop a translational infrastructure

UNIVERSITIES / R&D
Invest in research excellence

Technology Readiness Levels
1 2 3 4 5 6 7 8 9

Barriers
IM Market
IMPlatform Capabilities

26-MODEL EMULATION
No existing capability

7-DATA ANALYSIS
Building on the outputs from Moonshot 2016
Not under significant investigation in industry

Score
6 8 5 6

Justification
No change, unless they collaborate in the project.
Unchanged

TSC Actions

TSC TRL
3 3 4 5 5 6 7 7 7

Moonshot Baseline
As is
As is
As is

2016 outputs to support wider adoption

Moonshot 2016
As is
TSC 3 No current skills / capability
As is
Industry 4 Not under significant investigation in industry
M ainstream industry unlikely to adopt rapidly. Collaboration 
with leading researchers possible.
- None
- None

Why do we need it?
In order to answer any of the 'What if…?' questions associated with innovations and interventions in Intelligent Mobility a set of tools will be needed to predict the effects of such innovations. It is likely with the demonstrators and applied models we develop (particularly those with interactive elements), there will be a need for robust tools to support decision making.

• combined into a larger system model, or a 'system of systems' model.

What is it?
The joining of two or more agent based models to understand how they interact. Consider a control strategy such as hardw are in the loop (HiL) simulation could take traffic control systems, and run it within a simulation. The effect of operating the control systems, and the impact of human factor on the system performance is considered. The detailed modelling of shared space schemes in which multiple agent types operate in the same spatial area. E.g. various modes and as such can offer significant benefits but there's currently no accepted methodology and interaction between simulation and ITS UTC systems. The moonshot project will use the API of a simulation and a number of protocols to model the human factor and different sub-systems (traffic lights, sensor systems, weather systems, etc.) such as interventions which are likely to be only crudely represented with current approaches.

Why do we need it?
To perform different simulations, model the interventions, and make visible the impacts on the system. The models are generated through predictive modelling and the results are then tested through predictive modelling and visualised through different tools. These tools can be used to understand the implications on robust decision-making. Sources of uncertainty can include: input data measurement errors; hardw are in the loop (HiL) simulation could take traffic control systems, and run it within a simulation. The effect of operating the control systems, and the impact of human factor on the system performance is considered. The detailed modelling of shared space schemes in which multiple agent types operate in the same spatial area. E.g. various modes and as such can offer significant benefits but there's currently no accepted methodology and interaction between simulation and ITS UTC systems. The moonshot project will use the API of a simulation and a number of protocols to model the human factor and different sub-systems (traffic lights, sensor systems, weather systems, etc.) such as interventions which are likely to be only crudely represented with current approaches.

Reasons why:
- Extract modelled data
- Obtain review
- Scope project
- Microsimulation licences purchased
- None
- Extract modelled data
- Reformat modelled and observed data for analysis
- None
- Re-apply skills to support microsimulation model development (i.e. signal timing optimisation)
- Development of a central urban area microsimulation model
- Linkages to UTC systems
- Work with wider community to enhance Moonshot 2016 outputs to support wider adoption
- None
- Acquire public transport data
- Extract modelled data
- Reformat modelled and observed data for analysis
- None
- Re-apply skills to support microsimulation model development (i.e. signal timing optimisation)
- Development of a central urban area microsimulation model
- Linkages to UTC systems
- Work with wider community to enhance Moonshot 2016 outputs to support wider adoption
OUR CAPABILITIES

AUTOMATED TRANSPORT SYSTEMS

MODELLING & VISUALISATION

CUSTOMER EXPERIENCE

INFORMATION EXPLOITATION

SMART ASSET MANAGEMENT
OUR NEXT DESTINATION
INTEGRATED TEST ENVIRONMENT

IM CENTRE FOR HUMAN-CENTRIC DESIGN
- Re-defining the use of social media data for transport

IM INFORMATION PLATFORM
- Crowdsourced data on passenger journeys

IM INTEGRATED TEST ENVIRONMENT
- Driverless pods and cars in the real world

IM CENTRE FOR OPERATIONAL TRIALS AND EVALUATION
- Informing the need for a safety events database.

IM MODELLING & VISUALISATION PLATFORM
- Unifying pedestrian, vehicle and pod modelling

IM ACCELERATOR
- Tools and processes to enable innovation in rail.

IM CENTRE FOR CRITICAL SOFTWARE SYSTEMS DEVELOPMENT
- INNOVATION IN RAIL FRANCHISING

SENSE MAPPING
- CATCH!
- PASSENGER JOURNEY DATA
- INTRODUCING AUTONOMOUS CARS AUTODRIVE
- AUTONOMOUS ROAD VEHICLE SAFETY EVENTS DATABASE
CASE STUDIES

1. TECHNOLOGY STRATEGY 2016 – Sharing the vision for intelligent mobility
2. SENTIMENT MAPPING – Re-defining the use of social media data for transport
3. TRAVELLER NEEDS SURVEY – Identify key IM areas and recommend investment priorities and policy interventions
4. STATION INNOVATION – Innovative technology and operational solutions in stations
5. INNOVATION GRANTS – T-TRIG and ALSTOM challenge
SHARING THE VISION FOR INTELLIGENT MOBILITY

1. Make travelling an end-to-end user-centric experience
2. Generate billions when moving people and goods
3. Improve accessibility for all segments of society
4. Make our transport systems more sustainable and reduce its environmental impact
5. Make our transport systems more resilient
6. Save many lives
7. Make our transport assets more productive
8. Make transport of people and goods quicker

http://tsctechstrategy.co.uk/
SENTIMENT MAPPING

PHASE 1 – Proof of concept
Aiming to give travellers:

• Door to door journey ‘health check’
• Live map of services overlaid with conditions and sentiment
• Informed choice prior to departure

How is sentiment data used?

