AGENDA ITEM: 02

MEETING: RSSB Board Meeting
DATE: 05 July 2012
SUBJECT: Research and Development – Review of 2011/12 and Implementation
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1. Purpose of paper
   To update directors on the achievements and value of the RSSB managed industry research and development programme in 2011/12. To report the results of a recent review of implementation and propose changes to further strengthen industry governance.

2. Key points
   - 2011/12 saw 44 projects completed and published, with an average benefit-to-cost ratio (BCR) of 7.7, representing a good return on the investment.
   - Programme highlights include
     o The launch of the £multi-million Accelerating Innovation in Rail competition
     o Further development of the knowledge and technology transfer services
     o The launch of RRUKA and SPARK
   - Findings from a review of implementation and experience of the governance changes introduced in the year have led to proposals for us to work with industry to strengthen some of the aspects of R&D delivery to further facilitate industry implementation, including
     - clarifying the roles of Project Champions and cross-industry client groups
     - better planning for implementation
     - reviewing and reporting industry progress with implementation.

3. Review of 2011/12 – Programme highlights
   3.1 Overall, 2011/12 has been a successful year. Key achievements include:
   - There were 44 projects completed and published. The potential financial (weighted) benefits from these projects are estimated to be over £160 million over 20 years, leading to an average benefit-to-cost ratio (BCR) \(^1\) of 7.7 for these projects (see section 4 for highlights). This represents a realistic view given the likely level of industry implementation. The achievement of higher levels of implementation would clearly lead to greater benefits being realised. Additionally, some of the research has primarily non-financial benefits, for example through contributing to industry knowledge, solution and/or product development and decision support.

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\(^1\) The weighting represents a realistic evaluation at the end of a project and makes assumptions about the likelihood of implementation and industry commitment to taking the necessary actions. The costs used in the evaluation include the actual cost of the R&D and an estimate of industry implementation costs.
• The knowledge and technology transfer services consolidated their popularity with stakeholders, with a year of high demand and positive feedback. 38 searches were completed, with 43 new searches commissioned.

• The Technical Strategy Leadership Group (TSLG) bid for £150m in the Initial Industry Plan to be used to establish an innovation fund. This could change the game for technology development and demonstration during CP5. This has led to the proposal to establish an innovation capability in the industry, the Enabling Innovation Team (EIT) (item 6 on today’s agenda).

• On behalf of TSLG, the RSSB/TSB Accelerating Innovation in Rail competition was launched and achieved a four-fold leveraging of industry funding (£2.5m to £10m)

• DfT confirmed the award to RSSB, on behalf of TSLG, of a grant for development and implementation, (on top of the existing core research grant). It was used to a) support a number of workstreams led by RIA aimed at promoting innovation in the supply chain, b) increase the contribution to the Accelerating Innovation in Rail competition and c) fund the RSSB/RIA Innovation Prize (won by Park Signalling for its Virtual Lineside Signalling system).

• The launch of SPARK as the tool for sharing knowledge, with external users, including from members of RSSB, continuing to increase. Additionally, RSSB signed an agreement with the UIC for SPARK to become a global knowledge sharing platform, giving GB rail access to an even richer source of knowledge.

• RRUKA was successfully launched in November 2011 and held the 24/7 railway event jointly with Network Rail, resulting in a number of research projects being funded.

• RSSB signed a knowledge sharing partnership with the CRC for Rail in Australia and continued to work with other research organisations around the world.

• New governance was implemented on 1 July 2011. A guide to the programme, including the new governance was published, along with a revamp of the R&D web pages, making it easier for stakeholders to understand the breadth of research and development opportunities and how to access the various elements of the programme.

4. Review of 2011/12 – Research project highlights

4.1 Project highlights include:

• Over the last few years the SRP has been working with industry to embed the Sustainable Development Principles (published in 2009) into key decisions and in 2011/12 they were adopted in the Initial Industry Plan, franchise specifications and the recent Government Command Paper. The SRP, which is funded via the R&D programme, has also developed an online self-assessment tool for organisations to measure themselves against the SD Principles – T767 SD Self-Assessment Tool.
• **S051 – Future energy risks affecting the railways in Great Britain** is considered a key foundation for the development of the industry’s strategy and view of energy and its implications for the future. It is informing key industry groups such as the Vehicle/Train Energy System Interface Committee (V/TE SIC).

