Accounting for differing perspectives and values: the rail industry

Dr Brendan Ryan
Human Factors Research Group,
University of Nottingham, UK

Presentation for the FonCSI HOF seminar,
Royaumont, France, 24th-26th January 2018

Who am I?

Environmental Science
U. of Salford

EHO

EH & Safety Consultant

- Different perspectives
- Self reports
- Observation
- Inspection
- Enforcement
- Advice
- Research

PhD Ergonomics
U. of Nottingham

National Accident Investigator
Network Rail

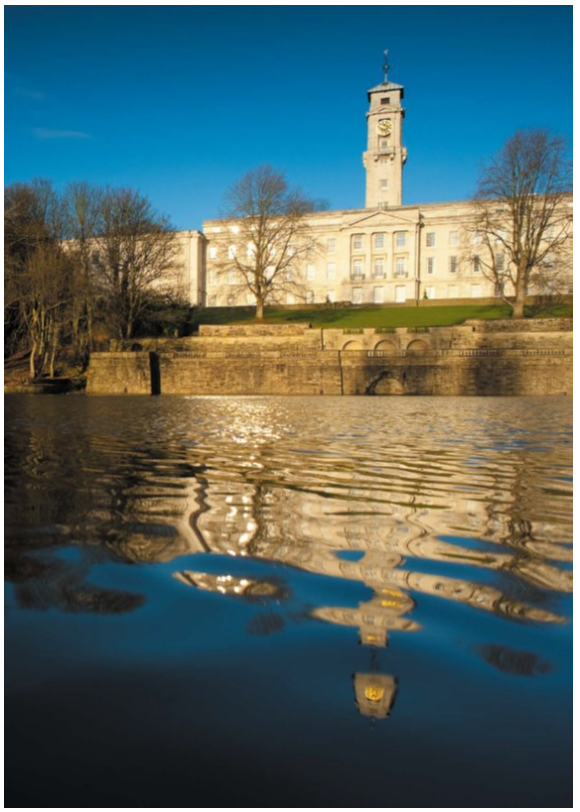
Senior Research Fellow / Assistant Professor
U. of Nottingham

Work activities
Workplaces
Work systems
Work Organisation




Human Factors Research Group, University of Nottingham

- The group philosophy - **Safe, effective and engaging performance** through understanding the characteristics and capabilities of people individually, in teams and their interactions with technology and other systems
- http://hfrg.nottingham.ac.uk
- Faculty of Engineering
- 7 academic staff, 16 research staff, 35 PhD students, 3 administrators
- Multi-disciplinary team including:
  - ergonomists,
  - psychologists,
  - computer scientists,
  - engineers,
  - operations management,
  - + access to other experts



FONCSI and HOF

- Discussion by email with Hervé Laroche
- My ideas were initially quite broad and I needed to decide whether to focus on fewer aspects…..
- …. empirical material to compare (or contrast?) top and frontline views of HOF issues.
- I decided to keep quite broad and conceptual

- Some of the HOF questions of relevance
  - …… implementation of human and organisational factors (HOF) approaches: how do organisations deal with this, either internally by developing knowledge and training or with expert help from outside;
  - centralised or localised; top down or participatory; specialist led initiatives or HOF in all practices?

The railway (based on Wilson 2014)

- Complex
- Distributed in time, space and function;
- Dynamic/changing, though with many legacy systems
- Significant production pressures; multiple jobs and roles and influence from outside (e.g. public, customers).
- Rarely one organisation involved (inter-organisational relationships and influences)

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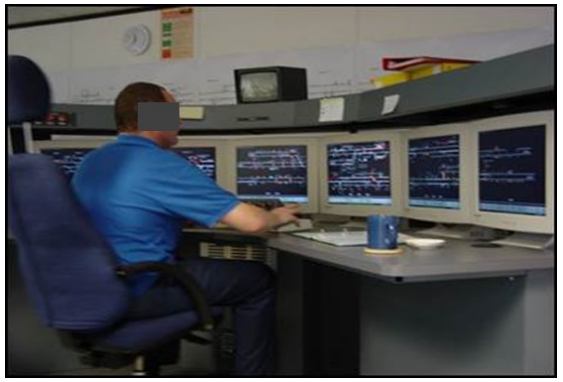
Our work at Nottingham

