Institution: King's College London

Unit of Assessment: 17 Business and Management Studies

Title of case study: Creating human capital: Apprenticeship programmes in the UK and the US

Period when the underpinning research was undertaken: 2011 - 2018

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Dr Paul Lewis	Professor of Political Economy	From 01/09/2005
Dr Johann Fortwengel	Senior Lecturer in International Management	From 01/09/2016

Period when the claimed impact occurred: 2017 - 2020

Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact

The creation of human capital is critical both for firms to have a sustainable pipeline of talent and for individuals to achieve their full potential. Yet, for many years organisations have suffered from a skills gap, limiting their ability to flourish and restraining their employees' access to rewarding careers. Research at King's College London has investigated these challenges with a special focus on the life sciences and manufacturing sectors in the UK and the US, identifying apprenticeship training programmes as one important part of the solution. The research findings were instrumental in persuading policy-makers in the UK to create a new and unique apprenticeship programme for technicians in the life sciences and biotech sector, which is currently contributing to the manufacture of vaccines against Covid-19. Moreover, the findings influenced policy-makers and industry-level organisations in the US to support new networks to help small and medium-sized enterprises train apprentices.

2. Underpinning research

A body of research carried out at King's investigated two issues concerning contemporary apprenticeship training: the capacity of new apprenticeship programmes to meet emerging skills needs; and the benefits of cross-national exchanges of good practices to inform the implementation of apprenticeship programmes.

Addressing the emerging skills gap in the UK's life sciences sector

In response to a lack of knowledge about the skill requirements in new, emerging high-tech industries, King's research explored and identified a significant skills gap in the UK's life sciences sector [1,2]. Drawing on original empirical data, the research found that firms struggle to hire suitably qualified technicians from the external labour market, not least because the industry is too young to have developed a qualified and experienced pool of technician labour. Faced with this challenge, many firms have resorted to hiring bioscience graduates, who are available in large numbers, to fill technician roles. However, the research uncovered specific problems with this strategy: first, graduates lack the practical skills required to apply their knowledge to good effect in the workplace [1]; and second, they tend to have unrealistic expectations about their salary and the kind of work they will be doing, leading to discontent and high labour turnover [2]. To help overcome these issues, King's research highlighted the potential benefits of an apprenticeship programme. As the life sciences industry develops, apprenticeship programmes can be used to meet the increasing demand for skilled technicians.

Learning from other countries to tackle the skills gap in the US

Research at King's also revealed the potential of cross-national knowledge exchange of good practices for apprenticeship training. Drawing on the example of the transfer and diffusion of German-style apprenticeship programmes to the US, King's research has investigated the complementary roles of multinational enterprises (MNEs) and government support in enabling the successful transfer of good practices across countries. One important finding was that subsidiaries of German MNEs located in the US often team up with local colleges, which provide the theoretical

instruction, as well as with other firms to offer an apprenticeship programme collaboratively [3]. By forming inter-organisational networks, cost burdens can be shared, enabling small and medium-sized enterprises (SMEs) to afford an apprenticeship programme. While often founded by German MNEs, these networks over time integrate domestic organisations, and thereby function as a mechanism for inter-organisational learning, and for the transfer and diffusion of good training practices from Germany to the US [3].

Further in-depth research investigating inter-organisational networks for apprenticeship training was undertaken to improve knowledge about the challenges and possible solutions for collaboration [4]. One critical challenge emerging from the research is size differences across partner organisations. To overcome this issue, the research highlights the importance of adapting network rules and identifies the advantages of installing a third party to govern the network, in order to manage the tensions between firms of different size effectively. When managed carefully, inter-organisational networks for training can achieve their promise of contributing to solving the skills gap.

3. References to the research

[1] is a published research report, funded by a competitive grant and reviewed by the Gatsby Foundation. [2], [3] and [4] are published in leading journals and went through strict peer-review processes.

