Skills shortages: A brake on the British car industry?

Begley, J. , Collis, C. and Donnelly, T.

Original citation & hyperlink:
Begley, J. , Collis, C. and Donnelly, T. (2015) Skills shortages: A brake on the British car industry?. *Local Economy*, volume 30 (6): 593-608
http://dx.doi.org/10.1177/0269094215598112

DOI 10.1177/0269094215598112
ISSN 0269-0942
ESSN 1470-9325

Publisher: SAGE

Skills Shortages: a brake on the British car industry?

Jason Begley

Coventry University, UK

Clive Collis

Coventry University, UK

Tom Donnelly

Coventry University, UK

Abstract

In 2012 KPMG published a report outlining the successes in the growth and development of the UK automotive industry. All augured well for the future. Tucked away at the back of the report was a warning that the industry's progress could be hindered due to a serious lack of skilled labour at both the graduate and non-graduate levels. This paper seeks to explore the various reasons why this deficiency in skills has arisen. The seriousness of the problem has been recognised for many years, but it is only recently that it has been afforded the attention deserved. The discussion will focus on and evaluate government, employers and the education system's roles in this and also their attempts to alleviate the problem.

Keywords

Engineering shortages, innovation, apprenticeships, graduate skills, government policy, employers, education provision.

Corresponding Author:

Tom Donnelly, School of Business and Environment, Priory Street, Coventry CV1 5FB,

United Kingdom.

Email: Thomas.Donnelly2@coventry.ac.uk

Introduction

In the twenty-five years following the Second World War the British car industry enjoyed a considerable reputation as one of the world's leading producers with output reaching almost two million units in 1972. By the end of that decade all had changed and the industry was at times described as the 'sick man of Europe,' having fallen behind Germany and France in terms of production many years earlier (Thoms and Donnelly, 2000). Recent reports, however, produced by the Confederation of British Industry (CBI, 2013) and KPMG (2012) indicated that the UK car industry once more seemed buoyant in comparison with several of its European counterparts where production was languishing, a view confirmed by the Automotive Council (2013).

Between 2011 and 2012 UK car production rose by 15 %, compared with a fall in Germany of 3 % and a 13 % reverse in France (West, 2013). The UK sector is diverse, produces per annum circa 1.6 million cars and commercial vehicles as well as 2.5 million engines. It enjoys an annual turnover of £59 billion with £11.9 billion in net value added. In 2012 alone it contributed approximately 3 % to GDP (SMMT, 2014; CBI 2013). Featuring high in exports are the premium brands produced by JaguarLandRover, Rolls Royce and Bentley whose products are attractive to rich consumers in emerging economies such as China. At this point it also needs stressing that much of the UK's car industry is primarily foreign owned which indicates that the country is a favoured destination of choice for foreign direct investors.

Despite the upbeat tone of the authors of the above mentioned reports, there is a common caveat; what may impact adversely on future growth and development is a lack of engineering skills in the auto industry. Even more recently The Times predicted a total shortfall of circa 200,000 qualified engineers by 2017 (Bennett, 2013). In many ways this is not a new phenomenon, but is simply recognition that the car-manufacturing sector has, in recent decades, suffered difficulties in recruiting sufficient numbers of staff of the right skills and calibre to sustain the industry's growth (Leach, 2013; Leech, 2012). In essence, car manufacturing parallels the wider challenges facing British engineering/scientific industries due to mutual dependence on recruitment from the same labour pool for highly qualified graduates, technicians and apprentices.

The principal aim of this paper is to analyse the reasons for such skilled labour shortages in the automotive industry within the wider problems experienced across the engineering sector in Britain. Moreover, it is the intention here to analyse to what extent the plethora of causes for this scarcity can be ascribed to the actions of government, firms and even the education service itself. This will be achieved through exploring the respective roles of these institutions in bringing about such a situation, and then evaluating their attempts to remedy this state of affairs. In pursuing these areas, the questions will focus on emerging skills challenges facing the automotive sector that cannot be addressed by traditional apprenticeship training, a legacy of the engineering sector being locked into a low-skills equilibrium caused by a long-term failure to educate and train its workforce and so skills shortages are both a product and a cause of such failure (Finegold and Soskice, 1988).