• **S054 – In service train length adaptation** concluded that significant wider implementation (above and beyond that already undertaken by the TOC community) of in service train length changes are unlikely to be economically viable. The conclusion was accepted by the V/TE SIC, which meant commissioning a comprehensive research project was not necessary, saving significant industry and RSSB cost, effort and time.

• **T942 Pantograph sway acceptance requirements and methodology (PANSWAY)** proposed new limits and methodology for pantograph sway requirements, allowing vehicle builders to make a much cheaper and more realistic assessment of their trains and unlock potential major cost savings for future electrification projects. It has already been used by Network Rail when installing overhead lines to Haymarket Tunnel and is estimated to have already saved about £1m.

• The outputs from two strategic projects, **T964 Operational Communications - a programme of work to develop an effective strategy that supports rail innovation** and **T916 Research into station design and crowd management**, were used to deliver information to the data room for current franchise bidders. For example, T964 will support TOCs in developing their future plans and thinking in delivering services to customers on trains, in particular WiFi and broadband services.

• **T852 The application of leading and lagging indicators to the industry (measuring safety performance)** created ground-breaking guidance to industry on how to identify, analyse and react to safety risks, to more effectively manage and reduce risk, have greater confidence in safety performance, reinforce safety culture and increase efficiency. The project was highly commended at the Rail Business Awards 2011.

• **T935 Reliability Modelling** (part of the whole system reliability game changer) indicated that double the capacity on the existing infrastructure, based on an “on time” railway with 120-second headway, could be achieved if there was a step change in system performance. The research determined what would be needed to achieve this and has led to requests: for work with Southern to develop a model for the Brighton main line to optimise performance; to develop a model for the Northern Hub to better understand the issues of ageing rolling stock; and to model the Great Western line.

• **T950 Investigating the economics of the 3rd rail DC system compared to other electrification systems** showed that a 25kV overhead line system is likely to be the best long-term option for replacing life-expired third-rail. The benefits are numerous including lower whole life costs, increased energy efficiency and reduced journey times. The research is informing industry’s planning and investment strategies for CP5 and beyond for track, trains, signalling and migration and is being taken forward through Network Rail’s GRIP (Governance for Railway Investment Projects) process.
T889 Controlling the rail vertical contact stresses was championed by Freightliner as an example of ‘why RSSB research matters’ at the ATOC Professional Engineer Development Scheme’s annual conference. The research found that the limit used to control and manage vertical contact stresses between the wheel and rail could be safely increased, benefitting the freight operators by potentially extending wheel life. It should also enable larger freight containers to be introduced. A standards change is proposed.

5. R&D implementation and governance

5.1 RSSB commissioned TRL to undertake a review of industry implementation of RSSB-managed R&D. This looked at a random sample of 41 projects from the 213 projects completed over the period 2009 to 2011.

5.2 The main finding from the review (summarised in Appendix 1) is that outputs from 32 (78%) of the 41 projects had been implemented in some form, which is broadly comparable with an earlier DfT review of rail research implementation.

5.3 The report highlights the challenges for industry in implementing the findings from cross-industry R&D. The conclusions, while recognising the good work that is being done by the industry with the support of RSSB, point to key structural and organisational issues that can hinder successful implementation. These include maintaining continuity and the right level of industry input from beginning to end – people changing roles part way through projects, different people being involved in the specification from those considering implementation, the costs and benefits lying in different places, corporate memory loss and silo working.

5.4 To the extent that we can help industry to overcome these, we can improve the implementation rate still further and reap the benefits in terms of, for example, reductions in cost and increases in capacity and performance. However, it requires a co-ordinated and collaborative industry approach ie RSSB can do much to support the industry, but does not control the levers of implementation.

