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**Breaking down the Barriers – the
Participation Puzzle**

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Executive Summary

The purpose of my study is to understand the presence and nature of barriers that prevent SMEs entering into and/or trading successfully in the rail sector, or that slow their rate of progress in penetrating this market. The corollary to this is to understand why the upper reaches of the sector, the buying and commissioning community (including government), are so poor at managing and developing their suppliers and benefiting from their inherent vibrancy. The supply chain in terms of qualified suppliers has remained static for over 5 years and within this total the proportion of SMEs has also remained substantially unchanged.

My hypothesis is that the current difficulties in the supply chain are a direct result of the fragmentation caused by the breaking up of the railway at the time of privatisation in 1992. Until such time as the railway sector has found a way of creating a coherent and conscious ecosystem, its ability to improve its performance will remain inadequate. Additionally, I address the hypothesis that, effectively, a major barrier to entry for SMEs is the inadequate provision of testing and evaluation facilities.

My research has established that the consequences of fragmentation remain the primary barrier and that this has fed an inclination towards exclusion and actions that amount to anti-competitive behaviour. The testing and trialling provision is thus but a small part of a wider malaise.

Based on my research I recommend that further work be done to align collective and individual objectives in the rail sector such that the inherent structural weaknesses can be overcome through the application of a challenge-based approach such as Formula Rail. An important consequence of this would be to address the background political imperatives behind the privatisation of the sector, to adapt the structures in the light of a changing environment and to diminish the tactical interventions of governments by clarifying their overarching strategic role.

The author conceived the term Formula Rail as a label for a forward looking approach to creating a virtually integrated railway. The Formula Rail process starts by re-interpreting the requirements of one or several stakeholders and creates an agreed problem statement that allows all parties to contribute fully to achieving a timely, economic and acceptable solution. The process is cognisant of the nuances of the sector, its current challenges, future ambitions and multiple ecosystems, of the fact that the very environment and its 'rules' are subject to change and re-interpretation by politicians, officials and a wide variety of other players.

Dedication

I would like to formally record my thanks to my long-suffering wife, family and friends without whose support and belief I would never have completed this work. They never gave up on me even when I had.

In particular I would single out Prof Felix Schmid who aside from being my supervisor is a great friend, mentor and inspiration to me.

Finally I would like to say a word of thanks to my two little friends Billy and Buster whose company during the many hours of research and writing was very special...

Thank-you all.

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List of Abbreviations

| Term | Definition |
|-------------|---|
| ATOC | Association of Train Operating Companies |
| BEIS | Business, Energy, Innovation and Skills |
| BIS | Business, Innovation and Skills |
| BR | British Rail |
| CADMID | Concept Assessment Design Manufacture In-Service Disposal |
| CEBR | Centre for Economic and Business Research |
| CDP | Capability Delivery Plan |
| CMCG | Creating the Market Conditions for Growth |
| DfT | Department for Transport |
| EIT | Enabling Innovation Team |
| ELG | Export Leadership Group |
| ERDF | European Regional Development Fund |
| ESIF | European Structural and Investment Fund |
| FOC | Freight Operating Company |
| GBRIIF | Great Britain Railway Innovation Investment Fund |
| GRIP | Governance for Railway Investment Projects previously the Guide to Rail Investment Projects |
| ICMM | Innovation Capability Maturity Model |
| IIF | Innovation in Franchising |
| ILG | Innovation Leadership Group |
| KTN | Knowledge Transfer Network |
| LBG | Lloyds Banking Group |
| LEO | Leading Edge Only |
| MAS-WM | Manufacturing Advisory Service – West Midlands |
| MTA | Manufacturing Technologies Association |
| NR | Network Rail |
| NRTS | Network Rail Technical Strategy |
| OEM | Original Equipment Manufacturer |
| OJEU | Official Journal of the European Union |
| QRTC | Quinton Rail Technology Centre |
| RA | Rail Alliance |
| R&D | Research and Development |

| Term | Definition |
|-------------|--|
| RDG | Rail Delivery Group |
| RFOA | Rail Freight Operators Association |
| RIA | Rail Industry Association |
| RIDC | Railway Innovation and Development Centre |
| RIGT | Railway Innovation and Growth Team |
| RISQS | Railway Industry Supplier Qualification Scheme |
| ROSCO | Rolling Stock Operating Company |
| RSA | Rail Systems Agency |
| RSG | Rail Supply Group |
| RSSB | Railway Safety and Standards Board |
| RTS | Rail Technical Strategy |
| SIC | Standard industrial Classification |
| SME | Small to Medium-sized Enterprise |
| SRA | Strategic Rail Authority |
| TfL | Transport for London |
| TIC | Technology Innovation Centre |
| TLG | Technology Leadership Group |
| TOC | Train Operating Company |
| TSB | Technology Strategy Board |
| TSLG | Technical Strategy Leadership Group |
| TVS | Testing Voucher Scheme |
| UKRRIN | UK Rail Research and Innovation Network |
| UIS | Unlocking Innovation Scheme |

1 Introduction

The rail sector in the UK, as in many countries around the globe, is enjoying record levels of investment across a broad range of its assets and activities. There is a widespread recognition that its supplier base needs to expand to meet both the needs of this growth and those of the UK government's Industrial Strategy, aimed at building a stronger, diversified economy. The railway needs to improve its ability to adopt emerging as well as existing technology from other sectors. In short, the railway in the UK remains a very challenging place to do business.

The Rail Value for Money study team's report *Realising the Potential of GB Rail*, published in May 2011, was the most comprehensive examination of the post-privatisation railway that has been conducted to date (DfT/ORR, 2011a). It was widely consulted and drew on the resources of a number of the major consultancies. This study resulted in a number of key changes to the way in which the sector behaves and how it is organised, e.g., the formation of the Rail Delivery Group (RDG). However, it failed to address and analyse fully the wider value for money that could accrue from a vibrant, strong and coherent supply chain. Instead it seemed too readily to accept the view that the supply chain was well served by existing organisational structures, save for the area of the development and support of innovation:

Innovation is stymied by adversarial, procurement-driven relationships and a lack of clear accountability. When impasses are reached, horse-trading rather than leadership is the rule. Stakeholders recognise that some innovation happens despite these factors and instances of success have relied in the past on strong personal relationships. Time and again, misalignment of commercial drivers is cited as reason that whole-system value is not sought. (DfT/ORR, 2011b, p 6)

In the aftermath of the publication of the report there was a widely held view that there had been a watering down, by the Department for Transport (DfT), of some of the study's conclusions and that this could account for the absence of any meaningful recommendations about the supply chain itself (Wolmar, 2011).

In most industrial sectors, small to medium-sized enterprises (SMEs), in the UK that is to say companies with less than 250 employees (House of Commons Library, 2017), particularly mid-market businesses, i.e., companies employing 50 to 249 people, are recognised as significant contributors to the economic resurgence of the UK (SME Growth Watch, 2017). In fact, since 2015, this part of the UK economy has, in terms of revenue generated, significantly outperformed its counterparts in Germany's Mittelstand, the cohort of businesses often held up as the engine room of Europe's biggest economy (Dakers, 2016). In the UK, SMEs represent

99% of all businesses, 60% of employment and 51% of turnover (House of Commons Library, 2017).

Currently, according to the data held by the Railway Industry Supplier Qualification Scheme (RISQS), there are approximately 4300 UK qualified businesses supplying the rail sector and, given the high level of investment in the existing rail network and the development of a new high-speed infrastructure, there are opportunities for many more companies to join the market in all areas of activity; and yet this total figure and the proportion of SMEs (upwards of 80% at any given time) within it have remained static for over 5 years (Achilles, 2017).

This study exposes system failings that run through the sector and my aim is to produce a piece of work that will create a new perspective and provide a platform for a better understanding of the challenges faced by SMEs and mid-market businesses. Allied to this is an evaluation of whether there is any evidence to suggest that the buoyancy of mid-market companies in the UK economy generally is reflected in the rail sector and the impact if this is not the case.

My hypothesis is that the current difficulties in the supply chain are a direct result of the fragmentation caused by the breakup of the railway industry at privatisation in 1992 and that, until such time as the railway sector has found a way of creating a coherent ecosystem, its ability to improve its performance will remain sub-optimal and inadequate.

Additionally, in the context of the Rail Value for Money Study, I address the subsidiary hypothesis that, effectively, *'a major barrier to entry for SMEs is the insufficient provision of testing and evaluation facilities'*.

This study has also been influenced by the Rail Supply Group's (RSG) *Fast Track to the Future* published in February 2016, the Rail Technical Strategies (RTS) published in 2007 (Railway Safety and Standards Board – RSSB, 2007) and 2012 (RSSB, 2012) and the Network Rail Technical Strategy (NRTS) for 2013, which are widely accepted as the blueprints for the evolution of the GB's requirements for its railways and their capability over the next 30 years, covering technologies as well as operational approaches. Subsequent to this, the RTS Capability Delivery Plan (CDP) was published in February 2017 (RSSB, 2017b) and identifies twelve whole-system 'key capabilities' that the railway needs to develop in order to meet the challenges of increasing capacity, enhancing customer satisfaction, decreasing cost and reducing carbon.

The overall landscape is made more complicated by the almost total absence of indigenous original equipment manufacturers (OEM)/Tier 1 businesses in some areas of the industry, for example, in traction and rolling stock production. To be factored in is the as-yet unknown

impact of Brexit. The fulfilment of the sector's vision thus relies heavily on the ability of indigenous SMEs and also larger enterprises to court the attention of foreign-owned multinational companies, with potentially ever more limited GB-specific agendas of their own as they operate both within and outside of the GB.

The government has recently published a Green Paper entitled *Building our Industrial Strategy* (BEIS, 2017). A cornerstone to its proposals is the development of Sector Deals which in themselves are based on a sector's ability to identify a course of action that will see step changes in productivity and utility, etc. The House of Commons Business, Energy & Industrial Strategy (BEIS) Committee *Industrial Strategy: First Review* published in February 2017 expresses some concern at this approach and has highlighted weaknesses in the approach by stating:

“sectoral policies appear to have worked well for the automotive and aerospace industries. However with regards to other sectors this approach had, at best, mixed results. Furthermore, this approach appears to have the greatest risk of policy being built on the vested interests of big businesses and incumbents that are best equipped to lobby ... There is a risk that a sectoral approach encourages business to maintain rather than break down silos, and leads to policies designed to suit preferred industries at the expense of other sectors and the wider public interest.” (House of Commons BEIS Committee, 2017, para. 54)

A sector deal for rail could ultimately have a positive impact on the indigenous supply chain. Although, after the launch of the strategy in February 2016, the RSG lost all momentum, it is now starting to perform more coherently and its response to the call from the government to develop a sector deal is heartening; however, the concerns of the select committee, stated above, should resonate. The move to align the RSG with the RDG is most welcome and will provide a level of horizontal integration not seen since privatisation.

This study is based on my experience as a senior military logistics officer who, in the course of his duties, was fortunate enough to have been given the opportunity to realign the railway elements of the UK's defence capability. This proved to be a microcosm of the national system and faced many of the same challenges, driven by similar political imperatives. Since leaving the Army I have run successful businesses in the sector and also formed and developed the Rail Alliance, which has grown to become the sector's leading business to business networking organisation. Both of these roles have given me a unique opportunity to examine the GB rail sector. I have routine access to senior politicians through their Departmental teams and I am

also fortunate enough to be a full member of the Railway Supply Group (RSG) Council and a number of its subsidiary management boards, such as the Innovation Leadership Group and the Export Leadership Group. My motivation for this particular study is to challenge the sector to strive for excellence and to perform to its true potential.

2 Background and Today's Scene

2.1 Background

Any meaningful observation and analysis of the GB rail sector's supply chain needs to take into account the position of the railway industry in the overall industrial landscape of the country in the 21st century. The factors specific to the sector will be examined later in this chapter; however, there are some more generic aspects that help place this all in context.

The UK, like many countries around the world, is very reliant on SMEs to power its economy. It is generally accepted that this tier of the economy accounts for >99% of all businesses, employs 15.7m people and generates a £1.8t turnover. The economy as a whole employs 26.2m people and turns over £3.86t (BEIS, 2016). SMEs can thus be said to provide almost 50% of the UK's industrial activity.

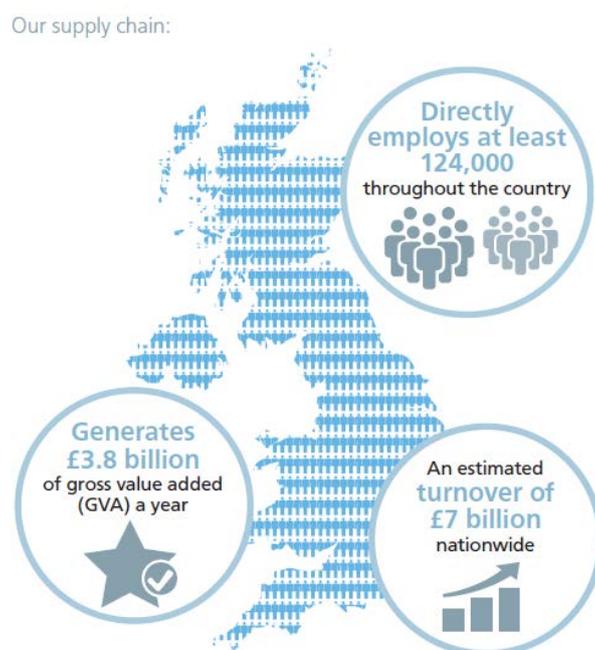


Figure 1 – Railway Supply Chain's Contribution to the UK Economy (RSG, 2016)

According to the RSG's strategy document *Fast Track for Growth* (RSG, 2015) the GB rail sector employs some 124,000 people and accounts for £7bn in turnover. However, to set the rail sector in a national context, this represents 0.473% of the working population and 0.002% of turnover.

It is also an accepted mantra that the SME is the home of innovation, although there are perhaps more complex reasons for this, other than some form of innate ability that only appears within this type of company.

Given that the railway industry accounts for such a small percentage of overall turnover, the picture of a supply chain populated by companies that consider rail as a small, although important, part of their overall trading starts to become clearer. Work that I conducted in 2014/15 for the then Enabling Innovation Team (EIT) showed that approximately 95% of the railway supply chain was made up of companies that do not consider themselves to be rail suppliers (RSSB, 2015b). More recent work conducted by ComRes, on behalf of RSG, broadly validates this percentage at in excess of 75% (ComRes, 2017). Therefore there are issues that will act as barriers to entry to the sector that are in fact generic by nature; that is to say they reflect the difficulties that any 'non-specialist' has when trying to enter a specialised and, in this case, highly conservative and risk-averse market. As a generic indication of the scale of diversity, Lloyds Banking Group (LBG) have identified that their Relationship Managers in, for example, Healthcare or Construction each look after market sectors that are defined by between 120 and 150 standard industrial classification (SIC)-coded elements (LBG, 2017). The manufacturing sector has in excess of 8000 SIC codes and hidden within this pool are the mass of railway suppliers, both in terms of rolling stock and infrastructure equipment.

The perspective of this report is that of the SME and how such organisations can be involved in the GB rail industry and, indeed, how they can play a significant part in enabling the industry to meet its many challenges. Thus I believe that it is important to outline some simple 'truths', which can help to define SMEs. It is the general experience of the SME in its dealings with the corporate world, including that of government and its many agents, that it is regarded as a corporate in miniature. In reality, the SME has no such pretensions nor does it need to. The following points draw extensively on the EIT work mentioned above:

- Firstly, the SME is a very different animal, in almost all characteristics, from the corporate business and is driven by completely different objectives. It will generally be more entrepreneurial, more flexible and more fixated on the company's long-term growth and health although, crucially, it is more vulnerable in the short term. In other words: jam tomorrow = no cash today = no future;
- The Secretary of State for Transport has described the railway sector as disjointed (Grayling, 2017), and thus almost by design, its default setting is towards the adversarial end of the spectrum. In transactional analysis terms it seldom gets better than a 'parent-child' relationship. This discourages trusting, collaborative relationships and inevitably leads to the SME seeking business in other sectors. The SME thrives on trust because high-trust relationships mean that business is transacted more quickly and the relationship is more responsive to innovation;

- The position of the SME in the railway sector supply chain is precarious. The almost total absence of indigenous OEMs means that the route to market is most often in competition with overseas players, better supported by intra-national structures and 'closed' local supply chains. The SME does not usually have the depth of resource to conduct long-term, open-ended campaigns; it will typically have just one or two people looking after business development;
- The majority of SME suppliers to the sector do not supply whole solutions; they are in the main providing goods and services at subsystem or component level. By contrast, the generic procurement processes are very much system-based and biased towards the corporate style of compliance. They are therefore very often beyond both the reach and understanding of the SMEs who simply do not have the knowledge, manpower (resources) or time to comply.
- Innovation is in the DNA of most SMEs and entrepreneurs. It does not need stimulating specifically. What it does require is some form of encouragement and nourishment, mainly in terms of a clear or at least identified route to market.
- In my experience as a first generation SME owner they are entrepreneurs and therefore risk-takers. They will challenge and seek passage around obstacles. It is generally their money in the game and therefore they will be very conscious of the consequences of their actions. Doing nothing is rarely an option. By contrast, the corporate world is typified by risk aversion and the pursuit of stability – do nothing is always an option!
- SMEs understand collaboration – they usually hunt in packs.
- Finally, the extremely risk-averse nature of the rail sector and the obsession of the higher tiers with passing risk down the supply chain are not conducive to building high-trust, collaborative relationships.

In essence penetrating the GB rail market requires a level of detailed sector knowledge that few SMEs have or are able to obtain. The rail supply chain is dominated by a limited number of OEMs, Tier 1s and their near-monopoly customers, e.g., London Underground and Network Rail (NR). The vast majority of players in the supply chain are not rail companies and would not describe themselves as such. This is recognised in the Future Railway report *SMEs and the Rail Industry: Creating a Chain Reaction* (RSSB, 2015b). It is therefore a much disaggregated and confusing sector. Good market intelligence on which to base business case development is vital. The default setting of the SME is to identify and exploit niches but it can only do this with accurate, contemporary and detailed market intelligence data. The diagram below draws these threads together in the context of collaboration (See Figure 2):



Figure 2 – Collaboration in SMEs

2.2 The Four Pillars

The Sector, in the opinion of the RSG, considers that there are the following four primary challenges (RSG, 2016):

2.2.1 Market Conditions

SMEs do not have a clear view of market conditions. This is typified by:

- Limited collaboration between customers, OEMs, Tier 1/2 suppliers and SMEs;
- Customers often wield extreme purchasing power;
- 'Single voice' leadership in the industry could be stronger;
- Uncertainty: limited forward visibility of demand;
- Peaks and troughs in demand and a lack of collaborative procurement strategies;

- Barriers associated with being aware of company standards, understanding needs and addressing product approval.

2.2.2 Innovation

SMEs' natural instinct to innovate is stymied by:

- Limited investment in GB rail research and development (R&D);
- Time-consuming product approval process;
- Risk aversion in bringing innovations to market;
- High barriers to entry into existing and new markets;
- The way in which GB simulation, validation and testing resources are structured and promoted rendering them invisible and inaccessible to many.

2.2.3 People and Skills

SMEs are affected by the wider human resource issues experienced in today's railway industry, namely:

- Growing skills gap and growing demands;
- Ageing workforce and changing skills requirements;
- Difficulties in attracting talent and poor gender diversity;
- Limited training resources and shortage of trainers and lecturers;
- Uncoordinated range of skills initiatives fragmenting effort;
- Lack of a joined-up approach across subsectors.

2.2.4 Exports and Inward Investment

SMEs in the UK are generally good at identifying markets for their products and services but barriers are typified by:

- High-value consultancy activity is not being leveraged for the benefit of UK supply companies;
- Investment decisions by large suppliers may not be made in the UK;
- Lack of UK-based turnkey supply offerings to overseas customers;
- Poor-quality industry data.

Many if not all of these are actually generic difficulties, common to many sectors, but are no less important for that. However, in this thesis they will not be addressed separately, so as to not detract from the overall aim of focusing on what is important to the railway.

It is also important to define at this point what the term 'rail industry' actually encompasses. I would maintain that it is common parlance to talk in terms of a railway industry when, in reality, no such entity exists. There are individual companies and there are groups of companies. They vary in their individuality and some 'families' are much bigger and more extended than others. However, it is a meaningless and redundant term when used in its current sense. I would argue that it is an ill-defined attempt to encompass any and/or all activity related to the rail sector, as a means of creating the appearance of volume and significance when, in fact, neither exists nor passes detailed scrutiny.

This perhaps arcane point is important because any serious observation of the sector very quickly becomes mired in attempting to understand a set of related and interdependent ecosystems, as opposed to a single entity (i.e., an industry). To some extent, this can be explained by the technical, operational and organisational characteristics of the rail mode of transport which result in a complex and complicated system of systems (Kemp, Camm, Evans, & Elphick, 2013; Schmid, 2010).

There are many ways in which the railway could be viewed but to attempt to group any and every activity that happens to benefit from the interface between metal wheels and metal rails is disingenuous. It can be argued that, had the railway not been de-nationalised in 1993, it might have been possible to create an effective whole-system view although I would suggest, given the diversity in the supply chain, such a notion would still be fundamentally flawed. Yet, it is a view that persists, even though the supplier base of the railway was already diversified and fragmented at the time of privatisation.

At one level the railway is viewed by its paymasters, the taxpayer, as a single entity and, in the foreword to her recent report, Nicola Shaw describes it as such:

"Part of the country's collective psyche, the railway is important for economic and social development, requires substantial public investment, carries us around – daily for some, on occasion for others – has significant impacts on our built environment and landscape, and is, mostly, photogenic. These things, together with the colourful characters who have worked on, designed, managed and regulated the system, mean that rail is regularly featured in the British media and discussed around kitchen tables, on social media, and in Parliament". (DfT, 2015b, p 4)

That the railway is a complex, interdependent system of systems (Kemp et al., 2013) is not in question, but it is not an industry. The generic term industry is generally taken to mean 'the economic activity concerned with the processing of raw materials and manufacture of goods

in factories' (OED, 2017). The main output of the railway sector is the transport of passengers and goods from B to C. A relatively small subset is the manufacture of goods to support that activity (see Figure 3).

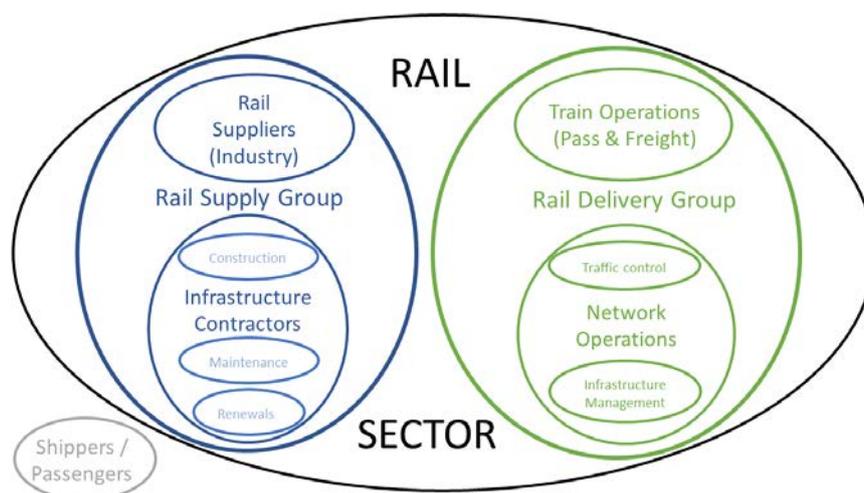


Figure 3 – Diagrammatic View of the Rail Sector (courtesy B. Eickhoff and F. Schmid)

Conversely, as we will see below, the automotive industry manufactures automobiles and the aerospace industry manufactures aircraft.

To put this in context, in the Automotive Council's overview of their sector (Automotive Council (2013)), it states that the UK automotive industry is very diverse and, paraphrasing, it reports that there are more than 40 companies manufacturing cars in the UK, in some of Europe's most productive plants. These include 11 of the world's global vehicle and engine manufacturers – Aston Martin, BMW (MINI and Rolls Royce), Ford, General Motors (Vauxhall), Honda, Jaguar Land Rover, Lotus, MG, Nissan, Toyota and Volkswagen (Bentley) — as well as specialist brands, such as McLaren and Morgan, and Triumph motorcycles (Department for Business, Innovation and Skills, 2013, p. 11). The presence of strong premium and niche vehicle producers in the UK means that the UK is second in the world to Germany for premium vehicles. There are also major manufacturers of commercial vehicles in the UK, including Leyland Trucks, Dennis Eagle, Wright Bus, Optare and Alexander Dennis, as well as construction, agriculture and other specialist equipment makers like Case New Holland, Caterpillar, JCB, Komatsu, Perkins, Terex and Thwaites. By inference, the automotive industry does not include highways, traffic control, driving standards, service stations, etc. (see Figure 4).

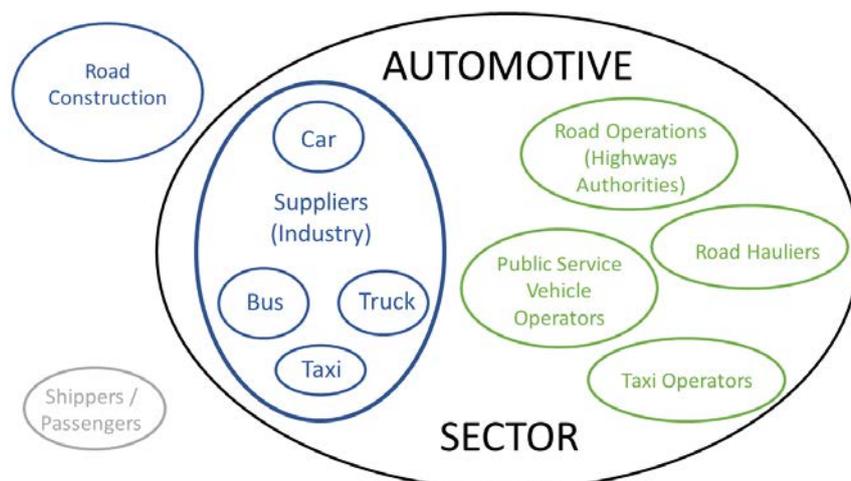


Figure 4 – Diagrammatic View of the Automotive Sector (courtesy B. Eickhoff and F. Schmid)

The aerospace industry, which has as its representative council the Aerospace Growth Partnership, describes its sector as “everything from business jets to the very largest twin aisle passenger aircraft and helicopters to advanced turbo props”; at no point does it attempt to widen its scope to include airports, passenger handling, ticketing and airspace control etc. (see Figure 5).

