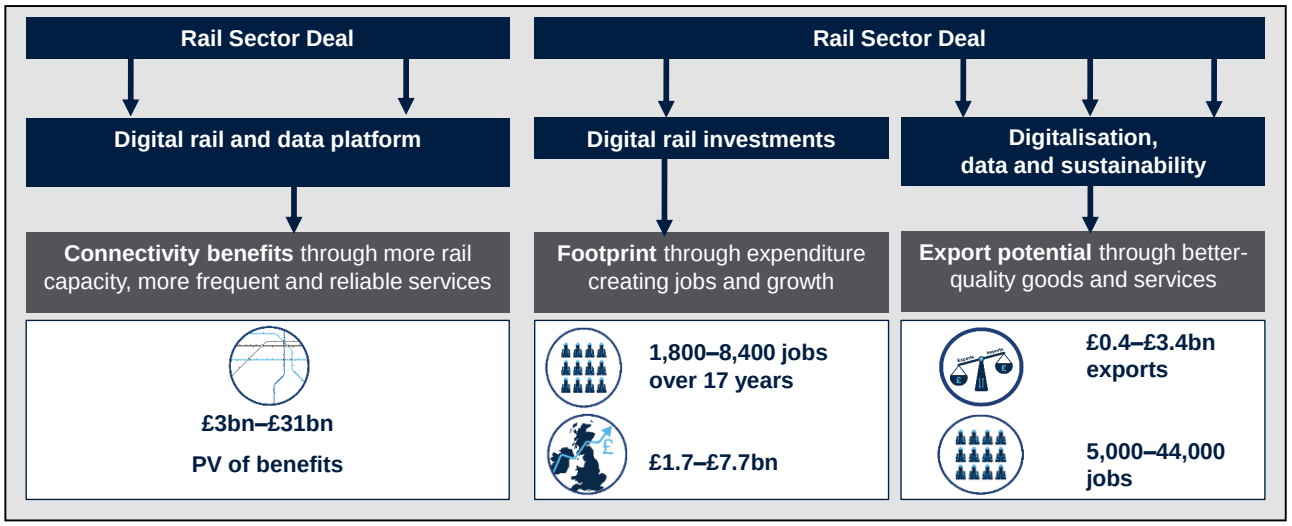
ECONOMIC BENEFITS OF THE RAIL SECTOR DEAL

Prepared for: Rail Supply Group

Date: 6 July 2018



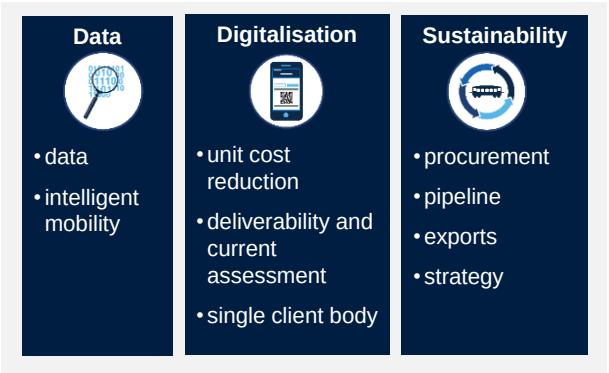
Source: Oxera. All prices are in Q1 2018 terms.

Structure of the Rail Sector Deal

The Rail Delivery Group and Rail Supply Group, supported by the Railway Industry Association, the Rail Alliance, Rail Forum East Midlands, and a number of individual businesses and stakeholders from across the rail and digital sectors, have developed a proposal for a **Sector Deal** for the rail industry. The Sector Deal is designed to transform the sector, using digital technology as a catalyst.

The Rail Sector Deal consists of three pillars that each contain several themes, as shown below.

Figure 1 The three pillars of the deal



We have assessed:

- demand-side benefits through connectivity improvements—these impacts come from the use of rail services by people and businesses;
- the economic 'footprint' of investments facilitated by the Sector Deal.