5.5 Based on the conclusions and recommendations, RSSB will now work with industry stakeholders to define an action plan that responds to these which will be presented to the board for its endorsement in September. Without wishing to prejudice the outcome of these discussions, the action plan is likely to focus on proposals for strengthening project governance and communication, including:
- Reinforcing the need for and role of Project Champions, including the need for continuity and/or knowledge transfer, particularly within organisations,
- Reinforcing the need for and extent of implementation plans at the start of projects, including making even more explicit the nature of the required output and how far it goes towards delivering a business-specific solution,
- Ensuring that implementation plans are regularly reviewed and updated as projects progress,
- Establishing the means by which industry and RSSB more formally and regularly consider industry progress, learning the lessons from both the successful and unsuccessful industry implementation of R&D.

6. Recommendations

6.1 The board is asked to:
- NOTE the achievements over 2011/12
- ENDORSE the proposal in 5.5 for RSSB to present an action plan to the board meeting in September that will address the findings of the implementation review.
Appendix 1

RSSB-commissioned review of industry implementation of R&D

The specific aims of the review were to:

- Determine whether the results of the research have been successfully implemented by railway industry stakeholders;
- Identify the factors that lead to successful implementation of research outcomes as well as the barriers to implementation; and
- Provide recommendations to improve implementation and better realise the value from future projects.

Extracts from the TRL review of industry implementation of RSSB-managed R&D

Executive Summary

RSSB manages a large portfolio of rail research and development projects with a cross-industry remit. This report sets out the findings from a review of the implementation, by industry, of the outputs from 41 randomly selected projects (completed over a 3-year period, 2009 to 2011). Each project was reviewed in detail and consultations were held with industry stakeholders (members who had knowledge of the projects and how the outputs had been used and/or were directly involved in the implementation of the findings. Discussions were held with stakeholders from DfT and a number of RSSB member organisations and covered: the implementation of research outputs; the barriers to implementation; the factors that led to successful implementation; and broader discussions on how the implementation of research outputs by the industry could be improved.

Quantitative Findings

The review included a quantitative assessment of the implementation of research outputs, based on seven implementation types, ranging from ‘Implementation – Actual’ where the outputs from the research have been implemented by the industry and have had an impact operationally; through to ‘Not Implemented’ where no evidence of implementation could be found during the review. The quantitative assessment showed that outputs from 32 (78%) of the 41 projects had been implemented in some form based on the implementation types identified by the review.

Qualitative Findings

A key finding of the review was the disconnect between those involved in the identification of research needs, development of specification and final implementation of research outputs. For example, some of the projects in the sample had delivered outputs which were not implemented by the industry as they were viewed as either trivial or not relevant to addressing the central research problem. This highlighted the importance of forming the right research question during the project specification stage and exercising due diligence to ensure that the research question and the resulting project outputs will be implementable by industry. The appointment of appropriate industry champions with continuity of input from the problem identification and specification of research stage through to implementation is a key enabler in pushing through the implementation of research outputs.
The review identified a lack of traceability and feedback from the industry to the outputs from research. It was often difficult to ascertain the implementation status of research outputs as no formal mechanism exists for industry to respond to the outputs from research.

The management of knowledge within the rail industry is hampered by the presence of silos between the different parts of the industry as well as within individual organisations. This limits the domain knowledge that can be brought together during the specification and management of research projects and creates a barrier to the development of a whole systems approach to research that could deliver more readily implementable research outputs.

The structure of the industry around 5 to 7 year franchise agreements creates artificial barriers to the implementation of research, since investment in implementation needs to be at the beginning of franchise periods to achieve the greatest return on investment. This also impacts on the uptake of research outputs with a longer term or more strategic focus.

During the identification of research needs and specification of research projects the commercial drivers for the stakeholders who will be responsible for the implementation of the research outputs need to be taken into consideration. RSSB employ a variety of dissemination mechanisms to communicate the outputs from research to industry making the outputs readily available. However, evidence from the review suggests more could still be done to raise awareness in the industry of the information that is available and some of the stakeholders consulted were unaware of research outputs relevant to their work. There is a need for industry to be more proactive in checking the available, relevant guidance and outputs from research.