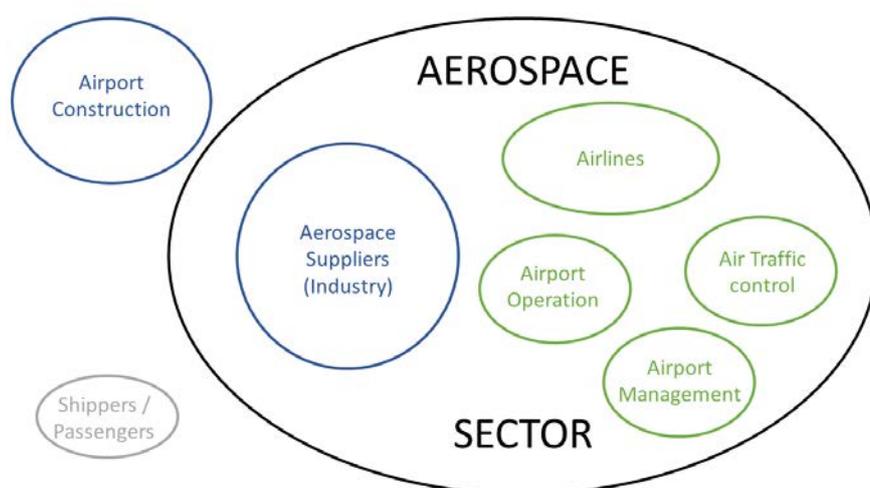


Figure 5 – Diagrammatic View of the Aerospace Sector (courtesy B. Eickhoff and F. Schmid)

Later in this thesis I will examine why the GB rail sector is in its present form and from that I shall draw conclusions about its health and openness to trading. However, at the present stage, I am now simply stating that the term ‘railway industry’ has no objective meaning and that I will henceforth refer to it as the ‘rail sector’, which I describe as the ‘economic, social and cultural activity associated with the operation of the heavy and light rail network’. For the purposes of this paper I will further narrow this definition to mean the activity associated

directly with the operation of rail vehicles, their systems and rail-specific infrastructure, i.e., track, signalling, stations and associated structures, such as tunnels, bridges, etc.

3 Privatisation of the Railway and the Law of Unintended Consequences

The GB rail sector today has been framed by the decision of politicians in the late 1980s to break up and privatise what was then known as British Rail (BR). The Thatcher governments post-1979 were very focused on their commitments to privatisation and deregulation, with a primary ethos that removing barriers to competition would lead to free markets that in themselves would automatically encourage efficiency and increased levels of productivity. Along the way the political value of creating a new class of share-owning public had the perceived advantage of consolidating the Conservative vote.

It is worth noting that although the move to remove the railways from public ownership was not the government's first priority (buses, telecommunications, gas, water and electricity had already happened), it is easy to forget that the railway system in this country was founded and developed through active competition between companies and that seeking private profit has been fundamental throughout its existence (Glaister, 2004). For a variety of political reasons (as opposed to economic arguments), over the intervening years governments of all political parties have felt uncomfortable with this position and have intervened incessantly in the 'public interest', with debatable efficiency and effect. The modern history of the railway in particular is littered with such interventions, which merely serve to further confuse an already obfuscated market place and do little to build confidence.

Some 5 years prior to the act of privatisation the House of Commons Transport Select Committee concluded that:

The fundamental objective of advocates of privatisation is to free the nationalised industries from bureaucracy and political intervention and to replace these forces with the disciplines of the market, in the expectation that this will lead to greater efficiency, lower unit costs and a better allocation of resources. The corollary of this, usually welcomed by management, is that the enterprises are freed from constraints on investment and on funding imposed as part of public expenditure controls. It is also argued that the very process of privatisation forces consideration of all the rights, duties and constraints affecting an enterprise, which is the basis for a far better identification of social objectives and their means of achievement than the historic process of control of nationalist industries. Opponents of privatisation argue that it is primarily a convenient way of abandoning the traditional social duties of the public enterprises, and of renegotiating, to the disadvantage of employees,

their terms of employment. (House of Commons Transport Committee, 1987, para. 232)

As the White Paper expected in late 1991 was postponed until after the 1992 General Election the first real indication of the government's intentions came in the Conservative party manifesto:

We believe that the best way to produce profound and lasting improvements on the railways is to end BR's state monopoly. We want to restore the pride and local commitment that died with nationalisation. We want to give the private sector the opportunity to operate existing rail services and introduce new ones, for both passengers and freight.

A significant number of companies have already said that they want to introduce new railway services as soon as the monopoly is ended. We will give them that chance.

Our plans for the railways are designed to bring better services for all passengers as rapidly as possible. We believe that franchising provides the best way of achieving that. Long term, as performance improves and services become more commercially attractive as a result of bringing in private sector disciplines, it will make sense to consider whether some services can be sold outright. (Conservative Party, 1992, p. 35)

It is clear that in terms of previous international railways experience, the form of privatisation adopted by the UK Government is both novel and experimental (in the sense of being untested). It is true that some elements of the Government's proposals have been put into practice or contemplated in various parts of the world. Yet in no country with a rail system of comparable size and density of use is there an example, either in operation or even under consideration, of a complete scheme such as that contained in the Railways Bill. This does not of itself mean that it cannot succeed. To take that argument to its logical conclusion would mean that no innovation ever took place. What it does mean, however, is that because of the lack of previous experience to draw upon, the risk that something could go badly wrong is that much higher. To put it another way, the system of railway operation proposed by the Government probably can work, but, in the words of one witness, it may need to be made to work.

The onus lies firmly on the Government to demonstrate that its plans will provide a better service to the travelling public. If all the Government's assumptions are correct about such matter as:

- the prospects for investment;
- the practicality of the relationship between Railtrack and operating companies;
- the response of the private sector to the new opportunities on offer; and
- the feasibility of combining open access with franchising.

then there may be the potential for an improved railway system. Whether the Government is right in these assumptions is a matter of political judgement. The final verdict will rest with rail users. (House of Commons Transport Committee, 1993, paras. 523 and 524)

Yet many, including senior people within the Conservative party, believed that privatisation was merely a mechanism to manage the railway's gradual decline without too heavy a burden on the taxpayer (Calder, 2016). It is a highly debatable point as to whether the manifesto and consequent White Paper aims have been realised across the intervening 25 years and to note the accuracy of the Transport Select Committee's commentary.

This course of action was therefore in no small part based predominantly on the understanding that the sector was in terminal decline and the organisation formed to take the infrastructure forward (Railtrack) was designed to manage that process. If it was to have a future then that had to come from the application of free market forces and the benefit of real competition.

The free market was to be left to manage the major routes and very little public money was to be available for the purchase of new traction or rolling stock.

It is fair to note that since privatisation the railways in Britain are carrying 92% more passengers, more safely and on a newer fleet of trains (DfT, 2013, p. 5). However, there is also a fair case to be made that, given the real cost to the taxpayer across the same period, this would have happened anyway, or at least that alternative instruments may have been engaged to achieve the same end. There is little or no evidence to suggest that the indigenous supply chain supporting the sector has seen any similar level of growth or benefit. A simple measure would be to look at the membership of the railway supply chain's own trade association, the Railway Industry Association, across this same period. It could be said that this is a useful barometer of the part of the supply chain that specialises in rail. In broad numerical terms it is slightly larger today; however when companies registered in the UK but

parented abroad are removed from the membership, the number of companies of significant size remaining which are genuinely indigenous shows a picture of significant decline.

Concomitant with this political doctrine, the European Union in its *First Railway Package* (EU Directive 91/440/EC) had recognised that the existing structures within the community's railways were not particularly conducive to the development of a free and open market and thus this and subsequent legislation sought to increase competition through separation of the operation of rail services from the provision of infrastructure (the removal of so-called horizontal and vertical integration). **This did not in itself mean that state railways had to be privatised and, in fact, the UK government was the only member state to interpret the rules in this fashion and act accordingly.**

Based on the managed decline premise (Mathieu, 2003), the process was conducted at pace and thus began a period of change and instability that was to last until the present day. Although there is a level of stability in the current system it could not by any measure be said to be in a steady state. In its comprehensive *Britain's Railway Crisis* the University of Bath Centre for the Study of Regulated Industries (CRI) eloquently described the railway as it was in 2004, some 10 years after privatisation; many of the failings discussed are still true today. Notable are the key challenges posed by "excessive fragmentation and the industry's interface complexities", combined with the "problems of political, governmental and regulatory management of the large public subsidy" (Bartle, 2004, p. 1).

The CRI study concluded that there are four aspects which make the sector different to others, and that it has certain characteristics that make it stand out amongst the utility industries and even different transport modes:

First, and perhaps the most well-known, is that it is an inherently loss-making industry dependent on government subsidy, and unlike coal and steel, for example, the supply of rail services cannot be imported, and the British rail industry must be kept in business (although individual companies could be allowed to go bankrupt and taken over by others). (Bartle, 2004, p. 4)

Although estimates vary between £9bn and £14bn (The Hendy Review, 2015), the value to the UK economy of the output of the railway is considerable with annual movement of 1.65b passengers and 503.2m tonnes of freight, hence the value to the taxpayer of keeping a "loss-making" sector in business is self-evident (RSSB, 2017b, p. 6). This critical national output value should be considered a key factor when considering the railway's response to the Sector Deal programme covered later in this work (BEIS, 2017).

Secondly, the rail industry is constrained by highly complex interfaces, a result, in part, of the 170 year legacy of its infrastructure. Significant upgrades, such as new rolling stock or lines, cannot be installed and operated with clearly discrete and limited interfaces; new trains, for example, must be compatible with the tracks, bridges and tunnels, signalling systems and station platforms, most of which were built at different times with different interfacing requirements. (Bartle, 2004, p. 4)

Layered onto these complex interfaces is the safety-critical nature of mass public transport.

Thirdly, there are significant network capacity limitations which have become increasingly evident during the 1990s as a result of the substantial increase in user demand. While other network industries have network problems, none has had its performance compromised by its capacity in similar ways. (Bartle, 2004, p. 4)

One of the key values of the new European Rail Traffic Management System is to try and overcome the severe limitations imposed on increased scale of operations by the lack of available infrastructure. No other mode of modern transport is so confined in this way and, of all of the European nations, the UK is the most constrained, thereby presenting it with both a unique challenge and an opportunity.

Fourthly, the rail industry in Britain is also severely constrained by the scarcity of land particularly in densely populated areas of England which also have a high demand for services. This is a serious constraint if the network capacity problems are to be addressed by network expansion. It is much more difficult to develop new lines (such as high-speed inter-city lines) in England than in countries such as France and Germany which are much less densely populated, and new lines on green field sites are more easily achieved. (Bartle, 2004, p. 4)

This fourth aspect is compounded by emerging EU noise level legislation. As population density increases it is ever harder for the railway to achieve new routes that are deemed socially acceptable. The recent grant of Royal Assent to the HS2 Hybrid Bill took 3 years of negotiation, parliamentary hearings for 1600 of the 2588 objections and an eleventh-hour bid in the House of Lords to defeat the scheme, and the cost of the project to date is circa £1.4bn (Plimmer, 2017). It is clear that the level of complexity and cost involved in creating new lines on a congested island means that only 'mega' infrastructure projects are likely even to get off the starting blocks.

3.1 Conclusions

It seems clear that the primary objective of the process to privatise the GB railway system was to significantly reduce the level of public expenditure in a system that was assumed to be in long-term, and possibly terminal, decline. The assumptions based on privatisation of other core national assets such as telecommunications, utilities, etc. proved to be false in the case of the railway sector, and thus the unintended consequence was that an entirely artificial oligopolistic marketplace was constructed, in a manner unique to the GB. Such markets are characterised by dominance of a relatively small number of powerful players/actors. The ability to 'game' the market (badly in the case of government departments or well in the case of franchise operators) is distinct and the inevitable outcome is reduced competition, poor market behaviour and extreme, short-term protectionist (exclusive) behaviours. These characteristics, combined with the inability of government departments to manage complex interdependencies and provide clear, unambiguous and consistent leadership, have created a complex business landscape for the supply chain to navigate.

4 The McNulty Study as a Baseline

The sector today remains a fragmented, complex and disjointed beast. It is nicely summarised by Professor John Stittle Professor of Accounting at Essex University in a recent article in the Financial Times:

“The train you catch is owned by a bank, leased to a private company, which has a franchise from the Department for Transport to run it on this track owned by Network Rail, all regulated by another office, and all paid for by taxpayers or passengers. The complexity is expensive” (Plimmer & Ford, 2018)

It survives because it is so vital but it is not in any way a user-friendly place to do business, or even to travel. Since privatisation there have been a number of reviews and studies commissioned and executed.

Those related to the aftermath of accidents like Southall, Ladbroke Grove, Hatfield, Great Heck and Greyrigg have all contributed significantly to the development of the safe system that GB rail enjoys today (ORR, 2016a). For the purposes of this study I have not considered such studies any further.

However, there has been an extensive range of work of some relevance to the supply chain over the intervening years. For the sake of clarity and to maintain a contemporaneous approach I have worked from a baseline using the Rail Value for Money study which produced the *Realising the Potential of GB Rail* report jointly commissioned by the DfT and the Office of Rail Regulation published in 2011. It is worth noting that Sir Roy McNulty leant back on the 2004 *Future of Rail* White Paper.

The report was chosen as it is the most comprehensive examination of the post-privatisation railway conducted to date, and as part of its deliberations it made reference back to the privatisation process, producing a simple analysis of what lessons could be learned (DfT/ORR, 2011a, p. 41). It was widely consulted, and drew on the resources of a number of the major consultancies. Although it was widely criticised at the time for the way in which, to quote the seasoned rail journalist Christian Wolmar, “the process was hijacked by the Department for Transport which ultimately stifled debate and ensured that the report’s conclusions contradicted its findings” (Wolmar, 2011), it is nonetheless a vast body of research work to draw upon. That the final report’s conclusions were clearly ‘managed’ by the DfT does not detract from the groundwork of the reports on which these conclusions were based.

It also had the unusual pedigree in that it was commissioned in February 2010 by Secretary of State for Transport Lord Adonis under the Labour administration and then completed its

work under the Philip Hammond, his successor in the Conservative/Liberal Democrat coalition government. The report did not lack ambition and thus some of the statements early in its final iteration are bold and confident. That it was subsequently diluted rather aligns with the comments made previously in the CRI report about the susceptibility of this sector to political and departmental interference (Glaister, 2004). The timing of the report's final publication was also probably not helpful to its ultimate integrity. Reports that do well are driven by the political imperatives of that moment.

A contemporary exemplar is the Hauser report which also started life under the auspices of the Labour government (Lord Mandelson) and concluded under the Liberal Democrat Secretary of State for Business, Innovation and Skills, Sir Vince Cable. This work set the scene for investment to establish a network of technology and innovation centres (the Catapult Centres). Although this spanned the same timeframe as the McNulty review, in stark contrast it has gone on to be hugely successful. Part of the difference is that the Catapult process was fully aligned politically to the coalition government's aims and objectives, whereas the McNulty review inevitably drew attention to the failures of privatisation and of the subsequent franchise processes, both of which are deeply rooted in Conservative politics. Secondly, the McNulty review was first envisaged in the post-recession period when the assumption was that recovery would be protracted, and therefore dramatic savings would need to be found. This did not prove to be the case in terms of rail travel and thus the moment passed. Politically, by the time the report was being finished, a whole new set of political imperatives were in play and therefore it was cherry-picked by a department that did not have a political master committed to any particular agenda other than not rocking the boat. Instead, it was followed up by the DfT with its 2012 White Paper which "could be fairly represented as McNulty with a political spin" (Bowman et al., 2013, p. 144).

Later in this thesis I will make some observations about why so few of the review's recommendations were adopted or implemented. I will also review the "important prerequisites" that, according to Sir Roy, "need to be in place within any industry or activity to make cost reduction actually happen" (DfT/ORR, 2011a, p. 35); he noted that the study showed quite clearly that many of these conditions were missing from the then current system and I maintain that little has changed in the intervening years.

The original terms of reference for the report were as follows:

- 1. To examine the overall cost structure of all elements of the railway sector and to identify options for improving value for money to passengers and the taxpayer while continuing to expand capacity as necessary and drive up passenger satisfaction.*

2. *In particular, to examine:*

- *what legal, operational and cultural barriers stand in the way of efficiency improvements;*
- *the incentives across different parts of the rail industry to generate greater efficiency;*
- *the role of new technology, processes and working practices in fostering greater efficiency;*
- *ways of generating more revenue, e.g. car parking, gating at stations, better utilisation of property; and*
- *to make recommendations.*

3. *The Study will examine the whole-industry costs and revenues and their composition. In doing so, it will look at comparable industries in the UK and abroad.*

4. *The Office of Rail Regulation (ORR) will be a joint sponsor of the Study. The ORR will remain responsible for delivering efficiency improvements by Network Rail (NR) and for safety regulation. The Study should take account of ORR's benchmarking work for the period 2009–14 and beyond.*

5. *The work will divide into a scoping study and a detailed report, the former to be completed by the end of March 2010.*

Although there is no specific mention in the terms of reference of the role that the supply chain has to play, I would suggest that this is implicit in the first three bullet points of section 2 above. The Level One (summary) report of the final document set out the principal findings, recommendations and assessment of the potential for reduction in costs based on a template drawn up for all elements of the study and including the following 'prerequisites' which the study team considered needed

to be in place within any industry or activity to make cost reduction actually happen:

- good leadership from the top;
- clear objectives and the right values (which focus on costs, but also protect other key values such as safety and service quality);
- good quality, devolved, financial information available to all concerned;

- a culture where the status quo and previous assumptions are continually challenged;
- an organisation structure that fosters: – well-motivated management teams; – the correct organisational alignment; – whole organisation effort; and – the right speed of action;
- incentives and contractual mechanisms that encourage cost reduction;
- implementation and focus at every level;
- effective communications;
- a focus on detail and making change happen; and
- consistency of purpose over long periods. (DfT/ORR, 2011a, p. 35)

Based on template assessments against the generic prerequisites above, the study team identified what it called its “top ten themes” (DfT/ORR, 2011a, p. 35), a grouping of the barriers to efficiency as they were seen at that time. In terms of their relevance to the needs and wants of the supply chain I would make the following observations:

4.1 Fragmentation

There was a clear recognition that the multiplicity of sector players combined with poorly aligned cultures and objectives have created a “co-operation deficit”. It is perhaps not surprising that whilst there is a clear need for strong leadership, clarity of purpose and the adoption of a strong focus on the right values, the DfT is merely cited as having a role to police franchise obligations and little more. In such a fragmented sector the leadership role of the department itself must be called into question and examined.

4.2 The Main Players’ Way of Operating

Although NR’s complexity, arrogance and detachment from its customers’ needs came in for criticism, along with the conflict that train operating companies (TOCs) have with NR and passengers whilst pursuing short-term commercial interests (DfT/ORR, 2011a, p. 36). The adversarial nature of relationships between TOCs themselves and then with NR has done little to instil collaboration or efficiency in the supply chain. Instead, this adversarial culture flows downwards.

4.3 The Role of Government and Industry

Due to the highly subsidised nature of the sector there is an inevitable level of interaction between the government, through the DfT, and delivery bodies like NR and the TOCs. This of course, by extension, reaches into the world of the rolling stock operating companies

(ROSCOs) and the OEMs. In this section the study team made the error of referring to ‘industry’ as if such a thing exists. They then go on to observe that within current frameworks, the responsibility for sector performance, especially in relation to cost reduction, has rested with government rather than industry, which has failed to take responsibility. The study focuses here on NR and the TOCs (industry); however, the role of the wider supply chain and its capabilities have been missed out completely.

4.4 Incentives

There is little doubt that, outside of the routine cut and thrust of franchise re-tendering, there is little evidence to suggest that the picture is any better now than it was when the study reported. The issues surrounding alignment of objectives and businesses persist and outside of re-franchising there seems little proactive focus on continuous improvements in the pursuit of cost reductions. Given the current activities of the Hansford review team, the final comment that “there is insufficient contestability for much of NR’s expenditure” is particularly telling, as it would seem that little has actually changed in the intervening 6 years. Following the announcement at the annual Future of Rail conference in 2016 by NR CEO Mark Carne that he would commission an independent review into the barriers to alternative product delivery models, the Hansford review, chaired by Professor Peter Hansford (former Construction Industry Advisor to the Department for Business, Innovation and Skills) of University College London, has been set to work. At its heart is their hypothesis

that greater contestability in the UK rail market would provide more opportunity and encourage third parties to invest in and take responsibility for delivery of rail infrastructure improvements, which in turn is required for the UK rail network to grow and meet future challenges. (Hansford, 2017, p. 7)

In this setting, contestability is taken to mean the presence of the following characteristics:

- The threat of competition exists to keep prices low;
- The barriers to entry and exit should be low;
- The number of competing companies is not significant.

At the time of writing, the study had not completed its deliberations.

4.5 Franchising

Aside from the more obvious commentary around the barriers imposed by short-term franchise periods, over-prescription and inflexibility to react to changing market places, the study noted that there was poor usage of residual value mechanisms which in themselves are

key to stimulating and encouraging innovative and continuous improvement measures, most notably in the domain of rolling stock enhancements to give them a reasonable return on investment period. This has been formally addressed since the study but has not had a marked effect, probably because it sits in isolation. This links back to the incoherence that epitomises the supply chain environment.

4.6 Fare structures

From a supply chain perspective the key finding in this area was to once again make the point that the sector lags behind other sectors and thus its implementation of SMART technologies is poor. These are opportunities lost to the wider supply chain ecosystem. A theme that has and will keep recurring in my work is that this inability to embrace change reduces competition and opportunity which in itself leads to a declining not growing supply chain focused in on itself and acting to exclude new players.

4.7 Legal and contractual framework

At the heart of this section are observations that show how the complexity of the system is such that it has led to ‘gaming’ of it by some players and the adoption of negative and adverse behaviours. All of this has served to erode any sense of esprit de corps carried forward from BR and, instead, self-centred adversarial relationships have perpetuated and grown.

4.8 Supply chain management

Section 4.8 of the Value for Money study is one of the few places the supply chain gets any real mention other than in the context of support to innovation (DfT/ORR, 2011a, pp. 38–39). Comments are made about the sector lagging behind others in terms of demand profiles; short-term relationships with low levels of collaboration; overly complex relationships between franchises, traction and rolling stock purchase; leasing and maintenance; and habitually late engagement, the latter four being particularly characteristic of the railway sector. The government has recently commissioned a number of reviews into NR alone. The two extracts below are from Nicola Shaw and Dame Colette Bowe’s reviews; they also tell a consistent story:

You’ll note already that although I have been asked to report on Network Rail, I am setting this in the context of the railway as a whole – that’s because the industry has complex interactions between different elements. Over 35,000 people work for Network Rail, with tens of thousands more working across its supply chain and for the train operators who use the rail infrastructure. Between these different businesses there are contracts, regulations, codes,

committees and licences which govern interactions. These interactions mean that changes to Network Rail may have implications elsewhere. (DfT, 2015b, p. 4)

When it came to delivery, costing errors, unanticipated interdependencies, a lack of consideration given to deliverability, engineering issues and a poorly managed supply chain also contributed. (DfT, 2015a, p. 6)

In its strategy published in 2016 the RSG also noted the following shortcomings in the sector:

Market conditions

- Limited collaboration between clients, Tier 1/2 suppliers and SMEs;
- ‘Single voice’ leadership in industry could be stronger;
- Uncertainty: limited forward visibility of demand;
- Lack of coherent procurement strategy;
- Barriers associated with company standards, understanding of needs, and product acceptance.

Innovation

- Limited investment in GB rail R&D;
- Time consuming product approval process;
- Risk aversion in bringing innovations to market;
- High barriers to entry;
- Insufficient GB simulation, validation and testing capacity.

The picture has remained much the same between the publication of the Value for Money study and the most recent Hansford review.

4.9 Limitations on whole-system approaches

A theme that I will develop later in this thesis is that a lack of systems approaches in what is a sector dominated by the need for system integrity has had a crippling negative effect. The study reinforced the view that fragmentation and the behaviours that have been previously covered have served to lead players to “optimise their positions within their own silo” (DfT/ORR, 2011a, p. 39), a characteristic that I will explore in greater depth when I examine the culture of exclusion in Chapter 5.

4.10 Relationships and Culture

This part contains within it perhaps the most significant observations of supply chain barriers and, although at the conclusion of the chapter the comment is made that “the Study does not see this list of barriers as a recipe for despair”, it is clear that the statement was made on the assumption that “with strong leadership and concerted effort” they can be overcome (DfT/ORR, 2011a, p. 40); this may have been somewhat too hopeful. The report highlights the unproductive nature of a number of key relationships but crucially in the second part it goes on to expand on the “inherited characteristics” of what it calls a “relatively old industry” (DfT/ORR, 2011a, p. 72). The ecosystem that is a consequence of this culture demonstrates:

- a lack of openness and transparency;
- a tendency to be somewhat adversarial;
- weak capability in terms of partnership;
- a disinclination to look outside the rail industry for new ideas; and
- a limited focus on continuous improvement. (DfT/ORR, 2011a, p. 39)

These five failings are, I believe, at the heart of what is systemically wrong with the sector and until such time as they can all be addressed in a genuine and concerted fashion there will be no improvement in the supply chain. I will examine these further in Chapter 5: Why Does the Railway So Actively Exclude?

4.11 Barriers to value for money

It was interesting that the study settled on adopting the National Audit Office definition that “good value for money is the optimal use of resources to achieve the desired outcomes”, not least because the team then found that the railway sector structure at that time was very difficult to understand and that, stemming on from that, there was little or no clarity on what the “desired outcomes” were in reality (DfT/ORR, 2011a, p. 40). I believe that a fundamental issue here was that it appears that there was no attempt to take account of the wider economic value of money spent in the sector in terms of value to the indigenous base, in other words to grapple with the issues surrounding whole-life cost and subsequent whole-life value. From my direct experience in the Ministry of Defence I would estimate that the railway sector is at least 15 years behind in its thinking and 20 years behind in its activity (Based on the premise that MOD worked with the professional service company KPMG to produce the CADMID Cycle of whole life management and costing, in the period 1998-2000 and that currently the railway at large is only at about the point the MOD was 2 years into that process).

In November 2010 the Northern Ireland Procurement Board revised its definition to read “best value for money is defined as the most advantageous combination of cost, quality and sustainability to meet customer requirements”. Importantly it also went on to be clear that:

In this context:

- **cost** means consideration of whole-life cost;
- **quality** means meeting a specification which is fit for purpose and sufficient to meet the customer’s requirements;
- **sustainability** means economic, social and environmental benefits, considered in the business case, in support of the Programme for Government. (Department of Finance, no date)

Had the review team taken a more lateral and innovative approach to their pursuit of a definition, this far more useful and equally credible version may have enabled a slightly different approach which could have resulted in a fuller examination of the role of the supply chain.

McNulty rationally focused on the measurement of productivity but did not state in full the embarrassment of the productivity figure, as in the highly asset-intensive sector the normal expectation is that the greater the use the greater productivity and profit.

Unit costs (i.e. the total cost of running the railway) per passenger kilometre have not improved since the mid-1990s. The Study’s initial “should cost” analysis, against the 2008/09 baseline used in the Study, suggested that GB rail’s costs ought to be 20-30% lower. Further benchmarking has identified an efficiency gap of 40% against four European comparators. Some of that 40% gap may be systemic, and therefore cannot be eliminated fully, but I believe that the industry should be aiming to achieve a 30% reduction in unit costs (i.e. costs per passenger-km) by 2018/19. (p. 5)

The results of the general dismissal of the report are clear to see in the cost per passenger-km achieved over the same period with no meaningful increase in productivity. Since McNulty, passenger-km cost has increased a further 13% which should have made delivering productivity improvements relatively easy. However, the stark reality of falling productivity remains evidenced in the industry (ORR, 2015).

