Chapter 16

Promoting Workforce Planning as a Means of Embedding a Learning Culture in the Rail Sector

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Abbreviations

SIM	Skills Intelligence Model
SMEs	small and medium-sized enterprises
UK	United Kingdom

16.1 How Skills Intelligence and a Workforce Planning Approach Underpin Sector Improvements

16.1.1 Overview

Governments everywhere regularly invest billions of dollars in infrastructure projects. Their successful delivery rests not only on investment in physical resources, but also relies heavily on having the right human capital in place. Governments require access to high-quality data in order to take an evidence-based approach to policy making for skills development; however, the private sector also needs to be convinced that positive returns will be forthcoming if they are to invest in people for the long term. Experience from the United Kingdom (UK) demonstrates how robust, accessible evidence of current and future skills needs informs policy and forward

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planning, helps target investment, improves the quality of education and training, and encourages dialogue and action among stakeholders.

The Skills Intelligence Model (SIM) designed by the National Skills Academy for Rail (NSAR) in the UK has galvanized the rail sector to build a focused, continuous learning and training approach to underpin its safe operation. The SIM developed a workforce planning strategy that contributes to improved productivity and profitability and helps to anticipate the impact of potential disruption—including from new technology, demographic trends, and global pandemics. Although the SIM has been applied to the rail sector, the model provides a methodology for systematically collecting, organizing, and presenting data as intelligence, then using it to help embed a lifelong learning culture with demonstrable benefits to governments, the private sector, communities, and individuals.

The chapter discusses the skills challenges facing the wider infrastructure sector highlighted by the available data; NSAR's use of its innovative SIM to undertake a thorough analysis of supply and demand in the rail sector; and detailed results of the study that have succeeded in driving a continuous learning culture within an industry, which until recently, was noted more for a short-term approach to skills development. It closes with some lessons learned and recommendations.

16.1.2 Opportunities and Challenges Facing the Infrastructure Sector

As a result of the government's ambitions to improve the UK's infrastructure, the projected demand for skills is well documented in reports such as the National Infrastructure Plan for Skills prepared by the UK HM Treasury (HM Treasury 2015), and the Department for Transport's Transport Infrastructure Skills Strategy (Department for Transport 2016). These £600 billion (\$810 billion)¹ plans to upgrade the UK's primary infrastructure over the next decade or so entail new power stations, transmission lines, rail lines, and trains; as well as upgrades to existing rail, water, telecommunications, road, and energy infrastructure.

The growth in infrastructure investment set out in the National Needs Assessment—a vision of the UK's infrastructure—created a demand for over 250,000 construction and over 150,000 engineering construction workers, driving a need to recruit and train nearly 100,000 additional workers.

Supported by strong data sets, industry agreed that skills training clearly needed to extend to and be embedded into franchise operations, procurement contracts, and supply chains. This required a complete overhaul of the way people are recruited, developed, and deployed within the sectors involved. However, for employers to buy into and participate in the proposed learning culture, they need to see the value in it and in the supporting skills programs that government has put in place.

¹Conversion rate: £1 = \$1.35 as of 15 December 2020.

16.1.3 *Economic Costs and Risks of Not Meeting the Skills Challenge*

If the construction sector (in its widest sense) does not secure the skills it needs, it will put at risk the timelines for delivering government's planned infrastructure projects. This will put pressure on costs and profit margins if the sector has to buy in the skills it needs in an already competitive market, as a result of the UK leaving the European Union.

The HM Treasury has very clear expectations of success for the projects, especially the return on investment required. Skill shortages will create delays and have a consequential effect on economic growth forecasts and confidence.

Already, there is evidence of wage inflation in rail construction, and employers as well as government want to ensure that this does not extend across more sectors—or out into the wider economy. In construction overall, wage inflation in 2008–2014 was 5% compared to 75% in rail construction (Fig. 16.1).

This is evident mismatch of skilled labor supply and demand, with insufficient training as one of the principal contributors.