The Sector Deal aims to facilitate the digitisation of the rail network, leading to **connectivity benefits** through increased capacity and improved reliability of rail services. The data pillar in the Rail Sector Deal could lead to additional connectivity benefits by facilitating an intelligent mobility system, which allows for more active demand-side management and additional savings through data-driven asset management. Moreover, improvements in the way that the rail industry and its supply chain interact commercially, such as changes to the procurement model, could lead to **productivity gains**.

Expenditure on Digital Rail (DR) investments would also support **growth and jobs** in the rail supply chain itself, as well as in the wider economy. Moreover, an accelerated roll-out of DR technology has the potential to give the UK a competitive advantage, particularly in the design and development of goods and services that could be **exported** internationally as other countries digitise their own rail networks.

1. Connectivity benefits and cost savings

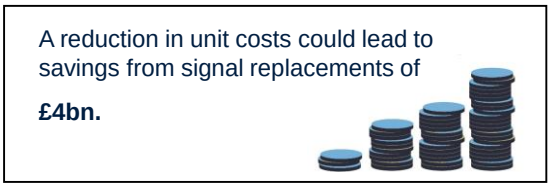
Under the **digitalisation pillar**, the industry:

- **asks** for a DR strategy and delivery plan for all elements of train control under a single DR client body and funding for strategic business cases;
- **offers** accelerated delivery of DR with whole industry collaboration.

The Rail Sector Deal seeks to create whole-life unit cost reductions and deliverability improvements for DR investments, thereby allowing the DR programme to be more ambitious than what would be possible otherwise.

Productivity improvements could also be achieved through a number of different channels. Most immediately, a **reduction in unit cost** in line with the Rail Sector Deal would mean that digital signalling across assets that are due to be replaced over 17 years from 2019 could be delivered at a significant cost saving. The Rail Supply Group estimates that across these 40,000 signals, the capital cost saving could be around **£4bn** over the current cost for analogue signals. Additional whole-life cost savings related to maintenance and repair could increase savings further.

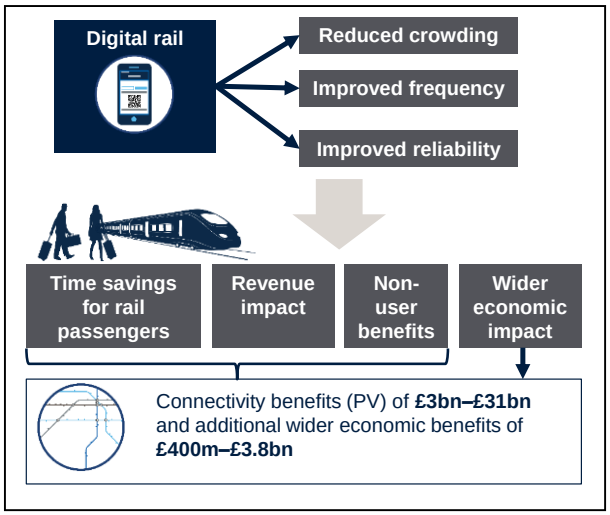
Figure 2 Savings from unit cost reduction



Source: Oxera, based on analysis performed by the Rail Supply Group.

Moreover, in addition to the potential cost savings, digital technology has the potential to **improve connectivity** on the network, leading to a range of benefits as shown in Figure 3. DR could deliver increased rail capacity, as well as more frequent and more reliable trains. This benefits existing rail users through a decrease in journey time. It also attracts additional rail users, which increases revenue and benefits non-rail users (through reduced congestion, for example). Additionally, an improvement in rail services would make it easier for people to commute and would therefore expand the pool of labour available to businesses in cities, leading to productivity gains outside the rail industry through 'agglomeration' effects.[1] There could also be an economic benefit from increased output, as lower transport costs can increase the productivity of businesses. These agglomeration and output effects are known among economists as wider economic impacts (WEIs).