Table 1 – Cost Per Passenger

| Year | Passenger-km cost (franchised) | Subsidy per mile | TOC passenger revenue/passenger mile | Total cost of use per mile |
|------|--------------------------------|------------------|--------------------------------------|----------------------------|
| 2010 | £53.3bn | £0.11 | £0.21 | £0.32 |
| 2011 | £55.9bn | £0.08 | £0.22 | £0.30 |
| 2012 | £58.1bn | £0.08 | £0.23 | £0.31 |
| 2013 | £58.1bn | £0.07 | £0.24 | £0.31 |
| 2014 | £61.8bn | £0.07 | £0.24 | £0.31 |
| 2015 | £63.6bn | £0.06 | £0.25 | £0.31 |
| 2016 | £65.0bn | £0.06 | tbc | |

(<http://www.orr.gov.uk/statistics/published-stats/additional-datasets>)

If the productivity gains McNulty recommended had been made the cost per passenger mile would be £0.21 by 2018/19 and would need to have achieved £0.25 in 2015 on a straight-line basis.

The initial value of the McNulty report can be seen in the launch of a range of initiatives over the year by DfT and NR, including deeper partnerships, the East West Alliance and the focus on innovative leasing models.

McNulty recognised the complexity of the situation but worked within the paradox common to regulated sectors of centralised planning and control with a desire to unleash market forces, where the delineation between state and sector have become so blurred that in some respects the DfT has become the proxy of the railway sector in government rather than focusing on the key deliverables and providing leadership.

This can be summarised as the rail sector not being a free market but characterised by the same management practices that were prevalent in the USSR, with 5 year plans and working towards fixed demand forecasts for key metrics through control periods and high level output specifications.

The DfT has done significant work to fill the leadership vacuum in the sector, as can be seen in the DfT’s efforts to drive leadership into the industry with mixed results such as the RDG. The DfT list its priorities as:

- Boosting economic growth and opportunity;
- Building a One Nation Britain;
- Improving journeys;

- Safe, secure and sustainable transport. (DfT, no date)

The first two priorities relate directly to remits of other government departments such as BEIS and the Department for Communities and Local Government. A series of quick Google searches identify no significant joint working or commissions between these departments to identify transportation needs outside of the development of autonomous vehicles. The DfT has multiple work streams working closely with business operating in transport and specifically rail. A good example of disjointed activity is the work being conducted by BEIS for the Industry Strategy Green Paper and DfT's Infrastructure Efficiency Strategy, which have many areas that overlap significantly.

Amongst a complex web of relationships McNulty identified:

“barriers to efficiency” and we have identified that amongst the principal barriers are fragmentation of structures and interfaces, the ways in which the roles of Government and industry have evolved, ineffective and misaligned incentives, a franchising system that does not encourage cost reduction sufficiently, management approaches that fall short of best-practice in a number of areas that are key cost drivers, and a railway culture which is not conducive to the partnership and continuous improvement approaches required for effective cost reduction. (p. 5)

Many of the barriers identified above are interconnected, and they all come together in the industry's culture and relationships. Despite some considerable thought on the matter, the Study remains uncertain as to whether the industry's culture causes the lack of leadership at industry level, or whether the lack of leadership has contributed to the problems in relationships and culture. On balance, we think the latter explanation is more likely. (p. 10)

Whilst McNulty does not dwell on the part played by the supply chain in this centrally planned world he tellingly only uses the word 'failure' once.

There is poor application of supply chain management, including a poor take-up of collaborative approaches around the high-risk and high-value procurements. This has, in part, been due to a failure to develop the right culture and behaviours, especially at senior management level. There is a lack of supply chain management skills and experience in the rail sector, with an emphasis on behaviours that are geared to traditional competitive procurement alone. (p. 56)

This failing of supply chain management can be seen in every aspect of the sector from recruitment of new leaders through to cost over-runs on electrification. An economist viewing the rail sector would view it as a series of failed markets as every aspect of the sector is dominated by monopolies, duopolies and oligopolies all, arguably, involved in rent-seeking behaviour. It is worth noting that according to the National Skills Academy for Rail fewer than 20% of people in leadership roles in the sector have any formal training, coaching or mentoring for their role (Neil Robertson, CEO NSAR, addressing the RSG SME Conference April 12, 2017).

One of the few aspects of the report to be enacted was regarding innovation. The study recommends the creation of a leadership group to drive innovation in the industry

drawing on models that have been used in the aerospace and automotive sectors, potentially to be known as the Rail Innovation and Growth Team (RIGT). It would focus on encouraging industry parties to innovate through identifying technological opportunities, showing where and how those parties could obtain returns for their investment, and would operate under the direction of the RSA.

The RIGT would research and highlight potential areas for innovation, and match potential innovators with gaps in the market in areas such as IS, retailing and rolling stock, while recognising that innovation is not just about new technology, but also relates to processes and business ideas. (p. 59)

This came to pass in a much reduced sense as the EIT, which subsequently became FutureRailway and is currently RSSB Innovation. It resides in the un-reconstituted RSSB. However, from the start there were problems beneath the surface, with some members of the team clear that promoting innovation for its own sake would not lead to a change in the delivery of innovation and that the key focus should be on organising industry-wide change, as envisaged by the McNulty review in the form of the Railway Innovation and Growth Team (RIGT)/Rail Systems Agency (RSA), and others who wanted to focus on the delivery of an innovation portfolio under the guise of the Technical Strategy Leadership Group innovation programme. This dichotomy was never resolved; time will tell if the ILG/TLG axis will do so.

One of McNulty's undelivered recommendations was that

A small independent Change Team that is tasked with planning, coordination, monitoring and reviewing implementation across all elements of the industry of a complex series of actions – this team should include proven “change

agents” to facilitate action across the broad scope of this report’s recommendations. (p. 69)

Arguably, the division within the EIT came down to a problem foreseen by McNulty in this unrealised requirement for an independent change for the mechanics of his proposal to succeed, with key team members wanting to focus on filling this gap in relation to the McNulty report. However, any move in this direction would have been doomed to failure as the group reported to RSSB and was under the auspice of the Technical Strategy Leadership Group whose remit did not include the change agency.

The split within the EIT was focused solely on the delivery of innovation to market rather than the wider McNulty challenge. This tied back to the failure of the supply chain that McNulty had identified but not probed deeply. Understandably, in McNulty’s dialogue regarding market and market forces, 18 out of 21 items relate to the position of TOCs and Freight Operating Companies (FOCs) as being best placed to adapt to market signals and how DfT could enable more flexibility for these organisations to respond. An articulation of McNulty would be that there is no effective market for TOCs or users. The extrapolation of this, given the barriers to entry he identified, is the rent-seeking behaviour in every aspect of the sector; the absence of any significant cohesion or meaningful collaboration with the supply chain and from that near catastrophic failure of the rail sector as an effective and productive market place.

Within the context of the EIT, the conclusion of part of the team seemed to become that the supply chain was well equipped and financed to deliver innovation into the rail sector, however the business cases and mechanisms for purchasing innovation were immature, with few if any significant organisations having the capability to purchase innovation. This failure to procure extended within RSSB, with the average time to sign an innovation contract remaining near to 12 months after initial award for the first 3 years and now dropping to 6 months for the recent TOC16 competition. In short, this was a reinforcement of past failure or malaise. It seems to me that the team was allowed to operate in a bubble of its own making and lacked any real accountability or transparency in its actions to the sector. A lesson for the future would be to engage more effectively with a more diverse cross section of stakeholders.

To bring this part of the story full circle it is worth taking note of the study team’s observations over what lessons, if any, there were to learn or to inform their own deliberations. So far as privatisation was concerned their conclusions were that it had to be considered a work in progress and nowhere near complete, at least in the terms that the original 1993 Railway Act envisaged. They also observed, as it turned out presciently, that the sector has a poor record

of actually implementing change. Of particular note was the 2004 White Paper *The Future of Rail* which had identified fragmentation, leadership and poor cost-control as areas of serious concern. The study team felt that due to this poor record of implementation the sector needed to concentrate on “evolution rather than revolution” (DfT/ORR, 2011a, p. 43), based on the premise that only so much change can be handled at any one time. I believe this to be misguided and later in this thesis I will make the case for better leadership, focused on the right changes delivered with confidence and momentum and, furthermore, that this leadership is pivotal to the act of change which in itself is the stimulus that the supply chain needs to thrive.

In my experience there are few better sectors than the railway for defeating change by reducing the pace of it to zero through the implementation of multiple layers of meaningless bureaucracy, generally lacking in executive function. As George Muir, a previous leader of the Association of Train Operating Companies (ATOC) noted when talking about the layers of new bodies recommended by the McNulty team it is “Frankenstein, the fat controller” and then perhaps somewhat unfairly then likened it to “a manual on local authority organisation” (cited in Wolmar, 2011). One wonders what he might say about the current situation if asked to comment!

4.12 Conclusions

It is very clear from what the McNulty review found that there are numerous clear fault lines that run through the sector and that their genesis was predominantly the moment of privatisation, although the underlying condition may have been endemic even at that point, e.g., the reticence of the sector to be open and transparent.

These vertical faults when combined with poor behaviours, lack of collaborative spirit, 360° adversarial relationships and low-grade leadership have served to create and sustain a distorted and dysfunctional market place for the supply chain to work with. The inability to create and sustain meaningful and structured change reduces the ability of the supply chain to innovate or novate and thus the marketplace remains in a period of stasis. The sector is as difficult today as it ever was, and has few if any parallels in the UK economy.

5 Why Does the Railway so Actively Exclude?

I believe that one of the most damaging fault lines that has emerged from privatisation and is still apparent today, as we have seen in the McNulty study and more recent work, is the way in which the railway sector has created itself around a self-centred model. That is to say its default setting is in fact to create silos and be adversarial rather than collaborative, to ‘game’ in a system of winners and losers:

Players within GB rail are more inclined to follow approaches which maximise their position within their own silo, rather than optimising outcomes for the industry as a whole, for example in the areas of technology and innovation (McNulty, 2011, page 10)

In short, to create a default setting that excludes. This is a hugely corrosive behaviour and sets the bar high for would-be ‘interlopers’. In this chapter I will first set out what this silo mentality means in general and then specifically in the context of the rail sector.

In her book *The Silo Effect*, Gillian Tett (2015) set out some clear observations on the way in which we as a species are hard-wired to arrange ourselves into easily definable sets, or silos. Later in this work I will look at how this silo mentality has led to constrained growth and sub-optimal development in the rail sector at an industrial level. However, there is a deeper cause for concern. The railway is by its very nature a sector that lends itself to division in the sense that to be a player on the grand stage, i.e., a national operator or provider of hugely expensive systems whether they be trains, stations or signalling systems et al., needs to be a very large, corporate beast.

Equally it is a system that is very focused on eliminating any variation of choice through the adoption of immutable rules, procedures and standards; this again “puts people and organisations in their place” (Tett, 2015). Applying another filter, that of the corporate body trading in the same space as the smaller enterprise, the clash of cultures embodied by the difference between the entrepreneur-led world of the SME bumping up against the risk-averse, finance (cum shareholder return)-led world of the corporate is encountered.

In the GB rail sector this leads to some interesting divisions along this cultural fault line, made more intractable as all the major corporates dominating the sector are foreign-owned and very much of their parent nations. The oil-and-water nature of this relationship is quite striking. At a more basic level it is a simple fact that the business culture and ethos that pervades the body corporate is fundamentally different to that of the supply chain, populated in the main by SMEs. The rail sector in the GB has a unique level of privatisation which drives

these behaviours. Large nationalised industries will typically be arrogant by their very nature and size. This is often neglected, I believe, because being nationalised they are seen to be ‘of the nation for the nation’. In a privatised sense this is not so clear and thus corporate arrogance lives in the space between the embodiment of pride in the company and all that it stands for and a commercial sense of xenophobia. The corporate motivation of these organisations leads back to wherever the company is actually based; there is no implied allegiance to the UK, nor is there any reason for this to be so.

This simple facet when combined with our social inclination towards a mind-set that somehow sees a greater worth or standing when viewing a corporate as opposed to the patronising attitude towards the smaller business makes for a difficult mix, made all the more perplexing considering that the UK economy is made up of 99% SMEs employing 95% of the workforce (RSG, 2015). A part of the conundrum may be that we as a species can mentally only process a certain level of detail at any one time and we naturally seek to ‘chunk up’ data sets in order to handle them. In this context I would maintain that a chunk that is a Bombardier, Siemens, Alstom or Rolls Royce is easier to identify with than, say, that amorphous 99% SME in all its diversity.

Drawing on the work and life experience of the French anthropologist Pierre Bourdieu, Tett sets out what she describes as five of his most important concepts (2015, p. 43). Although they were set in the context of human nature within society I believe that they map directly across to business relationships and again frame the challenge posed by the clash of culture between the SME and the corporate. In the boxes below I have summarised Tett’s description of Bourdieu’s points and then provided a ‘translation’ across to the commercial domain.

First, Bourdieu believed that human society creates certain patterns of thought and classification systems, which people use to arrange space, people and ideas. (Tett, 2015, p. 44)

It is obvious to state that businesses reflect the society in which they trade. In doing so they also utilise the same patterns of thought and classifications: ‘the way of doing business’.

Second, Bourdieu also believed that these patterns help to reproduce the status of the elite. Since this elite has an interest in preserving the status quo, it also has every interest to reinforce cultural maps, rules and taxonomies. (Tett, 2015, p. 44)

In commerce this then leads to the situation where an elite forms around wealth: business, unlike society, has an uncluttered ability to form hierarchies; it does not need to take account of heritage, upbringing, education, class and so on, merely the simple scale of the entity. The elite in this context, the corporate, therefore seek to preserve the status quo as that keeps them in a dominant market position. It follows, then, that their aim is to preserve the system not to change it (BEIS, 2017).

Third, Bourdieu did not believe that the elite – or anyone else – created these cultural and mental maps deliberately. Instead, they arose as much from semiconscious instinct as conscious design, operating at the border of conscious and unconscious thought. (Tett, 2015, p. 44)

If it is accepted that these maps form in an unstructured, unconscious fashion it is also true that they are ‘read’ by the elite and non-elite alike. They apply universally and are *ingrained* in a way that makes them *seem natural and inevitable*. They therefore set out how the market segment or sector may be navigated. There will of course in the case of business be a series of interrelated maps, the equivalent in society of trying to layer any number of similar cultures in the same geographical space. The OEM and Tier 1 would have a map that sets out their relationships with each other, and whilst the SME could read or attempt to use such a map it is more likely that it would need to ‘change scale’ and instead refer to another chart of the elites’ making.

Fourth, Bourdieu believed that what really matters in a society’s mental map is not simply what is publicly and overtly stated, but what is not discussed. Social silences matter. The system ends up being propped up because it seems natural to leave certain topics ignored since these topics have been labelled as dull, taboo, obvious, or impolite. (Tett, 2015, p. 45)

There is, I believe, a really important observation to be made here. What Bourdieu calls social silences are what is often called the elephant in the room. For a wide variety of reasons ranging from fear through to reluctant acquiescence, many discussions never take place, voices are not heard, lessons not learned and the boat not rocked. There is no contention that there is some form of conscious plot at work (although in my direct experience this is the case with a number of Tier 1 organisations within the sector). Bourdieu himself noted that “the most powerful forms of ideological effect are those which need no words, but merely a complicitous silence” (Tett, 2015, p. 45). To break this established status quo in society is a

significant task; in business, however, it is actually generally less complex. Within the rail sector there is a deeply entrenched sense of place and hierarchy, further complicated by history and culture. The sector is also highly conservative, resistant to change and has a market driven by tender which in itself is framed and subject to the interpretation of the UK government or EU law. The latter serves to reinforce the dominance of the few and their maps through their control of the tender process.

A fifth key point that is implicit in Bourdieu's work is that people do not always have to be trapped in the mental maps they inherit. We are not robots, blindly programmed to behave in certain ways. We can also have some choice about the patterns we use. (Tett, 2015, p. 45)

Modern high-performing sectors have become adept at creating new maps and not accepting those which they have inherited. It is equally true that high-performing companies are the ones who either navigate better than their peers or have been able to create their own maps. Either way it is self-evident that some succeed whilst others stagnate or fail. In the UK economy at the time of writing there is a dramatic resurgence in the field of advanced manufacturing, and the automotive sector is out performing its European competitors by achieving record growth, is attracting significant levels of inward investment and is a global leader in R&D (Automotive Council, 2017b); similarly the aerospace sector is a “successful, vibrant, high-value, high technology engineering, manufacturing and service industry” (ADS, 2017). I do not believe that the railway as a sector can be judged to be anywhere near as successful as its counterparts in these industries.

As previously discussed this is a fragmented and disjointed sector, and this fragmentation has led to a culture of silo-based exclusion. What follows are, I believe, some important examples of this exclusion, an analysis of why it is so damaging and its consequences. In turn this behaviour will be related back to Bourdieu's thinking and lead to a similar conclusion that in this case the railway sector does not have to be trapped in its current map.

There are, I believe, three key generic areas of exclusion which have all been present since privatisation:

- Corporate – organisations, competition, structures and complexity;
- System – rules, standards, regulation and ‘financial’;
- Individual – attitude, mind-set and culture.

5.1 Corporate

The sector like many is dominated by corporate players; there is nothing intrinsically wrong with that. However, in the case of the rail sector the sheer scale of complexity throughout the domain has led to dominance and to rule by a small elite. This oligopoly in some cases has managed to retain near-monopoly positions held since the original breakup of BR, notably in the fields of component supply and rolling stock ownership. In other cases the erratic, saw-tooth profile of procurement has seen the passing of all of the indigenous OEMs into either oblivion or foreign ownership and of the sector being dominated by foreign (mainly European – Hitachi being the exception to this) train builders.

The infrastructure is predominantly owned by just four players (NR, TfL, HS1 and HS2) and all of the TOCs are also predominantly overseas constructs, themselves often derivatives of European state-owned subsidiaries.

The net effect of foreign ownership is that whilst serious efforts are currently being made by the DfT to ensure UK content into new public sector programmes, i.e., the order of new train fleets and infrastructure builds, it would be naïve to think that this is actually little more than a sticking plaster on a major wound (too little too late). Given the nature of the EU and its fundamental regime of open trade, and of the trade relations with the USA and the Far East, UK companies are inevitably competing with overseas indigenous supply chains, and attempting to supply products, goods and services into manufacturers' generic global platforms; increasingly, very few rail vehicles are designed exclusively for the GB market. Although it is too soon to know what difference the Brexit process will bring about, it can reasonably be assumed that it is unlikely to improve the lot of the UK supplier by any great margin, although there is hope in the work being conducted by the RSG Creating Conditions for Market Growth workstream. In the next section (System) I will provide an overview of the Treasury/departmental methodology that should provide a bias towards UK content but in fact entirely fails to do so.

It has certainly not helped the situation that the government's own departments have not been at all aligned until very recently. That the sector itself has been unable to speak with one voice is not surprising once you get past the false position that assumes there is such a thing as the 'railway industry'; however, this same excuse does not work for government. *Primus inter pares* for the rail sector is clearly the DfT, supported by the likes of BEIS and the Treasury.

It is only in the last 4 years, incrementally from 2013 when the former Minister of State for Business, Innovation and Skills (BIS, now BEIS) Sir Vince Cable conceived and drove

establishment of the RSG as the latest sector council, that there has been a ‘minding of the gap’ between, in particular, the DfT and BEIS. The RSG is co-chaired by the two Secretaries of State and a senior private sector representative. The level of expertise and understanding in the DfT of detailed supply chain issues, beyond the wants and needs of the Tier 1/OEMs, is limited. It seems to have a complete blind spot regarding its own role leading not following a distorted market of its own making.

Conversely, this understanding and empathy is highly advanced within BEIS as it is a core capability for them, and yet their detailed and comprehensive knowledge of the sector is limited.

Fundamentally the two departments are in many ways oil and water. In the DfT corporate *Single Departmental Plan 2015 to 2020*, which was last updated in October 2016, its first objective is listed as “boosting economic growth and opportunity” (Section 1) and yet nowhere in this document does it actually reference the supply chain as relevant to the economy. This rather disappointingly leads towards a possible interpretation that the economic growth and opportunity in question has a more nebulous political meaning away from any recognition of the wider benefits accruing from or to the UK supply chain. In its conclusion where it highlights the other government departments with which it is collaborating it fails to mention BEIS at all, although it does at least in the penultimate bullet-pointed paragraph of the entire document mention that it is “working with Crown Commercial Services to deliver the government’s 33% commitment of our spend with small and medium enterprises by 2020”.

Initiatives such as the formation of the RSG have the potential to engage with these departments and to at least give visibility and scrutiny to some of these issues although this may be quite limited. On a positive note, the very existence of the RSG serves to force these two departments to work together much more proactively. The DfT has radically improved its overall business support performance since the formation of the Rail Executive which is (at the time of writing) called the Rail Group. Initiatives such as the Innovation in Franchising (IiF) Scheme, developed in conjunction with the Transport System Catapult and delivered through RSSB, have the potential to make a real impact as it provides a mechanism for realising the value of long-term investments whose payback period is beyond the length of the franchise, although the execution of the scheme has been disappointing to date. This scheme would I feel have been much stronger if the DfT had given it much more positive and competent leadership thereby negating the tendency for it to drift and not maintain the level of priority and attention it deserved. Instead TOC teams focussed quite rightly on the delivery of their contractual service obligations have in the main achieved little of any real substance in IiF.

Similarly the BEIS has made a significant change in recent years to its approach in that it has recruited more staff to work in the sector, has actively sought to develop its knowledge base and has enhanced its relationships with key sector organisations and businesses. It must also be given credit for the initiative and persistence it showed in creating the RSG in the first place.

Later in this chapter, when I consider Bourdieu's comments about not being trapped by the mental maps of others, I will examine the role of the RSG further and make some recommendations about how it could act to improve the lot of the indigenous UK supply chain through a closer relationship and greater alignment with the RDG, an issue that the McNulty study failed to deliver on. Whether this process survives in the current political and economic environment remains to be seen. It currently enjoys a high level of sector support and the challenge will be for the RSG Council to demonstrate its worth.

The apparent willingness of the UK to routinely accept overseas ownership of major companies has led to a 'careless indifference' with regard to supply chain issues. There is an attitude that routinely merely looks to the best (lowest) price winning, with an almost total disregard to whole-life cost and to system value to the UK economy (this is by no means a particular characteristic of the railway sector and is a trend that stems in particular from the period of the Conservative government of the 1980s). Recent rolling stock procurements have started to buck this trend and there are now numerous initiatives, such as the TfL New Tube for London project which ensure that lowest whole life costs are considered. Overall though this is in marked contrast to countries like Germany, France (and the USA) who all have sophisticated ways of ensuring that the national value in terms of local input to major contracts is fully taken into account when awarding them; their perfectly legitimate use of EU instruments to this effect is in stark contrast to the UK approach (covered later in this chapter).

All of this has served to reduce any real competition to a very small number of players. The dominance of a small number of very powerful companies has created an arrogant, adversarial culture and one that remains obfuscated by confusion and conflicting information. It is very difficult for a new supplier to enter this market place as the most basic of detail is not at all obvious and data is hard to derive. Even for major entities like NR there is no 'road map' which will guide and inform the route to market. Indeed, there is evidence to suggest that in the move towards a more regional approach there are likely to be different requirements around the country for essentially the vendor of the same product with the same end use to navigate.

5.1.1 So What?

The supply chain that supports the sector is wide and varied. As demonstrated earlier it is estimated that over 95% of the railway supply chain is company participants which are not 'railway' businesses, that is to say that rail business comprises less than 10% of their overall turnover. The conclusion that I draw from this is that for companies with little or no direct knowledge or expertise in the sector to have to navigate such a difficult and demanding landscape, for an unknown level of reward, will inevitably mean that the system, if it can be called such, protects and sustains the traditional or pre-existing supply base. This serves to reduce competition and to maintain barriers to entry.

The privatisation process was rooted in an assumption that competition would drive costs down and value up; the McNulty review recognised the need for greater contestability (as have studies since) and the Rail Group in the DfT has as its first objective "the government's response to the recommendations proposed by Sir Roy McNulty and subsequent proposals for the reform of the rail industry" (Gov.UK, 2017), yet there is no evidence that would support a corresponding surge in the state of health of the UK supply chain. Bourdieu's observations prove accurate. The corporate narrative, whether in the private sector or government, has served to create a system that naturally inclines towards the elite of the multinational and maintains their standing unquestioned. Organisations such as trade associations that are reliant on this elite are inevitably compromised in their ability to represent the enormity of the supply chain and in fact reinforce the status quo.

5.1.2 Case Study

Good evidence of this is to be found in the following case study into the hypothesis that 'new trains are the only way to win a franchise'. Typical of the complexity of the British railway system there is no easy way in which to ascertain whether this is a good or bad situation overall. The passenger gets new stock on which to travel, train-builders supply chains flourish whilst legacy rolling stock owners have a challenge with the value of their residual assets and the overhaul/refurbishment market suffers. I am grateful to Kevin Lane, the Managing Director of Onyxrail for his insight.

It is the case that all new rail franchises are looking at the precedent set by (at the time of writing) the last two rail franchises (Northern Rail and TransPennine Express in late 2015), which has led to a view that the only way to win a new rail franchise is to completely replace the fleet with new trains. However, this has a silent but very dangerous effect on UK businesses.

The ‘new trains wins franchises’ issue causes profound problems not just for the ROSCOs (train leasing companies) but also for the whole UK supply chain. It is an increasingly pervasive destructive force.

According to Kevin “it flies in the face of what the Department for International Trade is supposed to do and also is against policy on Northern Powerhouse, Midlands Engine and of course Brexit”.

Engineering is a key government area for growth and protection during Brexit. The Chancellor Philip Hammond announced, as part of his 2017 Budget, new funding for policies aimed at bridging the skills gap, whilst this issue in the rail sector is a serious problem and has the ability to actually reduce available skills in rail by displacing them into larger international companies away from the indigenous SME base.

Engineering is seen as the economic saviour and something that needs to rise in terms of contribution to GDP and employment; however, here is the impact of this situation:

- Maintenance becomes tied into new train provision as long contracts, which will potentially mirror the length of the franchise. This affects the UK train maintainers and the UK maintenance supply chain which will no longer have this workstream available to them;
- The new trains problem makes relatively new vehicles and very good existing vehicles virtually unleaseable, as many were built for specific routes and purposes and they simply do not fit business models or routes elsewhere;
- It creates an interesting conundrum for the leasing fraternity which is faced with the situation where financing a new train can be self-defeating as the new trains could displace their own assets on lease. It also changes the finance model as the new assets (trains) may have a very short life if the original hypothesis is true the next time a franchise is let. It would seem unlikely that this model can perpetuate and will rectify itself with the current rounds of tendering;
- SMEs rely on the availability of a market that is approachable and available to those with the ability to continuously improve, seek technology to transfer from other sectors and to innovate. They provide UK employment, but they seldom have the financial size to meet the supplier profile required by new builders, whilst at a lower level they provide a valuable service to the industry and UK employment;
- Companies like Onyxrail in the supply chain rely on there being older stock that has a perfectly suitable residual life to work on. This same stock also provides a platform for companies to demonstrate both their technical competence and their capability to

bring forward products and innovations that could be integrated into new bids, future-proofing them;

- The supply chain in the UK, based on experience, is very likely to be displaced in favour of the local and established suppliers to train builders which, although established in some cases in the UK, in reality answer to the demands of their parent boardrooms overseas. This inevitably results in UK taxpayer money supporting foreign companies and European employment and not UK companies and UK employment. This situation is of course not unique to the rail sector, however it is mitigated in the likes of the automotive sector by the high volumes of production and rapid turnover of models; creating more sustained and higher levels of demand. In rail there are a small number of high value longer term contracts placed making the impact of “off-shoring” much more pronounced;
- Finally to quote Kevin verbatim “UK companies like ours now have to go cap in hand to international new builders to place product against an established supply chain that is already predominantly outside of the UK. It is a very hard sell”.