16.1.4 *Industry Response and Technology*

Employers have now committed time and money to understanding the problem, analyzing the available data, developing new apprenticeships, and assessing where they can add value.

Rail, for example, has a skills delivery plan. This tackles issues such as the aging workforce, technology challenges, and the increased demand for rail use through a

Fig. 16.1 Comparison of average employee cost by business sector (%) (*Already, there is evidence of wage inflation in rail construction*). Source National Skills Academy for Rail. 2017. NSAR productivity review, 2017. London: UK Government Office for National Statistics. Unpublished

variety of measures: improvements in training and quality assurance, standards and qualifications, recruitment and retention, promotion and attraction, intelligence, and leadership and productivity.

All of the reports into future skills needs highlight the challenges created by new technology. Skill sets are changing by 40% in some cases, as digital-driven systems replace analog or mechanical ones. This is creating enormous challenges for employees and employers. But while investment in new technology is critical, there are concerns that the short-term horizons associated with projects are undermining the prospects for this investment. Employers need to have greater confidence in the future and some time to see the return on investment in skills and in new technology.

16.1.5 The Potential of Procurement to Incentivize Training

An increasing feature of the UK government's policy to drive a learning economy and society is the incentivizing of apprenticeships through the procurement process. An early attempt to formally link infrastructure procurement to skills development was in the Transport for London tube upgrade in 2007. Transport for London wanted successful contractors to engage and train specific numbers of young apprentices from particular postcodes. Other more recent examples are Crossrail, the new line across London, and the new High Speed rail program.

Much has been learned about how to mandate training with precision. Specifying a ratio-to-contract spend for example, of one apprentice per £3 million spent, is workable and, crucially, relatively easy to measure. However, there is a need to vary the ratio or have other measures such as percentage of the workforce.

The government has encouraged this paradigm shift in delivering apprenticeships through procurement. But under European Union state aid laws, they can only intervene in the market if they have evidence of skills market failure, so they need a way of producing this. Other countries are also pursuing this route: Malaysia's offset program takes an analogous approach but lacks the underpinning data. Similarly, in the People's Republic of China, the skills passport system allows the management of supply and demand, but demand is based on fairly crude ratios, which are insensitive to local markets.

The crucial role of data in underpinning and helping to formulate government skills policy is clear. But industry is primarily concerned with profit, and employers want evidence that skills development will drive productivity.

16.1.6 Productivity for Skills Development

The UK's infrastructure program is designed with a core requirement to boost productivity. The much-quoted statistic is that if the UK matched the productivity of the United States, then gross domestic product would be 31% higher. Productivity

will be one of the key measures for the sector as well as for the country. But what does the data show?

While transport and storage had returned to prerecession trends by 2013, according to annual business survey data from NSAR (National Skills Academy for Rail 2017), construction productivity has failed to do so. This might suggest that there is overcapacity in the construction sector that can respond to growing future demand (Figs. 16.2 and 16.3).

Within construction, productivity has remained broadly flat since 2005. This trend had continued up until the COVID-19 pandemic was declared in March 2020. The estimate for productivity improvements after employee costs are stripped out is 15%, which is much reduced.

Companies have historically followed fairly understandable processes to protect margins. In response to either rising costs or falling demand they initially seek to raise prices and, if this is unsuccessful (as it often is), they reduce costs accordingly cutting staff, training, and/or investment in technology and processes. In these circumstances it is much harder to argue at the Board level for investment in new technology and a for process of business transformation that would ultimately lead to lower costs. We have seen this in Asian markets too, such as the People’s Republic of China where the UK Government FCDO Prosperity Fund project offered free training but local employers were reluctant to release workers to attend. However, clear evidence that demonstrates the risk of not investing in new technology and business transformation has caused a change of mindset in the UK’s infrastructure. In summary, investing in skills is a core part of productivity, but companies often do not do it. Data has shown

