Early Contractor Involvement Phase Two Recommendations

Delivering Digital Train Control Technology Efficiently – to drive capacity and performance on the railway

July 2017
The Early Contractor Involvement (ECI) programme sits at the heart of the Digital Railway programme and the transformation of Britain’s rail network, underpinning everything we do and closely aligning with the Government’s emerging Industrial Strategy. Stage one of the ECI programme was successfully completed in December 2016, with nine companies from our supply chain coming together across seven workstreams. Whereas this work focused on the industry’s established supplier network, ECI Phase 2 has engaged with non-traditional rail suppliers, drawing on cross-industry experiences and expertise from companies and organisations in different sectors. With nine workstreams spanning a range of diverse subjects, ECI Phase 2 has harnessed thinking from leaders in high-technology industry sectors – including automotive, aerospace, defence, petro-chemical and electronics.

A number of common themes emerged from the work of these nine groups, with issues around people, data, communications and commercial strategies running through them all. The teams used their experiences and approaches from other industries, including their use of automation and common data platforms, supported by appropriate commercial strategies. With technology and data developing rapidly across all transport modes, and our industry platforms changing so quickly, we are moving from an industry that is focused on infrastructure and trains, to one that is dominated by a set of integrated systems, all of which are supported and linked by data and connectivity. In many ways, this explosion in data is our equivalent of the financial services sector’s ‘big bang’ which was the catalyst to transform trading across the globe. Used cautiously, with strong regulation and security it can help transform the way we operate. If harnessed properly it will not only transform our customers’ experience, but the productivity and efficiency of the industry. Already we are seeing the benefits of better quality data, and the potential uses for it are many and varied – from passenger flow modelling to asset management and real-time timetabling. But to realise its full potential will require a paradigm shift – away from traditional contracting and acceptance methods, to more innovative, risk sharing, collaborative approaches with supply chain technology partners.

Optimising Network Use

As the custodians of a valuable national asset, Network Rail is tasked with deciding how best to utilise the network’s infrastructure. This involves balancing the short-term needs of passengers against the long-term sustainability of the network. Effectively, this is a daily decision: “Should it be used for trains to run, or does it need to be taken out of service for maintenance or upgrade?” – but of course we have to do both.

The themes of this report address this fundamental issue, which is at the heart of good asset management, and provide processes through which inefficiencies can be addressed.

The opportunities identified can radically transform this process, not only better informing the decision-making process, and therefore ensuring that better decisions are made, but also then enabling more rail services to be delivered more efficiently, bringing significant benefits to rail users.
Common Themes

Although each of the nine workstreams worked to clearly defined briefs, a number of common themes have emerged from their work – themes that are at the core of the Digital Railway Programme.

Data

Data is at the heart of the Digital Railway Programme. Building one common set of data will enable multiple business uses to be supported, including operations such as asset management, operations management, timetabling and signalling.

Digital Railway Programme will align to the processes and philosophy of the new decision support tools that are being deployed on the railway. It will also clarify the important interfaces that will be needed to deliver information to business and consumers, recognising both the value and the importance of the data for a wide range of applications – including asset management, timetable production, passenger information and management.

Ultimately, to achieve the improvements in information and maximise the benefits from the available data, a clear industry-wide data strategy will be developed and adopted, with the involvement and agreement of every interest group – including the Government, rail operating companies, supply chain and other network operators. With the availability of data comes responsibility. Opportunities for open-source data to drive innovation will need to be weighed against the need for security and regulation to make sure that data is up-to-date, accurate and secure.

People – not just technology

Although the Digital Railway Programme is underpinned by technology, it is much broader and more complex than that – fundamentally it relies on people to deliver and drive the digital transformation that is required.

A digital railway will affect people’s roles and responsibilities across the industry, requiring different knowledge, skills and ways of working. We must recognise this. Providing support for people with training to help make this change is essential, if the opportunities provided by new technologies are to be fully embraced. Digital transformation of the railways means we will no longer consider the management of track and trains as absolute concerns. Rather, our primary focus must be our people; how they work with data, systems and processes to deliver vastly improved rail services in a smart, connected transport system.

Finally, it is important that relationships right across the industry are simplified so that the whole rail sector works effectively and collectively to derive maximum value from the available information. This will help drive innovation and strategic planning in a more cohesive way, ultimately supporting the delivery of digital transformation.

