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Title of presentation	Institution
Human Factors at Network Rail: **Looking Backwards into the Future**	Network Rail

Please highlight workshop topic(s) your paper is relevant for

- □ Ergonomics and Usability of Advisory and Assistance Systems
- □ Automation, Train Control Systems
- □ Risk, Human Error and Human Reliability
- □ Human Factors Integration (e.g., in organizational processes)

Abstract

The railway is a complex socio-technical system, designed to deliver people and goods to their destination in a manner that's safe, sustainable and convenient. These system goals are straightforward, but in an era characterised by digital innovation, extreme weather events, a global pandemic and an uncertain socio-economic future, finding the capacity to create and maintain a resilient transport system requires innovative thinking and new approaches.

Network Rail, as the owner and operator of the GB rail infrastructure, must develop safer, better, cheaper and faster ways to enable continuous improvements. This requires an integrated strategy to move beyond today's thinking and yesterday's technology in order to solve the problems of tomorrow.

To show how these challenges are being addressed, this presentation will demonstrate how human factors interventions and systems thinking have been used to find solutions at the interfaces between people, processes and technology. Case study examples from the areas of infrastructure management, digital technology and resilient human performance will be used to illustrate some of the successes delivered (and obstacles faced) during work to embed human factors integration (HFI) within contemporary rail projects.

Infrastructure management
The first case study will describe the problems presented by the legacy of ageing signalling infrastructure and the potential offered by a future reference command control and signalling architecture (RCA). In addition, it will outline current work on Network Rail's Target 190plus programme (which aims to find ways to halve the cost of signalling renewals) and explain why human factors engineering approaches are critical, not only to the development of human-centred processes, tools and new technology, but also to support changes to strategic enablers and corporate policy.

Digital technology
The second case study will explain why HFI is critical to the delivery of digital innovation projects where cutting-edge applications interface with legacy systems, new assumptions are embedded into well-established processes, and the worlds of operational technology and information technology collide. The design of increasingly automated systems is shifting the burden of responsibility for real-time decision making from front line operators to software developers and engineering managers. Human factors contributions to system architecture, requirements analysis and safety engineering are therefore critical to future success.

Resilient human performance
Progressive thinking in the areas of safety management, system resilience and sustainable human performance requires hindsight, insight and foresight. This final case study will introduce a philosophical approach to the management of risk in which data, peer-reviewed research and a strong

theoretical foundation is necessary to build evidence-based decision making to cope with disruption management at the level of strategic uncertainty and real-time railway operations.

The presentation will show the value and benefits of focusing on the context of use whilst combining methods from cognitive systems engineering, ergonomics, user experience design, cybernetics and resilience engineering. This multidimensional approach allows teams to look backwards and forwards at the same time – backwards to preserve the insights, research and lessons of the past, and forwards to imagine future possibilities at the human-system interface.