The review identified an expectation from industry that research would deliver tailor-made 'turn-key' solutions to problems and that some research outputs did not go far enough in explaining how to do something in addition to what to do. Due to the cross industry nature of RSSB managed Research and Development projects there is a requirement for the outputs from research to be taken up by industry and adapted to specific stakeholder needs. The division of responsibility for this between RSSB and industry needs to be agreed and understood from the outset.

**Key Conclusions and Recommendations**

Based on the evidence and information collected from the stakeholder consultations and detailed analysis and interpretation of the quantitative and qualitative findings the key conclusions from the review are:

- Industry has implemented 78% of the sample of RSSB managed research projects, based on the definitions of implementation used in the review.

- Comparing the results from this review to those from an earlier DfT review of rail research implementation (Read, et al., 2009), showed that the level of successful implementation is broadly similar, although the sampling methodology and definition of implementation used in the two reviews were different.

- In the majority of cases the stakeholders consulted during the review felt that the outputs from RSSB managed research projects were useful, especially guidance documents, which in a majority of cases are well used by the industry.

- The disconnect between those involved in the definition of the research question and project specification and those responsible for implementing research outputs has a negative impact on the implementation of research outputs.

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• Involving the right stakeholders in the implementation of research outputs and maintaining continuity of input, in spite of organisational changes, is a key enabler of implementation.

• Implementation of research outputs can also be facilitated by the appointment of a project champion with sustained input through the project and implementation phases.

• The structure of the industry around 5 to 7 year time periods creates a barrier to the implementation of longer term strategic outputs and incentivises stakeholders to invest in the implementation of research outputs towards the beginning of franchise periods.

• Costs and the benefits of implementation can sit within different parts of the industry. The combination of current industry structure and the need to obtain a return on investment within short time frames is therefore a key barrier to implementation.

• Some research outputs were considered, by implementers (e.g. those looking for turn-key solutions), to have been provided in a manner that did not facilitate implementation.

• RSSB uses multiple dissemination pathways to inform industry of the research outputs. Despite this some stakeholders were unaware of the outputs from research and did not think to investigate the available information.

• There is a lack of traceability connecting the outputs from research with industry’s response to the outputs. Continuity of ownership of the research outputs and the responsibility for implementation are important contributors to successful implementation.

• There is a tendency for industry to base decisions on long established paradigms and exhibit reluctance to take up research outputs that, while robust and evidence based, challenge the status quo.

Key enablers to research implementation are maintaining continuity of input from problem identification/specification development through to implementation by involving the right stakeholders at the different stages and embedding ownership with a strong project champion to provide sustained input throughout. Overcoming the current disconnects between the participants at the different stages of a project lifecycle and the lack of traceability will facilitate implementation.

The current structure of the industry which promotes short-term decision making and the diffusion of costs and benefits through the industry are barriers to the implementation of research outputs that challenge the status quo.

The findings from the review led to the development of the following recommendations:

• RSSB should work with industry to implement a protocol for formally capturing industry’s response to research outputs;

• RSSB should strengthen the existing requirements for each research project to have a nominated champion;

• RSSB should strengthen the dissemination of and increase awareness of research outputs;

• RSSB and industry should establish a methodology to ensure that the costs and benefits associated with the implementation of research outputs are integrated and cross-industry impacts are captured;
• RSSB should work with industry to support the implementation of research outputs and better meet the industry’s expectations for ‘turn-key’ solutions;

• RSSB should take a more assertive role with industry during project specification and ensure appropriate domain knowledge is captured;

• RSSB should ensure that the business cases developed to support research projects acknowledge the inherent optimism bias and uncertainties in the benefits that research can deliver to industry; and

• Industry should improve its knowledge management to mitigate the implementation of research outputs ‘stalling’ due to changes in personnel responsible for implementation.