Figure 3 Mechanism of connectivity benefits



Source: Oxera, based on modelling results from Network Rail business cases. Present values are in Q1 2018 prices.

Network Rail has estimated the economic benefits from investments in digital signalling (ETCS) and traffic management on five routes[2] based on principles set out in DfT guidance. Of these, there are three projects (Wessex, Anglia, East Coast) that do not have committed funding, but could be facilitated by the Sector Deal. Network Rail estimates that the connectivity benefits of these schemes would be around **£3.1bn**, with an additional £390m of WEIs.

A detailed assessment of other routes has not yet been carried out, and the returns to other projects could be lower than these early projects. It is particularly important to note that there might not be significant capacity shortages on some other routes, limiting the scope for connectivity benefits. Moreover, digital investments need to be combined with conventional upgrades to achieve capacity

[1] 'Agglomeration effects' refers to the improvements in productivity from economic density, for example from technology spillover effects

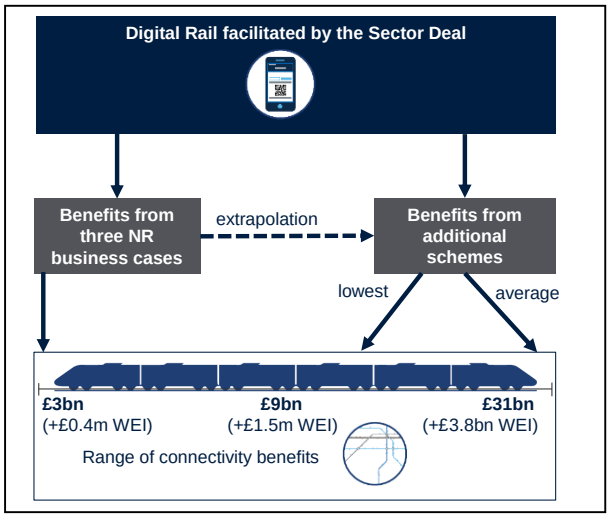
[2] Strategic Outline Business Cases for Wessex, Anglia, East Coast, South East, and Western.

benefits where these are possible. Nevertheless, we have developed some illustrative ranges to show how connectivity benefits could be extrapolated as digital technology is rolled out more widely. In particular:

- The Rail Supply Group estimates the overall capital expenditure of fitting signals due for replacement with digital technology at around £10.5bn.[3] We deduct the capital expenditure for the projects that have already been committed from this total to give an estimate of potential additional investment.
- To estimate the connectivity benefits associated with this investment, we then scale the connectivity benefits using the NR business cases as a guide, keeping in mind that returns are likely to be on the lower end.
    - If the connectivity benefits of rolling out DR across the whole network are in line with the lowest of NR's business cases, it would mean benefits of **£9.3bn** plus an additional £1.5bn in WEIs.
    - If connectivity benefits are more in line with the average of the three non-committed business cases, this would mean economic connectivity benefits of **£31bn** plus an additional £3.8bn in WEIs.

This is illustrated in the figure below.

Figure 4 Range of connectivity benefits



Source: Oxera. All prices are present values in Q1 2018 terms.

The overall connectivity benefit from rolling out digital technology across the network is highly uncertain. Routes not yet assessed in detail may not be capacity constrained; in other cases, the effect of introducing digital signalling may not be able to relieve capacity constraints where they do exist. The higher end of the range is therefore likely to overstate the benefits of DR roll-out across GB.

Further connectivity benefits from data and intelligent mobility

More advanced use of data and intelligent mobility systems could unlock additional capacity benefits. The **data pillar** asks and offers are aimed at utilising the potential of an open data structure. The industry:

- **asks** for a platform enabler to be established and for the conditions to be in place to support commercial intelligent mobility models;
- **offers** to provide the data and data structure to enable intelligent mobility with rail at its centre, and to create a new skills strategy for developing rail-specific technology capabilities and expertise.