This work draws on a range of reports from governments bodies and professional bodies, including the Society of Motor Manufacturers and Traders

(SMMT), House of Commons reports, Department of Business, Innovation and Skills (BIS), the UK Commission for Employment and Skills (UKCES) and the Automotive Council. Additionally, analysis emanates from many years of research[1] into the automotive industry which has involved a great deal of interaction with representatives across the industry, including semi-structured interviews with senior managers drawn from within the automotive sector itself including Sir Nick Scheele (former Ford World President and CEO), John Towers (Chairman of the Rover Group), Mark Foster (former Communications Director at Ford Land Rover) and Ken Giles (former Jaguar Programme Director) as examples (Donnelly, Morris and Collis, 2007).

Contextualising the Car Industry

Due to their interrelated nature, the auto industry cannot be separated out entirely from the wider engineering and metal industries, as it was from these that the sector evolved. Modern cars are no longer easily assembled mechanical instruments, but are highly complex machines that span a range of trades, disciplines and sciences, new materials, aerodynamics, computer hardware, software, electronics and "infotainment" technologies. Furthermore, the multiplier effect of car manufacturing in an economy can be enormous in terms of wealth creation, economic growth, research and development, innovation, employment generation and government revenue-raising via taxation (RAE, 2010 and 2012).

[1] Much of our long-term research is located in Thoms and Donnelly (1985; 2000) as well as Gomes, Collis, Donnelly and Morris (2010).

Today's car industry is dynamic from a skills needs perspective. The Sector Skills Council for Science, Engineering and Manufacturing Technologies (SEMTA) estimates that over 127,000 people are employed by 3000 automotive assemblers and supply chain firms within the UK. Of these, 53,000 (42 %) work in direct technical occupations (engineers, scientists and technologists) and nearly a third of these (17,000) are employed in higher-level occupations - managers, professionals and technicians (UKCES, 2013). Moreover, the struggle to recruit sufficient levels of graduates is mirrored by the fact that the automotive sector only attracts 5 % of new graduates annually, compared to 7 % for manufacturing as a whole (Automotive Council, 2013). Coming decades will doubtless witness further advances made in propulsion technologies embedded in diesel engines, hybrids, electric vehicles and hydrogen fuel cell technologies. Allied to these will be the increased use of new materials such as carbon fibres in construction not only to reduce weight, but to comply with EU health and safety regulations. Just as important will be the growing incorporation of advanced internal and external vehicle communication technologies. Indeed, for some years now much of the new technology going into vehicles is generated outside the industry, particularly in the area of telematics. This trend is set to continue and will no doubt put further pressure on the assembly and components sectors by demanding new skill sets (Donnelly, Barnes and Morris, 2005; Holweg, 2009; Automotive Council, 2013).

In essence, the industry will undergo further transformation driven by technological and restructuring imperatives as countries and firms seek to reinforce or improver2009). Such a transformation will be in tandem with the rising demands made by increasingly wealthier and information rich consumers from both advanced and emerging economies, capable of demanding more sophisticated forms of motoring to fit in with their lifestyles. While this will doubtless commence at the luxury end of the trade, it will eventually percolate down to the volume and small car segments (Kroll and Carpenter, 2007; Deloitte, Touche, Tomhatsu, 2011).

None of the above will be achieved unless management, engineers, physicists, craftsmen, assembly line workers etc. have the appropriate skills at the right level. For instance, the development of advanced and low carbon technologies will demand the integration of a range of engineering disciplines such as mechanical, electrical, electronic, materials chemical and software engineering etc., sometimes referred to collectively as 'mechatronics'. To achieve this, workforces will be required to have a much more integrated approach to production, research and development and be prepared to work in a much more interdisciplinary manner in which both codified and tacit knowledge is shared openly (Deloitte, Touche, Tomhatsu, 2009).