Commercial relationships

Traditional contracting methods will not allow the full value of the shared data that is being created to be enjoyed by all parties. New strategic commercial approaches are being developed to ensure that data is created, used and shared effectively, with a collaborative engagement with the supply chain at the early, development phases of the programme, covering projects, contracts and processes. Government and commercial strategies will be aligned to support this cross-industry approach which will be a key enabler to both innovation and implementation.

Communications systems

The railway’s telecommunications network is a crucial asset. It is the fourth largest communications network in the UK in terms of geographical scale, reach, volume and breadth of assets. Telecommunications are critical to the successful operation of the railway and many of its systems, with terabytes of data continually transmitting through it in real time.

A successful digital transformation is dependent on fixed and wireless communications systems operating smoothly and effectively, making sure data flows in and out to support every user – from franchise operators to passengers – with data access and transfer both key programme enablers. When new communications systems are introduced, connectivity must be a pre-requisite, enabling users to be quickly and seamlessly connected. To achieve this, new investment opportunities to attract private funding streams have to be identified, with private partnerships investing in future systems development.
“I am delighted to welcome this second Early Contractor Involvement report on behalf of the rail supply chain. It makes recommendations in the key areas where the rail industry will need to embrace change to successfully deliver the Digital Railway vision. Importantly, as well as vital technical issues such as the telecommunications backbone and the management of data, it examines the vital issues of leadership, culture, behaviours and commercial approaches. It is no exaggeration to say that this is an important step towards not just the delivery of the Digital Railway Programme but also to the possibility of the UK creating an exportable world first in the form of a digital signaling roll-out on an existing high intensity and mixed-traffic railway.”

Darren Caplan, Chief Executive of Railway Industry Association

The Nine Early Contractor Involvement Phase 2 Workstreams

Working closely with the Department for Transport, the Department for Business, Energy and Industrial Strategy, and partners across the supply chain, the Digital Railway Programme identified nine core workstreams for the second phase of the Early Contractor Involvement programme.

Although each had a discrete and clearly defined area of focus, each group’s task was to identify how we can make changes to the operation of the railway that will deliver transformative improvements for passenger and freight customers, the taxpayer and the industry itself.

Reducing possessions during project implementation and maintenance

This workstream carried out an industry-wide review of best practice for the implementation of digital technology. As part of this implementation, reducing possessions can dramatically improve productivity during project implementation – making improvements more affordable and ultimately, reducing passenger disruption.

Key recommendations:
Digital Railway’s ORBIS programme (a set of decision-making tools for operators, maintainers and renewers of the railway) has the potential to reduce the number and efficiency of possessions significantly. Early implementation of collaborative data-sharing is critical to releasing its full value. Commercial relationships have the potential to incentivise innovative solutions, such as robotics, which will reduce the time taken to install or maintain trackside equipment, reducing disruption to rail users.
**Simplifying the product acceptance process**

This team looked at streamlining the product (and process) acceptance process. Promoting innovation and the use of modern digital and ‘disruptive’ technologies into the rail environment, and adopting this more quickly, should bring benefits to the development, staging, testing and deployment of digital systems.

**Key recommendations:**
Product acceptance has historically been seen as a barrier to innovation, disconnected from the development and production of new products. New systems are therefore required to bring down the barriers to entry, which, if combined with synthetic environments for testing and validation and the introduction of outcome-based criteria, could make it a fully-integrated part of the process. With the pace of change increasing, this improvement will encourage the rail industry to exploit and, more importantly, lead on the development of the latest technologies.

**Attracting investment to unlock the potential of the network’s telecoms assets**

Given the scale and potential capability of the network, this group examined the opportunities for generating best value from the telecoms assets and infrastructure, as well as opportunities for future income streams. Innovation, partnering and relationship models were all considered, as well as wider UK PLC requirements such as 5G deployment.

**Key recommendations:**
Opportunities certainly exist to support UK PLC objectives (with 5G a potential catalyst), and while effective partnerships are crucial, to be the ‘partner of choice’ will require a clear focus on people, process and technology. With passengers needing connected information, and business and commerce looking for opportunities to connect to them, content and integration are the key requirements. These commercial opportunities have the potential to create value for the benefit of Network Rail and its stakeholders.

**Simplifying on-train digital systems and networks**

With more and more systems being installed on rolling stock, the future goal will be to simplify the interfaces between all these systems (European Train Control System – ETCS, train radio, train performance and passenger information). This simplification creates the challenge of delivering both lower costs of initial manufacture, and cost and time savings during maintenance, without affecting functionality.