[1] Lewis, P. (2016). How to Create Skills for an Emerging Industry? The Case of Technician Skills and Training in Cell Therapy and Regenerative Medicine. London: The Gatsby Charitable Foundation. DOI: 10.2139/ssrn.2903909

[2] Lewis, P. (2020). Developing Technician Skills for Innovative Industries: Theory; Evidence from The UK Life Sciences Industry; and Policy Implications. *British Journal of Industrial Relations*, 58(3), 617–643 . DOI: 10.1111/bjir.12532

[3] Fortwengel, J. (2017). Practice Transfer in Organizations: The Role of Governance Mode for Internal and External Fit. *Organization Science*, 28(4), 690–710. DOI: 10.1287/orsc.2017.1135

[4] Fortwengel, J., & Sydow, J. (2020). When Many Davids Collaborate With One Goliath: How Inter-organizational Networks (Fail to) Manage Size Differentials. *British Journal of Management*, 31(2), 403–420. DOI: 10.1111/1467-8551.12313

4. Details of the impact

The UK and US are facing major challenges with skill shortages in STEM (Science, Technology, Engineering, and Mathematics) and other areas requiring technical knowledge. Business costs to UK firms are estimated at up to £6.5 billion, threatening economic growth and business competitiveness. To address this problem, King's research has helped policy-makers and businesses identify where skills shortages are and advised them on how to create and manage apprenticeship programmes in the UK and US. These findings have benefitted government departments of education and lifelong learning, industry associations that support skill investments, businesses in different industries in the two countries, as well as the apprentices taking part in the new programmes.

Developing apprenticeship training programmes in the UK life sciences sector

King's research by Lewis [1,2] identified the emerging need to train people with the right skills to fill manufacturing technician roles in the UK cell therapy industry, leading to the development of new apprenticeship training programmes. The Director of Programmes at the Gatsby Foundation, a charity one of whose goals is to promote technicians, described the immediate impact of Lewis's work as follows: *"His research was taken up by the Medicines Manufacturing Industry Partnership (MMIP) who, through Paul, approached Gatsby to discuss a possible project to address the technician issue. Gatsby met with BEIS and Innovate UK to discuss how technician skills in the sector could be supported and have agreed that Gatsby would fund a project to enable employers in the sector to collaborate on the development of an apprenticeship which would help to fill the technician skills"* [A].

In 2017, the Chief Operating Officer of the Cell and Gene Therapy Catapult Centre (the institutional 'home' for the apprenticeship) described the impact of Lewis's work as follows: *"On the basis of your work and sustained commitment, the Gatsby Foundation has agreed to fund a project that*

will enable employers in the sector to collaborate on the development of an apprenticeship training programme that will help to fill the emerging technician skills gap. […] It is highly unlikely that this would have happened without your work" [B].

More specifically, the Gatsby funding, which ran from 2017-18, enabled the Cell and Gene Therapy Catapult Centre to employ a team of educational consultants who worked with employers to develop a manufacturing technician apprenticeship scheme to fill the skills gap. The Gatsby funding was made conditional on a guarantee of further government support for the scheme. This additional funding, which came on stream in 2018, was secured through an application to Innovate UK by the MMIP, an industry-led taskforce whose goal is to ensure that the UK remains a world-class centre for advanced medicines manufacturing. The application was informed by King's research on the need for technicians [1, 2]. In the words of the MMIP Chairman, King's research *"was invaluable in understanding the scale of demand for technician roles and […] instrumental in securing interim catalytic funding from the Gatsby Charitable Foundation and ultimately £1.5 million of Innovate UK funding to support the development of the apprenticeships"* [C].

The ultimate impact of the research was that 29 apprentices, drawn from 11 advanced therapies companies, began training in 2018. This grew to 72 apprentices across 29 employers in 2019-20 and reached 100 apprentices across 32 employers in September 2020 [D]. In 2020 the programme was also extended to Scotland [E, p13], and the UK government described the apprenticeships programme as an example of *"what works"* in policy that *"UKRI will build upon"* [F, p21]. Furthermore, the UK government saw the programme as an investment that *"is already paying off – as these skillsets and techniques are capitalised in the pursuit of vaccines"* [F, p21] – a critical area of research and development as illustrated by the COVID-19 pandemic.

More widely, Lewis's research has influenced the High-Value Manufacturing Catapult to become more involved in technician training: *"there is a clear line of sight from your writing and findings about the importance of technical training and its vital relationship with successful innovation, to our current proposals to formally extend the scope and scale of the Catapult's role in workforce development"* [G]. The Welsh Government also benefitted from this work, with its Director of Skills writing that, *"your work on skills in emerging industries has informed our thinking on support for the compound semi-conductor cluster of companies in and around Newport"* [H].

Scaling up apprenticeship networks in the US

In the US, research by Fortwengel highlighting the potential of cross-national knowledge exchange of good practices for apprenticeship training [3, 4] led to the scaling up of inter-organisational networks to tackle local skills needs. The impact was achieved by improving awareness of the network solution, influencing the financial support for networks in the US and contributing to changing the practice of one prominent network. The new networks helped SMEs, which would not otherwise have the necessary financial and human resources to implement an apprenticeship programme, to engage in human capital formation.