• Uses Twitter Firehose - Approx 3m Tweets processed per month, available for retrospective analysis
• Sentiment score is based on natural language processing
• Mapped to an individual running service or station - Normalised against live operational and environmental data
• No # tags or keywords – all data is processed, mapped and categorised in real time
SENTIMENT MAPPING

PHASE 2 – Demonstrator
Aiming to give rail travellers:
• Enhanced map of phase 1, plus
• Predictive and live push alerts

Zipabout take billions of pieces of data…
…and use machine learning to:
• Analyse the past
• Identify patterns in real time
• Predict behaviour / disruption in the future

TSC in collaboration with Zipabout, Transport Focus, Nottingham University and Keolis, funded by DfT
Map of live running services and sentiment analysis

Tool based on 2 years of historic operational data and sentiment analysis. The tool allows for multi-modal expansion.

web based door to door
Traveller Journey Health Check
SENTIMENT MAPPING

PHASE 3 – Extend scope of demonstrator

1) Enhancing travelers demonstrator
2) Aiming to give train operators:
   • Enhanced business intelligence and customer experience tools for staff, train crews and control
   • Ability for targeted, service-level communication

3) Visual Business Intelligence tool
   • Provide a visual representation of customer sentiments for different train operators
   • To provide senior managers with an overview of train service performance overlaid with real-time customer sentiment

https://ts.catapult.org.uk/current-projects/sentiment-mapping/
The Traveller Needs UK Capability Study

Main aim:
To identify IM areas of value, recommend investment priorities and policy interventions to deliver value to the UK (by 2030)

- Extensive multi-modal Intelligent Mobility study
- 10,000 online respondents
- 100 detailed interviews with industry experts
Why traveller needs?

Many studies have analysed user travel sentiments

• Most are specific to a transport mode or geography
• Short-term incremental improvements of current transport systems

Other studies have explored future mobility technologies

• Tendency to focus on technical innovations in a specific sector

This study takes a holistic view of Intelligent Mobility

• Transport modes
• Sectors
• UK geographies
• All aspects of Intelligent Mobility
Traveller types

- **Default Motorists**: 26%
  - Require mobility services that provide independence are affordable and cost-effective.

- **Progressive Metropolites**: 14%
  - Ideal lead users for new Intelligent Mobility solutions

- **Local Drivers**: 24%
  - Driving experience and Context aware information services would benefit these users

- **Dependent Passengers**: 21%
  - Require mobility services that provide independence are affordable and cost-effective.

- **Urban Riders**: 15%
  - Opportunities for sharing and affordable 'non-local' travel

Flexibility of door to door solutions. Dynamic, seamlessly integrated.
Capability priorities

Collaborate with other countries

Priority developments

Potential developments

Lower priority developments

Market observation

UK relative capability

Collaborate with other countries

Priority developments

Potential developments

Lower priority developments
Next steps for the study…

Benefits include:
- Cross-sector and cross-modal alignment
- Framework for investment priorities
- New business opportunities
- Richer and broader knowledge base
- Understanding Value spaces
- Placement to analyse data with a focus on user segmentation

IM roadmaps in development

https://ts.catapult.org.uk/current-projects/traveller-needs-uk-capability-study/
Station Innovation

PHASE 1 – Preliminary investigation

Main Objectives:
• Audit of access, movements and station-train interfaces
• Generate a set of options through ideas shops
• Identify barriers to innovation for further capacity improvement
• Low fidelity pedestrian modelling of potential options
• Create an on-line portfolio of high impact SMEs;
• Recommend actions from short- to long-term.

Challenges identified
• Reducing constraints from congestion and lack of speed
• Reducing conflicting flows to increase capacity and movement
• Minimising obstacles which block movement
• Is industry innovation rapid enough compared to passenger needs?
PHASE 2 – Pilot and trials of solutions from Phase 1

Main Objectives:

- Establishment of Pilot Station
- Pedestrian Tracking and Carriage Occupancy Technology Pilots
- Passenger flow optimised rail time table and platform allocation
- Operational Trials and Customer Experience Innovation
- Connected and Autonomous Vehicles Impact on future station design

https://ts.catapult.org.uk/you-us/open-calls-space/stationinnovation/
INNOVATION GRANTS

• Transport Technology Innovation Grants (T-TRIG)
  Competition run in collaboration with the DfT to fund (via the means of a grant worth up to £25,000) innovative transport research ideas that will help progress the industry within the UK and beyond. TSC had a coordination and evaluation role.
  [Link](https://www.dft.gov.uk/innovation-grants/)

• ALSTOM Challenge
  The Rail Grand Challenge competition will have a prize of up to £50,000 to help an SME develop their idea or product.
  The winner will also have the opportunity to work with Alstom to see their concept realised and in use on the railway network.

[Link](https://ts.catapult.org.uk/you-us/open-calls-space/)
Conclusions

TSC has been designed to accelerating the impact of transport research and innovation initiatives by embracing challenges and turn into bigger opportunities.

Develop shared knowledge building on travellers value, experience and needs.

After 2 years TSC has demonstrated, through several case studies, that can make a big impact to transport innovation.

TSC is open to provide support and share the experience gathered so far to develop new national and international initiatives.

Other excellence exist within the United Nations community,

....... Transport Research and Innovation HUB!