None of this is good news for the UK economy unless one takes only a very narrow view of cost and value, one that does not take into account residual value, whole-life cost and the wider social/economic value to the broader reaches of the supply chain. The winners in this game are the international companies, many of which are, perversely, owned by the governments of European countries that increasingly run British railways. It is unclear whether the DfT has the capability to wrestle with the conflicting priority of providing a step change to the passenger experience which it seems to assume new trains will do and at the same time meet its key priority of “boosting economic growth and opportunity” (DfT, no date). At the present stage of the cycle with Brexit and the general growth in the UK economy I would maintain that we should be trying to break away from such behaviours not encourage them. Instead, as described at the start of this chapter, we are left to the elite ‘gaming’ the system and the government’s ‘careless indifference’.

The upshot is that this could destroy what is left of the GB rail supply chain and damage the mechanism for vehicle financing by UK leasing companies. It is not a sustainable model for rail franchising and is deeply harmful to our indigenous rail sector and all who work within it.

The final exclusion that I would like to highlight under this corporate section is that of government procurement. I am grateful to Anna Ince, the CEO of Resonate and leader of the Creating Conditions for Market Growth (CCMG) workstream of the RSG, for her extensive input, guidance and advice for what follows in this section. It is well understood that

procurement policies impact market conditions and therefore can be either an enabler or a barrier to growth. Indeed, the government's Modern Industrial Strategy Pillar 5 'Improving Procurement' states that "we must use strategic government procurement to drive innovation and enable the development of UK supply chains". There has been a body of research in recent years into attempts at defining for the rail sector what Automotive calls its sticky technologies, or the equivalent of the attention that Aerospace puts into wings engines and seats. The underpinning work (RSSB, 2013) was conducted by AD Little for the Enabling Innovation Team (EIT – which became Future Railway and has subsequently been subsumed into RSSB). In the 4 years that have elapsed since this report there has been very little if any credible progress other than recent work emerging from the Modern Industrial Strategy in the form of the latest Government initiative around Sector Deals. For the rail sector this has taken the form of a proposal called One Railway: Digitally Connecting the Nation (RSG, 2018). Through the necessity to get universal cross sector support this proposal has a very tight focus and its original 3 pillars (Accelerating the delivery of the digital railway/Significantly enhancing the customer experience/Delivering a sustainable GB rail sector) have now been focussed onto a single vision and the pillars modified to be Transformation Through Digitisation, Pioneering Intelligent Mobility and Sustainable GB Rail Sector. This work is at a formative stage and it is difficult to predict what effect this will have on the sector as a whole, especially given the high level of DfT involvement, which experience says will restrain/inhibit innovation in the same way it did with the final results of the Rail Value for Money study.

This section considers departmental level procurement practices in the rail sector. It does not attempt to cover the wider activities of the major buyer community. The detail of this paper was produced following meetings and desktop analysis by the RSG workstream. At the departmental level the process is driven by a combination of the HM Treasury *Green Book* (2013), the *Public Sector Business Cases using the Five Case Model* (HM Treasury, 2015b) and the DfT's *Transport Analysis Guidance (TAG) data book* (DfT, 2017), commonly referred to as WebTAG. These in turn are heavily dependent on current EU legislation and even with Brexit in the future it is reasonable to assume that similar directives will take their place. Before drawing some conclusions on these directives I will outline what they are and where they fit.

The current utilities sector European Parliament Directive (2014/25/EU) is implemented in England, Wales and Northern Ireland through a statutory instrument (The Utilities Contracts Regulations 2016, SI 2016/274). There is a parallel statutory instrument for Scotland (The Utilities Contracts (Scotland) Regulations 2016, SSI 2016/49). The rules and principles laid down in the directive apply to the water, energy, transport and postal sectors. Directive

2014/25/EU takes into account the specific features of these sectors which play key roles in meeting society's needs.

The purpose of the new Directive 2014/25/EU is made very clear in the Recitals (4).

Public procurement plays a key role in the Europe 2020 strategy, set out in the Commission Communication of 3 March 2010 entitled 'Europe 2020, a strategy for smart, sustainable and inclusive growth' ('Europe 2020 strategy for smart, sustainable and inclusive growth'), as one of the market-based instruments to be used to achieve smart, sustainable and inclusive growth while ensuring the most efficient use of public funds. For that purpose, the public procurement rules adopted pursuant to Directive 2004/17/EC of the European Parliament and of the Council (4) and Directive 2004/18/EC of the European Parliament and of the Council (5) should be revised and modernised in order to **increase the efficiency of public spending, facilitating in particular the participation of small and medium-sized enterprises (SMEs) in public procurement and to enable procurers to make better use of public procurement in support of common societal goals** [emphasis added]. There is also a need to clarify basic notions and concepts to ensure better legal certainty and to incorporate certain aspects of related well-established case-law of the Court of Justice of the European Union.

There are a number of clauses specifically directing procurement in relation to SMEs:

'Market access opportunities' (70), participation through appropriate categories (75), 'adaption to the needs of SMEs' by explicit use of lots and obligations therein as well as making 'direct payments' where appropriate (87), appropriate tendering timeframes (89), 'Given the potential of SMEs for job creation, growth and innovation....encourage their participation.....this Directive as well as through initiatives at the national level' (130).

There are also a number of clauses specifically directing procurement in relation to innovation:

Spur innovation ... Buying innovative products, works and services plays a key role in improving the efficiency and quality of public services while addressing major societal challenges'(57); 'Because of the importance of innovation...allow variants as often as possible'(58); 'crucial to driving innovation, which is of great importance for future growth in Europe'(100); 'Given the potential of SMEs for job creation, growth and innovation ...

encourage their participation ... this Directive as well as through initiatives at the national level (130). Use of Innovation Partnerships (Article 49).

Contract performance is key to enabling procurements to deliver wider economic benefits and Directive 2014/25/EU Chapter IV Contract performance states:

Contracting entities may lay down special conditions relating to the performance of a contract, provided that they are linked to the subject-matter of the contract within the meaning of Article 82(3) and indicated in the call for competition or in the procurement documents. Those conditions may include economic, innovation-related, environmental, social or employment-related considerations.

The UK enacted the new Directive through two statutory instruments: The Utilities Contracts Regulations 2016, SI 2016/274 and The Utilities Contracts (Scotland) Regulations 2016, SSI 2016/49. The UK statutory instruments do not have any recitals stating the purpose of the change. The phrase SME does not appear in the statutory instruments. There is no inclusion of more specific clauses to direct procurement in relation to SMEs, which is a very specific aim of the Directive. The word innovation mainly appears in relation to the use of Innovation Partnerships. The instrument's contract performance clause in entirety replicates the EU Directive (Chapter 4, Clause 86).

The net result is nicely summarised by Anna Ince in her Creating Market Conditions for Growth (CMCG) report to the RSG on the subject (RSG, 2017):

The outcome for UK PLC is that the UK's statutory instrument does not require the contracting parties to create procurement models for 'adaption to the needs of SMEs' or to 'encourage their participation'. Nor are there specific requirements (outside Innovation Partnerships) related to innovation. This is a missed opportunity to drive innovation and strengthen the UK supply chain, which in turn drives export. Export is impossible without a strong home market and home reference sites.

Both the anecdotal evidence and the evidence of the percentage of local content delivered through rail procurements in Western Europe suggest that the contract performance (Chapter IV) element of the Directive is used to its fullest extent by other European countries. The result is that these countries have a very large domestic rail industry, with embedded supply chains and high export volumes. In the UK, only 10% of railway equipment and

manufacturing revenue comes from exports, compared to 20% for France and 50% for Germany.

To return to the UK-specific detail, both the Green Book (inclusive of the five-case model) and WebTAG are appraisal and evaluation tools designed to prioritise one project or spend over another, rather than procurement tools. That is to say they are the essential tools that the department uses to establish its business case ultimately to Treasury to pursue a scheme or to sort one scheme from another. It should be noted that:

- The aim of WebTAG is to provide specific transport guidance and its principles remain fully aligned with and tempered by the Green Book;
- Socio-economic measures related to procurement are absent from the Green Book. Such measures are restricted to the proposed project. Therefore, a project's evaluation score would be unaffected by whether or not there was UK content or consequent creation of UK intellectual property or skills. However, this issue is more complex than this as the five business-case model makes specific provision within its Strategic Case to ensure that it demonstrates "how the spending proposal fits in relation to national, regional and local policies, strategies and plans and furthers the required outcomes" (HM Treasury, 2015b, p. 11). It also goes on within the Economic Case to be clear that the "purpose of the Economic Case is to demonstrate that the spending proposal optimises public value (to the UK as a whole)". As noted below, there would appear to be little or no traceability of these factors once subsumed into the overall business case;
- There is also poor traceability from the WebTAG output, through the project authorisation process to contracting bodies (e.g., NR, TfL, HS2), to the final deliverable. This may well be because the aim of the business cases is to establish the case from within the department (DfT) to Treasury as its 'customer'. This business case makes key assumptions about the procurement but it does so in the full knowledge that any such assumptions are *not then carried forward into the tender process. This would be especially the case when the expenditure would actually be made by a third party* such as NR or TfL (Transport for London). It is therefore entirely probable that *although the business case may have assumed, based on good evidence, that there would a particular level of benefit to the UK indigenous supply chain in the widest sense, there would not be any real compulsion driving this forward.*

The work conducted so far by Anna Ince and her CMCG workstream, and drawn on heavily here, suggests that there is an issue to be addressed regarding the UK's statutory instruments, which for some reason failed to mirror the 2014 Directive's intent in relation to SMEs and

research and innovation. Notwithstanding the historical context for this, the government has made “improving procurement” one of the 10 pillars in its Modern Industrial Strategy Green Paper, along with “supporting businesses to start and grow” (BEIS, 2017, p. 11). The interpretation therefore of the EU Directive into UK legislation and the subsequent clear and unambiguous interpretation of that legislation by Government departments and contracting parties must be at the heart of “improving procurement” and, as the government notes, “these pillars all reinforce one another” (BEIS, 2017, p. 12); therefore, this is a call for systemic action to remove yet another force for exclusion.

The interpretation of those statutory instruments by contracting parties and/or government departments needs to be better understood and more comprehensively addressed. The underlying reasons why UK contracting parties rarely (if at all) take account of “economic, innovation-related, environmental, social or employment-related considerations” are currently opaque (Public Contracts Regulations Commentary, 2015). It may be fair to assume that this is as result of ignorance rather than a wilful intention to omit. Equally the use of the word ‘may’ in the contract performance conditions (Chapter 4, Clause 86) would appear to allow an excuse for no direct action being taken in this regard by contracting parties. Specific actions in the form of clear leadership by government may be necessary to drive a change in contracting parties’ behaviour.

The proposed Balanced Scorecard within the Industrial Strategy will need to be clearly and easily deliverable within the legal framework as it is and as it emerges. Ironically, the existing UK procurement statutory instruments would appear to be barriers in this respect where the EU Directive is not. The balanced scorecard principles will need to apply for procurements below £10m to drive sufficient change in SME participation and innovation through the supply chain. The RSG CCMG Working Group would like to see a level playing field with other EU countries suggesting, as a minimum, that the EU Procurement Directive thresholds should be applied, i.e., €414k for supply and service contracts/design contests, €5.1m for works contracts. Further, the Government’s target “to ensure a third of its total procurement spend is with small business by 2020” (RSG, 2016) will require specific measures for SMEs (along the lines of the Directive).

The EU Directive (Recitals (1)) applies to “entities operating in the water, energy, transport and postal services sectors”. It is a working assumption, in relation to SMEs and research and innovation, that other utility sectors will mirror the rail experience, to a greater or lesser extent, since the key issue relates to the lack of specific clauses to direct procurement in the UK statutory instruments. The application of the “economic, innovation-related, environmental, social or employment-related considerations” may be more industry-specific

given that the UK statutory instruments replicate the EU Directive in relation to contract performance in its entirety.

The Industrial Strategy Green Paper also cites the need for procurement improvement “in key industries like health and defence where Government’s role as customer provides unique opportunities to achieve wider benefits through procurement”. The key utilities procurement issues appear to be with the UK statutory instruments and therefore it may be supposed that the same underlying statutory or regulatory issues are replicated outside the utilities industries. The same issues may feature in the solutions to the procurement improvements required by Government in these sectors.

The work by Anna Ince (RSG, 2017) and her team leads to a conclusion that it is not EU law and the Official Journal of the European Union (OJEU) process that is the barrier to UK indigenous growth, but rather it is UK legislation and/or erroneous interpretation by officials of the EU Directives. The simple act of amending the UK’s approach, initially in line with the EU Directive, would appear to be eminently achievable and of significant importance to the future success of UK PLC.

The inescapable conclusion that I draw from this particular snapshot of the body corporate, whether governmental, institutional or private sector, is that there is clear evidence to suggest that they are acting to exclude through a mutual sense of indifference to the consequences of their actions. In the case of government it is guided by corporate individuals and consultants according to a map that does not have the granularity to understand the detail of the terrain. In the absence of clear leadership and political will there will be no change to this behaviour. From the perspective of the private sector or institutional body its ability to act relatively unencumbered by a wider responsibility for the supply chain and, through that, wider indigenous economic and social benefits is attractive. Again in the absence of clear legislation or official expectation to the contrary this demonstrates a poor grasp of corporate social responsibility but is not unlawful.

5.2 System

I have already established that railways are complex systems. I have also established that GB, due to the act of privatisation, has a unique level of fragmentation and, through that, wide dispersal of information and knowledge sources. It also has a relatively small number of major (predominantly international) players on the supply side effectively forming an oligopoly, and the demand side is equally constrained to just a handful of customers, notably NR, TfL and the DfT.

The primary ‘guardians’ of the system are the same government department that commissions output (DfT), the Office of Rail and Road (ORR), the sector regulator which describes itself as the “economic regulator for railway infrastructure ... the health and safety regulator for the rail industry as a whole... and the industry’s consumer and competition authority” (ORR, 2017) and the RSSB whose mission is, according to its website “through research, standards, analysis and insight, RSSB supports our members and stakeholders in driving improvements in health and wellbeing and delivering a safer, more efficient and sustainable rail system” (RSSB, 2017c). RSSB was set up in 2003 as a direct result of the recommendations that came out of Lord Cullen’s report into the Ladbroke Grove rail accident.

It is the last of these three, the RSSB, which is the most likely touch-point for the supply chain as the DfT and ORR are geared more towards policy than commerce. The RSSB, however, provides, under its current constitution, an entry point to the world of rules, standards and compliance as well as a diminishing responsibility for the delivery of funding for innovation. The innovation mantle is passing to InnovateUK via RSSB at the moment as part of transitional arrangements. It is unclear at the time of writing as to how current schemes such as IiF (RSSB, 2017a) will be taken forward, although this is likely to be heavily influenced by the newly formed Innovation Leadership Group (ILG) which has, as the name suggests, the role of providing leadership and governance to the coordination of innovation on behalf of the sector. The ILG answers via the Technology Leadership Group (TLG) to both the RDG and RSG. This plethora of bodies is in part what George Muir was reflecting on in the context of the McNulty study. In the context of providing shape and form to the newly published CDP and to the provision of much-needed transparency and a level of governance to the activities of the likes of RSSB these groups should be both effective and useful. However, to the further reaches of the supply chain looking to work in the sector they look confusing. This obfuscation is a recurring theme and one that will now be developed in the context of what the supply chain sees when trying to navigate the sector.

Returning to the role of RSSB for standards, for many companies the starting point for their entry into the sector is to gain an understanding of what might be termed the ‘official standards’ they and their products, goods or services need to meet. The RSSB strategy for standards and their application has been designed to set out the key challenges and the industry-agreed actions related to them. Essentially this bridges the gap between the existing Railway Group Standards and wider global standards. RSSB describes this as follows:

Railway Group Standards due to their narrow scope cannot be the only ‘go-to’ suite of standards for organisations to meet their legislative and commercial obligations. Users must take into account and rely on the wider suite of

standards including European/International standards (such as Technical Specifications for Interoperability), domestic standards (such as Rail Industry Standards), company standards and suitable and sufficient risk management processes to fully address their obligations. (RSSB, 2016)

To put this into plain English, as a potential supplier to the sector, you need to work out what the implications of the pan-European Technical Specifications for Interoperability mean to you and the level of compliance required that is not covered by Railway Group Standards domestic standards. You may well find that this is not clear and indeed that if you have a new (to the railway) or innovative product that falls between the two the risk aversion of the sector is likely to mean you will spend a great deal of time and energy establishing a position.

The next stage, although this may not follow any set sequence as it is entirely possible that a company does not learn of the challenges ‘in sequence’, is then to seek some form of product approval, which is the company standard. In the case of NR and many others in the buying community this is also the point at which the company discovers the requirement to become accredited to RISQS, the supplier pre-qualification service used by buyers of all products and services throughout the GB rail sector.

To return to the point I made earlier about the fact that a very high percentage of companies in the railway supply chain are not railway companies (or would not describe themselves as such), and that at most they are marketing subcomponents or subsystems, this is a daunting place to navigate. To further challenge suppliers, their primary customer appears to be one of the corporate elite that I described in the previous section who of course know this system well and assume the ability and willingness of others to tackle it. Existing key suppliers at Tier 1 and 2 are able to benefit from such a confusing and inconsistent landscape to the point that they are able to exploit their position to disadvantage potential new suppliers. Just to add another layer of challenge into this particular equation it is very difficult to establish basic business facts. The volume of sales that could be expected, some indication of purchase timeframes, and the potential value of sales are all numbers that are all but impossible to establish, as is who your actual customer is likely to be: an infrastructure owner, OEM, Tier 1 integrator, TOC or ROSCO. It could be any of them; within NR this could vary according to region and within TOCs it could vary according to the nature of the lease.

What we have, therefore, as previously described in Chapter 4, is a fragmented and complex system that has a distinct and natural or intuitive bias towards existing players, who in themselves may well be predominantly part of a foreign indigenous supply chain. There is little that is deliberate or contrived about this difficult system. It is both a classic example of

the law of unintended consequence, in this case starting with the untested assumption at privatisation that the simple act of introducing competition would solve the challenges presented to the government by British Rail and of the circumstances that Bourdieu described in stages 1 to 3 at the start of this chapter, namely a taxonomy that develops of its own accord creating patterns that help reproduce and sustain the status of the elite and reinforce the version of the map that is theirs; albeit in an assumed, semi-conscious manner. As he stated “the most powerful forms of ideological effect are those which need no words, but merely a complicitous silence” (in Tett, 2015 p. 45); the supply chain has grown to know its place and quickly recognises that in a relatively small marketplace that has had a tendency towards ‘Buggins’ turn’ (The Phrase Finder, 2017) staying quiet is often the only way to stay in the game.

5.3 Individual

The final area of exclusion relates in the main to the mind-set, attitude and culture of the railway sector, in particular the character that tends to pervade and prevail. That the sector in this country has a glorious and distinguished past is not in question. It once was able to call itself an industry with the likes of Derby Works producing 200 wagons and 20 carriages a week in 1920 (it is an interesting irony that this same works started production in 1873 by assembling kits provided by the Pullman Company of Detroit – not dissimilar to much of the activity by Bombardier Transportation (BT) Derby today). However, in the 21st century it is most certainly not an industry and as I noted at the very start of this paper the specifically railway supply chain is a very small part indeed of the UK economy whereas the railway system’s output *is* a crucial economic enabler conveying as it does 1.65bn passengers and 503.2m tonnes of freight per annum (RSSB, 2017b).

This is in a way a continuation of the same pattern that has created the system and corporate maps I have mentioned previously in this chapter. Whilst many sectors (and industries) adopt behaviours that mark out the individual as from that ‘club’, in my experience the railway sector has a particular ability to return to a default setting that seeks to exclude ideas, goods, products and even people who are not from within. Because the vast bulk of the railway supply chain does not consist of railway companies an obvious conclusion can be drawn from such behaviour that the motivation, whether conscious or not, is to exclude in order to reduce competition or reinforce status. The desire of primary organisations like NR and HS2 to reduce the number of companies in their direct supply chain allows the systems/component supply chain integrators to maintain a role acting as a ‘gatekeeper’. These integrators are unconstrained by viable competition and thus they are able to lever their near monopoly

position to the potential disadvantage of the supply base. Without doubt the Unlocking Innovation Scheme run by RIA on behalf of RSSB has had a positive impact in the sector, allowing a wider range of companies to network, collaborate and innovate in the company of interested Tier 1s and OEMs. However this program has run its course in terms of both funding and energy and would seem to not be a commercially sustainable model.

Ultimately, corporates and systems are led and run, supported and sustained by people, individuals. It is they who create and reinforce the maps that sustain the exclusion. People like organisations to not have to remain prisoners of a particular mind-set or culture. The railway in recent years has made much of bringing in high-level leaders from outside of the sector, and indeed through bodies like the RSG it looks publically at least to seek learning from elsewhere. What it has not been at all successful at is to bring its staff with it on this journey. Until individual horizons are broadened the process of excluding rather than including will continue to handicap performance, reduce competitiveness and efficiency and reinforce barriers to entry.

6 Where do we go from here? The Missing Link...

Whilst we have already seen that the McNulty review has been substantially ignored and many of its key recommendations diluted, there is merit in looking at some of what was developed and taken forward, most notably the formation of the RDG, which over time has managed to bring forward many of the recommendations or at least to fulfil the strategic intent in partnership with the DfT and ORR. This is important as it gives a glimpse of what might have been and of what could be. Although there were a number of reasons for the formation of the RDG, the key elements from the perspective of my work are those with a direct impact on the supply chain. The RDG's roles and responsibilities were anticipated by the McNulty team in outline as:

- A focus on “making happen what might not happen otherwise” with a principal regard to “developing, validating and monitoring the implementation of plans for the delivery of the cost savings identified by the Study” (DfT/ORR, 2011a, p. 46);
- A sustainable commitment from senior C level executives from across the full breadth of the sector;
- An encouragement of a whole-system approach, where appropriate, to improve efficiency;
- To work with pre-existing pan-industry bodies, leveraging capabilities to encourage effective change. Importantly it was charged with reviewing the effectiveness going forward of such cross-industry groups and for the RDG to be pivotal in the establishment of the RSA, examined further below;
- To encourage a change of culture within GB Rail (note a pan-sector role not just confined to their membership). The direction of movement towards “partnership, openness, and continuous improvement”;
- The creation of effective interfaces with DfT and ORR whilst at the same time insuring that it acts without discrimination and independent of individual members' interests.

It is easy to see how, in the internecine way in which the sector tends to operate, that elements of these roles and responsibilities could be further cherry-picked or interpreted to suit. As the RDG was based on the ATOC structure (indeed the two merged completely in October 2016; RDG, 2017) then the intuitive avoidance of any competition between for example the Railway Industry Association, a trade association representing the interests of a narrow but influential part of the railway supply chain, inevitably led to a dilution of roles which was pan-industry. Thus it suited the parties involved to maintain what could be

described by them as a healthy gap but in reality was a sub-optimal protection of vested interests.

Following on from the fourth bullet point above, it is worth noting, in the broader context, that McNulty was making the assumption that in parallel or concurrent with the formation of the RDG there would also be the creation of what it termed the RSA “to lead the industry in achieving technical excellence in standards management, technical integration, and driving innovation” (DfT/ORR, 2011a, p. 13).

Prior to the final report’s publication the supporting work conducted by Arthur D. Little on the enhancement of innovation delivery into the sector had sought to establish that such an independent system authority would be different from the “former unsuccessful Strategic Rail Authority” (SRA) in the sense that its role would not be commercial or regulatory and instead primarily technical (Little, 2011, p. 13). Having said this the roles and responsibilities it outlines, when combined with the commentary provided, lead me to conclude that whilst the SRA may have been deemed a failure much of what the McNulty review implies is how to recreate it in a different guise or guises without actually saying so.

Atkins, in its contribution to the McNulty process, concluded (and therefore recommended) that there was the need for an RIGT to be at the heart of taking forward innovation and the development of a technical strategy for the next 30 years, linking to other remarks about the need to create some order amongst such fragmentation (Atkins, 2011). Figure 6 shows its remit and position clearly:

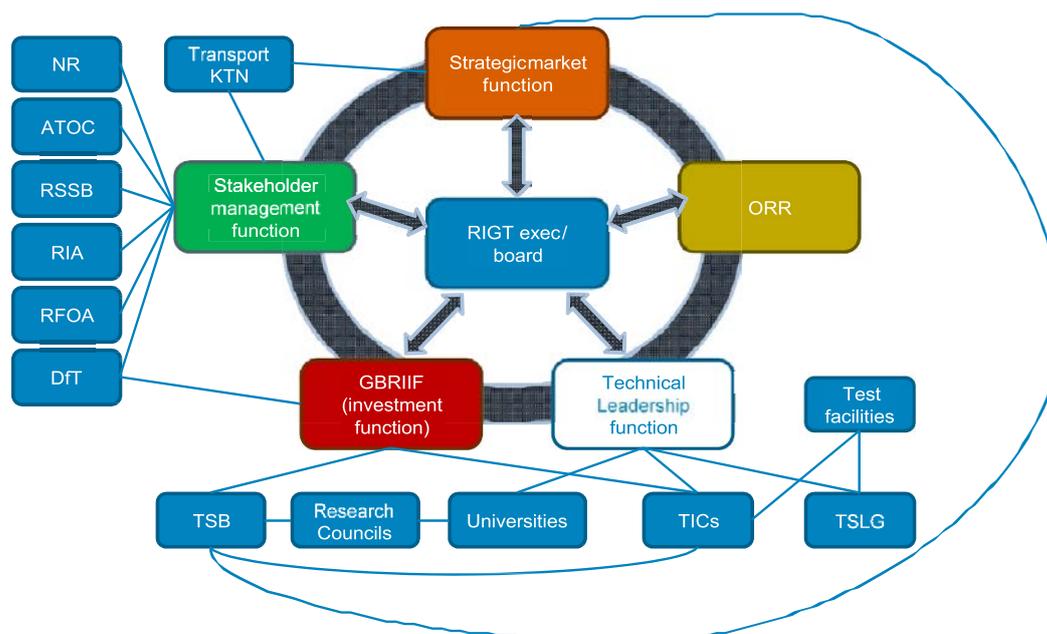


Figure 6 – Rail Innovation and Growth Team (Atkins, 2011)

Concomitant with the RSA and RIGT were a whole range of comments in the main report and both of the supporting works by Little and Atkins recognising the fact that there were serious weaknesses in the supply chain in terms of leadership. The extract below from the Executive Summary of Part One of the Atkins review is unequivocal:

Our analysis revealed that the industry is underperforming at innovation and the most significant difficulties arise from poor behaviours, lack of a systemic perspective and difficulty in working across organisational boundaries, whether commercial, technical or managerial. As a result, business drivers are misaligned, conflicting and parochial and objectives are not aligned to deliver overall rail system benefit for the taxpayer. Whilst individual organisations within the industry have made, in some cases, significant investments in innovation capability, at best, they are able to succeed only within their own span of control and can only go beyond when the right systems leadership behaviours are present. (Atkins, 2011, p. 4)

In the main report at Chapter 6.7 it further adds:

There is poor application of supply chain management, including poor take-up of collaborative approaches ... This has in part, been due to a failure to develop the right culture and behaviours, especially at senior management level. There is a lack of supply chain management skills and experience in the rail sector, with an emphasis on behaviours that are geared to traditional competitive procurement alone. Procurement practice is variable, with the buyer often far removed from the end user, protracted and inefficient tendering processes, and barriers preventing new suppliers from entering the market. (DfT/ORR, 2011a, p. 56)

In the same chapter the point is made that “effective supply chain management requires leadership from senior management delivered by appropriately-empowered, competent and engaged staff” (DfT/ORR, 2011a, p. 55).