Fig. 16.2 Productivity strategy (*Using pretested tools and benchmarks, the maturity of trainees was assessed against six factors, with particular focus on two or three areas for improvement*). Note A to F represent six opportunities to avoid capital cost overruns and deliver efficiencies. Source Infrastructure and Projects Authority. 2017. *Transforming infrastructure performance*. UK HM Treasury. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/664920/transforming_infrastructure_performance_web.pdf

Fig. 16.3 Productivity index for the construction sector in the United Kingdom 2000–2013 (*Productivity has remained broadly flat since 2005, and overcapacity is evident*). Note Actual versus extrapolation. *Source* National Skills Academy for Rail. 2017. *NSAR productivity review, 2017*. London: UK Government Office for National Statistics. Unpublished

that employers would rather risk wage inflation than train workers. This has been due to a short-term view of demand and workforce requirements.

COVID-19 has exacerbated the existing market failure in infrastructure at a time when the economic and political dependency on the infrastructure sector has never been greater. In spite of 15 years of government skills strategies that have identified the importance of employer training to a wider learning culture (Leitch 2006), the market for skills and training had not been producing enough skilled workers. In fact, employer investment in learning has stagnated, as employers take a short-term view and rely on economic migrants for lower-skilled roles. As a result, wage inflation in technical roles and unemployment in the indigenous workforce has set in, with whole communities left behind.

The next section identifies opportunities that a data-led approach can bring to reversing this trend.

16.2 The National Skills Academy for Rail and Its Skills Intelligence Model

The National Skills Academy for Rail is part of a network of National Skills Academies—employer-led organizations established by the UK government in 2006 to raise the quality of training provision in their sector and broker better relationships between employers and training providers (Institute for Employment Studies 2011). Part of their remit is to attract significant employer investment in skills, and design

and deliver standards, qualifications, and curricula that meet current and future sector needs.

Through workforce data, NSAR helps the rail sector to make informed decisions and target investment in resource planning. It enables the industry to increase its competitiveness by matching skills and workforce demand to training and education supply for both upskilling and apprenticeships, thus enabling rail companies to deliver a more efficient railway.

In support of its work, NSAR has developed its Skills Intelligence Model (SIM), a detailed and innovative skills forecasting tool that provides a comprehensive picture of which skills are needed now and in the future. Assured by the UK's Department of Transport, it is a statistical tool that can report both at industry and at company level in a way that is easily interpreted by end users. The information collected shows the "gap" between the requirements of the future workforce and the current workplace, allowing industry to plan ahead of time to address any gaps.

The SIM allows users to conduct scenario mapping, business modelling, and cost saving and efficiency projections. The power of the SIM is its ability to deliver intelligence that informs the industry, skills supply chain, and prospective new talent, rather than simply "data".

The SIM is the central tool used for workforce planning in prominent organizations such as the UK government, Network Rail, the offshore wind industry, and Heathrow Airport. Among infrastructure employers in the UK, workforce planning has become central to creating a learning culture to prepare for Industry 4.0, as well as the accelerated technological change brought about the COVID-19 pandemic.

16.2.1 Development of a Workforce Development Strategy Using the Skills Intelligence Model

In light of the demand for skills created by the planned investments in the UK's national infrastructure outlined above, and the burgeoning evidence of mismatch between labor supply and demand, in late 2019, NSAR conducted a comprehensive study of supply and demand in the rail supply chain in the UK. All reasonable demand scenarios were considered, and the most likely one extensively modelled. Using the SIM, a large confidential data pack was collated. The modelling showed that the supply chain lacks sufficient capability and capacity to fill the gaps—clearly a market failure. As a result, a long-term workforce training and implementation plan was prepared to resolve this.

The analysis showed that the forecasted skills shortage is certain to lead to further wage inflation especially in the rail and civil engineering supply chain (from 5.6 to 8%). The business plan for the investment expected that the economic value of the associated jobs would be £6.3 billion (\$8.3 billion, rising to over £8 billion (\$10.8 billion) if a full social mobility approach was adopted. The practical impact of this market failure would be to reduce the economic benefits by 40%, or £2.5 billion

(\$3.4 billion). This outcome would have risked the whole business case and cost projections. Planned and unplanned disruptions (Britain's exit from the European Union and the COVID-19 pandemic) exacerbated the situation. Given that the time required to train to the level required by industry (level 3 in the UK) is 3 years, a long-term plan and renewed approach was deemed necessary to address education and learning challenges in these disruptive times. In this case, the SIM planned for a period of 15 years.