Rail engineering and maintenance



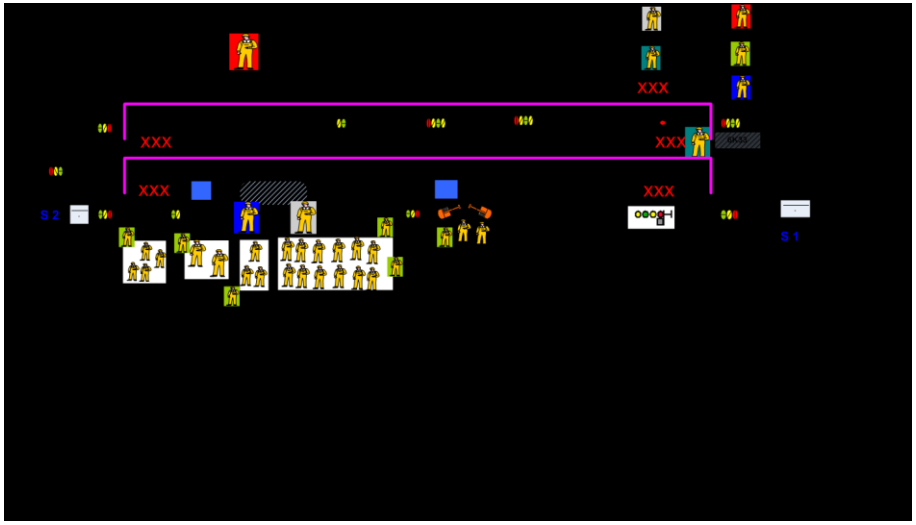
Signalling and traffic management

Driving

Public safety and passenger experience

Understanding engineering work on the railway

- 7+ years of study of access to the railway for rail engineering work (Wilson et al, 2009)
  - Introducing HF analyses alongside safety analyses for a new approach for safety track access (HF risk log, HF Case – Eurocontrol, Barry Kirwan)
- This included several PhDs
  - Schock 2010 – Using scenarios, principles for HF in rail engineering
  - Ferreira 2011 – Resilience in planning of rail engineering
  - Farooqi 2016 – Understanding opportunities for error in rail engineering
- Produced
  - In depth understanding of functions and risks
  - Descriptions of contexts, issues, problems
  - Knowledge of human factors affecting performance of functions



Groupings of Human Factors
- Planning,
- Communication,
- Understanding of work, roles, workload
- Rules and processes
- Organisational and safety culture
- "Things that go wrong" (including human error, risk, resilience)

Wilson, J.R., **Ryan, B.**, Schock, A,, Ferreira, P., Smith, S., Pitsopoulos, J., 2009. Understanding risk in rail engineering work systems. Ergonomics, 52, 774-790.

The HF case approach in rail (Wilson et al 2009)

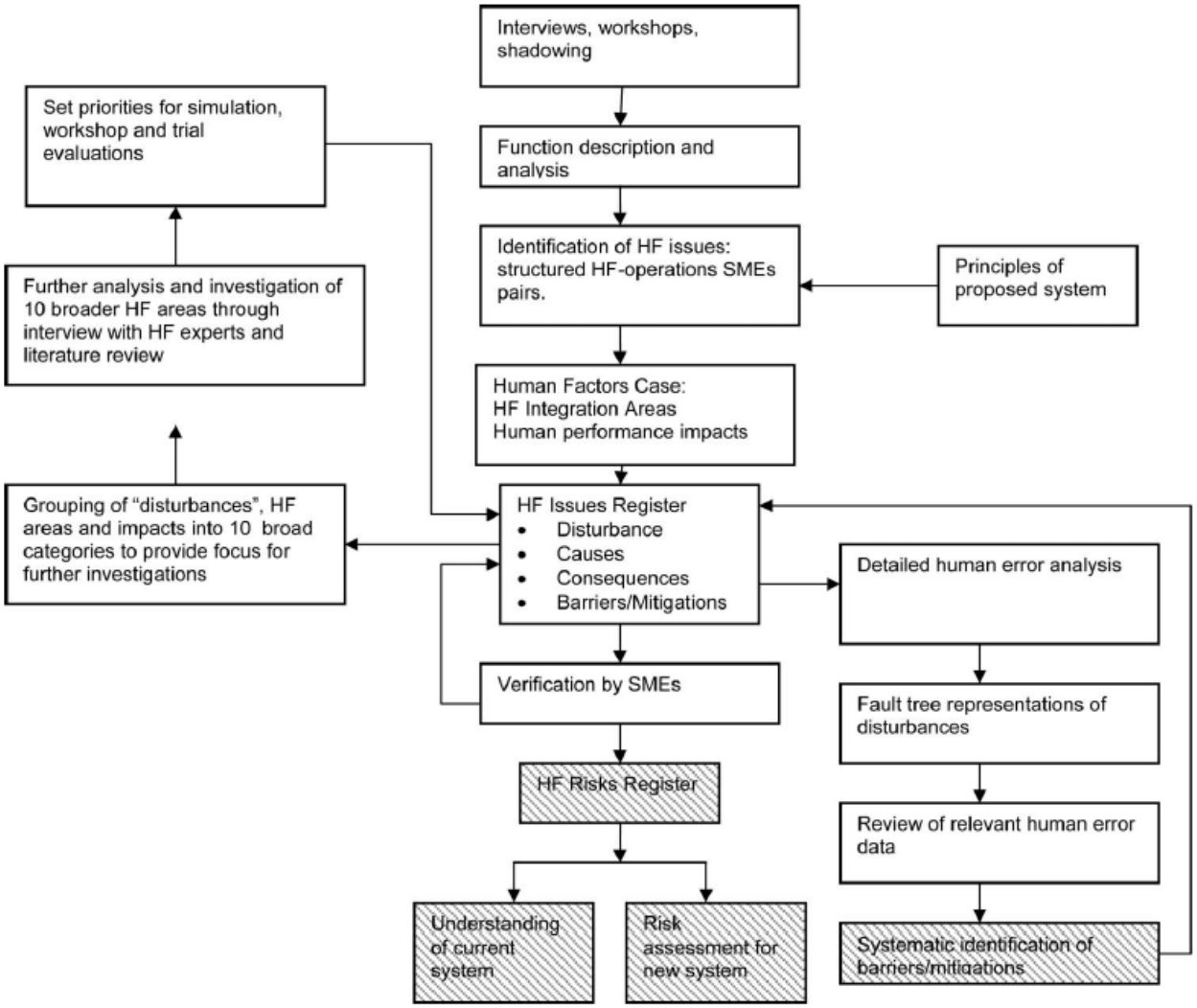


Figure 2. Human factors case programme for rail engineering (shaded boxes show work still to be completed at the time of writing).

