

Automating Inspection and Maintenance Activities to Remove Workforce from High-Risk Areas and Improved Data Capture

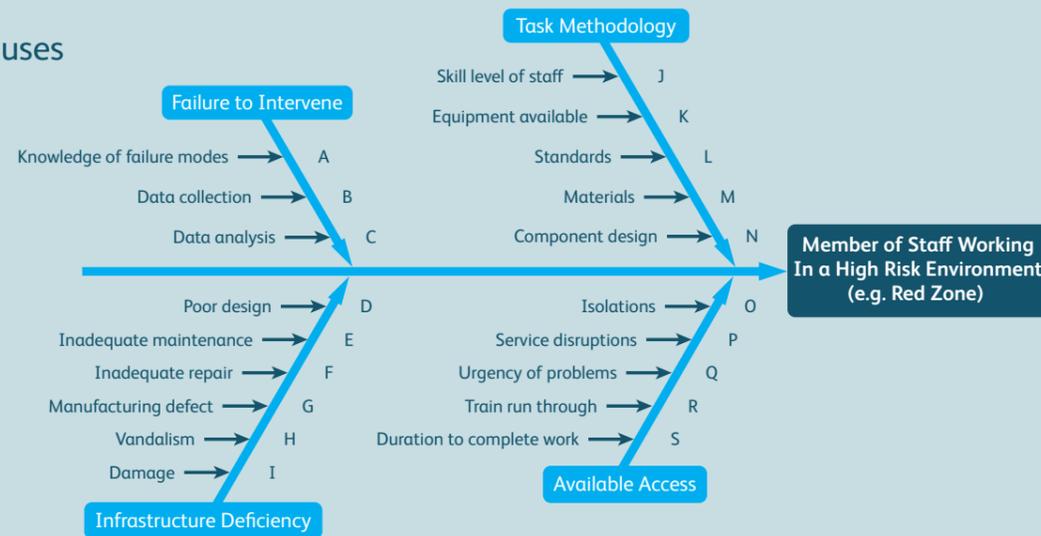
What is the situation? Robotics, Automation and Artificial Intelligence (RAAI) offers a potential step change in the way we manage asset data, undertake infrastructure inspection and maintenance activities on the UK railway network. This innovation will help us to deliver key business objectives of safety, performance, customer experience, capacity, cost efficiency and sustainability.

The introduction of the Digital Railway and the deployment of ERTMS will lead to an increase in capacity of the network. As we increase capacity and run more train services, the opportunity to undertake maintenance operations will reduce and degradation rates will increase.

We also need to accurately understand the condition of the assets so we can plan and perform timely maintenance activities. Autonomous systems will monitor the network, providing Artificial Intelligent Systems the data to analyse and develop trends of asset-risk. This will enable decision support tools to schedule the most effective inspection and maintenance programs with minimal disruption.

More trains will equate to more wear on the infrastructure. This will lead to an increase in inspection and repair requirements. We need to be more productive with possession time. It is expected Robotics and Automation could be one answer in enabling more productivity.

Analysis of causes



Priority problems

Specific priority problems

- Carrying out inspections in hazardous environments puts staff at risk. Therein a need to investigate means of doing this autonomously or remotely to reduce the risk.
- Demonstrating improved quality of inspection data capture (reproducibility and repeatability).
- Create an economical solution, where all devices are modular and use common communication protocols.
- Providing proof-of-concept within a system engineering environment.
- Logically planning the progression along the degree of automation.

Related goals

- Creating an overarching systems architecture to operate all remotely controlled (unmanned) systems.
- Concept demonstrator for:
 - railhead repairs and
 - brick-lined tunnel inspections.
- Identifying and replacing, through technological development, further high-risk activities currently performed by some front-line staff to go through the same process.

Scope

There are significant challenges facing the railway, including a need to reduce disruption to services.

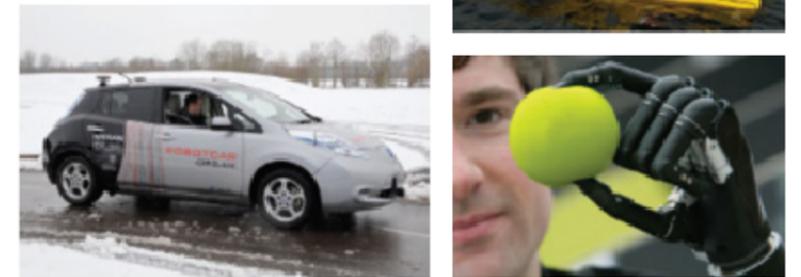
The requirements are to:

- Improve workforce safety: be more productive using automation and increase the reliability of the infrastructure, thus increasing the capacity of the infrastructure.
- Improve workforce safety: reduce the need to access the infrastructure, develop technologies to enable activities to be remotely controlled from safe areas and mechanise and automate processes to remove manual tasks.
- Increase infrastructure reliability: automating inspection activities would improve the precision and accuracy of the data collection, introducing data analytics, removing human bias from these activities, improving repeatability and reproducibility. This will improve information about asset condition, inform inspection and repair schedules based on asset risk.



Both the Rail Technical Strategy (RTS) and Network RTS identified that autonomous robotic systems could be a potential step towards a resolution.

Demonstrator Statistics: Quality issues (e.g. Level of Rework); Number of staff working red zone; Level of injury due to manual handling/HAV.



Expected impact & benefits

We see this technology being used in two main scenarios:

- Development of a distributed sensor network enabling data to be provided to modelling, analytical and decision tools to support systems. With the aim of reduced cost and maximised network availability for routine inspection and maintenance interventions.
- Development of modular robotics to automate maintenance and inspection activities. This will reduce the requirement for infrastructure access improving worker safety, reducing cost and maximising network availability for routine inspection and maintenance interventions.