Fortwengel actively shaped the conversation around apprenticeships, highlighting the promise of networks for effective implementation of good practices in workforce training in policy think-tank publications and outlets targeting a wider audience. His expertise led to the German Federal Ministry of Education and Research commissioning him to undertake a market demand study, which directly influenced decisions about the financial support available for the growth of existing and the creation of new apprenticeship networks. Fortwengel worked with the German American Chamber of Commerce, a critical player in the apprenticeship landscape that promotes German-style programmes. As stated by Stefanie Ziska, President and CEO of the German American Chamber of Commerce (South), the collaboration *"led to a sustained growth of our activities to form new and extend existing apprenticeship networks in the states of Georgia, Tennessee, Alabama and Texas,"* which in 2019 included 27 firms and 68 apprentices [I]. As a result, the number of inter-organisational networks managed by the German American Chamber of Commerce increased from one in 2016 to four in 2019, with three more launched in 2020 [I].

Furthermore, the market demand study led the German Federal Ministry to announce in 2020 *"two calls to financially support the creation of additional apprenticeship networks and clusters. The support will likely be around EUR500,000 over a period of three years, and it will strengthen our strategic interest to support the demand-based training of skilled workers for German and US*

companies, and might as well serve as an action-based example for US State and Federal Government(s) and their attempts to reform their apprenticeship policies" [J].

Finally, the research led to the improved governance of one prominent network in the US, the Michigan Advanced Technician Training Program (MAT^2). This network comprises 20 active firms and 55 apprentices, but *"historically, the administrative burden on the partnering firms has been quite high, causing inefficiencies and tensions"* [K]. To address this challenge, the network took up the King's research recommendations by hiring the German American Chamber of Commerce as a third-party organisation. Sophie Stepke, Training Manager of the ZF Group and chair of the strategic steering committee of MAT^2, confirmed that *"research done by Dr. Fortwengel has been influential in shaping the governance of the MAT2 network and shaped the decision to install the GACC [as an administrative organisation] in 2019…. [This decision] minimizes the resources to be spent by each individual firm on managing the network, thus lowering the barrier to entry into our apprenticeship offering"* [K].

This intervention strengthened the network's governance and had a significant impact on SMEs, which often cannot afford large investments. It also empowered individual apprentices to fulfil their potential. A testimonial from one of the graduate apprentices is illustrative: Nicholas *"had always had an aptitude for technical and hands-on tasks… but he struggled with the traditional academic setting at his previous university. Nicholas dropped out of the engineering programme and was working as a security guard"*, before opting for an apprenticeship with the network. *"Nicholas has now graduated […] and is continuing to work for the employer that sponsored his apprenticeship"* [L].

Overall, research by King's researchers has been transformative not only for government departments, industry associations and businesses in the UK and the US. It has also enabled individuals in both countries to access apprenticeship programmes, fulfilling their potential and achieving their professional aspirations.

5. Sources to corroborate the impact

[A] Testimonial from Daniel Sandford Smith, Director of Programmes at the Gatsby Charitable Foundation, 4 August 2017

[B] Testimonial from Stephen Ward, Chief Operating Officer at the Cell and Gene Therapy Catapult Centre, 2 October 2017

[C] Testimonial from Andy Evans, Chairman at the Medicines Manufacturing Industry Partnership, October 2018

[D] Cell and Gene Therapy Catapult (2020) *Annual Review 2020*

[E] Scottish Government (2020) *Life Sciences Innovation and Responding to COVID-19*. Edinburgh: Scottish Government.

[F] HM Government (2020) *UK Research and Development Roadmap*

[G] Testimonial from Ian Collier, Director of Operations at the High Value Manufacturing Catapult Centre, 5 March 2020

[H] Testimonial from Huw Morris, Director of Skills, Higher Education and Lifelong Learning, the Welsh Government, 19 November 2019

[I] Testimonial from Stefanie Ziska, President & CEO at the German American Chambers of Commerce, 4 December 2019

[J] Testimonial from Hannes Barske, Acting Head of Internationalization of Vocational Education and Training at the German Federal Ministry, 3 August 2020

[K] Testimonial from Sophie Stepke, Chair of the Strategic Steering Committee of the MAT^2 network, 31 January 2020

[L] MAT^2 Apprenticeship Programme (2020) *A second chance at a career with the MAT^2 Apprenticeship Programme*, Network website