Understanding the railway as a complex socio-technical system

This was followed by …

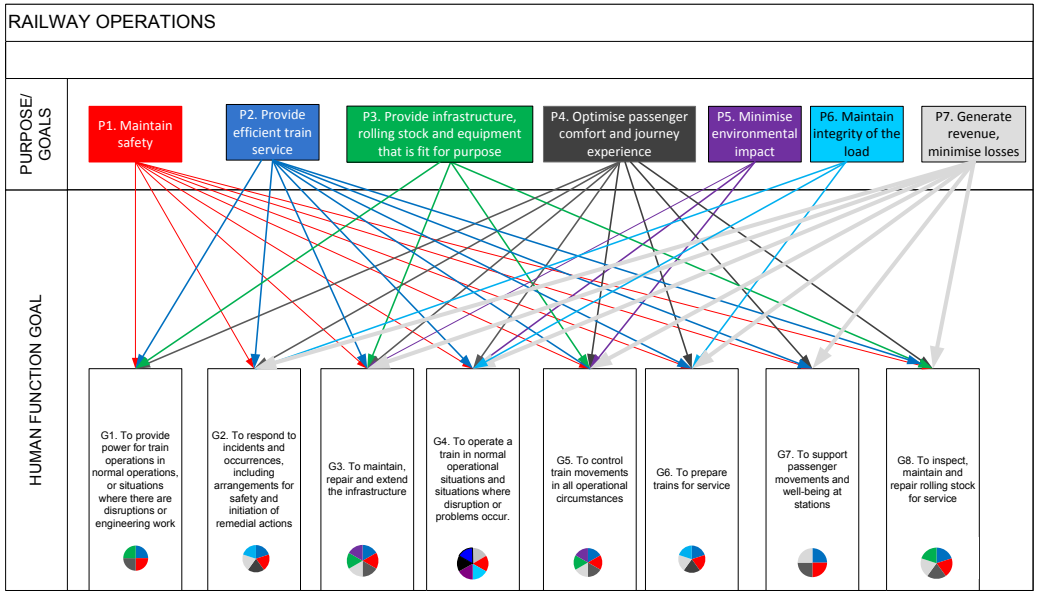
- Research on behalf of the ERA (now EUAR)– Human Functions in European Railways
- EUAR wished to promote the importance of people in rail systems
- Existing emphasis on technical systems, rather than human processes
- Analysis of all frontline railway roles
- 7 higher level system goals, 8 human function goals, 62 human functions
- http://www.era.europa.eu/Document-Register/Pages/Study-Human-Factors-Integration.aspx

European Railway Agency

The University of Nottingham

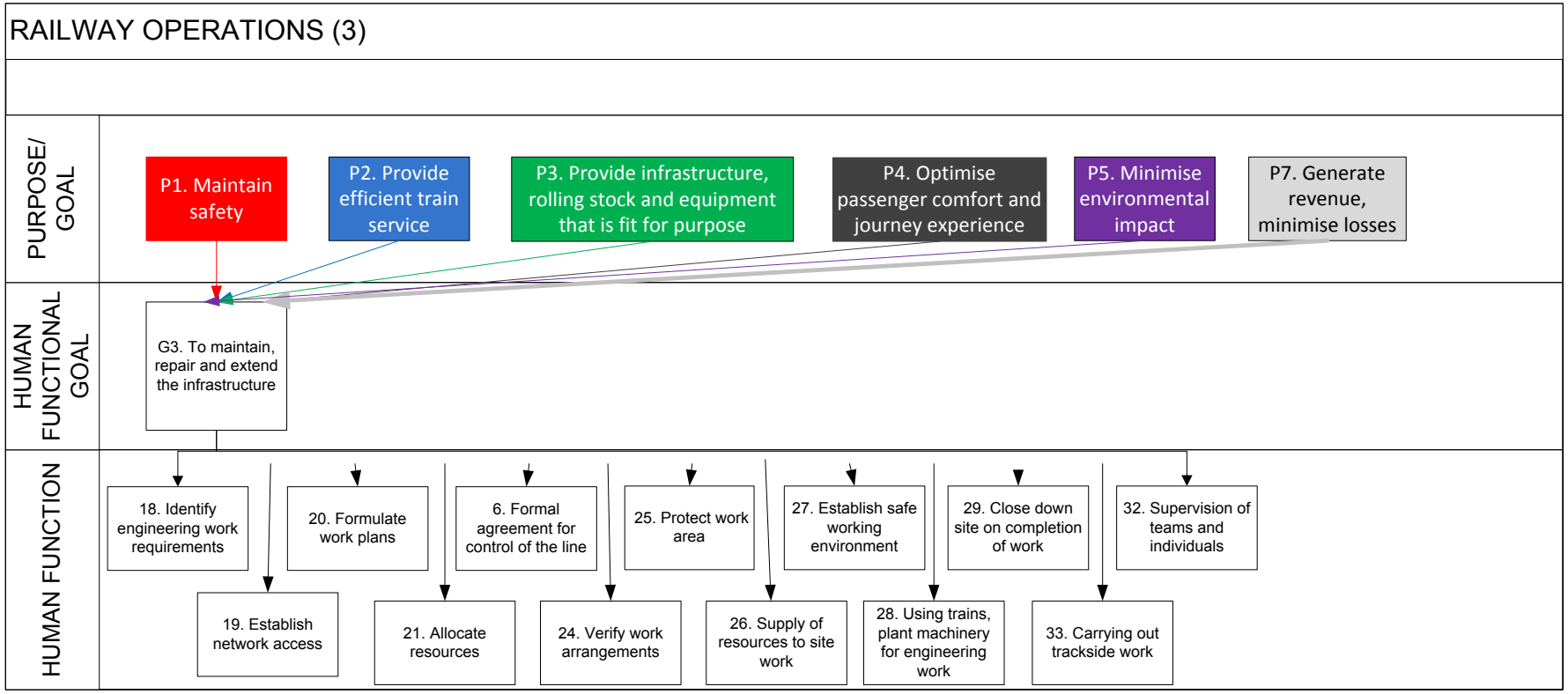
Framework of human functions in railway operations