A data-driven rail system could lead to additional connectivity benefits through a number of mechanisms. In particular, an intelligent mobility platform and a data-driven rail infrastructure could lead to:

- reduced journey times in the case of disruptions by giving passengers better alternative travel options;
- reduced journey times from route-optimisation and better matching of route options to real-time travel patterns;
- more active demand-side management, where travellers who do not need to be on peak trains can be 'nudged' towards off-peak services—for instance, the system could better inform travellers about the crowding and ticket price implications of their journey time;
- a modal shift from using private cars to using intelligently-linked public transport options, including rail;

[3] Note that there would be other non-capital costs associated with future projects.

- more effective maintenance and better maintenance scheduling using data-driven assets.

These effects could result in significant economic benefits. The release of open data by Transport for London enables third-party app developers to produce journey-planning tools. Researchers have estimated the value of saved time for network passengers resulting from *better journey planning* enabled by data to be between £70m and £90m per year and the value of *additional passenger journeys* at up to £20m.[4] Other studies have estimated the benefits from intelligent mobility to the whole of the UK, suggesting overall time-saving benefits could be worth £4bn per year by 2025.[5] These estimates include other modes of transport in addition to rail, but they illustrate the potential for significant economic benefits from better use of data in the transport sector.

Separate analysis undertaken for the National Infrastructure Commission suggests that infrastructure monitoring and data-driven asset management in the rail sector could lead to savings of up to £600m.[6] These savings would include lost passenger time due to delays as well as increased revenue from rail fares.

2. Economic 'footprint' of investments

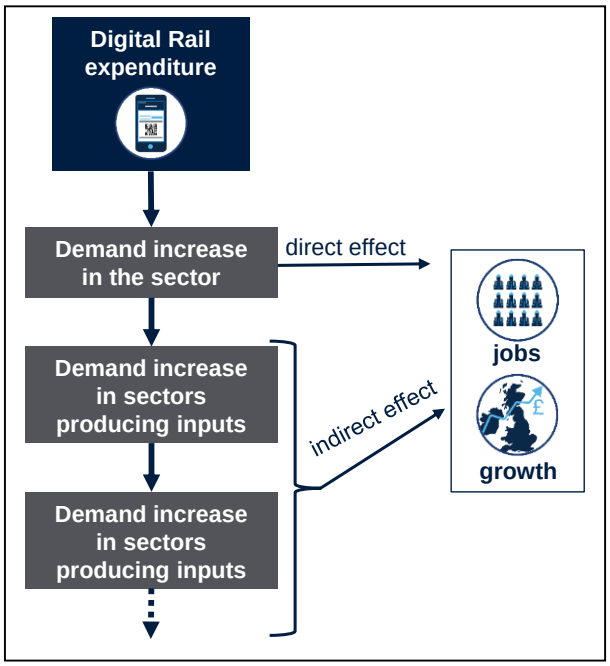
Expenditure on digital rail technology would support **jobs** and **economic output** across the domestic supply chain. Moreover, the investment in digital rail, as well as the new **skill strategy** proposed as an industry offer under the data pillar, would lead to up-skilling of the labour force. This technical knowhow would improve the quality of UK-based goods and services and increase the **export** potential of the sector.

2.1 Economic footprint

Mechanism

The Sector Deal seeks to facilitate digital rail investments, which would have a direct effect on demand in the rail supply chain. Additionally, the rail supply chain would purchase additional goods and services from its own suppliers. The overall output increase in the economy is therefore larger than the initial investment stimulus. Through this 'multiplier' effect, expenditure on digital rail investments creates additional demand across the entire economy. The multiplier effect is illustrated in Figure 5.

Figure 5 The multiplier effect



Source: Oxera.

The direct and indirect impact of an increase in rail investment can be modelled using ONS data on industry inputs and outputs that capture how a demand increase in one sector affects demand in other sectors. Using sector-wide ratios of output to GVA, as well as labour productivity, we can estimate the overall GVA associated with these investments and the level of employment supported.