As a reinforcement of the above point, it has been suggested that within a short space of time carmakers in the United States may require that those working on the assembly lines have been educated to at least a two-year community college degree level (Silke-Carty, 2010).[2] Finding candidates with such qualifications will not be easy and might well be hindered by factors such as the number of engineers graduating with the appropriate qualifications, but who do not want to work in the auto industry. Consequently, they may gravitate to areas such as accountancy and finance, where, as will be shown later, because of their numerical skills, they are

[2] The approximate equivalent of an English Foundation Degree or Higher National Diploma.

increasingly sought after and offered greater financial rewards (RAE, 2010; 2011 and 2012).

Such Labour shortages can have an adverse effect on production and new investment as both existing and potential inward investors may decide not to invest in the UK auto sector and so capital may well flow elsewhere. Once such decisions have been made and, more importantly, implemented, it then becomes extremely difficult to retrieve the situation in the medium-to-long term, with adverse consequences for employment, wealth creation and tax revenue (Henry and Scholfield, 2012). From what has been written so far, it is clear that skilled labour shortages could exert an unfavourable effect on the automotive industry (and by extension on the engineering industries), posing considerable future difficulties; so it is on the original subject matter, skilled labour shortages in the car industry that the remainder of this article will concentrate.

Engineering Skills Shortages and the UK Car Industry

Skills shortages may be defined internationally where a country fails to produce a workforce with the necessary qualifications compared to its competitor nations. A second definition is where employers cannot recruit sufficient staff of the right calibre to fill vacancies or expand the work force to meet increasing demand even allowing for in-company training programmes (Keep, 2012). As Finegold and Soskice (1988) have demonstrated, the UK has a long history of skill shortages in key industries. Even as late as 2012 it was reported by the Royal Academy of Engineering (RAE) that Britain needed to produce 'tens of thousands more engineers' every year if it was to supply industry and assist in the rebalancing of the economy away from its over-dependency on banking and finance towards Hi-Tech Manufacturing (Lightfoot and Saunders 2012; RAE 2011 and 2012). This reinforced an earlier warning from SEMTA that approximately 30,000 skilled engineers needed to be added to the workforce per annum from 2010 to 2016. These engineers are required to fill the gaps that will be caused by retirees alone, as between 30-40 % of the work force was 45 years or older. Moreover, SEMTA estimated that, in total, recruitment to the entire engineering industry between 2010 and 2017 would be in the region of 587,000 skilled workers and around 100,000 new STEM (Science, Technology, Engineering and Maths) graduates per annum just to maintain the status quo; clearly, the overall position is serious (Wagner, 2010). This perhaps corroborates the proposition mooted by Finegold and Soskice (1988) that the UK has long suffered from a serious deficit in terms of manufacturing and engineering skills.

Similarly, the skills difficulties faced by UK engineering as a whole are also encountered in the car industry. Even in the boom years of the 1950s and 1960s automotive employers complained of such shortages, evidenced by the frequency of movement of skilled workers between firms in search of higher wages, especially in the Midlands where the labour market was tight (Thoms and Donnelly, 2000). With advances in technology in car design and production, as observed earlier, it is axiomatic that the skill sets demanded today have advanced significantly since the 1960s. Reinforcing this point, both Holweg (2009) and the recent Automotive Council report (2013) argue that the level and quality of current skills across the UK car industry lags behind international standards, particularly those of key competitors such as Italy, France, Germany and Spain.[3] UKCES estimates that retiring auto workers alone will generate demand for 48,000 new positions in the sector between 2010 and 2020. However, it has not been possible to quantify the precise number of shortages in the various categories of skilled workers in the automotive industry; suffice it to say that these have been experienced at all levels (UKCES, 2013). In 2012, for example, 18 per cent of UK automotive employers reported experience of skills shortages and found difficulty in filling vacancies (as will be shown later). Moreover, the workforce also has a higher age profile than the engineering sector generally, a trend more noticeable in SMEs in the supply chain than in the vehicle assemblers (UKCES, 2012a; 2012b; 2013).