Brendan Ryan and Laura Pickup, Rail Human Factors, Nottingham University
Susan Reinartz, Safety Unit, ERA



Ryan, B., Pickup, L., Reinartz, S., Atkinson, S., Dadashi, N., Golightly, D. What do people do on the railway? A framework of goals, human functions and safety relevant activities in frontline railway operations, (to be submitted to Ergonomics)

Expanding the analysis for rail engineering



Outcomes from this initial part of the work

- What do people do? - ***Function****, task, activity analysis, requirements*
- What can go wrong? - ***Risk****, error analysis*
- What can be done to prevent this? – ***Preventative measures, s****ystem design, safety interventions, barriers, mitigation*
- Does this work? - ***Evaluation***

Two more PhDs - Top down and bottom up approaches

- What do business leaders want? What is understood by people working at the front line?
- Interviews
  - In-depth interviews with industry leaders (Nolan-McSweeney et al, paper in preparation)
  - Interviews with decision-makers in various roles to understand safety leadership in multi-organisation engineering projects (Stiles et al, in press Safety Science).
- Future work is in progress to understand how people respond at the front line
  - Observational work with Apprentices (Nolan-McSweeney)
  - Case studies investigating the effectiveness of safety leadership interventions in 6 large engineering projects (Stiles).

Evaluating attitudes to safety leadership within rail construction projects (Stiles, Ryan and Golightly, accepted for Safety Science)

- Context – plateau in performance in high risk construction industry, need to move beyond compliance with procedures with more focus on improving behaviour and culture for a step change in performance.
- Safety leadership research is commonly within organisations. This research takes account of the **perspectives of people in different organisations** that work together in completing a construction project – **"What is good safety leadership in the rail construction context?"**
- **21 in-depth interviews** (Client, Principal Contractor and supply chain – mostly SME–98% of construction projects, 80% of costs)

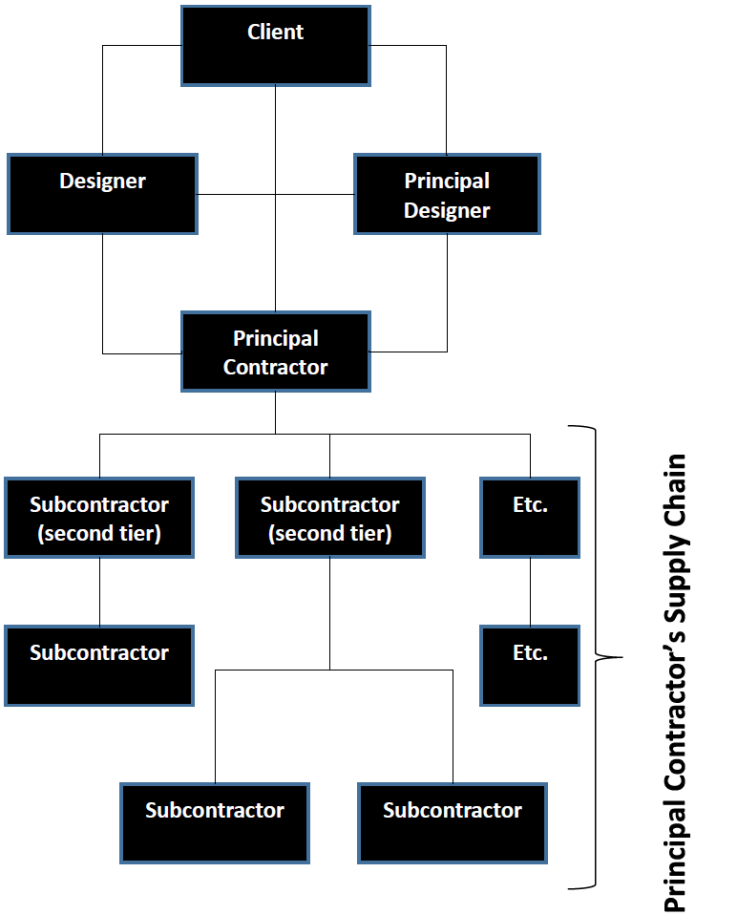


Figure 1: Typical structure of a Project Delivery Organisation

Stiles, S., Ryan, B., & Golightly, D. (in press). Evaluating attitudes to safety leadership within rail construction projects. Safety Science

