Enabling innovation in the GB rail sector – a systems approach

INCOSE UK RIG

2nd Railway Systems Engineering Workshop

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TSAG commissioned a study to validate the barriers to innovation and to propose solutions to enhance innovation across the industry

**Context**

- Implementing the Railway Technical Strategy, and meeting HLOS, will require short and long-term technological innovation – some of it radical

- There is a widely-held perception that the GB rail industry has a conservative attitude towards innovation and that there is a culture of risk-aversion

- We were asked to validate a prior systems analysis of barriers to innovation, to validate the analysis through consultation, and identify key strategic actions to improve innovation

- Reviewing and developing the analysis, we spoke with about 40 stakeholders across the industry, clarified barriers and sought to separate cause from symptom

- Our proposed solutions are under discussion at TSAG
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We reviewed prior work and refocused it to key aspects of innovation as a template for identifying barriers and solutions

Rail industry Innovation – a systems view

- We began with a starting point from Francis How and RIA

- In parallel we mapped supply chains, reviewed literature, consulted with railway industry stakeholders and drew comparisons with other industries

- This gave us a map of the industry and of the big issues seen by many practitioners
RIA’s system model identified many issues – for example external drivers, corporate competence and culture, and risks of introduction

The prior system diagram was developed by the RIA, aimed at characterising cause/effect chains affecting technological innovation. Thanks to Francis How
We developed the diagram – consulting with stakeholders throughout for validation of perceptions, issues, barriers and candidate solutions.

Note: ‘+’ illustrates self-reinforcing ‘virtuous circles’
A simplified diagram focuses on key linkages and the flow of innovation

- **Business and system context (National & International)**
- **Strategic imperative and corporate support (Intra-company)**
- **Processes, competence & culture (Intra-company)**
- **Implementation processes (Intra- and inter-company)**
- **Clear corporate incentives and visible rewards for innovation**
- **Robust Business Case**
- **Effective Risk Mgt Tools: Acceptance processes, Standards, Testing facilities**

Relevant innovations brought swiftly and cost-effectively into use
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We confirmed three types of barrier which hinder delivery of innovation and lead to a reputation for risk aversion towards new innovation introduction.

**Type 1 Barriers**
- Lack of holistic “Systems View”

**Business and system context (National & International)**

**Type 2 Barriers**
- Weaknesses in organisation processes, competence, culture

**Strategic imperative and corporate support (Intra-company)**

**Innovation flow**

**Type 3 Barriers**
- Poor implementation risk management

**Organisation processes, competencies & culture (Intra-company)**

**Implementatio**

**n processes (Intra- and inter-company)**

**Effective Risk Mgt Tools: Acceptance processes, Standards, Testing facilities**

**Robust Business Case**

**Relevant innovations brought swiftly and cost-effectively into use**

**Clear corporate incentives and visible rewards for innovation**

**Indicates barrier**
Within each type, specific strategic and practical barriers have been identified that significantly affect key players across the supply chain.

**Holistic “Systems view”**
- Alignment of business drivers and incentives
- Visibility of opportunities that cross system or organisation boundaries
- Understanding customers’ priorities
- Constrained timescales to deliver benefits
- Franchise conditions that delay innovation
- Small market for applications unique to GB

**Organisation processes, competence and culture**
- Monetising benefits of innovation
- Concerns about risks exceeding rewards (safety and reputation)
- Cultural barriers from history of frustration about innovation
- Possible weaknesses in processes / resources / competencies

*But most organisations regard themselves as competent innovators!*

**Implementation risk management**
- Access to testing and trialling facilities
- Acceptance processes – understanding and flexibility (e.g. accepting of prior trial evidence)
- Equitable management of implementation risk
- IP protection under cost focused procurement processes
- Maintenance/operational practices rely on long experience
- Standards - understanding of their creation, development and change
- “Ex-BR” approach
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We focus now on the issues of systems perspectives of innovation

The impact of a systems view

- First – a key premise: People can innovate, overcoming barriers, if they understand the need and can make a commercial return at an acceptable risk.

- It is difficult to see the full extent of possible returns from innovation within a complex system - it’s hard to see the need.

- It is difficult to realise benefits from a complex and fragmented system – and even harder to realise benefits equitably.

- Risks multiply through a complex system that is hard to influence.

- While other barriers undoubtedly apply, system understanding and commercial motivation are primary blocks to innovation.
We proposed three main areas of intervention: to underpin motivation for systemic innovation; to build capability; and to manage the risk of introduction.

1. Create systems leadership for innovation
   - Provide commercial motivation for innovation, especially radical innovation with the capacity to transform system performance and through-life economics
   - Open the innovation landscape by providing stable and credible systemic strategies for the rail industry

2. Enhance industry capability for innovation
   - Create a focus for large-scale research and feasibility demonstration in the industry
   - Provide support to individual companies seeking to enhance their internal innovation capabilities and resources

3. Reduce the risks of introducing innovation to the system
   - Manage better the risks of bringing innovations onto the rail system, thereby improving speed of introduction
   - Enhance the effectiveness of approaches for standards, acceptance and testing
Today we will focus on the systems aspects – and specifically on building a landscape within which systemic innovation is better understood.

1. Create systems leadership for innovation

**A ‘system sponsor’ function**

- Senior executives from key organisations in the industry
- Powerful enough to make big strategic commitments
  - about direction
  - about budget
  - about trade-offs

**A ‘system leadership’ function**

- Systems engineers and economic modellers
- Tasked with identifying and assessing options and implications of innovative schemes
  - across boundaries
  - across timescales
Systems context for innovation – what do people need to do?

A ‘system sponsor’ function
Direct the focus of the analyses and assessments
Review and adopt the recommendations

*Make commercial arrangements and commitments that allow system innovation to go ahead*

A ‘system leadership’ function
Develop schemes, structures, alternatives and trade-offs
Make recommendations that allow system optimisation
Clarify benefits, disbenefits, costs and returns

*Make visible the implications of systemic innovation*
A systems view to enhance innovation

Systems context for innovation – what are the factors for success?

1. Create systems leadership for innovation

**A ‘system sponsor’ function**
- Credibility and authority
  - Visible and credible ability to act in the interests of the industry at large rather than organisationally
  - Clarity of scope and authority

**A ‘system leadership’ function**
- Credibility, competence and independence of team
  - Ability to articulate commercial, operational and technical trade-offs, advantages and disadvantages
  - Minimum bureaucracy and maximum agility
Systems context for innovation – issues?

How to make it work in practice

Scope and size – project, route, region, network?
Capacity and cost – new body, adapted previous entity, permanent, seconded?
Credibility and independence?
Overlap with other bodies and avoiding yet another entity?

Examples
Aerospace
Railway

1. Create systems leadership for innovation