16.2.2 A Socially Inclusive Plan to Deliver the Skills Required

Like many governments, the UK government is attracted to investments in less developed areas of the country, expecting that these will create both construction and operational jobs. However, the modelling done for the rail sector showed that on its own, this policy would not have the desired impact. The SIM also showed that it would be possible to grow capacity and capability in the supply chain, but it would need to be a conscious and concerted strategy. As a model, the SIM and its application to workforce planning can be applied much more widely, not just in the UK, and way beyond the rail sector.

The SIM process follows a typical sequence: preparation of a strategic workforce plan, a full statement of anticipated demand for skills and people, and mapping against supply to understand the gaps. Next a recruitment plan is drawn up outlining how many will be recruited, when, and into what roles; and identifying options for how this is to be done, e.g., by promotion, upskilling, but mostly by new recruitment. Once the who, where, and how many need to be recruited is known, a training plan is drawn up. This is in effect a guide to the training supply chain (training providers) to deliver the necessary upskilling, and notably to bring in new skills such as digital and management skills.

Public sector clients increasingly expect social value outcomes, so a social inclusion plan is also prepared—a clear and relatively simple plan to target recruitment for roles and training places from a more diverse range of backgrounds and communities. This social inclusion plan sets out practical steps for employers, such as how to work with local colleges to offer work experience programs in the industry. Procurement contracts for infrastructure projects include clauses such as a minimum 10% (up to 20%) of recruits should come from disadvantaged backgrounds. Colleges are provided with additional funding to enable them to meet demand. The preferred training model is the people-focused apprenticeship, which plans are then integrated into the wider “value for money” strategy—or what is called a “productivity plan”, referring to both quality and efficiency (see Fig. 16.2).

Investments in new technology alone do not realize value if staff and managers are not trained. Research has shown that 50% of the time, returns are not realized because of a lack of skills and/or understanding. A productivity maturity tool (see

Table 16.1) helps to create understanding, which incentivizes employers to invest in training, even when they do not see the importance of the wider learning culture and approach. An example of this in the UK composites industry (Lewis 2013) (Table 16.1).

16.2.3 *Impact of the Skills Intelligence Model and Subsequent Workforce Development Plan*

With an investment pipeline of £600 billion (\$810 billion), views were sought on how infrastructure could be delivered without major wage inflation, with strong socioeconomic benefits, and especially with maximum value to the local communities. In order to embed learning society values in industries that had

Table 16.1 Productivity maturity tool

Value	10%–20%		20%–40%+	
	5%–10%			
Timeframe (months)	0–18	18–36	36–48	48+
People	Team dynamics	Workforce levelling, training	Long-term career development	Culture change
Processes	Explicit method reuse	Documented processes	Continuous process improvement	ISO standards for continuous delivery
Designs	Design templates	Repeat building same asset	Standard assets	DfMA Asset standards
Contracts	Heavy lifting to document intent	Reuse and/or extend same framework	Small changes	Repeatable standard call-off
Technology	Project tools and templates	Automated design and reporting	Whole life asset management	Digital replicas of assets
Resourcing	Consultants, contractors, and subcontracts		Employees, trainees, and long-term supplier relationships and talent development	

A productivity maturity tool helps to incentivize employers to invest in training, even when they do not see the importance of the wider learning culture and approach
Source National Skills Academy for Rail. 2017. *NSAR productivity review, 2017*. London: UK Government Office for National Statistics. Unpublished. *Note* Design for manufacture and assembly (DfMA) is a design approach that focuses on ease of manufacture and efficiency of assembly, and is increasingly adopted for use in off-site construction

previously shown a reluctance to train, the immediate negative impact of traditional approaches needed to be demonstrated. The SIM showed a number of key choke points in demand and supply. On the assumption that it takes at least 5 years to create a meaningful increase in supply of skilled workers, it was clear that the workforce development plan needed to be implemented immediately.