Evaluating attitudes to safety leadership within rail construction projects (Stiles, Ryan and Golightly, accepted for Safety Science)

- Findings - Most participants had some understanding, generating suitable examples – Principal Contractors were strongest
- **26 different examples of safety leadership**, aligned with 9 areas from literature (e.g. demonstrating safety as a top priority, enabling safety reporting, encouraging workforce involvement, providing recognition for good safety performance)
- More than half of these related to **communications**
- Interventions were often those that could be **applied at supervisory levels** (increasing visibility around safety, providing recognition for good safety performance), **rather than senior management** (e.g. creating a more open and learning culture)
- The **success of the leadership interventions is influenced by 5 themes** (context, preparation, communication, leadership behaviour and style, and action)

Stiles, S., Ryan, B., & Golightly, D. (in press). Evaluating attitudes to safety leadership within rail construction projects. Safety Science

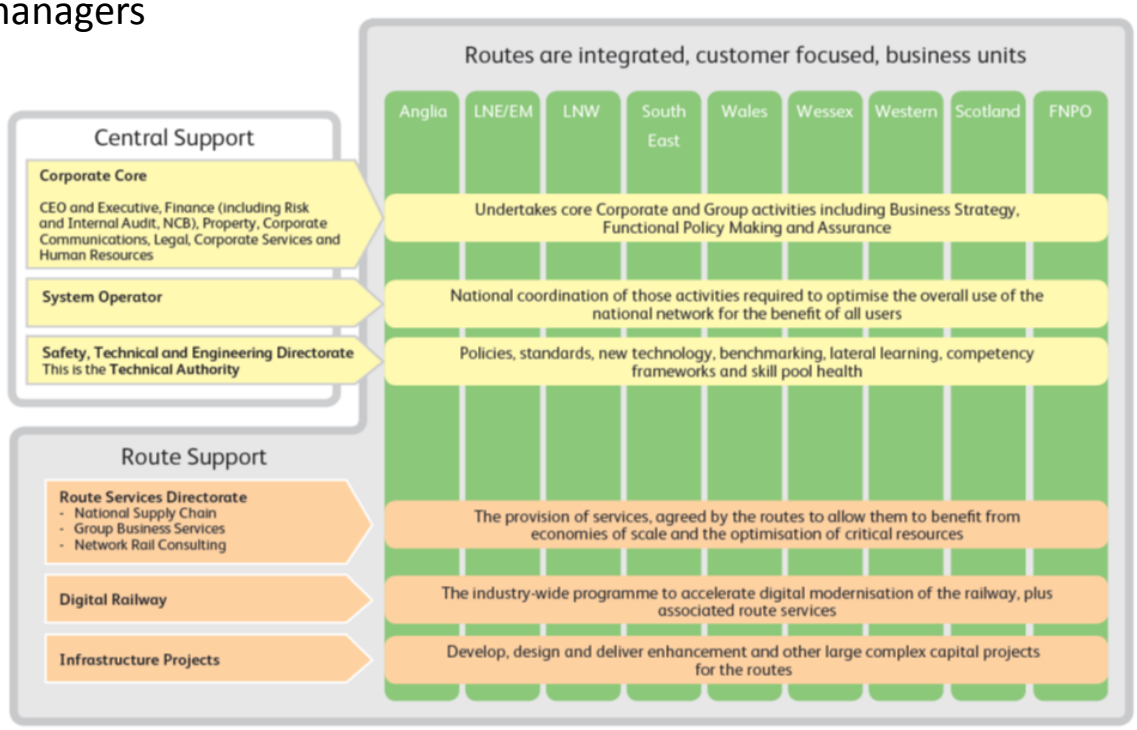
Opinions of key decision makers and perceived barriers to change in the railway industry (Nolan-McSweeney, Ryan, Cobb, in preparation)

- Background – There is much in the **literature on balancing different forms of risk, enabling consideration of trade-offs, studying communications, balance between stability and flexibility, and resilience**, but **can these be applied in practice.? Are these things that are considered by key decision makers**?
- Method – **25 interviews from amongst the most senior people in the industry** (Network Rail, DfT, ORR), focusing on the structure of the industry, safety leadership, change management, decision-making, goals and objectives.
- Analysis – Using themes from Rasmussen and Svedung (2000)

Theme	Sub-themes
Objectives	1. Clarity of objectives / vision 2. Objectives communicated within the system 3. Socio- technical- and economic considerations
Status Information	4. Decision makers properly informed 5. Boundaries of acceptable performance visible 6. Alignment to objectives
Capability	7. Competent decision makers 8. Functional properties (organisation design, technical core etc.) 9. Boundaries affecting performance
Awareness	10. Implications of decision making 11. Risk considered in the flow of work 12. Learning the lessons
Priorities	13. Resilience 14. Trade-offs 15. Decisions within a hierarchy

Opinions of key decision makers and perceived barriers to change in the railway industry (Nolan-McSweeney, Ryan, Cobb, in preparation)