One example of a UK automotive company affected by a lack of engineering graduates is supplied by Bentley Motors Ltd., a firm which designs, engineers and builds luxury cars. The company is in the top three for automotive R&D in the UK. In a submission to the Migratory Advisory Committee (as reported in Automotive Council, 2013), Bentley outlined the challenges facing the company in sourcing highly skilled engineering graduates. Due to supply shortages in the UK, the company had little alternative but to either recruit key labour from overseas or use contract labour at an increased cost. Indeed, out of the firm’s 900 fully qualified engineers, one-third were contracted. Finally, Bentley’s labour supply position will be worsened by an increasing number of employees reaching retirement age by 2020 (Automotive Council, 2013).

[3]Skills levels for the UK and its key competitors were scored as follows: UK, 2.76; France, Germany, Italy, Spain, 3.88; Central and Eastern Europe, 3.07; and Brazil, Russia, India, China, 3.07. For more detail on these figures and their computation, please see Holweg, 2009 and the Automotive Council Report, 2013.

The recruitment challenge for Bentley has brought it into direct competition with JaguarLandRover in the same scarce labour pool. While JaguarLandRover's annual investment of approximately £2.75 billion per annum (typified by the opening of a £350 million engine plant at Wolverhampton in 2014) has spurred demand for engineers, designers and technicians, it, too, has encountered critical skills shortages at all levels (Foy and Murray-Brown, 2013). The response from both Bentley and JaguarLandRover has been to entice engineering talent from Tier 1 and Tier 2 component firms, effectively moving the problems associated with skills shortages further down the supply chain[4] (Foy and Murray-Brown, 2013; Coffey and Thornley, 2003).[5]

Similar problems have been encountered by volume producers. In the North East of England, for example, there are reports of shortages of maintenance engineers, electrical engineers, software programmers and production cell managers.[6] As one Nissan manager stated:

> We have looked to produce more in the UK, but the lack of skilled engineers is a real problem. We have had to source from sister plants in Europe and look at increasing manufacturing elsewhere (Henry and Scholfield, 2012).

This observation in turn is echoed by managers in local component firms who frequently complain that Nissan attracts all the best recruits; as one of them stated '…all the good potential recruits head to Nissan and what is left is not good enough'

[4] We are grateful to our colleague Professor David Bailey of Aston University for this information.
[5] JaguarLandRover have also begun to recruit specialist staff who have been made redundant due to cuts in the British armed forces (Liautaud, A, 2014).
[6] As noted earlier, these figures cannot be disaggregated.

(Lightfoot and Saunders, 2012). Skill shortages are exacerbated through not having enough large Tier 1 suppliers based in the UK, which in turn intensifies the problem in the smaller Tier 2 and 3 suppliers who, often due to a lack of time and resources, find themselves unable to compete for appropriately skilled labour (Automotive Council, 2013).

Causes of Skills Shortages[7]

The public perception of engineering per se in the UK has long been one of ambiguity in that the term 'engineer' covers a wide range of occupations. This has a long historical pedigree. In many European countries the term 'engineer' is defined very precisely and carries a high social status, less so in the UK (Weiner, 1982). The outcome is that often highly qualified engineers are not accorded the same status as practitioners of medicine, lawyers or chartered accountants. This view is attested to by both Sir James Dyson, one of the UK's leading innovative engineers, and more pertinently by the UK's Engineering and Technology Board. They argue this lack of status may act as a deterrent to people entering the profession (Dyson, 2009; Engineering UK, 2013).