The reality has been that a perfect storm formed. There was clearly a high degree of ‘cherry-picking’ of the report’s conclusions and even though major shortcomings were recognised in the leadership of the supply chain and the propensity of the system to resist/frustrate the uptake/encouragement of innovation were obvious, no clear route map emerged and became reality. Evidence for this can be found in the final publication where it was stated:

The Study’s recommendations envisage major change, but change that is designed, as far as possible, to adapt existing structures rather than to sweep

them away, and to focus the efforts of all concerned primarily on the areas where efficiency can be improved rather than on total reorganisation. (DfT/ORR, 2011a, p. 43)

This single sentence I believe proved to be the Achilles' heel of the study. In a sector as conservative and inward-looking as rail had become the notion that major change could be delivered by existing structures is to give life to the definition of insanity that comes from the expectation that you can expect different results by doing the same thing over and over again. The exclusive behaviours I described in Chapter 5 came into play and what has followed is witness to this.

From the evidence I have reviewed in terms of both the full extent of the McNulty final report(s) and contemporaneous commentary in the railway press and work since, in much the same way that the Tory administration built privatisation on the sand of hope that was the ability of competition to act as bedrock, so too the McNulty Value for Money study set out a case that was built on the inter-relationships between its recommendations and the ability of the RDG to act in a way that would "promote best practice and identify what is required from the supply chain" (DfT/ORR, 2011a, p. 56). Whilst I believe that it is fair to say that the RDG is now indeed a cohesive and coherent force for good that is able to embrace much of what McNulty set out as vital, this has been achieved in no small part in spite of rather than because of government.

The formation of the RSG in 2015 and the subsequent launch of its strategy in 2016 is a belated, but nonetheless welcome, attempt by government to address the many issues raised by McNulty but subsequently ignored. It is worthy of note that the pressure to form the RSG came from BIS in the first instance, with support from the DfT initially tardy. Unlike the RDG which from the outset benefited from "staff support provided by member companies and the Association of Train Operating Companies (ATOC) as necessary" (DfT/ORR, 2011a, p. 46) the RSG is effectively a self-starting entity, reliant on the benign support of its Council members and the beneficiary of a one-off and relatively small amount of government funding made possible only through an underspend.

Aside from the fault lines that run through from privatisation to McNulty and the present day, most notably the issues surrounding fragmentation, another thread has been a preoccupation with the need for innovation as prerequisite to growth and efficiency in the sector. In the next chapter I will focus on what I believe this really means in the context of the railway of today, notably issues surrounding the absence of focus on continuous improvement linked to business as usual and the relationship with the uptake of innovation. This analysis will of

course remain focused on the issues surrounding the performance of the supply chain in the pursuit of a sector fit for the 21st century.

7 Innovation – the Lazy Man’s Consolation

The word innovation and its various derivative forms has become one of the most ubiquitous words in the business lexicon, loved by politicians, academics and the common mortal. It is held by many to represent the holy grail of economy, the change agent of those seeking ever-greater productivity and business success and yet, to misquote *Monty Python*, what has it ever done for us?

This section takes a serious look at what we mean by innovation. The flaws in the word start to reveal themselves the moment you actually look at the definition of the verb innovate, which is much more modest than the attribution it commonly gets. Although definitions of this word are many, for the most part they centre on the notion of “making changes in something established, especially by introducing new methods, ideas, or products” (OED, 2017). At the outset of the industrial revolution this word had a level of use it has never since achieved again in terms of common usage; however, it is interesting to note that at the time of the great feats of engineering and commerce that saw the emergence of the railway it was at its lowest ebb and that at that same time ingenuity was at its zenith.

The reason that I feel this word has become sullied to the point of indifference is that it is a lazy expression. There are certain things in modern life that we dare not challenge due to the danger of being thought politically incorrect, a Luddite or downright dangerous. I believe it was Edmund Burke who said that “the only thing necessary for the triumph of evil is for good men to do nothing”. In this context I would maintain that the fact that people feel uncomfortable about questioning whether innovation is appropriate leads to a situation where its pursuit is a given almost without question. To compound this error, because there are perceived barriers to innovation a whole new industry has built up to demolish them in order to release or unlock innovation; or perhaps more precisely to gain access to what has been a considerable funding stream. There are seminars ‘unlocking’ it (RIA), departments ‘enabling’ it (RSSB) and strategies ‘accelerating’ (DfT and NR) it; Directors, Professors and Champions of it. The apparent need for ‘innovation’ in almost any context is taken as a given and thus the trials and tribulations that follow are the fault of anyone but the innovator. The breaching of barriers and vanquishing of ‘Valleys of Death’ have almost crusade-like properties.

It is, I believe, an abstract concept that rather like a religious mantra repeated over and over has achieved a status that places it beyond reproach or question. This is why I believe that it is lazy. The almost mindless acceptance of the need to ‘innovate’ has not led to any great strides in productivity, despite the millions of tax payer and private sector investment lavished

on it, and in the railway sector alone it is difficult to find examples that prove the case for the wholesale support of innovation per se.

Innovate UK is the UK government’s innovation agency and seeks to drive productivity and growth by supporting businesses to realise the potential of new technologies, develop ideas and make them a commercial success. Formed in 2007 they have committed over £1.8Bn to innovation, matched by a similar amount in partner and business finding (IUK, 2018). In the main this disbursement of funding is through competitions, which in the case of the rail sector are now informed by official stakeholder bodies like the Innovation Leadership Group (ILG) and the Technology Leadership Group (TLG). It is perhaps no coincidence that within the railway sector the main beneficiaries of this type of support have been academic institutions, consultancies and corporate bodies.

The real challenge is that innovation is but one small part of the equation. It has a place but it is not the defining moment. The main effort needs to be in getting the product to market, as that is where the market failure would seem to be. Or perhaps more importantly putting the effort into understanding the market so that its needs and wants are anticipated, met or even led?

So when it comes to lazy, my real criticism is that we have vested in a single word hopes and dreams that are beyond its ability to deliver. In the same way that in many parts of the railway just to utter the words ‘safety critical’ stifles all debate and ends discussion; investment in terms of time, effort and money in innovation is always an unconditional positive answer. Innovate or Die is the battle cry... This leads to another inherent weakness: because innovation is treated as subject of its own it is most often the preserve of a discrete part of a company and therefore in isolation. I have yet to meet a Procurement or Commercial Director who has the responsibility for leading the uptake of innovation in a company, and yet these are the very people who own the process with which such goods and services may be bought. At the other end of the spectrum, in the SME world where the development of new goods, products or services is pivotal to profitability and therefore existence, the challenge is not in ‘innovation’ – that is the lifeblood of the SME – it is in the route to market.

Innovation is at the same time a playful hypnotic word, conjuring up the excitement of the new, cutting-edge even risky. It has a status that encourages the non-conformist, the slightly ‘left field’. If I am in ‘innovation’ it bestows on me a level of techy geek, not ‘just’ mainstream. The problem here is that it is this very behaviour or characteristic that is its Achilles’ heel. To most senior people in large organisations innovation spells risk and threat. In an industry where most contracts are as a result of competitive tender, innovation is a four letter word:

RISK. The isolation of innovators from the rest of the business ultimately creates the conditions for mistrust and doubt epitomised in the misguided notions of the Valley of Death, etc.

Innovation all too often is taken to mean ‘invention’. This is by no means a universal truth, but if not invention then certainly innovation is taken to mean novel and new. In an industry which has seen its R&D spend decrease in proportion to the overall spend, it is simply the case that the sector cannot afford to be choosy about where its future comes from. All that is new is not necessarily good and all that is old is not necessarily bad.

One of my close colleagues at Rail Alliance likes to make the point that for innovation to succeed it requires linked intelligence, creativity, purpose and support (in other words an ecosystem) and that in the last 20 years or so, this ecosystem has changed.

- **CLEVER** people remain, but available intelligence (insight) is overwhelming;
- **CREATIVE** people remain but within a more complex world, and have less time for ‘serendipity’;
- **PURPOSE** in the workplace remains, but has become spread too thin and become less ‘individual meaningful or resonant’;
- **SUPPORT** from our peers/stakeholders remains, but in diverse multi-stakeholder environments (rail), that support is more diffuse and slower to respond.

On a practical level, innovation in terms of ‘taking action’, and ‘following through’ to deliver new value from previously unfamiliar ideas, technologies, products and services has become harder to achieve within a standard business and sector structure and business practices. So rather than admit that innovation requires organisational and sector upgrades, and system thinking, innovation has evolved to become almost intangible (and therefore unattainable).

So much for innovation then; why should another word be so different or even make a difference? Well I will now set out the case for consigning the word innovation to the 20th century (Room 101) where it belongs and to embrace ingenuity, a word and concept for the 21st century if ever there was one!

Ingenuity was last in vogue when the great Victorian engineers were in full flow. Unlike innovation it is a word that as yet has not been saddled with the baggage of fame. It does, however, sum up so succinctly what it is that makes the British great: “**ingenuity** is the quality of being clever, original, and inventive, often in the process of applying ideas to solve problems or meet challenges” (Wikipedia, 2017). It is also interesting to note that ingenuity (ingenium) is the root Latin word for engineering!

What difference does a word make? I would contend a massive one as it gives us the game back and enables a paradigm shift. Whilst even I with my dislike of the word innovation would admit that in the context of engaging with the new and creative it is good, the real challenge here is to work to identify the critical parts of the ecosystem that will take the railway sector forward.

Ingenious carries with it the notion that there is so much more to be achieved than merely coming up with a great product or idea, it is the whole journey that counts. The point of being clever is the tacit recognition that there is more to a good idea than meets the eye. Is there a market, is there a need, what are the barriers, how can they be overcome ... is there a business case that stands up? Being clever means that you have taken all of this into account. How often have you heard the excuse that something was ‘ahead of its time’? It is easy to be benign but in reality too often it is an idea that is out of step with the market or one that has been poorly thought through and executed. Ingenuity is both human and mechanistic – you could say a type of ‘android’ – fusion of human insight and sentiment, and practical engineering thinking.

Ingenuity brings with it the possibility of a fresh start, by learning from the fleeting appearance and shallow fame of innovation. Look at the sheer scale and diversity of the typically quoted synonyms:



Figure 7 – Innovation Word Map

As I have previously described in this work, since privatisation, and arguably before, the railway supply chain is fragmented, complex and desperately difficult to engage with. The ingenuity that my own organisation, the Rail Alliance (RA), seeks is borne of a deep understanding of the multiple facets of the supply chain that serves the sector, one that recognises the chasm between stakeholders and the plethora of business models in play at any one time. Since the decades after the Second World War we have famously become a nation that has been brilliant at invention but hopeless at commercialising (House of Lords, 2006), to the point of exploitation, the subsequent product. That, I would maintain, is the price of paying too much attention to innovation and too little to being ingenuous.

To be ingenious gives us all a fresh start; it is so much more than just being ‘innovative’, it is a chance to reset the clock, start the journey from where we are today and with a better view of where we want to be. It is about applying our learning and understanding from the past but not being constrained by its rules and standards, embracing them as guidance for wise men not the obedience of fools. If we are genuinely to aspire to the greatness we are capable of then we must seek ingenuity and all that it makes possible. Innovation is just a tool in our bag like so many others; ingenuity is the mind-set that brought us the Industrial Revolution, the World Wide Web and Rugby Football.

It is clear from both observation and interview that the railway as a sector regards innovation as something that warrants special treatment. It is, in my experience, always treated at best as something that needs to be considered in parallel to the everyday business. It is often confused with that which might be better termed continuous improvement and at worst is effectively quarantined, the domain of the Innovation Director or similar. In my interviews, professional life and studies I have yet to come across a single rail entity which actually manages to integrate innovation into the fabric or core of their business.

There is a compelling view of innovation in the 21st century that considers that the true art of innovation is not in fact coming up with ‘big and new’ ideas but actually recombining ones that already exist. In their book *The Second Machine Age* Brynjolfsson and McAfee make the point that when you examine how major steps forward in human knowledge and ability to accomplish things actually occur, so the recombinant view of the world becomes convincing. They use the example of the way in which Kary Mullis won the 1993 Nobel Prize for Chemistry for the development of the polymerase chain reaction (PCR) which is now accepted as *the* technique for replicating DNA sequences. They go on to recount how:

The idea came to him on a night time drive in California, though he almost dismissed it out of hand. As he recounted in his Nobel Award acceptance

speech, “Somehow, I thought, it had to be an illusion ... It was too easy ... There was not a single unknown in the scheme. Every step involved had been done already”. “All” Mullis did was to recombine well-understood techniques in biochemistry to generate a new one. And yet it’s obvious Mullis’s recombination is an enormously valuable one. (Brynjolfsson & McAfee, 2014, p. 78)

There are two important factors here when one considers lessons for the rail sector. Firstly, due to the very nature and history of the sector and the way in which it is structured, i.e. risk-averse, based on very short return on investment structures, etc., it has a very poor track record in terms of R&D spend. This decline over the years seems to match the overall decline in transport spend in terms of GDP, which in the 1820s saw railways alone account for 20% of GDP whereas by 2015 this had declined to 0.5% for all transport and logistics.

At best, R&D spend levels sit at around 2% of revenue. At its simplest, therefore, the sector simply cannot afford to discover for itself. To quote the scholar Brian Arthur, so far as the sector is concerned “to invent something is to find it in what previously exists” (Arthur, 2009, p. 122). This is certainly a view that is held within the highly effective Innovation team at London Underground.

Secondly, and leading on from the first point, even the most cursory examination of the railway supply chain shows, as previously discussed, that the large majority of companies in it are not from the sector at all. The conclusion that one can draw from this is therefore that what they have is the ability to bring to the sector ideas, products, goods and services that have been developed elsewhere and are potentially the very ‘known’ or existing elements that are looking to be recombined to create something which to the sector is considered innovative. Many will also bring a significant track record of R&D spending. The respected Price Waterhouse Coopers (PWC) 2017 Global Innovation 1000 study shows for example that companies like Cisco and Oracle who are potentially major players in the digital railway space, both feature in the top 25 and both register 13% and 18% respectively in terms of their annual spend against revenue. From the same report it can be seen that there are 4 automotive manufacturers also in the top 25 and their spends average 5%, well above railway levels.

8 Formula Rail – Challenge-Led, Performance-Driven



Figure 8 – Formula Rail Logo

I conceived the term Formula Rail as a label for a forward looking approach to creating a virtually integrated railway; it must be recognised however that this program is the result of significant work by the Rail Alliance team, led and inspired in this case by Chris Denison. This chapter moves my work closer to real life and deals with a particular methodology and approach that could be used to redress the apparent inability or unwillingness of the McNulty review to find and indeed fire a “silver bullet” (DfT/ORR, 2011a, p. 5). There is a comment later in the same paragraph that is interesting:

“Achieving a 30% cost reduction will require a very substantial program of change, **addressing each and every one of the barriers identified in this report**, and doing so in ways that do not prevent achievement of other performance objectives.” (DfT/ORR, 2011a, p. 5)

The text in bold above is really telling; it clearly makes the point that the report relied for its effectiveness on the sector being able to take a holistic, joined-up and synergistic approach going forward, something it has to date singularly failed to achieve for the reasons that I have already discussed.

The publication in January 2017 of the Government’s *Building our Industrial Strategy* Green Paper has brought forward the potential for GB rail to recalibrate itself and to create a more focused identity. This is in no small part because of the ‘Sector Deals’ process that is being established as part of the 10 Pillar approach (Pillar 8 – Cultivating World-Leading Sectors)

(BEIS, 2017, pp. 8 and 20). The RSG and RDG have recognised that they need to work in unison in order to benefit from this process and that they need to create the conditions whereby they enable the railway of the 21st century to “speak with one voice” (outcome of joint session between RDG and RSG, London, April 19 2017). There is therefore a concerted effort from the private sector to both align itself holistically and to seek from that position of strength transformational change in the way in which the railway is organised and run.

In essence it is highly likely that the process of creating a Sector Deal will see a proposal to government that will, as a consequence, have the effect of dramatically realigning the DfT and rationalising its powers and those of a whole range of associated QUANGOs and organisations (RSSB/ORR, etc.). It has been noted that the DfT has for a variety of reasons taken on a miscellany of roles that, in many cases, have merely failed to find another home or are legacy elements of previous ‘failed’ organisations like the SRA. It has retained a level of control over the rail sector that it does not have or even seek in other modes. Perhaps more importantly, it acts both directly and indirectly as the customer for and commissioner of rail services and yet fails to provide the strategic leadership required on behalf of UK PLC. Its ability to think and act strategically on behalf of the nation is degraded by its incessant vulnerability to political tinkering, previously described in Chapter 3 and in the work of the CRI at the University of Bath and of its own desire to sustain itself (Glaister, 2004). It has long been recognised that the department is part of the challenge not the solution. At a micro level it has regulations embedded in franchise agreements that result in TOCs having to seek ministerial sign-off for the authority to alter ticket office opening hours by even a minute across their networks. Conversely, their obsession with the competition mantra:

notion that competition drives everything that is good in business is the bedrock on which modern capitalism, or neoliberalism to give the name of the credo that drives it, rests. Competition is the guiding principle for all economic activity, irrespective of the evidence or of the costs of trying to develop a competitive framework in a natural monopoly like the railways. Privatisation, outsourcing, fragmentation, and marketisation are its handmaidens. Nothing is of value that can’t be counted, no monopoly business can ever deliver good services, everything must be market tested – this is the constant refrain.
(Wolmar, 2017)

has led to a macro position which leads them to absolve themselves of all responsibility for the outcome of tendering and of the need to show any real leadership, falling back on a simplistic ethos of ‘following market demand’, which has a similar quality of justification as ‘I

was only following orders'. I would refer back to Bourdieu's fifth principle from Chapter 5: we are capable of making choices and do not have to follow the maps of others.

This has certainly been the case in the rail-focused elements of academia where a number of leading universities, who have in the past competed with each other, have taken the step of developing a Higher Education Funding Council for England funding proposal under a Higher Education Institution UK Research Partnership Investment Fund 2018–19 application to create the UK Rail Research and Innovation Network (UKRRIN). Although this is a partnership between the universities of:

Birmingham (UoB)
Huddersfield (UoH)
Southampton (Soton)
Newcastle (NU)
Sheffield (UoS)
Nottingham (UoN) and
Heriot-Watt (HW)

it is also a collaboration between a very wide range of other organisations and the private sector. Notably, it has secured a level of match funding commitments from the private sector as well as the direct support of the RSG and RDG through both TLG and ILG, respectively. The following is an extract from the bid document:

In partnership with the rail industry, the UK's leading rail research universities propose to establish the **UK Rail Research and Innovation Network (UKRRIN)**. This will be an internationally unique, world-class **Network of Centres of Excellence** bringing together academic and industry partners to deliver new challenge-led research, accelerate technology development and deploy innovative products into the rail industry. Supported by Government and key industry bodies, including the Rail Supply Group (RSG) and Rail Delivery Group (RDG) this multimillion pound initiative is recognised as being critical to the delivery of the rail sector's industrial strategy for growth and long-term success, enabled through world-class science and innovation. UKRRIN will future proof the GB rail industry through innovation and collaboration by creating opportunities that will boost the UK economy and drive productivity.

This bid is a logical evolution of the wider Rail Research UK Association (www.rruka.org.uk) academic partnership between 50 universities which have a varying level of engagement with the rail sector. In another important lesson for the sector at large this bid was conceived by

UoB and has been led by them; in other words, it has had the real benefit from the focus of a strong but inclusive ‘single voice’ and yet has managed to garner universal support across a very diverse range, bringing commercial and academic competitors together to collaborate and benefit from the strength of the whole not merely the sum of the parts.

Although this bid has become an industry-wide initiative it is in fact an amalgam of what was two very different proposals. The EIT and NR were exploring a program titled Project Pioneer which encompassed a ‘centres of excellence’ element. It failed to gain any real momentum although many elements of it were perfectly credible. UoB had previously attempted a Higher Education Funding Council for England bid, and the current UKRRIN proposal is a direct development of that. The RSG in particular has latched on to this latter bid and developed what was written in its strategy document to align with it. In itself this is not an issue although what started as a relatively clear academia-led proposal has now collected some important ‘baggage’, in particular the following two project objectives (extract from UKRRIN, 2017, p. 4):

Table 2 – Future Rail Project Objectives

| Objective | Outputs (to deliver objectives) | Outcomes (to measure success) |
|--|---|--|
| Providing leadership in rail research and innovation globally | Establish the UK as the global centre for rail research, innovation and leaders in deployment | Academic partners will develop new international relationships in every global region of the world within the first 3 years of operation, providing access to new research funding Industrial partners increasing their exports, from 7% to over 10% through innovative products and services exports developed in the centres |
| Delivering transformational innovation and accelerated uptake of rail systems technologies by the UK rail industry | New programmes of research, innovation and demonstrator activity with industry partners at the centres and deployment to the rail network | Double the numbers of technology innovations and patents filed by the academic partners and delivered into the rail sector over the first 7 years of the centres’ operation |

I believe these two objectives begin to reveal areas of potential conflict. The first column makes a bold statement about leadership but by the second this has changed gently to becoming “leaders in deployment”; by the time outcomes are considered there is nothing suggesting this is a feature at all. There is a clear difference between being a leading centre and providing leadership!

Second, in the next objective, the output has a level of credibility although the execution of this objective will rely heavily on the industry partners integral to the program; without the appropriate level of commitment from them it would be hard to understand the provenance of the notion that the academic base has in “delivering transformational innovation”, i.e. at the higher Technology Readiness Level and from that why it believes it could “accelerate the uptake of rail systems technologies” when this has not been the case to date. In the final box, outcomes, the success measure moves back to academia but leaves itself a hostage to fortune by pinning its innovation and patent count on the rail sector’s ability to deploy them. This series would seem to do little to build confidence that a) such IPR would be protected to the benefit of UK PLC and b) that there would seem little encouragement for the SME looking for early research succour.

My concern with this proposal is that it appears likely to become mired in the current railway bureaucracies, organisations and mind-sets that have failed to deliver any real step change in the last 20 years, instead of being truly focused on the development and delivery of coordinated world-leading research.

On a more positive note, the bid relies on the support of existing test track facilities, namely the two NR Railway Innovation and Development Centres (RIDC), London Underground Limited Acton facility and the privately owned Quinton Rail Technology Centre (QRTC). The table below sets out the overall capabilities of a number of these centres and places them in the context of other global sites. It can be seen that the sum total of capabilities actually meets virtually all needs and eventualities and that, with the exception of the provision of dynamic test rigs, the three UK locations cover everything that is available individually or collectively elsewhere. The UKRRIN partners provide a wide range of test rigs, thereby covering this aspect.

Table 3 – Test Facility Capabilities

| NAME OF FACILITY | Velim | Valenciennes | Wildenrath | Melton (NR) | Tuxford (NR) | Long Marston | Japan | Colorado |
|--------------------------------------|-----------|---------------|------------|--|--|--|-----------|----------|
| Location | Czech Rep | France | Germany | UK  | UK  | UK  | Japan | USA |
| Status | existing | existing | existing | existing | existing | existing* | existing* | existing |
| TRACK CHARACTERISTICS | | | | | | | | |
| Circle | Y | Y | Y | N | N | Y | Y | Y |
| Track Length Km | 13.5 / 4 | 2.75 /1.8/1.8 | 6/2.5 | 32 | 22 | 4 | 3.2 | 77 |
| Track Length Miles | 8 / 2.5 | 1.7/1.1/1.1 | 3.75/1.6 | 20.0 | 14.0 | 2.5 | 2.0 | 48 |
| Speed Km/h | >210 | 100 | >160 | >160 | 100.0 | 80 | 100 | 80 |
| Speed mph | >130 | 63 | >100 | >100 | 62.5 | 50 | 62.5 | 50 |
| min Curvature radius m | 300 | 190 | 200 | 300 | <80 | <80 | <100 | <100 |
| Max Curvature radius m | 4000 | 3600 | 600 | 3000 | >4000 | >800 | >1000 | >800 |
| Max Axle Load Tons | 25 | 25 | 25 | 25 | 25 | 25 | 25 | <25 |
| ELECTRIFICATION | | | | | | | | |
| LIVE 25Kv AC and or DC overhead | Y/Y | Y/Y | Y | Y/N | N | Y/Y | Y | Y |
| LIVE 750VDC Three Rail | N | Y | N | Y | N | P | N | N |
| LIVE 750VDC Four Rail (LUL) | N | N | N | Y | N | P | N | N |
| DELIVERABLE OUTPUTS | | | | | | | | |
| Crash Testing EN15227 – European TSI | Y | N | N | N | N | Y | N | Y |
| Non-stop mileage tests | Y | Y | N | N | N | Y | Y | Y |
| High speed testing <100k | Y | Y | Y | Y | Y | P | Y | N |
| Workshops | Y | Y | Y | Y | | Y | Y | Y |
| Multi vehicle Test Buildings | Y | N | Y | Y | | Y | Y | Y |
| Dynamic Test Rigs | N | N | N | N | N | P | NK | Y |
| Lab coaches | Y | N | Y | N | N | Y | N | Y |
| Equipment Dev Vehs | N | N | N | N | N | Y | Y | Y |
| On Track Plant Testing | Y | Y | Y | N | Y | Y | N | Y |
| Track Defect / Cant adjustment | Y | Y | Y | N | Y | Y | N | Y |
| Adhesion test (1:25) | Y | N | N | N | Y | P | N | Y |
| ECTS/SWIFT Development. | Y | Y | Y | Y | P | Y | N | ? |
| Signal interference Testing | Y | Y | Y | Y | N | Y | Y | N |
| UIC / RGS / TSI Compliance | Y | Y | Y | Y | Y | Y | Y | Y |
| Passenger Evacuation Tests | N | N | N | N | N | Y | Y | Y |
| Infrastructure gauging | Y | Y | Y | N | Y | Y | Y | Y |
| Traction supplied | Y | Y | Y | N | N | Y | NK | Y |
| Simulation (platforms etc) | N | N | N | N | N | Y | NK | N |
| Training Facilities | N | Y | Y | N | Y | Y | N | N |
| Noise Testing | Y | Y | Y | N | Y | P | Y | Y |
| Light Rail facilities | Y | Y | Y | N | N | Y | Y | Y |
| All year round access 24/7 | Y | Y | Y | N | N | Y | N | Y |

As a footnote to the UKRRIN bid it is worth noting that since privatisation the academic institutional bodies connected with rail have flourished. Had the former Railway Technical Centre at Derby still been in existence this may have still been the case although I would postulate that, unlike the wider commercial part of the rail sector where the fundamental model remains flawed and assumptions about the power of competition wrong, the modern, global academic sector has been able to adapt to meet the market’s needs and clearly benefited from the considerable, government-initiated, research project budgets. It is beyond the scope of my work to evaluate whether or not this has represented good value for money or indeed has met the sector’s needs. From my own direct experience I can say with conviction that the way in which innovation funding has been spent is, however, sub-optimal

and that there is a widespread belief that the sector, despite having been disbursed considerable funding, has not really made any step changes over the period since the McNulty review. The review highlighted the low level of innovation maturity, and later in this chapter I will explain the model developed by RSSB to help monitor and stimulate improvement; however, there is very little evidence to suggest anything more than a gently improving organic trend, which in part may be distorted by companies and individuals ability to ‘game’ the process.