**Key recommendations:**
Although a shift in culture has allowed new technology solutions to be considered, fragmentation issues have slowed down the adoption of Commercial Off-The-Shelf (COTS) products, with designs not being shared. For example, no two suppliers’ ETCS systems are the same, and so to succeed, we need to encourage the trend towards open integration, where common features can be shared, potentially reducing the whole life cost of rolling stock.
‘Predict and prevent’ innovation to reduce disruption to rail services

With the development of intelligent infrastructure monitoring, there is a need to understand how this could be used to improve maintenance activity. By more effectively monitoring the condition of assets, disruption to rail services could be reduced.

Key recommendations:
Assets are deployed with a huge amount of connected-technology, which means that due to the revolution in diagnostics, asset knowledge is now standard. We now need to make the step change to ‘predict-and-prevent’ asset maintenance. Improvements in safety, track availability and cost could all be realised if asset tracking and management technologies were to be introduced. Modern data management and analytics, supported by an effective communications network, will provide better infrastructure management – reducing disruption through system or product failures.

Delivering Industrial Strategy objectives through innovation management

It will be essential to work collaboratively and effectively across the industry, government and academia to create a consistent, effective plan for innovation that aligns with the Government’s Industrial Strategy and Digital Policy. This wide-ranging brief covered many aspects of structure, governance and funding.

Key recommendations:
A railway equipped with modern systems and processes, operated by a highly trained workforce creates opportunities for business growth and exports for the industry and UK-based digital companies. Successful innovation is delivered with good management and governance structures and supported by commercial, funding and exploitation arrangements, which provide a route to profitable implementation. This will allow the rail industry to make use of the knowledge and skills from people with the best technical and academic backgrounds from the UK universities, research institutions and business – creating opportunities for business growth and export.

Delivering a timetable that works, in real time

Working from the starting point of ‘how do we improve our current timetabling process?’, this workstream reviewed how digital technologies could be used to improve timetable production. Timetabling is currently a manual process because data describing the planning rules and infrastructure constraints is not readily available in a machine-usable format. No optimisation tools are currently used which maximise use of the infrastructure.

Key recommendations:
By capturing the infrastructure and operating influences, the timetable could develop a truly consistent data landscape, enabling direct correlation between use and cost. This will provide a more reliable timetable which can be updated more effectively, and offer more flexibility for passenger and freight operators, and their customers.
Modernising the railway’s mobile communications network

Given the scale of the network’s mobile communications network and its current architecture, this workstream focused on how best to facilitate future radio migration, against the background of current industry plans and designs. The team carried out a review of the state of the Future Radio Mobile Communications System (FRMCS) standards and examined the dependencies that can affect the start date, the duration and the smoothness of migration.

Key recommendations:
Spectrum allocation is critical, with retention and/or extension of the UIC (the worldwide railway organisation) band being crucial to the ease and cost-effectiveness of migration to FRMCS. Therefore, the industry must work with Government departments, Ofcom and European agencies to ensure the rail industry’s needs are taken into account. This should be evolutionary rather than revolutionary, with intermediate steps offering short-term benefits. As with all technology, obsolescence and whole life costs are important considerations, with succession planning needing to be carefully planned. Rolling stock standards and franchise agreements should be influenced to mandate an evolutionary path to FRMCS-readiness.

Using digital data to improve the customer experience

The implementation of digital technology will deliver a number of benefits and opportunities from the creation of data. This workstream focused on the use of data to provide better information to improve customers’ journey experience, as well as considering the potential for the data to inform carriage loading, heating, traction, journey travel options etc.

Key recommendations:
A data sharing strategy across transport and infrastructure operators needs to be agreed, such that the Digital Railway Programme and Rail Delivery Group (RDG) develop a roadmap and strategy for addressing specific challenges. These new systems could provide a great deal of information to customers, quickly and accurately, raising the question: how do we replace the decisions we must take? Innovation in data-oriented solutions should be encouraged, by making data easy to access and fostering collaboration between the industry, innovative companies and academia. This can provide a much better customer experience, supporting opportunities from Smart Cities and similar initiatives.
The programme has provided a number of interesting opportunities for cross-industry working and collaboration; if you would like to be involved in future activities, or require more information on any of the work summarised in this brochure, please get in touch with us.

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