To facilitate this, a committee called the Strategic Transport Apprenticeship Taskforce (STAT) was established (Strategic Transport Apprenticeship Taskforce 2017) to manage the increase in workers, and a sister committee called Transport Infrastructure Efficiency Task Force looked after the wider plan. An industrial strategy (Rail Supply Group 2016) added further value.

The STAT vision includes the following:

- (i) Create a national and regional strategic workforce plans.
- (ii) Adjust policy and regulation such that procurement can induce greater supply chain forward business confidence (possible target: 3.5 years).
- (iii) Train 5000 more local people to level 2 or level 3, using pre-apprenticeship provision to increase the proportion from disadvantaged backgrounds.
- (iv) Assertively link recruitment to these programs, incentivized through procurement.
- (v) Orient the skills supply chain to this demand, increasing capacity where required.
- (vi) Prepare and deliver a development plan for small and medium-sized enterprises (SMEs), and local skills capacity in tier 2 and 3 companies.
- (vii) Implement a transport policy that leads to government to “levelling out” demand and limiting poaching of skilled workers.

16.2.4 Lessons Learned About Strengthening Investment in Learning and Skills

The first lesson learned is about the power of comprehensive reliable data, presented in an accessible way that resonates with the skills challenges facing policy makers, the private sector, and individuals. Data gathered and presented as intelligence has the power to bring people to the table, instigate dialogue, highlight issues, and make a compelling case for action, even in sectors or organizations that have previously eschewed building a learning culture for the long term, in favor of short-term fixes to human resource problems.

The most effective route to engaging the private sector’s participation in a learning society culture is through the medium of productivity and intelligence related to this. Building on the compelling data already available, and taking this further, a workforce planning approach enables employers to see the costs, benefits, and returns for their investment. This is what NSAR did, and as a result of their analysis, for the first time in recent history, employers became convinced of the value of training and do not need to be compelled to invest in it.

An important finding from a 2-year study (National Skills Academy for Rail 2017) was that change needs a “burning platform”—change needs to become a priority at the Board level. In the more “protected” worlds of regulated infrastructure, the burning platform has often come through regulation. Economic regulation has played an important role in reducing unit costs in regulated infrastructure. Intended as a protection for consumers from monopoly commercial providers, there has been a clear focus on unit costs, with some successes and a body of good practice established. In the UK, this is particularly associated with energy and utility regulator that set the price that producers can charge within fixed time periods known as “RIIO” (revenue = incentive + innovation + outputs) The charging model includes an allowance for the training of new people to address an ageing workforce.

Economic regulation is of necessity sectoral in nature. Issues are complex, technical knowledge requirements are high, and a rich understanding of current business practices are key to effective decision making. However, the businesses that are among the most affected by regulation are often the few, large, tier 1 contractors who work across a number of regulated sectors and have common supply chains. There is a well-documented inefficiency associated with contracting and procurement uncertainty, which is that opportunity arises to “even out” demand, understand the cumulative impact of regulation, and share good practice. This requires an agency, individual, or project to look across the main sectors, and then directly influence decision making.

Where more radical changes in supply chain are required, e.g., to grow a more highly and widely skilled supply chain, other measures may also be necessary. The case of Offshore Wind is instructive. Unit costs of offshore wind power were over £150 (\$202.50) per megawatt-hour. Investment was needed to reduce these and increase local labor content and skills. The policy of “contracts for difference” was followed, where long-term contracts with price guarantees were agreed with suppliers, who in turn invested in people and technology. The price dropped to £47 (\$63.50), a point where incentives and subsidies are barely needed, and a whole new local infrastructure is in place.

While regulation and procurement may sound technical and divorced from learning, it should be acknowledged that a slew of government initiatives, reports, studies, policies, and even regulations have collectively failed to encourage employer investment in learning, where these measures are succeeding in developing and embedding the culture of a learning society.