- Findings - Common **focus on structure** – many references to a matrix organisation. … though it was suggested that the **structure solves nothing – "it is the way the people operate the structure that makes the organisation succeed or fail".** … …need to develop the right culture and behaviour ….
- **Belief that people resist change**
- **The way in which key messages are delivered and goals are articulated** needs consideration
- Some **interactions and inter-relationships are more complex after change**
- The flow of **money, revenue and costs can't be ignored** in decisions around safety
- **Trade-offs** were recognised as being essential, though some disagreement on whether trade-offs are really tradeable
- **Managing complexity** is a core skill for managers



Network Rail Matrix Structure (Shaw, 2016)

Some preliminary findings on areas of interest from these two interview studies

- Interviewees **demonstrated understanding of aspects of the socio-technical system in rail** (key interfaces, complexity, successes and barriers to change). There is a **desire for improvement, but the challenges in implementing changes are recognised** (e.g. harnessing and communicating the vital role that people play in the system).
- Identified **issues around multi-organisational performance** in a complex rail system.
- Highlighted **issues around different sources of risk, how these can be made more visible, and enable consideration of the likely trade-offs** between socio-, technical and economic performance when making decisions
- **Need for wider consultation** around the perceptions and motivations of staff at various levels (beyond executive level, to management and front-line staff)
- **Improved knowledge of safety leadership interventions**, but **needs more on how these can influence safety outcomes**. Can impacts of leadership interventions be measured? What influences safety leadership at different levels e.g. senior management and supervisory levels?

What might appear to be a diversion

- There is value in taking an alternative viewpoint of the system

On Top of the Sears Tower | Chuck Przybyl | Director of ...chuckphoto.com

1.69 billion passenger journeys, a 2 % increase on 2014/15

0 Passengers or workforce fatalities in train accidents for the ninth consecutive year

8 passenger fatalities in individual incidents, all at stations

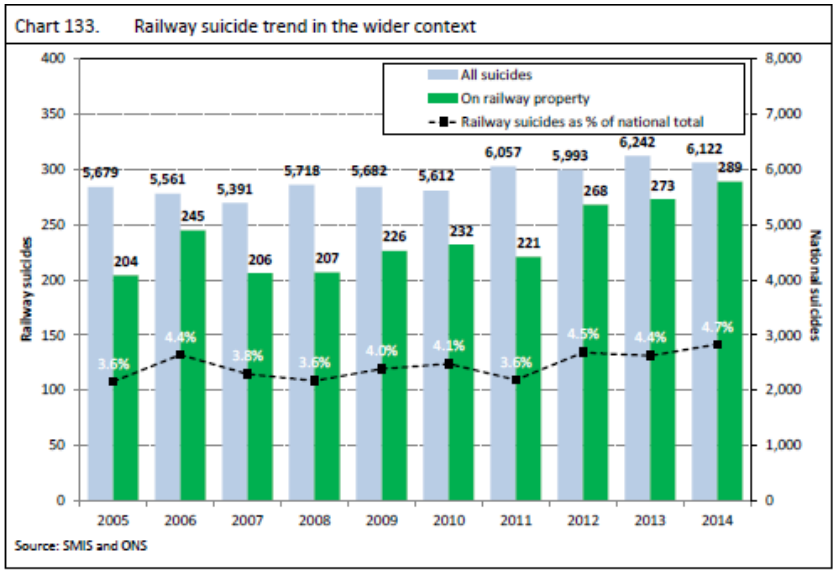
0 workforce fatalities

289 Public fatalities -
252 were suicides or suspected suicides
30 were trespassers
3 occured at level crossings
4 died from other causes

288 major injuries to passengers

157 major injuries to members of the workforce

www.rail.co.uk



Prevention

Would You Accept Screen Doors For The NYCTA?
forums.bvestation.com

Images from Network Rail

Current prevention strategies

- Discourage ideation
- Prevent access
- Influence people when in a place of risk
- Mitigation of consequences

However,

- We know that this will continue to happen (*cf* violations, threats from beyond the boundary of the system)
- It is arguable that we could do more, though this would have huge impacts on the system (train performance, economics)
- We don't know enough about prevention (how does it work, in what circumstances?)

Ryan et al (in review) Evaluating measures to prevent railway suicide and trespass fatalities

Concluding - Drawing things together

- There has been a **desire for integration of human factors approaches** from the various parts of the industry (e.g. rail engineering with Network Rail, human functions with EUAR)
- Our research has **taken account of the wide ranging stakeholders / organisations** involved in running, maintaining, using the operational railway. Interviews with senior executives have been encouraging in terms of their aspirations re HF concepts, but more analysis needed to be clear on implementing this in practice.
- We have tried to **understand and describe what people do** – there are many (human) functions, but analysis can be manageable at this level of detail (but we can't stop there).
- There are **different perspectives of people that need to be considered**, within and between organisations; also different points of focus for researchers, investigators, managers / executives (e.g. resilience, culture, behavioural, technical).
- **Successful engagement with the industry** has not necessarily been labelled as "human factors" (e.g. suspicious behaviours and effectiveness of interventions for rail suicide)
- We **need to look harder** (look in a different way e.g. behaviours before suicide (Ryan, in press) … try to *really* understand behaviours and motivations before safety related incidents). Our qualitative approaches have been valuable – doing a lot with what can seem to be a little. Understanding and describing the detail and context is essential.