Economic footprint of Digital Rail investments

We have estimated the economic footprint following the approach detailed above and using investment assumptions on DR from Network Rail's business cases and the Rail Supply Group's figures.

This shows a **GVA impact of £1.7bn–£7.7bn** and **1,800–8,400 jobs** on average over a 17-year period underpinned by the Digital Rail investments that could be facilitated by the Rail Sector Deal.

[4] Deloitte (2017), 'Assessing the value of TfL's open data and digital partnerships, July, p.5.
[5] Catapult (2017), 'The case for government involvement to incentivise data sharing in the UK', March, p.9.
[6] The National Infrastructure Commission (2017), 'Value Analysis: Better Asset Management', December, p.1.

The lower end of this range is based on an initial investment in line with the capital expenditure from the three NR business cases that do not yet have committed funding but could be facilitated by the Sector Deal. The higher end of the range is obtained using the Rail Supply Group's estimate of the overall capital expenditure of fitting signals due for replacement with digital technology (£10.5bn).[7]

2.2 Exports

Mechanism

Investments in digital signalling technology facilitated by the Rail Sector Deal would lead to the development of **expertise and know-how**. This is of particular significance in the context of the UK, where the large and congested network and complex signalling layout make implementation especially challenging. Moreover, the data pillar contains specific offers relating to the development of **digital skills** in the rail sector.

This combination of implementation experience and investment in training could 'upskill' the labour force, leading to a competitive advantage in the development and provision of goods and services for digital rail technology. In addition to the expertise developed, a **unit cost reduction** in line with the Sector Deal could decrease the relative price of exported equipment compared to other countries.

These factors could create a **competitive advantage** for the UK, and it would be well-placed to become a global leader in this field. Achieving this expertise before other countries begin to digitalise their networks at scale and develop similar skills would allow the UK to benefit from a 'first-mover-advantage'—that is, it could reap the benefits of being a major exporter of goods and services for digitisation before other countries begin to catch up.

Rail Sector Deal Impact

The precise impact of the Rail Sector Deal on UK exports is difficult to quantify, and any estimation method must rely on a number of input assumptions. We have used evidence from the trade economics literature[8] to establish a relationship between a relative decrease in price or increase in productivity and the level of exports.[9] The relative price decrease has been assumed to be 30%, in line with the Rail Supply Group's estimates of unit cost reduction. This may be an overestimation of the pure price effect if other countries also achieve cost reductions. However, it does not take into account the quality improvement resulting from an upskilled labour force. In addition, the potential size of the market affected by this increase in exports needs to be estimated because this technology is currently not exported. Due to the uncertainty around this, we have used a range of UK and global market size estimates for the purpose of this analysis.[10]

Using this methodology, we estimate an increase in exports of digital rail goods and services of around **£0.4bn–£3.4bn** per year, for as long as this level of competitive advantage persists.

As with a domestic increase in demand, increased demand from abroad would also indirectly affect the entire supply chain through the multiplier effect set out above. Applying this model to the estimated export figures results in **GVA of £0.3bn–£2.7bn** per year, which could support **5,000–44,000** jobs.

[7] As with the connectivity benefits, the capital expenditure from the two schemes for which there are NR business plans but that have already been committed, has been subtracted from the £10.5bn.

[8] Imbs, J. and Mejan, I. (2010), 'Trade Elasticities—A final report for the European Commission', December, Table 8 and Dosi, G., Grazzi, M. and Moschella, D. (2014), 'Technology and costs in international competitiveness: from countries and sectors to firms', 5 May, Table 2.

[9] The analysis focuses on a decrease in price rather than an increase in quality, as the latter is difficult to quantify. A decrease in price could be seen as a proxy for an increase in quality for the purpose of this analysis.

[10] Based on HM Government Green Paper (2017), 'Building our industrial strategy', January, and Rail Supply Group (2015), 'Fast track for growth', December.