16.3 Impact of COVID-19

Evidence from the SIM is able to show the impact that COVID-19 has had on the infrastructure sectors in the UK, which includes the accelerated use of technology, offering the prospect of greater productivity, reduced asset ratios, and more investment. Interestingly, there has been a net increase in the demand for training, as existing workers are upskilled for new technologies. Sharp declines in

employment in adjacent sectors such as aviation have led to skilled staff from those sectors seeking roles in growth infrastructure sectors, in turn requiring reskilling programs. The net effect of COVID-19 so far appears to be a positive focus on workforce planning, training, and wider productivity.

16.4 Moving Forward with Lessons Learned— Some Recommendations

Based on what has been learned, below are some recommendations to consider for a national workforce planning approach that seeks to embed a culture of learning and skills development for infrastructure sectors:

- (i) ***Develop best practice models across infrastructure and allied sectors.*** Professional approaches such as SIM-style data and workforce planning can be used to drive a longer-term view of linking continuous learning and training with improving productivity.
- (ii) ***Explore productivity deals with governments.*** This can be done by raising skill levels that are directly attributable to savings.
- (iii) ***Engage multinational companies and industry associations more actively to support SMEs.*** SMEs are the backbone of most economies and supply chains. Supporting learning links between large and small companies for skills development, for example, through learning and development, will improve their resource efficiency, reduce the impacts of disruption, strengthen value chains across the infrastructure industry, and enhance standards.
- (iv) ***Pursue sustainable supply chains.*** These will contribute to boosting business confidence, which in turn leads to investment and includes skills development.
- (v) ***Aim for liquidity of employment.*** Avoiding peaks and troughs can be through skills passports. Employers taking on someone from elsewhere in the sector need to know their capabilities and development needs and to have confidence that this assessment is sound.
- (vi) ***Enhance entry arrangements for people with technical skills.*** This is to improve the incentive for technical education and training in support of infrastructure. Possible routes include high-quality, 2-year, college-based programs aligned to apprenticeships that smooth the pathway between learning and training and jobs.
- (vii) ***Incentivize apprenticeships through procurement of infrastructure contracts.*** Linking skills development formally to infrastructure procurement will directly contribute to a learning culture at the workplace and bridge gaps between institutional and hands-on training, thereby improving the technical caliber of the workforce. Ultimately, this will drive a learning economy and society that benefits the infrastructure sector.

- (viii) ***Capitalize on sector attractiveness.*** Data can be used to understand skills gaps and create learning pathways that offer entry and progression points for learners. The use of data and evidence amplifies prospects of helping new entrants to the workforce as well as existing workers to understand job and career opportunities in the sector.
- (ix) ***Increase diversity.*** Strengthening existing industry-wide plans will require targeted and coordinated action across the industry if the pool of skilled and talented workers is to grow.
- (x) ***Emphasize leadership skills.*** Include the design and delivery of an industry-wide leadership program to enhance leadership capability at all levels, and prepare leaders both for managing the present and preparing for the future (see Department for Transport and HM Treasury 2016).
- (xi) ***Safeguard quality.*** Strengthen end-assessment verification to ensure quality of provision, adopt new high-quality standards, and observe continuous monitoring and tracking of quality.

Infrastructure projects drive economic growth and increased job opportunities. Critical investments in skills development in a lifelong learning paradigm addressing young and old workers will help to reap both economic and social benefits. Increasing adoption of digital technologies is causing skill sets to change by 40% and more, calling for more real-time attention to ongoing skills development for infrastructure projects to be completed on time and to high standards. The promotion of greater uptake of energy-efficient and climate-resilient infrastructure would need adequate talent pools and technical expertise to design, execute, and maintain projects. The need for an in-depth understanding of current and future skills requirements to inform workforce planning seems set to develop and grow. This type of knowledge is power in the context of understanding how to build and strengthen a culture of learning to serve economic sectors such as infrastructure through focused training and continuous skills development.

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