In the specific instance of the automotive sector though, there are a number of explanations offered for skill shortages that are associated with employers, government and the education establishment. To start, however, it is essential to highlight the traditional sources of skilled labour in the auto industry. Looking at

[7] Skills and training in the UK is a devolved matter and, therefore, the governments of Scotland, Northern Ireland and Wales bear responsibility for training in their respective domains. Space prohibits an extensive discussion on the Celtic nations. Therefore, the focus on the following sections concerns primarily the position in England.

higher level skills the obvious source of talent are the universities and similar institutions. Nevertheless, the numbers of domestic engineering graduates completing UK first degrees have fallen by 4.9 % between 2004 and 2010. In contrast the number of non-European students graduating from UK institutions in engineering rose by 56 % during the same period. According to the Higher Education Statistics Agency (HESA), the total percentage of non-EU students studying science degrees in the UK averaged 10.6 % of the total number, whereas in engineering and technology this figure was substantially higher at 24.3 % in 2012/13 (HESA, 2013). Such statistical data is reflected, for example, in the composition of the student intake in electrical engineering at London’s Imperial College. In 2012, 101 out of 146 entrants were from abroad, with 21 from China alone (Grove, 2012; Sandford, 2013).

The difficulty presented by the growing numbers of non-European graduates in the UK is that such potential workers after graduation are currently subject to strict visa regulations regarding employment under existing immigration policy, thereby reducing the potential supply of skilled labour (UK Visas and Immigration, 2015). This has prompted the Executive Director of JaguarLandRover, Mike Wright, to recommend an easing of the restrictions on highly skilled, non-EU students graduating from top universities with manufacturing related degrees to work in the UK (Wright, 2014).

A key problem in the recruitment of many home-based students to study engineering degrees appears to be their lack of proficiency in physics and mathematics, rendering them unsuitable for admission to higher level or degree level courses (Ashton, 2014; Lightfoot and Saunders, 2012).[8] This situation is also compounded by the fact that nine of out ten secondary school children give up sciences at the age of 16 which may in part be affected by the shortages of suitably qualified maths and physics teachers in state schools (Devlin 2014; Mills, 2013).

In contrast to the graduate route, skilled tradesmen, mechanics and maintenance engineers often came through the ranks from apprenticeship schemes. Traditionally apprentices learned their trade usually by working alongside a journeyman and perhaps taking a part-time course in either a local Technical or Further Education College (Richardson, 1972). However, the culture began to change in the 1960s with more emphasis placed on outcomes rather than time-served. New concerns came to the fore such as competences, national standards, changing work processes and the increasing pace of technological change (Evans, 2011).

Parallel to the changes in the nature of apprenticeships was a decline in their absolute numbers. For example, in 1968 the number of apprentices working in the engineering sector as a whole stood at 243,700, but fell to 139,600 by 1974 before plummeting even further to 53,000 by 1990 (Gospel, 1995). By 1994 concerns over the numbers and quality of apprenticeships prompted a government response that saw the establishment of the Modern Apprenticeships scheme. These new apprenticeships focussed on occupational competence and recognised national standards via transferable skills. The National Apprenticeship Service (NAS) stated that these changes since 1997 have led to "a major improvement in the number of apprentices and in the quality of apprenticeships", pointing to the total number of apprenticeship starts in 2010/11 which stood at 457,200 in total (BIS, 2012). In terms

[8] Often students who are admitted to higher education with relatively low grades in STEM subjects require remedial work prior to beginning their degree courses.

of engineering and manufacturing, the number of apprenticeships has risen over the last five years, but at a moderate pace, as shown in Figure 1 below.