Ryan, B. (in press) Developing a framework of behaviours before suicides at railway locations. Ergonomics

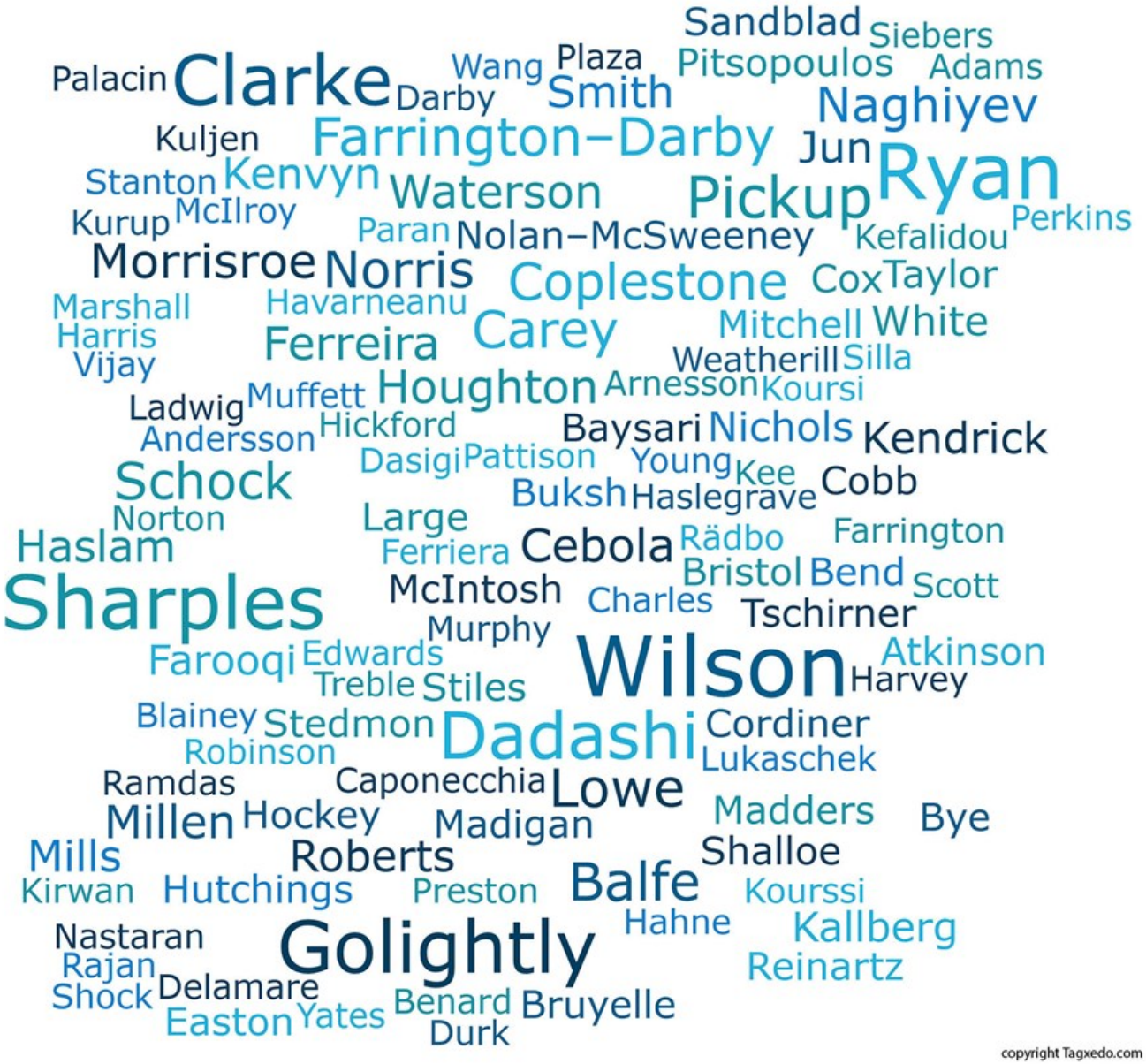
The future railway

- The railway is changing and needs to continue changing (e.g. innovation, new technologies, demands for capacity, efficiency, continuous improvement).
- We need to understand the opportunities and challenges of the 2050 railway – e.g. the role of the railway in mobility in the future.
- We will continue our work in considering the important roles of people in the railway system. How do people use and contribute to a high density, high volume, high functioning and potentially high risk form of mobility?

The twelve key capabilities are:

1. Running trains closer together
2. Minimal disruption to train services
3. Efficient passenger flows through stations and trains
4. More value from data
5. Optimum energy use
6. More space on trains
7. Services timed to the second
8. Intelligent trains
9. Personalised customer experience
10. Flexible freight
11. Low-cost railway solutions
12. Accelerated research, development and technology deployment

Many thanks to the contributors to rail research at Nottingham in the last 30 years



Thank you for listening.