In his book *The Great Degeneration*, based on his 2012 Reith Lectures, the scholar Niall Ferguson drew parallels between Charles Darwin’s work on evolution and the behaviour and nature of commercial markets, financial in particular:

“Like the wild animals of the Serengeti, individuals and firms are in constant struggle for existence, a contest over finite resources. Natural selection operates, in that any innovation (or mutation, in nature’s terms) will flourish or will die depending on how well it suits its environment.” (Ferguson, 2012, p. 63)

The Formula Rail process is cognisant of the nuances of the sector, its current challenges, future ambitions and multiplicitous ecosystems, of the fact that the very environment and its ‘rules’ are subject to change and re-interpretation by politicians, officials and a wide variety of other players. It is, I believe, original work and a unique approach, providing a comprehensive and yet unobtrusive way of creating synergies and networks where none currently exist. It creates a synthetic structure which effectively closes the gaps caused by the fragmentation of the sector.

The narrative, provenance and development of Formula Rail is described below.

8.1 Context

It is clear that attempts to increase levels of innovation in the rail sector are continuing to demonstrate a penchant for a predominantly top-down approach, with the UK government and the corporates (infrastructure owners/OEMs/operators) creating a compelling case for supply chain innovation, then deploying a variety of organic (mundane) mechanisms to respond to that case.

However, the scale of the change of magnitude sought demands a clear, common and compelling target, a credible delivery rationale and a channelled, dynamic mechanism (process), plus strong intellectual and emotional attachment of all stakeholders to both the target and mechanism. The current approaches fall far short of satisfying these demands.

There is seldom a clear target, delivery mechanism or rationale. There is currently no fully representative/empowered stakeholder community. There is no real intellectual or emotional attachment.

This, I believe, leaves GB rail exposed to ineffectual rail cost planning/budgeting, increasing alienation from passengers, risk to the welfare of a talented pool of human capital, and lost opportunity for UK growth/increased productivity.

This chapter tracks the development of a new and alternative model, method and mechanism that have evolved from a decade of experience forming and then leading the Rail Alliance. The general format of what follows is different from the rest of this work. It is a range of extended observation and short-term insight followed by response or activity stream.

8.2 PHASE 1 – THE RAIL ALLIANCE

The Rail Alliance was formed in response to both the perceived need for greater supplier diversity in the rail supply chain and, from that, the need to support companies, not already immersed in the sector, to navigate a route to market. Supplier diversity was and is considered a significant inhibitor to innovation or the introduction of better performance methods, technologies, products and service to the GB rail supply chain.

8.2.1 Observation

By comparing supplier diversity in Rail against other sectors such as automotive and aerospace it is clear that the supply chain diversity in both of those industries and its resulting impact was compelling. Even though the structure of the GB rail sector is unlike other sectors in terms of its governance, there was no evidence to suggest that rail would not benefit significantly from the employment of expertise, technologies, products and services that were born and/or evolved within strong R&D and innovation environments and sectors outside the rail supply chain. A hypothesis backed by the fact that such a high percentage of rail sector supply chain companies are not per se railway businesses. Whilst there may be myriad ways to define a railway company, perhaps the simplest test would be that these companies would not qualify to be members of Railway Industry Association or the Rail Forum East Midlands e.g. that their turnover in rail was too small or that they are not UK/East Midlands registered/owned companies. Although not a fashionable view there is very little about the technology demands of the railway that are unique to it.

8.2.2 The Rail Alliance: the Response

In response, the Rail Alliance was founded, presenting a practical and economical approach for supporting suppliers interested in contributing to the rail supply chain. Through the core

Rail Alliance membership service, any supplier could now express their interest and explore the opportunities in rail, and begin to match their expertise against the diffuse rigours and requirements of the rail supply chain.

The Rail Alliance was created to develop and deliver a number of initiatives (MAS-WM, 2006) based on the work done by a combination of the then Department for Trade and Industry (now BEIS) and Advantage West Midlands (AWM), the regional Development Agency. These initiatives focused on delivery of the following benefits and proportions from a total score of 200 (the rationale behind this particular scoring metric was lost amongst the dissolution of AWM):

- Support the development of supplier rail acumen through networking suppliers and buyers to create meaningful dialogue (100);
- Perform as the rail sector ingenuity hub (75);
- Provide guidance on supplier qualification required for the GB rail supply chain (10);
- Communicate supply chain opportunities to suppliers (10);
- Support supplier solution design and testing (5).

This has formed the foundation to position the Rail Alliance as the largest (approaching 500 members) and best-recognised supplier gateway to GB rail.

8.2.3 Key Insights from 2007+

- The timing of engagement between a supplier and a prospective buyer is critical, with a preference for early engagement wherever possible (i.e., following the simple principle that it is better to fail quickly and move on). However, this is challenging when often facing poor or limited buyer appetite, weak drivers for early engagement and poor supply chain understanding;
- There remains a significant supplier acumen gap, with respect to knowledge of sector, buyer and solution preferences. Developing supplier acumen to the level required is not possible through simple ‘one to many’ events, due to a significant cost implication for codifying and delivering knowledge and insight to potential supplier;
- Buyers continue to demonstrate poor appetite for ‘opportunistic’ dialogue and engagement (weak drivers). Plus, the buyer design and procurement function favours conventional (familiar and predictable) approaches. Supplier original (unfamiliar and unpredictable) offerings are seen as non-core and require an alternative ‘approach’, positioned somewhere between traditional design and procurement (e.g., NR Governance for Railway Investment Projects process) and pure R&D (often an opaque

internal process). Buyers for the most part simply do not have the expertise or pressures to evolve their businesses to accommodate novel or original supplier offerings;

- In the past the DfT funded and, through a combination of RSSB and InnovateUK, guided innovation in the rail sector, but it was not clearly defined, expressed in terms of demand or driven (led). The DfT effectively limited its innovation responsibility to encouragement for market-driven innovation through schemes including the liF scheme, competitions and contractual recommendations for other large procuring organisations. In more recent times there has been an upgrade of the RTS (first published in 2007 then updated in 2012) in the form of the RTS CDP. The aim of the CDP is to align the sector onto a single plan. In the words of Graham Hopkins, (chair of the TLG and NR's Group Director for Safety, Technical and Engineering):

A plan that focuses our efforts, expertise, investment so that we are indeed doing the right things, once, in priority order. A plan that ensures the ambition for new products, systems and equipment is matched by the facilities to support research, development, simulations testing and validation.

The ILG and TLG are the bodies that will act in partnership to ensure alignment of activity with the core plan. They do this through industry led workstreams and are accountable for delivery to RDG/RSG

8.2.4 Rail Alliance as the Creator of a Network of Networks

The Rail Alliance's strength has been the ability to remain focused on its core purpose, that of using its ever-increasing and complex network to support the development of supplier acumen. The railway as part of the transport sector is inextricably linked to other elements of critical national infrastructure (see Figure 9) which, are in their own right, complex and highly interdependent and interconnected.

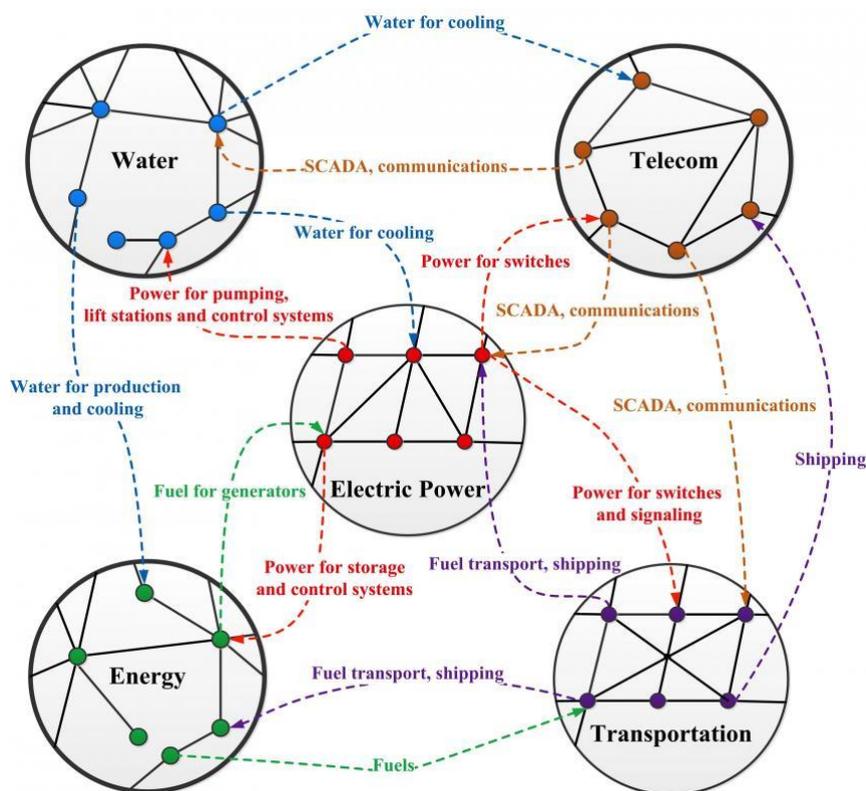


Figure 9 – A Network of Networks (Gao, 2014, p. 348)

Studies of such networks at a macro level show how “failure of nodes in one network leads to the failure of dependent nodes in other networks, which in turn may cause further damage to the first network” (Gao, 2014, p. 347). The CDP recognises that:

The railway is a tightly coupled ‘system of systems’ where changes to any part can have significant implications for other parts of the system. This interdependency between track infrastructure, rolling stock and command and control and communications together with the structure of the GB rail industry creates a highly complex system with myriad interdependencies and misaligned incentives. (RSSB, 2017b, p. 9)

Taking these two sets of comments at face value in the context of a fragmented and disjointed system you have a recipe for disaster. In its own modest way what the Rail Alliance was created for and manages to achieve is to assist the supply chain in understanding what it is actually looking at and to reveal the areas of failure in order to make sense of the complexity. In its endeavours to achieve this it has a number of tools.

First, at a macro level the Alliance is a full Council member of the RSG. This enables it to influence at the industry and political level as well as to learn from this forum. Here it has

been particularly successful in ensuring that the wants and needs of the SME are recognised and addressed.

Second, it provides a unique level of support to companies through a wide range of networking events and activities. These enable companies, whether in the sector or not, to build their knowledge, extend their contact reach and ultimately to enhance acumen.

8.2.5 Networking Insight

- The ability to provide a regular platform for companies to build their contacts in a focused and benign way is highly useful. In a fragmented sector this provides an alternative to the random process of sending brochures and materials to potential customers;
- From a buyer’s perspective, again the scale of diversity of companies at such events is in itself an educational experience. It also provides a useful opportunity to communicate ‘one to many’ and to gain insight into what may be available from non-traditional sources.

Next, it has been responsible for the development and delivery of a number of national business coaching and mentoring schemes, both on behalf of its own membership and of government departments (BIS, 2014) and latterly the RSG itself.

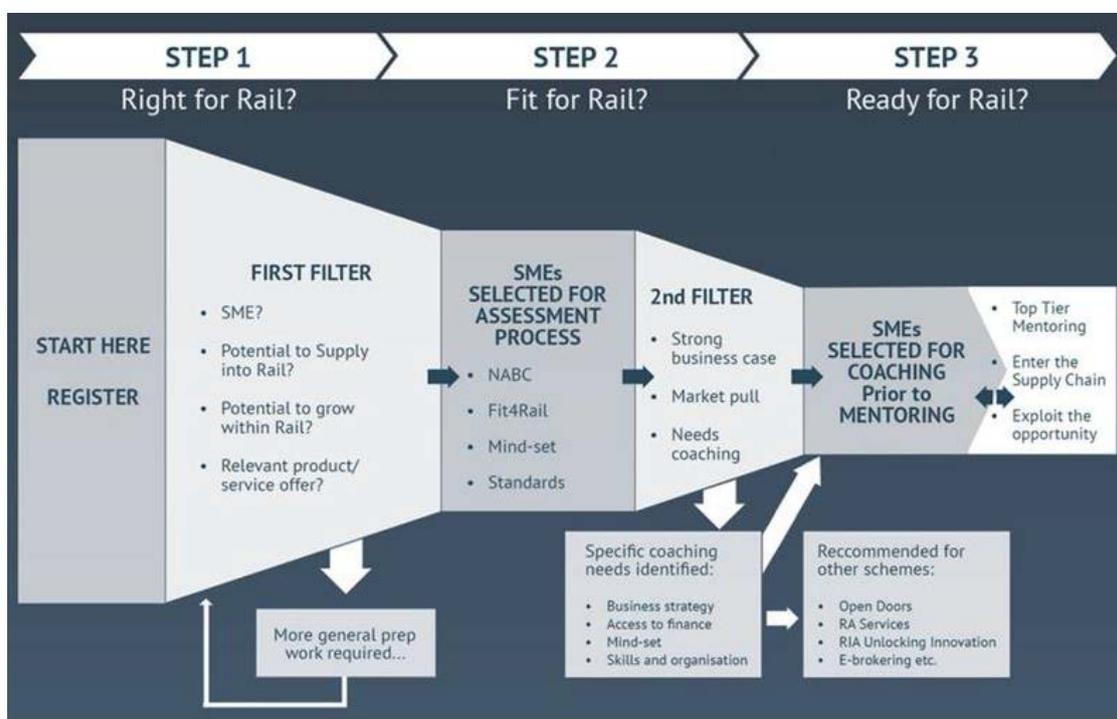


Figure 10 – Filtering Process

The mentoring scheme (www.railmentor.com) helps to build supplier acumen through coaching of specific task-related aspects of their business plan and then mentoring the suppliers as they explore ways and means for supporting more frequent (opportunistic) supplier/buyer engagement. The Alliance successfully made the case for the mentoring scheme based on acknowledgement of the scale and impact of the divide between suppliers and large rail buying organisations, barriers to buyer interest, procurement and adoption of novel supplier technologies, products and solutions.

8.2.6 Mentoring Programme Insight

- Timing and the nature (subject or theme) of supplier/buyer engagement is critical. As before, buyers demonstrate a weak appetite for opportunistic dialogue and engagement;
- The mentoring process frames supplier/buyer dialogue and engagement based on an artificial or unnatural timeline and theme, and does not readily embrace a buyer prioritised or buyer conversant/confident opportunity horizon;
- Mentoring does, however, support the development of supplier acumen. However, this acumen is limited to knowledge of individual buyers with a limited context of specific opportunities (i.e., reasons for buyer motivation);
- For the most part, buyer dialogue painted a picture of being beholden to a constrained master; this was particularly the case with certain well-established Tier 1 parts vendors and system integrators. Interest and appreciation in innovation did and does exist, but conditions for innovation were understandably weak at best or more often non-existent;
- The mentoring programme was only available to suppliers, for a specific period as part of a funded scheme. This program in that format has now run its course;
- Due to the funding and resource allocation this was by definition only a light-touch scheme.

Fourth, the Rail Alliance made the case to the DfT (Test Facility Steering Group) through the RSSB for a Testing Voucher Scheme (TVS) to encourage product development (Technology Readiness Levels 6 to 8) in the GB rail supply chain by delivering subsidised testing and trialling to qualifying suppliers, using the facilities at QRTC at Long Marston, near Stratford-on-Avon.

One of the reasons why the Rail Alliance was successful (with the original tender plus a recent OJEU tendering for a second programme) was the close proximity of the Rail Alliance to supporting the needs of thousands of suppliers serving or keen to serve GB rail.

8.2.7 Testing Voucher Scheme Insight

- Although a valuable mechanism for helping suppliers prepare their offerings for rail accreditation, the TVS is not funded or designed to smooth the path of supplier innovation, i.e., to provide any stimulus to support buyer appetite and uptake of supplier novel ideas, technologies and products;
- That said, the TVS does help suppliers reduce their cost of product development, it enables the product to be trialled/tested in a live railway environment and provides a demonstration opportunity, albeit in all of these cases a small step of a much bigger and challenging journey. This scheme also helps build provenance for the final product or solution, which may encourage the buyer community to take more interest in novel solutions or at least to take it more seriously.

Fifth, in support of the need for suppliers to be able to demonstrate the value of original thinking, technologies and products to an attentive buyer audience, the Rail Alliance developed low-cost access to national and international rail and engineering exhibitions, most notably Railtex/Infrarail and the Advanced Engineering Show in the UK and Innotrans in Berlin. This presents suppliers with an affordable opportunity to bring their products and capabilities into the rail buyer community spotlight, and share knowledge with other suppliers.

The challenge with working with established events taking a more traditional approach to supporting the rail supply chain was that the number of suppliers the Rail Alliance can support is limited by the available exhibition space. To overcome this barrier, Rail Live was created.

Rail Live is a Rail Alliance-owned and operated outdoor show for the benefit of suppliers (and buyers), creating powerful reasons for engagement and dialogue. In a few short years, Rail Live has grown to become the largest outdoor exhibition of innovative rail technologies, products and solutions in Europe.

8.2.8 Rail Live Event Insight

- With relatively few suppliers serving *only* the rail supply chain, support to enable supply chain diversity is key to encouraging and enabling GB rail sector innovation. From the feedback of many of the 350+ suppliers attending the Rail Live events, it is clear that suppliers often presented proof of better value against incumbent solutions or presented a new approach or product that would significantly and positively impact one of the key GB rail capability drivers, i.e., one or more of the four Cs (reduced cost and carbon or increased capacity or customer experience). The show gave them the opportunity to do this in a live rail environment;

- Though the facts speak for themselves, few original solutions capable of demonstrating an advantage to buyers will actually win work or orders. For the suppliers that do win work, it is often after complying with some extremely taxing product approval and procurement processes.

Finally, again in partnership with the RSG and HS2, the Alliance ran a very successful series of best practice workshop events over the course of an 18 month period (www.rsgbestpractice.org and www.railalliance.co.uk/event/rsg-best-practice-workshop). These aimed to further develop the participants' acumen levels in a specific range of activities such as Building Information Management and Lean tools, which were identified by the RSG (through the High Speed Rail workstream) as important subjects where it was felt that the buying community could learn from suppliers and vice versa.

8.2.9 Best Practice Insight

- The program was judged highly successful by its participants but did not really manage to engage with the breadth of audience it had hoped to. This was a good example of the lack of wide-scale buyer appetite to learn from the broader supply chain;
- Again, it was a light-touch series of events that was limited in the capability and ultimately ambition by a combination of low levels of funding and commitment from the buying community.

8.3 PHASE 2 – THE GENESIS OF FORMULA RAIL

It is our experience at RA based on delivery of the TVS that despite the apparent efforts of the rail buying community and UK government, levels of uptake and adoption of original supplier products and solutions in the rail supply chain remains unacceptably low.

Taking an independent view of some of the innovation initiatives (departmental, EU and private sector), many seemed to be over-simplified or naïve. Many demonstrated a poor understanding or appreciation that the outcomes were likely to offer no improvement to previous approaches. Many falsely raised suppliers' expectations of a good outcome, i.e., a sale or at least a clear route to market. The whole innovation in rail piece has become too corporately egotistical and almost more for entertainment value than productivity, performance or profitability. The show on offer was a bad re-write of a bad re-write and tickets were not cheap.

What the major buying community (inclusive of government departments and satellites) does not seem to comprehend is that being procured over the next few years begins its journey today with a responsibility extending decades. The whole rail economy machinery delivers

poor value for money to the UK as a whole and it delivers a poor-quality experience to both customers and the supply chain.

Observations from the Rail Alliance's unique and grassroots perspective of the landscape has revealed, with some degree of clarity, the key challenges facing GB rail and the conditions required to address them. The Rail Alliance came to the conclusion that an effective approach would be to complement and support the current TOP-DOWN approach with a new BOTTOM-UP and CONDITIONS-BASED approach.

BOTTOM-UP refers to a principle of 'purpose and practice with policy' for targeting and uniting individual buyer challenges and opportunities with qualified and highly enthusiastic suppliers.

CONDITIONS-BASED refers to stimulation, development and nurturing of the CLIMATE and CONDITIONS necessary for encouraging and enabling suppliers to demonstrate and prove the net value (buyer and supplier risk vs. reward) of novel solutions and supporting a buyer's business case to adopt them.

8.3.1 Conditions as a Key Enabler

We have identified four compound conditions that must be met to fuel the appetite and encourage the adoption of novel technologies, products and solutions within the GB rail sector.

- Strength of supplier sector, buyer and product knowledge and acumen for stimulating and nurturing buyer appeal of novel rail solutions must be appropriate to a supplier's customer profile, be demonstrable and current (**ACUMEN**);
- Dialogue between unfamiliar suppliers and buyers must be contextual, timely, productive and outcome-oriented. Dialogue between a supplier and a buyer must be organic and demonstrate willingness and collaboration from both sides. Productive dialogue must therefore have a common value target (**DIALOGUE**);
- A safe and open environment for enabling cooperative design of and support for novel, high-value solutions. Early cooperative design based on an expressive buyer target challenge, along with a clear target outcome is vital for constructing concepts capable of demonstrating better value or performance than established offerings and that are recognised by a buyer. A buyer convinced of an advantage is more likely to adapt its processes to accommodate it (**DISCOVERY**);
- A transparent approach or methodology for protecting buyer/supplier interests and objectives, i.e., assessment of risk vs. benefits, presented by novel technologies and

products must be created and applied. Supplier and any original product or solution must present a provenance and proof (**ADOPTION**).

Table 4 reviews a number of high profile government and industry initiatives for supporting innovation in rail. This simple assessment measures the extent to which each initiative satisfies each of the four conditions described above. This was followed by adding Rail Alliance initiatives.

Table 4 –Sector Initiatives

| INITIATIVE TYPE: FUNDING | INITIATIVE COVERAGE |
|-----------------------------------|---------------------------------------|
| NETWORK RAIL HLOS | DISCOVERY |
| INNOVATION IN FRANCHISING | DISCOVERY |
| FINANCE BIRMINGHAM | DISCOVERY |
| NR STRATEGIC INNOVATION FUND | DISCOVERY, ADOPTION |
| INNOVATE UK COMPETITIONS | DISCOVERY |
| RSSB COMPETITIONS | DISCOVERY |
| NON-FUNDING | |
| SHARPCLOUD | DISCOVERY |
| BRIDGELIGHT | DISCOVERY |
| STRATEGIC UNIVERSITY PARTNERSHIPS | ACUMEN |
| PROJECT PIONEER | ACUMEN, DIALOGUE, DISCOVERY, ADOPTION |
| RAIL SUPPLY CHAIN INTEGRATOR | ACUMEN, DIALOGUE, DISCOVERY, ADOPTION |
| UIS | DISCOVERY, DIALOGUE, ADOPTION |
| ICMM | ACUMEN |

Observations

A surprising number of initiatives concentrate on providing funds to support innovation.

This directive presumes the existence of an innovation funding challenge or gap. However, reality (based on experience and observation) presents an alternative conclusion.

Innovation dynamics are supplier push and buyer pull. We have already observed an imbalance, i.e., much more supplier push and very little buyer pull. Both are essential for innovation to work (in any sector and not exclusive to rail). So a simple question is ‘how would supplier funding for innovation (e.g., competitions/testing vouchers/rail growth fund) support the push and pull dynamic?’ and ‘how would buyer funding for innovation (e.g., liF) support this push and pull dynamic?’

8.3.2 SUPPLIER INNOVATION FUNDING

More suppliers offering products and solutions performing better than conventional ones exist than the number of buyers demanding these offerings. Additional funding for suppliers via the mechanisms mentioned is unlikely to improve the situation for many suppliers.

From a buyer perspective, more funding for suppliers may shine a temporary spotlight on responsive suppliers and their capabilities, although it would do little to increase the buyer pull. The scenario in which additional (more strategic) funding has the potential to stimulate buyer pull would be where a supplier invests in (i.e., self-funds) early support for the buyer challenge, objectives and or needs. In this situation, a supplier effectively performs the role of mentor or coach helping influence the buyer's technology, product and procurement roadmaps (Parsloe & Leedham, 2009). Even though this is pre-contract and the traditional tendering process will need to be followed, at least the buyer will have a clear and evidenced (trusted) understanding of the value vs. risk position associated with accommodating the supplier's novel approaches or products within an open bid.

That said, the time, attention and resource required for developing supplier/buyer trust, plus the responsibility of managing this relationship would likely prove too much for most companies to bear. In a nutshell, supplier funding for innovation is unlikely to move the innovation needle for many or most suppliers.

8.3.3 BUYER INNOVATION FUNDING

Poor buyer pull is due to an actual plus perceived need for a buyer shift or evolution of their mind-set, behaviours, methods and processes. This is borne out by the evidence produced in the work published by LBG and the Manufacturing Technologies Association (MTA) in November 2016. The report shows quite clearly the difference between the SME's appetite for innovation and its confidence in its business culture/risk-taking compared to the upper mid-sized company or corporate (LBG, 2016, p. 16).

Although a significant shift is necessary, the reality is that a buyer is simply seeking the best results. If a supplier can demonstrate that they can help a buyer achieve this, then perhaps the biggest barrier has been removed. A buyer would have a good reason for at least exploring what it will take to accommodate a supplier's novel ideas, methods or products. From our observations, the shift is much less onerous than it seems.

From a buyer perspective, additional external funding for innovation is almost always after the fact (that is to say, the funding is disconnected with the organic flow of existing business) and by definition is likely to demonstrate limited connectivity with the buyer organisation's strategic and operational space.

Any mechanism for increasing buyer pull (innovation investment included) must be easy, effective, economical and crucially rooted (or embedded after the fact) to a buyer's core purpose, aims and objectives. Funding for innovation is no exception. Funding for innovation must be more than a pot of money with ambiguous, externally created governance strings attached.

Embedding requires a welcome and prepared host. Creating a host is challenging for the reasons suggested earlier.

The bottom line, for buyer external funding for innovation to work, is that the funding scheme must easily integrate within the fabric of a buyer's organisation. To achieve this requires any funding scheme to comprise two parts:

Buyer Funding Component – Part 1 INTEGRATOR

This is, I believe, the (current) missing component. The integrator component is the investment delivery vehicle, which can be thought of as being the vehicle and the funding the passenger(s). This component will have been developed with a cooperative understanding of the dynamics and mechanics of a buyer organisation. The integrator component will respect and encourage the conditions essential for embedding the innovation funding within a buyer organisation.

Buyer Funding Component - Part 2 THE FUNDING

From a supplier point of view, additional buyer funding for innovation would achieve little beyond raising supplier hopes and expectations. This is because, in the current absence of Part 1 above, the typical buyer is poorly prepared for the full extent of activities associated with the support of external innovation; therefore, its adoption is highly unlikely to occur. For supplier innovation to work it requires the conditions for and the facilitation of it to be present in the buyer host and for there to be a strong connection with a buyer's core business. Funding for innovation should recognise this and invest in programmes where buyers are selected that demonstrate such conditions (naturally occurring) or where these conditions are actively in process.

Currently there is little evidence of the former and no examples of the latter.

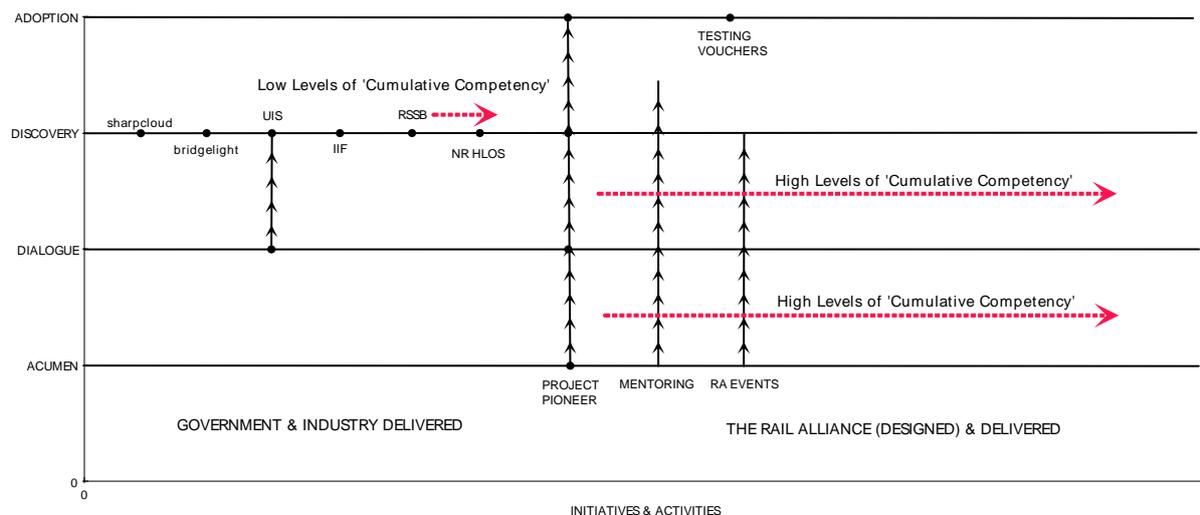


Figure 11 – Initiatives and Activities

Other Observations

From **Error! Reference source not found**.it can be see that, although this is an unsophisticated s chematic, it does serve to highlight poor ‘Cumulative Competency’ within the Government & Industry initiatives and zone.

Cumulative Competency can be expressed as the recyclable/reusable expertise, experience, know-how and relationships evolved from the delivery of many innovation initiatives. This should be a key consideration for government and industry, although with so many initiatives in play from widely differing sources, this will always prove difficult to achieve in practice.

That said, there is nothing stopping the government, e.g., via RSG/RDG and enablers like InnovateUK/RSSB from creating a set of learnings based on previous and current innovation support initiatives irrespective of their origins.

What this does highlight (diagram and reality) is, within the rail sector, the unique strength of the Rail Alliance’s cumulative competency. Whether by fortune or design, or both, this puts the Rail Alliance in a powerful position to evolve innovation initiatives bearing in mind learnings from previous activities.

A more ambitious opportunity for the sector here would be for a body with the independence and credentials similar to those of the Rail Alliance to host the rail sector’s innovation initiatives knowledge base, incorporating its own learnings plus broader learnings from all rail

innovation initiatives. This also needs to be set in the constraints I believe exist for the UKRRIN hub aspirations which are covered later in the chapter.

8.3.4 RAIL ALLIANCE INNOVATION PROGRAMME OPTIONEERING

In response to this challenge the Rail Alliance looked at ways to exploit its ‘cumulative competency’ and began to explore and assess ways to stimulate and nurture the four conditions (ACUMEN, DIALOGUE, DISCOVERY and ADOPTION) essential to encouraging and enabling the uptake and embedding of innovation in rail.

The options for each are assessed below in respect of the four conditions, and are discussed in terms of their pros and cons.

ACUMEN

Options for increasing levels of supplier and buyer ACUMEN.

Here, acumen is defined as the practical demonstration of the supplier’s sector knowledge, of its buyer and product knowledge and capability to help stimulate and nurture buyer appeal for the supplier’s novel, ingenious or innovative solutions; concomitant with this is the buyer’s ability to proactively nurture high-trust supply chain relationships.

OPTION 1

Strengthen the Rail Alliance supplier networking events, adding a deeper and more contextual layer of knowledge captured from a wealth of activities with suppliers and buyers, and packaging and sharing this with suppliers and invited buyers to develop their individual and collective acumen.

Table 5 – Acumen Option 1

| Strengths | Weaknesses |
|--|---|
| Networking events are well attended by a representative supplier and buyer community | Current networking focus is intelligence associated with exploring known buyer opportunities |
| There is high likelihood of supplier and buyer participation in knowledge capture/sharing | The subject matter (sector, buyer opportunities, products) is dynamic and can evolve quickly, so keeping a fresh and relevant focus will present an ongoing challenge |
| The Rail Alliance has a proven track record for developing basic levels of supplier/buyer acumen | The setup of an appropriate acumen programme would require a significant investment to stimulate, capture and package knowledge and to promote, test and refine an acumen programme |

| | |
|--|---|
| | An appropriate acumen programme would be difficult to scale and the Rail Alliance would struggle to maintain economically viability |
|--|---|

Conclusion

The Rail Alliance supplier networking events foster appropriate, ‘light touch’ relationships for capturing and sharing knowledge valuable in the pursuit of supporting innovation in the rail sector; however, such events are unsuitable for scaling up either in terms of periodicity (resource limited) or size (beyond about 50 attendees they become more bland/opaque and much harder to focus).

OPTION 2

Deliver learning material through the Rail Alliance website. Content types would include video, audio, PowerPoint and webinars to develop and strengthen ACUMEN.

Table 6 –Acumen Option 2

| Strengths | Weaknesses |
|---|--|
| There is a high likelihood of Rail Alliance member supplier participation | Current networking focus is intelligence associated with exploring known buyer opportunities. Demographic of participants and their company roles may not lead to effective engagement |
| The Rail Alliance has a proven track record for developing basic levels of supplier/buyer ACUMEN and using an online process would enable scalability | <p>The subject matter (sector, buyer opportunities and products) is dynamic and can evolve quickly, so keeping a fresh and relevant focus will present an ongoing challenge</p> <p>The setup of an appropriate ACUMEN programme would require a significant level of investment to stimulate, capture and package knowledge and to promote, test and refine</p> <p>Online delivery will be likely to generate lower level of supplier engagement</p> |

Conclusion

Would tend to be complimentary not core to enabling innovation in the rail sector. The biggest drawback is that education/learning of this nature should be contextual and based on real (live where possible) examples.

OPTION 3

Presents an evolved supplier mentoring programme. Its aim is developing ACUMEN through the targeted exploration of buyer appetite and drivers, and supplier suitability to supply novel capabilities to address buyer medium- to longer-term needs.

Table 7 – Acumen Option 3

| Strengths | Weaknesses |
|--|---|
| The current mentoring programme is credible. Designed and delivered by the Rail Alliance and sponsored by Government (BEIS) and sector (RSG) | The intimate nature of mentoring makes it difficult to scale and currently has no clear business model outside RSG/BEIS financial support |
| The current mentoring programme presents a ready-developed pool of engaged buyers and hungry suppliers | Buyer drivers for this kind of prospective dialogue (no urgent and strong commercial reason nor commitment) of this nature are limited |
| Topic of innovation within a complex rail environment is best suited to intimate dialogue | |
| Presents a good opportunity to stimulate, capture, share and test supplier acumen | |
| Presents supplier insight within a target buyer opportunity horizon (if one is available) | |
| Provides a unique insight into a buyer drives and competencies for adopting supplier novel solutions | |

Conclusion

Mentoring has proven its ability to deliver bespoke and high-quality levels of credibility in terms of supplier support for innovation, plus it puts enough pressure on the buyer community to at least discuss the viability of early and low-level opportunistic engagement. The down side of this engagement with the buyer is that for some it is led by a desire to be seen to be engaging and supporting the RSG as much as it is genuinely seeking solutions. It is clearly the case that this pressure really needs to come from within a buyer organisation for anything to really stick. Engagement through the mentoring programme should be presented,

and a strong case made, for buyers to be emotionally and intellectually attached to a roadmap for innovation. It should focus as much on the value of the journey rather than merely fulfilling mentoring programme key performance indicators. Mentoring also captures (with a little questioning and analysis) the nature of the gaps within a buyer organisation, for embracing innovation.

OPTION 4

The creation of a safe online environment for stimulating, capturing and sharing of knowledge centred on genuine buyer interests, objectives and/or opportunities. The development of buyer and supplier innovation ‘visual canvases’ provides a 360° expression of buyer interests and supplier capabilities, which in my team’s experience of other highly regulated and non-regulated sectors/industries sectors such as construction and financial services is a necessity in order to gain an expansive and immersive view of the buyer/client challenge.

Table 8 – Acumen Option 4

| Strengths | Weaknesses |
|--|--|
| The Rail Alliance is a strong candidate for hosting and facilitating this online environment due to its strong and appropriate ambition, expertise and reputation for independence | The Rail Alliance has limited experience with these online collaboration environments |
| Potential to encourage early and opportunistic engagement. This will generate immediate and ongoing intelligence (value) for a buyer due to the insights generated from challenge ‘canvas’ plus supplier contribution to discussions surrounding a challenge | Requires significant investment to construct a bespoke online environment, and ensure sustainable longevity or proofing against obsolescence |
| As supplier and buyer interaction is live and focused on a genuine buyer challenge, knowledge captured and disseminated is likely current | Off-the-shelf solutions are feature-heavy and unfriendly in use |
| From the points of view of suppliers and buyers, captured and shared knowledge is portable | Relies on a high level of perceived and actual trust and integrity |

Conclusion

An online environment, supported by offline activities has proved successful in non-rail sectors. If a suitable (accessible and stripped down to the base or built up from first principles, i.e., to encourage the four innovation conditions) environment was hosted and presented to

suppliers and buyers, then this could significantly support the conditions for developing and delivering supplier and buyer ACUMEN. Human control and facilitation is key.

DIALOGUE

Options for increasing levels of supplier and buyer DIALOGUE.

The objective is to ensure that DIALOGUE between suppliers and buyers is timely, contextual, productive and results- and outcome-oriented.

OPTION 1

Place more focus on early, contextual and productive dialogue within the Rail Alliance’s supplier networking.

Table 9 – Dialogue Option 1

| Strengths | Weaknesses |
|---|---|
| Networking events are well attended by a representative supplier and buyer community | Networking events are unsuitable for encouraging intimate (sensitive) supplier dialogue between individual suppliers and buyers, beyond a basic recognition of a potential need of both communities |
| There is high likelihood of supplier and buyer participation in basic early dialogue, assuming context and expectations are set appropriately | |
| The Rail Alliance has a proven track record for encouraging dialogue between suppliers and buyers | |

Conclusion

Supporting supplier/buyer dialogue is more suited as a two-stage process. Stage 1 involves supplier/buyer awareness of the potential for early, productive dialogue. This can be achieved at and during Rail Alliance networking events. Stage 2 is delivered in a more intimate environment. Stage 2 has strong synergies with the current mentoring programme.

OPTION 2

Presents an evolved supplier mentoring programme. Its aim is to develop a secure relationship between a supplier and a buyer to encourage earlier, productive dialogue with respect to new and emerging opportunities, buyer ambitions or for suppliers to help inform buyer product and technology roadmaps.

Table 10 – Dialogue Option 2

| Strengths | Weaknesses |
|--|---|
| The current mentoring programme is credible. Designed and delivered by the Rail Alliance and sponsored by Government (BEIS) and Sector (RSG) | The intimate nature of mentoring makes it difficult to scale and has no clear business model outside RSG/BEIS financial support |
| The current mentoring programme presents a ready-developed pool of engaged buyers and ‘fit for rail’ suppliers | Buyer drivers for this kind of prospective dialogue (no urgent and strong commercial reason nor commitment) are limited |
| The topic of innovation within a complex rail environment is best suited to intimate dialogue | |
| Presents supplier insight within a target buyer opportunity horizon (where available) | |
| Provides a unique insight into a buyer’s drivers and competencies for adopting supplier novel solutions | |

Conclusion

The mentoring programme could be an effective vehicle and channel for encouraging early, contextual dialogue between suppliers and buyers. Again, the responsibility for current low levels of DIALOGUE sits with supplier’s low levels of ACUMEN and with buyers it is a combination of low levels of interest, urgency and capacity for early, productive DIALOGUE. The mentoring programme could be recalibrated to begin to identify and evolve the commonalities rather than the differences.

OPTION 3

The merits of a technology platform applying artificial intelligence and machine learning, to ‘intelligently’ (deeply and contextually) match buyer needs. This would include short-, medium- and longer-term needs, i.e., challenges, opportunities and interests, with supplier expertise and ingenuity.

Table 11– Dialogue Option 3

| Strengths | Weaknesses |
|---|---|
| In time, the platform would be capable of identifying and evidencing (to both communities) a strong context for dialogue between suppliers and buyers | A supplier search interrogates (automatically) captured data. This data will lack nuanced meaning, which would be present if described by a human representative of the supplier organisation. This could tend to hide the true supplier capability when a candidate for a buyer match. This human expression is fundamental to developing a concept, design or solution that fully embraces the creative problem solving skills relevant to a buyer’s requirements |
| Due to the nature of platform automation, the barriers to diverse supplier participation are low | For most people, this platform presents an unnatural and uncertain environment, and does not encourage a response as a real-world meeting would. There is good reason for this. Accurate results will need many years-worth of data and a lot of supplier and buyer trust. Members of the rail buyer community that do use such a platform to inform them of candidate suppliers for early dialogue are unable to directly challenge the validity of search results |
| Supplier representation of expertise, experience, ingenuity and capacity is automatically presented | A platform of this kind would require a significant investment in terms of setup and operating costs until the results consistently present accurate matches |
| A platform of this nature is scalable | |

Conclusion

An artificial intelligence technology/platform will require considerable investment and proof before it can create enough value for suppliers and buyers. This is a chicken and egg scenario, as it will require lots of real data (from supplier and buyer activities) to prove itself. Human control and facilitation is key.

OPTION 4

A safe online environment for stimulating, capturing and sharing of knowledge centred on genuine buyer interests, objectives and/or opportunities. Applying buyer and supplier innovation ‘visual canvases’ for providing 360° expression of buyer interests plus supplier capabilities.

Table 12 – Dialogue Option 4

| Strengths | Weaknesses |
|---|---|
| The Rail Alliance is a strong candidate for hosting and facilitating this online environment due to its strong and appropriate ambition, expertise and reputation for independence | The Rail Alliance has limited experience with these online collaboration environments |
| Potential to encourage early and opportunistic engagement, as it will generate immediate and ongoing intelligence (value) for a buyer due to the insights generated from challenge ‘canvas’ plus supplier contribution to discussions surrounding a challenge | Requires significant investment to construct bespoke online environment |
| Supplier and buyer dialogue is live and focused on a genuine buyer challenge | Off-the-shelf solutions tend to be feature-heavy and unfriendly in use |

Conclusion

An online environment, such as the one proposed here provides excellent context for supplier and buyer dialogue. For instance, a buyer challenge canvas has the potential to present a very high volume of supplier points of interest. This interest is easily converted into productive dialogue through supplier questions and buyer answers to these questions.

DISCOVERY

Options for supporting the DISCOVERY of better performing solutions.

A safe and open environment for encouraging and enabling cooperative design of and support for high-value concepts representing novel methods, technologies, products or solutions.

OPTION 1

This presents an evolved supplier mentoring programme. Its aim is to encourage the development of multi-layered and multi-dimensional relationships between suppliers and buyers. This will aim to encourage the discovery of novel methods, technologies, products or solutions that demonstrate the potential to deliver better performance than existing offerings.

Table 131 – Discovery Option 1

| Strengths | Weaknesses |
|---|--|
| The current mentoring programme presents a ready-developed pool of engaged buyers and suppliers | A core aim of the relatively embryonic mentoring programme is to facilitate early and productive dialogue. Relationships between suppliers and buyers working in the mentoring programme are immature. This makes it challenging for buyers to support transparent, open and cooperative exploration of appropriate novel concepts |
| Provides a unique insight into a buyer’s drivers and competencies valuable for supporting the discovery of supplier novel solutions | The intimacy of the mentoring environment does not support creative input from a broad and diverse supplier community |

Conclusion

Mentoring seems to be less suited for the concept of DISCOVERY, and more suited to exploring and developing established or conventional relationships. Mentoring may therefore offer value to suppliers and buyers post-concept DISCOVERY, where a buyer is interested in exploring a specific concept. That said, the mentoring programme would supply valuable supplier and (especially) buyer insights that would support DISCOVERY.

OPTION 2

A safe and collaborative online environment for suppliers and buyers to discover better ways to address genuine buyer interests, objectives or opportunities (needs), applying buyer and supplier innovation ‘visual canvases’ for providing 360° expression of buyer interests plus supplier capabilities.

Table 14 – Discovery Option 2

| Strengths | Weaknesses |
|--|---|
| A visually expressive challenge canvas will encourage supplier ingenuity and help trigger the discovery of new connections and ideas to address the buyer objectives at the core of the challenge | Management, governance and administration of an appropriate collaboration environment would require effective and bespoke processes and methods |
| Such a scalable environment will permit and manage the contribution from multiple suppliers from a diverse spectrum of expertise, experience and sectors | The Rail Alliance has limited experience with online collaboration environments |
| The digital nature of the platform will present a comprehensive audit of supplier and buyer activities, valuable in encouraging trust and transparency through automatic recording of the origins of new ideas (i.e., foreground IP developed through collaboration) | Requires significant investment to construct a bespoke online environment |
| | Off-the-shelf solutions tend to be feature-heavy and unfriendly in use |

Conclusion

An online environment capable of nurturing the required conditions for innovation presents a significant opportunity for suppliers, buyers and government. Most of the ingredients required already exist in some shape or form and the challenge is therefore to identify and

bring together the most suitable components. They in turn then need to be imbued with effective practices, processes and governance to make it all work. A greater challenge is to ensure the environment maintains a positive and dynamic flow of information between users so as to deliver value (new insights through to new solutions) to suppliers and buyers throughout the development experience.

ADOPTION

A credible approach or methodology for protecting buyer/supplier interests and objectives, i.e., assessment of risk versus benefits, presented by novel technologies and products must be created and applied. This is to encourage positive engagement leading to ADOPTION.

OPTION 1

Suppliers (indirectly buyers) receive little support that encourages the ADOPTION of novel solutions. Beyond innovation funding or financing, the testing vouchers scheme stands alone in this regard. ADOPTION of novel solutions by the rail supply chain demands an immediate high level of certainty associated with performance and risk.

For the suppliers and their novel solutions, the path to ADOPTION can be extremely challenging. The three innovation conditions, ACUMEN, DIALOGUE and DISCOVERY, all play a vital part supporting and accelerating the ADOPTION of novel solutions.

Certainty is derived from assurance, which in turn is derived from a buyer's knowledge and acceptance of all plausible outcomes presented by a solution as a response to a buyer challenge.

ADOPTION is helped by identifying all plausible outcomes and, for each outcome, demonstrating a clear rationale that supports that outcome.

There currently exist no alternative methods within the sector to encourage the adoption of novel solutions versus traditional manual methods of product development.

OPTION 2

A cooperative agreement and partnership between various organisations supportive of the ADOPTION of novel solutions. During the development lifecycle of a novel solution, this development community would be encouraged to maintain solution data consistency, enabling a faster development cycle and delivering outputs more supportive of buyer assurance, certainty and ADOPTION.

Table 15 – Adoption Option 2

| Strengths | Weaknesses |
|---|---|
| Faster development path for novel supplier solutions | Requires considerable investment to develop a partnership representative of the capabilities required by a diverse range of supplier solutions and buyer requirements |
| Presents earlier, accurate data for supporting buyer decision-making and adoption | Requires genuine buyer interest in supplier novel solutions |
| Opportunity to present cost transparency to suppliers and buyers | |
| Presents a supplier and a buyer with solution provenance | |

Conclusion

The immediate and fundamental barrier to innovation in the rail sector is genuine buyer interest in supplier novel solutions. Developing a smart development community for targeting supplier novel solutions is of no value if little or no buyer interest in supplier novel solutions exists.

Fostering a smart development community based on a strong pipeline of interest in supplier novel solution is a stronger option.

OPTION 3

A safe and collaborative online environment for supporting buyer adoption of novel and better performing solutions.

Table 16 – Adoption Option 3

| Strengths | Weaknesses |
|--|---|
| Encourages early and productive dialogue between a supplier and buyer for generating genuine, contextual and informed buyer interest | Requires a trusted and competent entity to facilitate |
| Environment able to facilitate the exploration and supporting rationale of plausible outcomes associated with a novel solution | Requires significant investment to construct bespoke solution |

| | |
|--|--|
| Environment able to facilitate and respond to the contribution from a large community of suppliers | Off-the-shelf solutions tend to be feature-heavy and unfriendly in use |
| Environment able to facilitate various 'what if' scenarios | |

Conclusion

A collaborative online environment offers the potential for real advancement for the ADOPTION of supplier novel solutions within the rail supply chain. It provides a safe and secure space for encouraging open discussion and gathering enough evidence to provoke increased levels of interest and commitment from a buyer.

The challenges that need to be overcome centre on the platform itself, the significant cost to create a platform. We do not believe that existing platforms accommodate all of the features required to nurture the conditions for innovation.

8.4 PHASE 3 – FORMULA RAIL

Formula Rail is the result of a decade of observation and action in an attempt to support the greater diversity of the rail supply chain, facilitated by encouraging the four innovation conditions:



Figure 11 – Formula Rail Innovation Conditions

8.4.1 REASONING AND RATIONALE

Error! Reference source not found. illustrates Formula Rail’s potential to satisfy these four innovation conditions.

8.4.2 KEY OBJECTIVE

In early 2015 the Rail Alliance began to explore the options for defining a GB rail innovation platform and environment based on its substantial experience leading various innovation initiatives such as SMCF, TVS and ERDF/ESIF.

The proposed rail innovation platform and environment (Formula Rail) was formed by combining key Rail Alliance capabilities from the networking and mentoring programmes and supplemented these with two third-party technology platforms and services.

8.4.3 FORMULA RAIL POSITIONING

Formula Rail programmes encourage and focus supplier ingenuity to build and prove original, high-value concepts capable of addressing significant buyer problems or challenges.

Key Features of the Formula Rail platform and environment:

- A safe environment for suppliers and buyers to pursue original and better-value options to address a buyer problem or challenge;
- A challenge canvas giving a supplier an expressive, knowledge-rich, 360° interactive preview of a buyer problem or challenge;
- A powerful Q&A engine for enabling suppliers to discover the smallest detail of the buyer problem or challenge;
- A proprietary innovation methodology helps stimulate deeper and more targeted levels of supplier ingenuity and creativity;
- A private online supplier innovation canvas for capturing and sharing individual supplier thoughts, ideas, designs and proposals;
- A platform-embedded user activity audit to ensure original supplier and buyer ideas are credited to their creator;
- Formula Rail Member and Assured accreditation proves supplier ingenuity and collaboration based on actual contribution during buyer challenges;
- The world's largest innovation marketing platform for promoting supplier ideas developed on the Formula Rail platform to thousands of buyers in rail and other sectors.

A Formula Rail programme promotes early, productive supplier and buyer dialogue encouraging development of novel ideas with potential to out-perform incumbent solutions.

In terms of its positioning, the Formula Rail programme sits between feasibility and detailed design stages within a typical rail development process, e.g., the NR Governance for Railway Investment Projects process.

This positioning provides the following advantages over existing innovation development environments and processes:

- The Formula Rail platform supports a large volume (typically 30–50) of suppliers participating in a challenge;
- The staged Formula Rail innovation process encourages individual suppliers to team up with other compatible suppliers to form concept development groups;
- The Formula Rail challenge canvas is capable of expressing buyer needs as well as buyer aspirations;
- Supplier Q&A based on the buyer challenge canvas helps supplier define the boundaries or limits of a buyer’s appetite for innovation;
- The Formula Rail programme methodology challenges suppliers to continually evolve their thinking and ideas and focus on the underlying rationale.

8.4.4 FORMULA RAIL PLATFORM

Based on an analysis of options, it was clear that the online environment presented the most effective choice for supporting innovation in the rail supply chain. It was considered that the high cost and significant levels of expertise required to develop a platform capable of delivering the conditions for innovation was a challenge that could be addressed.

The route taken was to develop strategic development partnerships with two existing innovation platforms, where the Rail Alliance would provide the sector intelligence and expertise and in return the chosen platform owners would apply this intelligence and expertise to create a solution that could, in principle, stimulate the transformation of the performance of the rail sector.

Two third-party services were selected based on their ability to deliver the conditions required to encourage and enable innovation in the rail sector (described above), plus the following additional criteria:

- **IMPACT** – a platform and environment that is capable of nurturing the conditions essential to innovation. ACUMEN, DIALOGUE, DISCOVERY and ADOPTION;
- **EXPERIENCE** – a platform and environment created with the user in mind. A platform that presents a supplier, buyer and facilitator with a low level of user friction when using the platform. In simple terms, quite straightforward to use;
- **SCALABILITY** – a platform and environment that is able to quickly accommodate a practically unlimited volume of users whilst retaining an optimum user experience;

- SUPPORT – an organisation, platform and environment responsive to the needs of users and the Rail Alliance;
- ECONOMICS – an organisation offering a flexible business model, reflective of the early and exploratory stage of market penetration.

8.4.5 ONLINE INNOVATION PLATFORM

PlayTank™ (www.playtank.net) is a 'next generation' innovation management platform, founded in 2016 by Toby Farren with the goal of enabling large organisations to innovate at scale and effectively engage with their teams as well as external stakeholders.

In 2016, the Rail Alliance formed a strategic partnership with PlayTank™, and since then has developed a bespoke version of the core PlayTank™ platform to present a simple yet powerful innovation capability for rail sector buyers and suppliers. The ability to tailor an existing platform overcomes the reservations expressed above regarding the shortcomings of 'off-the-shelf solutions tending to be feature-heavy and unfriendly in use' and minimises the cost of starting from scratch.

PlayTank™ delivers two environments.