Please ask any questions or offer suggestions or advice?

brendan.ryan@nottingham.ac.uk

Additional slides

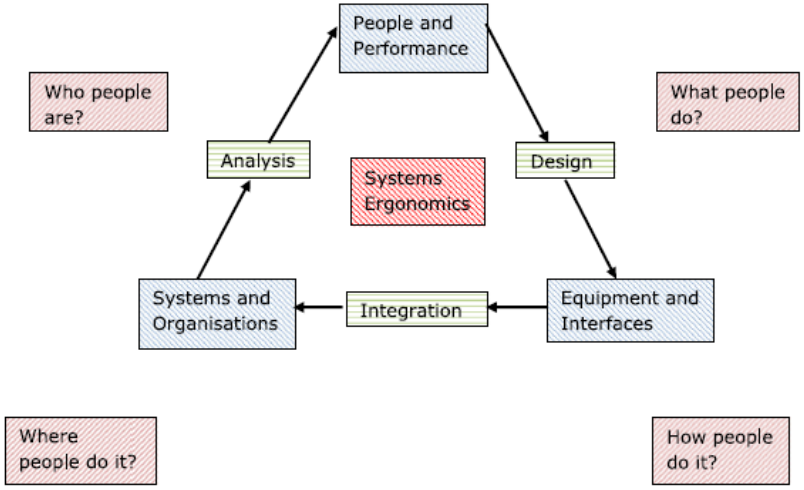
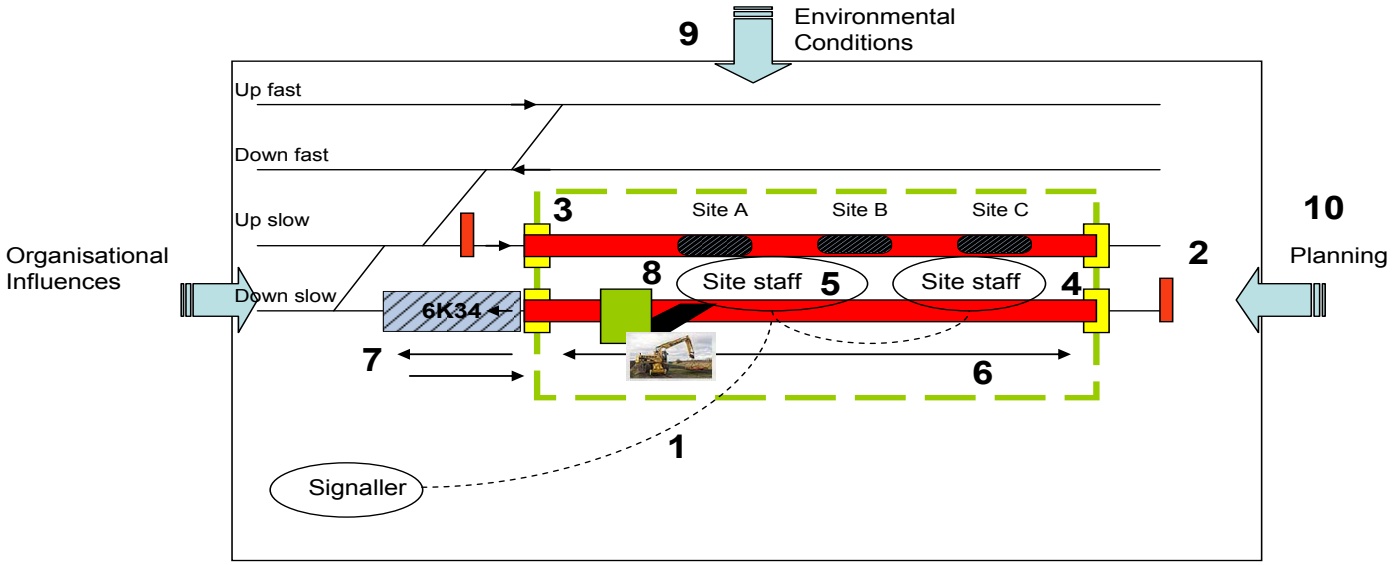


Fig. 1. Representation of rail systems ergonomics/human factors.

From Wilson 2014

HF principles for protecting rail engineering work



1. Exchange of information between relevant parties (communications)
2. Use of the fixed signalling infrastructure to protect engineering work and workers
3. Use of onsite demarcation and warning systems to protect engineering work and workers
4. Ensure that both site and remote based staff can identify relevant locations
5. Maintain control/supervision of site staff
6. Ensure workers on track are separated from vehicle movements
7. Ensure vehicle movements are controlled when entering, exiting protected areas
8. Ensure relevant areas of the infrastructure can be accessed safely and efficiently
9. Ensure system flexibility to respond to changes or unexpected situations arising
10. Ensure coordination between those planning the work and those planning the protection arrangements

Schock, A., **Ryan, B.**, Wilson, J.R., 2009. Principles for Protecting Rail Engineering Work - Challenges for the Human Factors Community, Third International Conference on Rail Human Factors, Lille, France, 3-5 March 2009

“Never events”

Mind the doors! © Stephen Craven cc-by-sa/2.0 www.geograph.org.uk640 × 480

One size does not fit all: history's legacy of platform gaps ..www.thecitizen.org.au

“The school run”

“There are 17 vine ladders on the 800-metre-high way home, but the most dangerous part is a path on the cliff without a vine ladder.”

Photograph: Feature China/Barcroft Images, http://www.theguardian.com/world/2016/may/27/worlds-most-dangerous-school-run-chinese-children-800m-cliff