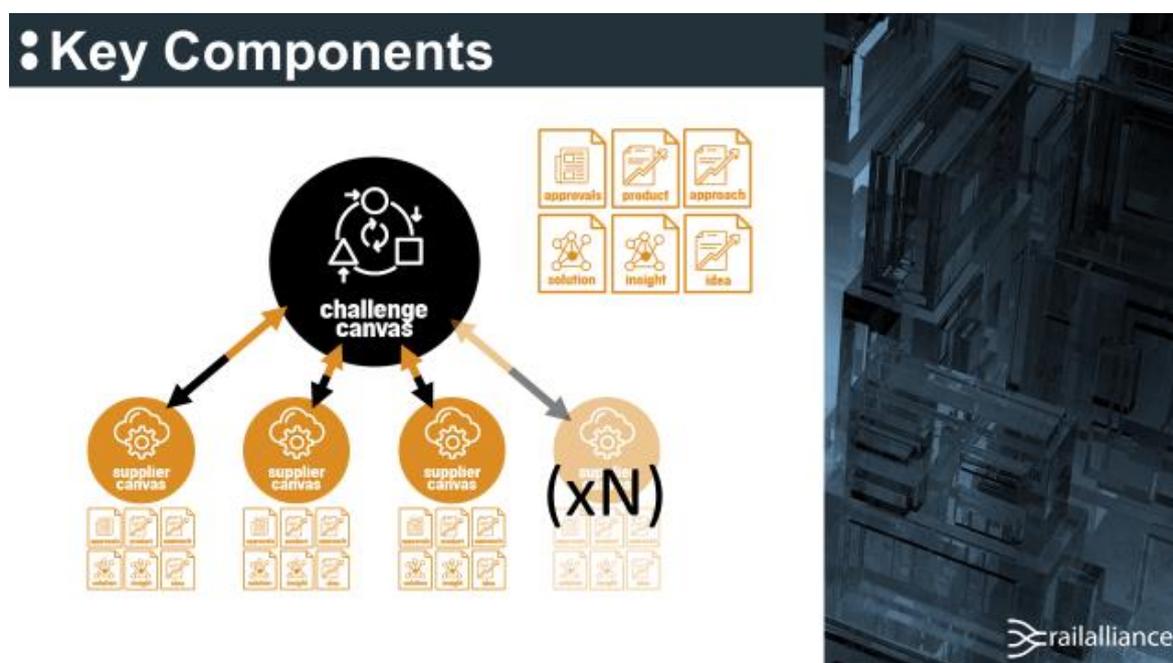


Figure 13 – PlayTank™ Key Components

The first is the client challenge canvas:

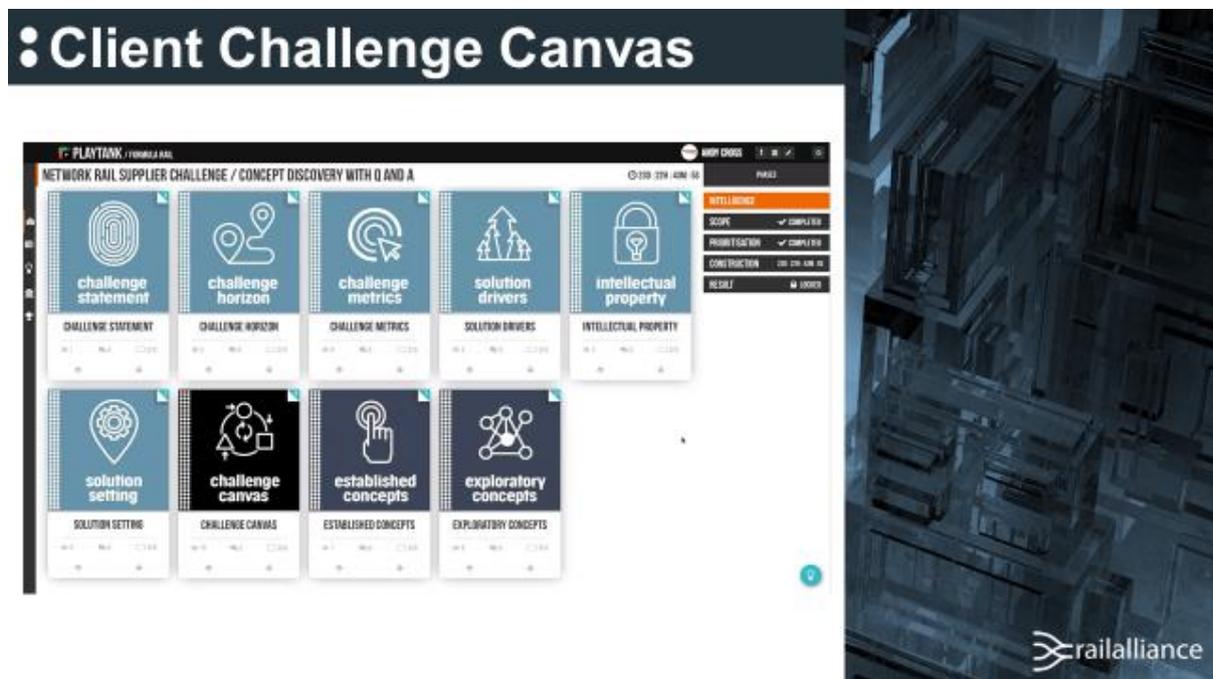


Figure 14 – PlayTank™ Client Challenge Canvas

In stage one of a Formula Rail programme, the challenge canvas is where suppliers develop their understanding of a buyer challenge through a comprehensive Q&A session. In stage three a variation of the challenge canvas is used to develop new concepts in response to a buyer challenge.

The second environment is the ingenuity or supplier canvas:

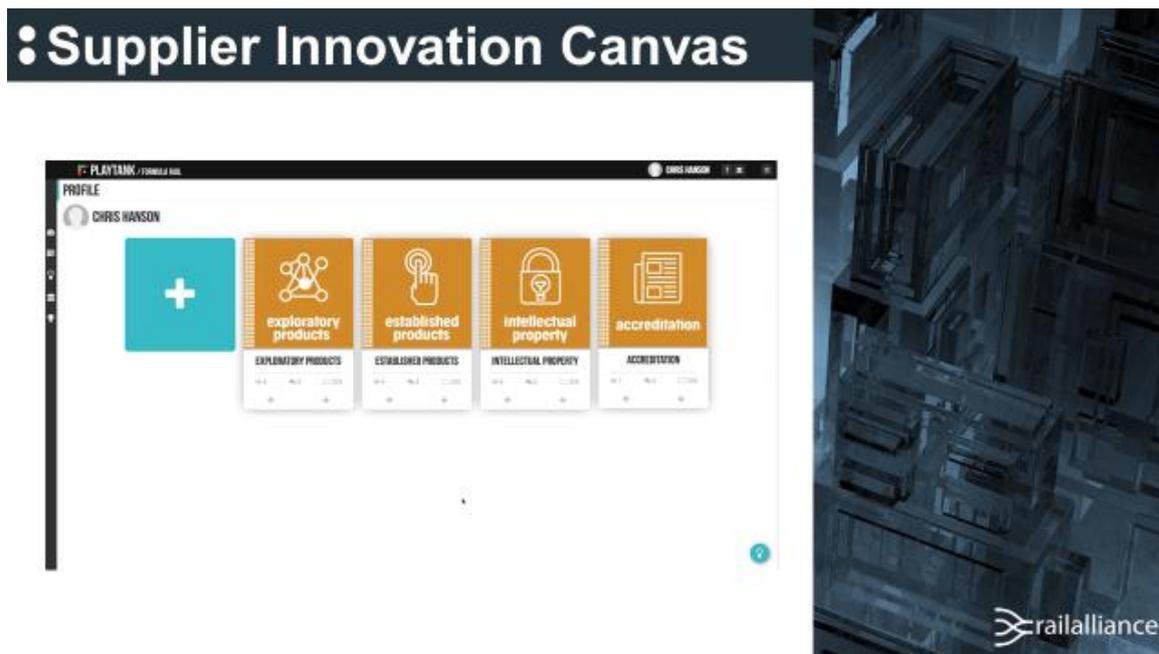


Figure 15 – PlayTank™ Supplier Innovation Canvas

This is a private, secure online space where a supplier is able to capture and share thoughts, ideas, designs and proposals that can be deployed during a buyer challenge.

8.4.6 ONLINE INNOVATION MARKETPLACE

The second third-party service is Leading Edge Only (LEO™; <https://www.leadingedgeonly.com/innovation-marketplace/communities>). LEO™ is the largest global online marketplace for innovative materials, technologies, products and services. LEO™ provides innovative companies with a channel to showcase their solution appropriate to their target market, promoting their innovation to the FTSE 100, the Fortune 1000, business partners, investors and other organisations across the globe.

In 2016 the Rail Alliance formed a strategic partnership with LEO™, and since then has developed a bespoke and exclusive rail channel within the LEO™ platform.

This presents a unique shop window for supplier concepts developed within the Formula Rail platform and environment.

The strategic partnerships with Rail Alliance, LEO™ and PlayTank™ provide a complete rail innovation ecosystem for suppliers keen to explore the opportunities within the rail sector and for buyers to work alongside innovative suppliers to identify existing better performing solutions or to encourage the creation of new ones.

8.4.7 ANALYTICS

The core Formula Rail platform (PlayTank™) presents valuable user analytics.

The data captured can express the following type of indicators:

- Supplier/buyer participation in terms of their contribution to a challenge;
- Supplier/buyer collaboration with a buyer, other participating suppliers;
- Supplier/buyer response to a question, task or challenge;
- Supplier/buyer ingenuity/originality in terms of their contribution to a challenge.

We are confident that the data available through the PlayTank™ platform will permit us to create meaningful and accurate measures that represent and express the indicators above. Perhaps for the first time (admittedly in a managed environment), the platform will capture real innovation and ingenuity.

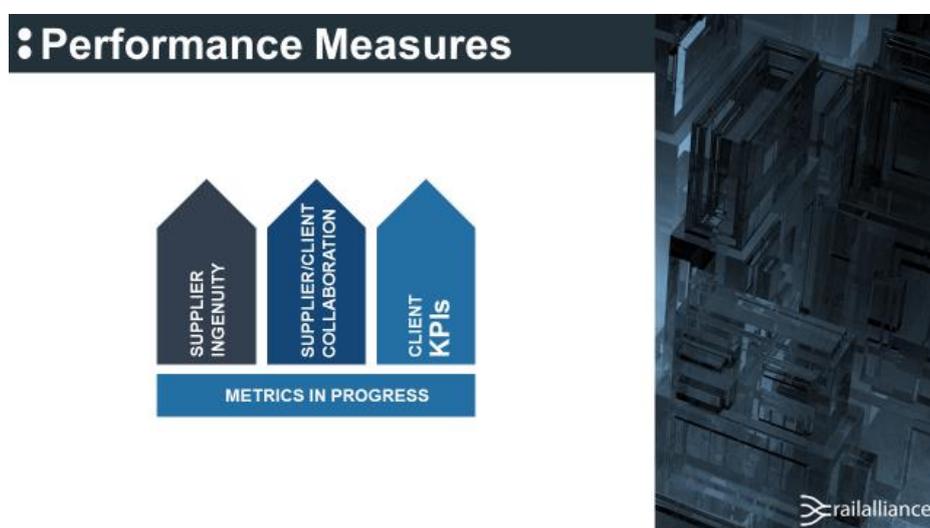


Figure 12 – Formula Rail Performance Measures

Collaboration has been a dynamic label for team performance for many years and its value a key aspect of the work of the McNulty study teams, especially in relation to devolved decision-making (DfT/ORR, 2011a, p. 47). Yet there remains no meaningful common or agreed measure of collaboration, in the same way that the Innovation Capability Maturity Model (ICMM) achieves for innovation. This is a significant inhibitor.

There are models that could be adopted such as the Lockheed Martin Skunkworks approach which typically now refers to the creation of a semi-secret (technology) collaboration space. Acting on the recommendations of the Hauser Report the UK Government enabled the creation of a series of Catapult centres across a wide range of technologies; their aim is in part to produce collaboration space for both consortia and individual bodies through access to expert impartial, business focussed, advice and technology. The Catapults with a few exceptions have an uncertain future though as they have failed to meet their funding targets and still rely on public subsidy. The BEIS sponsored review of their outputs conducted in

November 2017 (Ernst & Young, 2017) found that the Transport System Catapult along with Digital and Future Cities need remedial plans and are subsequently in danger of losing their funding. There have been attempts within the sector through RSSB competitions such as their Train Operator Competition(s) where they have attempted to create consortia bids based around collaboration but led by a TOC. These competitions have a somewhat mixed record of success and have been very slow to get to the delivery stage. The RIA UIS, again sponsored and funded by RSSB created a new space for a while, leveraging RIA's top tier members to bolster a simple model of getting a wide range of people, from companies large and small into the same room, with a common goal of collaboration. It has failed to evolve though beyond its original form and has ceased beyond the original funded period.

8.4.8 HUMAN FACTORS

It became clear that although technology plays an important part of the preferred option, it is people that bring together the necessary components to create an organism rather than a machine.

One of the components required for innovation is the appropriate mind-set. A preferred innovation mind-set was explored in depth, and its principles are embedded within the Formula Rail programme facilitation, methods and governance.

8.4.9 FORMULA RAIL INTERFACING WITH GB RAIL

The Formula Rail platform and environment is built to accommodate any sector/buyer challenge whilst addressing some of the key barriers to innovation in GB rail.

It should be noted that Formula Rail is not a grandiose, top-down scheme built to solve the sector's ills, but simply an attempt to create a safe space where innovation in rail works. These Formula Rail facilitated innovation spaces evolve, expand and contract to fit the size, nature and timing of a challenge. It is an incubator and accelerator all rolled into one:

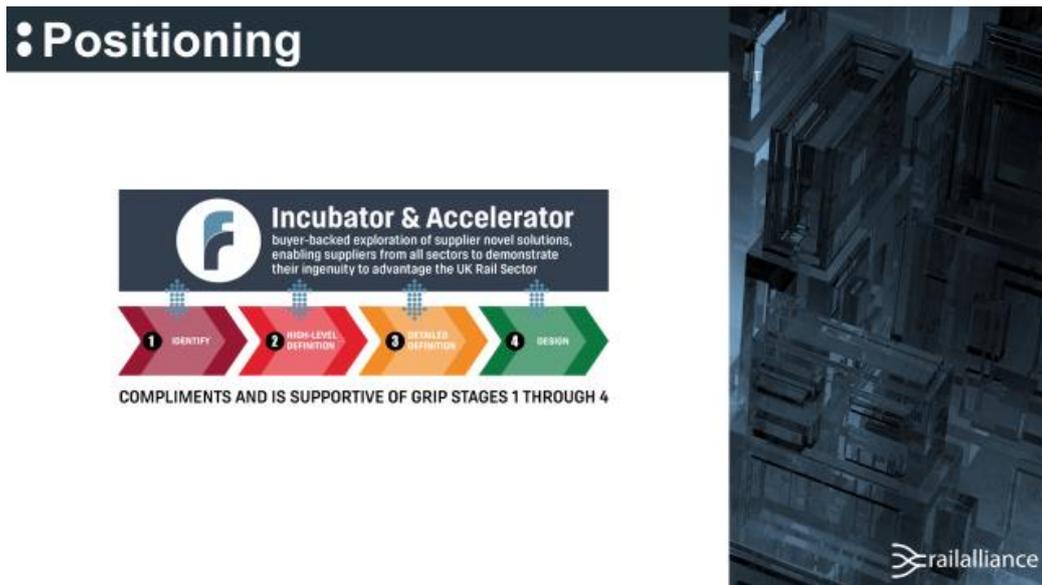


Figure 17 – Formula Rail Positioning

Importantly, Formula Rail is a vehicle that welcomes any and all organisations with a genuine interest in innovation. It is designed specifically to meet the challenge of being inclusive not exclusive.

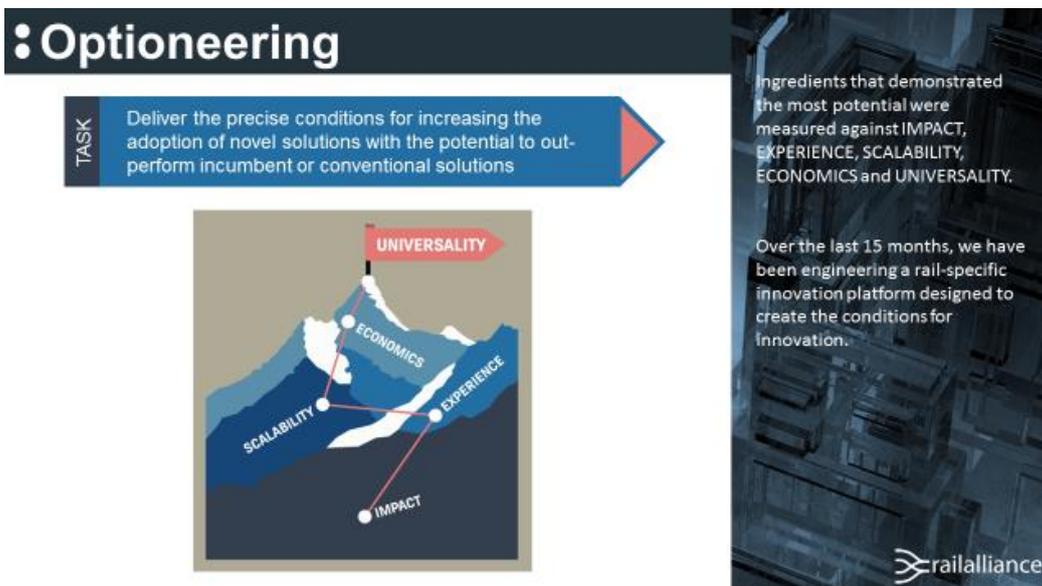


Figure 18 – Formula Rail Optioneering

Where Formula Rail can support the broader innovation agenda and challenges facing GB rail is through the production of genuine innovation experiences that demonstrate to suppliers and buyers what innovation in rail looks and feels like.

The Formula Rail platform and environment as described above can transform clever thinking into clever practical value. One example is the rail sector ICMM.

ICMM is an innovation capability assessment that targets supplier and buyer communities. Its aim is to create a greater understanding of innovation in the rail sector, what it looks like, what it can mean to an organisation and what an organisation needs to do to increase their levels of innovation. This is a fundamental outcome of the McNulty review, which recognised that GB was underperforming in terms of innovation maturity against our international peers (DfT/ORR, 2011a, p. 59). The aim is therefore to be able to measure performance at appropriate intervals and from that seek improvement.

ICMM assessment is broken down into six themes: Competitive Environment, Strategic Alignment, Internal Innovation Activities, External Innovation Activities, Organisation and Culture.

Currently, although the value of ICMM is clear to see, few suppliers are interested. The reason for most is that ICMM seems too much of an academic exercise, offering no immediate value and, it can be argued, which requires significant investment from a supplier in time and resource to make changes to improve their innovation capability.

These suppliers are more often than not entrepreneurs and innovators. Their innovation-speak is different from the innovation-speak of ICMM.

Where Formula Rail can help is by mapping a supplier ICMM assessment and its recommendations onto activities undertaken by a supplier during their participation in a Formula Rail challenge.

A supplier can then see for themselves the behaviours and activities that correspond to their particular needs contained within their ICMM improvement plan and embed the better practices within their ongoing activities within or outside Formula Rail.

8.4.10 ASSURANCE

The Rail Alliance is exploring strategic partnerships that can leverage the expertise and reputation of GB rail assurance and accreditation organisations, within the Formula Rail platform and environment. These include Achilles and the NR certification body.

In parallel to this, we propose the Formula Rail independent accreditation, 'Formula Rail Assured'.

Suppliers participating in a Formula Rail challenge are assessed in terms of their technical, creative problem solving and collaboration skills and expertise. This assessment comprises a pre-challenge capability screening capturing evidence of supplier expertise and experience that can demonstrate some affinity and relevance to a specific challenge. The second component of a supplier assessment involves measurement of supplier contribution during a

spending in the sector and in innovation this has not happened. That 20 years after privatisation and 5 years after McNulty both the TLG and ILG along with the RDG and RSG are still grappling with basic issues is further evidence of a lack of progress. In my opinion the combination of the development of the UKRRIN proposal and the uptake of Formula Rail has the ability to change this situation. The former will provide a sound platform to develop from and the latter the necessary mind-set change.

The two are linked but not interdependent. The governance structures that guide the UKRRIN will need to ensure that it does not become mired in either the potential rivalry between the primary collaborators or a hostage to the same failings that have dogged the sector since privatisation. It must avoid any pretension that it is the only source of innovation advice and assistance or that it is the only source of knowledge (acumen).

In parallel and aligned with UKRRIN, Formula Rail aims to establish a virtual and physical presence; such an entity must be characterised by an ability to receive, refine and rebroadcast challenge statements in a manner that engages the wider supply chain to the benefit of the sector and the nation. It will provide a neutral space, devoid of conflicts of interest akin to the highly acclaimed and successful Lockheed Martin Skunkworks programme. Crucially in such a highly disaggregated industrial sector, it will provide the much-needed coherence and system integration that has been lost since privatisation. When judged against the prerequisites that were so important to the McNulty review the case for a combination of Formula Rail and UKRRIN, when compared to the current situations looks like this:

Table 17 – Progress against McNulty Review Prerequisites

| McNulty “important prerequisites” | Present today? | Formula Rail | UKRRIN |
|---|-----------------------|---------------------|---------------|
| Good leadership from the top | N | Y | Y |
| Clear objectives and the right values | N | Y | ? |
| Good quality, devolved financial information | N | ? | ? |
| Culture where the status quo and previous assumptions are continually challenged | N | Y | Y |
| An organisation structure that fosters well-motivated management teams, organisational alignment and effort and the right speed of action | N | Y | Y |
| Incentives and contractual mechanisms that encourage cost reduction | ? | Y | Y |
| Implementation and focus at every level | N | Y | ? |

| | | | |
|--|---|---|---|
| Effective communications | Y | Y | ? |
| A focus on detail and making change happen | ? | Y | Y |
| Consistency of purpose over long periods | ? | Y | Y |

Y = yes; N = no data or too early to conclude; ? = debatable/not yet (DfT/ORR, 2011a, p. 35)

9 Findings and Recommendations

Through the research undertaken for this study, I have found that my hypothesis is correct and that the systemic fault lines that run through the sector can be traced to the unintended consequences of privatisation. I have not set out to analyse the rights or wrongs of the act of privatising the railway and thus am neutral on the subject. What is clear though is that the fundamental, dogmatic beliefs that triggered the Act were hopelessly flawed and the consequences are as apparent and damaging today as they were in 1993.

Conversely the hypothesis of the McNulty review is only partially true and that the overarching issue is the failure of the Tier 1/OEMs, better described as the major buyers, to recognise, encourage, nurture and embed the notion of continuous product development and innovation truly into all strata of their businesses. This failure has then led to the situation where all that is new is treated as being inherently innovative and thus presumed to be carrying high levels of uncertainty and risk.

The adoption of new technology is therefore relatively rare and piecemeal. The almost universal approach within the sector is to create ‘innovation stovepipes’ or ‘silos’ which distances anything new from business as usual (where both continuous improvement and innovation needs to be to become reality). Innovation has become a sullied, almost meaningless, word that is deployed to create an illusion of purpose when in fact it is all too often just a cynical ill-focused distraction. Crucially it is also very rare for the Tier 1/OEM community to give any financial assistance or any real support to such R&D. The culture within the sector is not one that really recognises and nurtures meaningful collaboration; in fact, “the business drivers in the GB rail industry continue to be defined in ways that are contradictory to collaborative innovation” (Atkins, 2011, p. 35).

The Rail Value for Money Study’s contention that a lack of affordable and readily available test and development facilities is a major barrier for SMEs to entering the rail sector is but one facet of this overall approach to innovation in the rail sector. In fact it hid the fact that this seminal study failed to address the failings of the supply chain and instead made assumptions that its needs and wants were being met by existing agencies such as trade associations. If their suppositions were valid, then so many years later, there would not have been any need for the formation of the RSG and the subsequent development of a sector wide Industrial Strategy/Sector Deal.

Ultimately there is a failure by government at departmental level and in the higher echelons of the railway supply chain to get to grips with the fact that the lack of a coherent route map for suppliers into the sector for even the most basic of business as usual product, goods or

service means that anything deemed innovative has little or no chance of surviving or even finding the route to market. This failing is driven by poor leadership, supply chain understanding and unresolved fragmentation.

Outside of specific stovepipes/silos the industry's actual indifference to and suspicion of any kind of innovation is degrading the indigenous supplier base. The ability to develop business cases for novel and novative products, goods and services to the point where they can gain product acceptance and approval and, hence, be adopted and purchased/procured by the major buyers, is severely limited.

If successful, the twin-pronged approach by the newly formed TLG and ILG has a chance of making a significant impact; however, recent history suggests this is by no means certain. Whether this will have any meaningful impact at Tier 2 and below within the broader supply chain remains severely in doubt. As demonstrated by the BEIS Select Committee report, the system remains loaded in favour of big business.

My work has been based on direct experience, case studies and interviews that are representative of the broader picture and illustrate the current problems, whilst also informing and encouraging a wider debate. My research leads me to make a strong case in support of the hypothesis but within the significant constraint that it is the failure to both create/map a coherent route to market and to embed innovation within business as usual that goes to the heart of the issue. The sector is a complicit prisoner of its own past and, to an extent, its own making. Although this is a reflection of human nature, this sector can do so much better and needs to create a map of its own to take forward. It does not have to accept the status quo, whether political, departmental or regulatory.

In turn, the real challenge is that the sector is so disjointed and disorganised that when it comes to product development there is in fact no such thing as a 'route to market' that has any form of universal application or coherence. The existing major suppliers/buyers within the sector have become very adept at creating an illusion of openness, unwittingly fed by the likes of the Enabling Innovation/Future Railway teams when in fact much of what they actually do, whether intended or not, is defend their own market position back in their national or home markets.

I also agree with previous commentators that there is a need for the development of a new, enhanced and empathetic understanding within the major supplier/buyer community of the needs, wants and capabilities of the indigenous GB supplier base; essentially, a major shift in culture and behaviour is required to develop an ecosystem fit for the challenges of the 21st century.

I have confirmed that the main challenge to doing business in the rail sector stems from the fragmentation fault line that was created at privatisation and has not been healed since.

I have identified that the main barriers that hinder and in some cases prevent SMEs and in particular mid-market companies entering the rail sector are the combination of a lack of coherence in the route to market and the default setting of the industry to exclude. I have analysed the underlying causes and issues;

I have established the validity of the findings of the McNulty study team in relation to supply chain development (or lack thereof) and analysed the underlying and background issues which appear to have frozen this work.

- In doing so, I have established the broad validity of the argument that there is a relationship between the incoherent adoption of elements of the McNulty review recommendations and the poor state of supply chain maturity and performance. This in turn has led to a confused and ineffective approach to innovation;
- In my view, the barrier created by the paucity of appropriate testing and trialling facilities is a symptom of a broader problem that could be addressed by the adoption of a proactive, clustering based incubator model as an integral part of the development of the UKRRIN bid when successful. The relationship between innovation and that which is merely an integral part of continuous improvement and in the rail sector has to be addressed and innovation needs to become the competitive edge of business as usual;
- The sector has become too dependent on following the patterns set by an oligopoly market but has the ability to challenge and change this model. To do so it will, however, have to adopt a different mind-set and create new more collaborative ecosystems. It lacks leadership of the quality and gravitas it deserves, a constantly recurring theme over the past 20 years. It is a sector that has forgotten its entrepreneurial roots and has become obsessed with management and procedure. It fails to inspire!
- There is a clear obsession with innovation as a panacea for all evils. It has become a much over-used word to the point that I would maintain it has become a lazy way of attempting to solve systemic underlying issues in the sector. Where it or, more precisely, ingenuity is required there is very little genuine support that will enable it to find a route to market;
- I have established suggestions for best practice in developing the capability of SMEs through the creation of a synthetic environment in the form of the Formula Rail approach to challenge-focused solutioneering in combination with the anticipated outputs of the UKRRIN.

Through my research I have also identified market failures and pinch points on the route to market in sufficient detail to enable further research to take place. I propose the establishment of a virtual and physical network of excellence and, in my conclusions, I would maintain that such an entity must be characterised by an ability to receive, refine and rebroadcast challenge statements in a manner that engages the wider supply chain to the benefit of the sector and the nation. It will provide a neutral space, devoid of conflicts of interest (commercial, academic or political) akin to the highly acclaimed and successful Lockheed Martin Skunkworks program. Crucially in such a highly disaggregated industrial sector, it will provide the much-needed coherence and system integration that has been lost since privatisation. I also have also set out the supporting philosophies and strategies that may be integral to its creation through the adoption of a Formula Rail type of approach to overcome the systemic deficiencies of the sector.

It is my recommendation that further work be completed to align the rail sector such that the inherent structural weaknesses can be overcome through the application of forward looking approaches such as that afforded by UKRRIN and Formula Rail. An important consideration in the process is the re-assessment of the background political imperatives behind the privatisation of the sector and a reduction of the inherently flawed tactical activities of Ministers and their Departments and clarification of their overarching strategic role.

To meet its true potential the modern rail sector should enjoy the same level of self-determination as Aviation, Highways and the Automotive Industry.

Word Count

There are 29,830 words between Introductions and Conclusions.

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