[Insert Figure 1]

Source: House of Commons, 2015

However, despite the improved numbers of available apprentices, automotive firms are still struggling to fill vacancies, suggesting that the uptake of apprenticeships is insufficient. For example, the Employer Skills Survey 2011 and 2012 showed that 39 % of firms encountered constraints in labour recruitment. Of these firms, 7 % reported ‘hard-to-fill’ vacancies[9], 6 % had difficulty retaining staff, 17 % had employees with skills gaps and 9 % had employees with technical skills gaps (UKCES, 2013). Regardless of the popularity of these schemes there is a perception that they are considered by some to be an inferior alternative to a university qualification, even though many schemes can lead to a degree (Christian, 2014).

Compounding the above point, car industry involvement in in-house training remains below the engineering industry average; in 2013 55 % of all UK automotive establishments trained their employees compared to 59 % of engineering companies nationally (UKCES, 2013). Moreover, serious questions have been asked about the quality of automotive in-house training, with the Automotive Council reporting that in many cases the training offered is light-touch and not of sufficient quality or duration. Weaknesses in training tended to be more prominent in SMEs in the supply

[9] The Employer Skills Survey does not distinguish between the different types of ‘hard-to-fill’ vacancies etc. in the automotive sector.

chain due to financial, time and, on occasions, expertise constraints (Automotive Council, 2013; UKCES, 2012a, 2012b, 2013).

Recruitment of engineers for the auto industry at both apprentice and graduate levels may also have been affected by sectoral shifts within the economy in the 1960s and 1970s. With the growth of the financial sector, graduates with degrees in engineering have since been enticed into the banking and investment sectors where their mathematical skills are in high demand with pay being commensurate, particularly in 'The City' (RAE, 2010; 2011 and 2012). For example, starting salaries in investment banking begin at £45,000 per annum compared with an average of £27,500 in engineering and industrial firms (HFR, 2015).

Arguably, the engineering and automotive industries generally have also suffered from a gender imbalance, as traditionally few women were employed other than in administrative positions. As late as 2013, a House of Commons Committee on Business, Innovation and Skills discussed the necessity of attracting more women into these industries, lamenting that fact that in the previous year only 1200 girls enrolled on IT apprenticeships compared with over 10,000 boys. In engineering the position was worse, with only 400 girls registering compared with nearly 13,000 boys, yet 58,000 girls had embarked on relatively low paying health, social care and beauty apprenticeships (House of Commons, 2013).

One reason offered for such an imbalance was that of the total number of students taking A level physics, only 20 % were females – this has not changed in 20 years. Indeed, as noted by Dame Anne Dowling, President of the Royal Academy of Engineering, only 54 % of state schools submit girls taking A level physics (IOP, 2011). However, it was noted that in terms of examination results pro rata, girls outperformed their male counterparts (House of Commons, 2013; Bennett, 2013). Nick Hillman, Director of the Higher Education Policy Institute, believes that early gender typecasting discourages female students from taking mathematics and science subjects, arguing that too often teachers reflexively pigeonhole girls and encourage them to favour non-scientific disciplines, a problem compounded by weak, arguably stereotyped, career advice. This has led to increasing polarisation with approximately 85 % of candidates accepted on engineering or computer courses in 2014 being male, despite women outnumbering men in two-thirds of degree subjects generally (Engineering UK, 2015). In terms of the automotive industry, the paucity of female engineers working in the sector might not be helped by the industry's traditional 'macho image' (TUC and YWCA, 2012).

Remedying the situation

The issue of skills shortages in the UK automotive and engineering industries came to the fore in the 1960s prompting government, employers and trades unions to develop a broad range of responses to try to improve the situation (Evans, 2011). An early step was the establishment of Industrial Training Boards (ITBs) in the 1960s. This was followed by the 1972 Employment and Training Act which established the Manpower Services Commission (MSC), which in turn was later replaced by Training and Enterprise Councils (TECs) in 1987. During the same period the Youth Training Scheme (YTS) was introduced, involving both public and private providers. This was complemented by other initiatives such as the Technical and Vocational Education

Initiative (TVEI) which started in 1983, was expanded nationally in 1987 until it was terminated a decade later.[10]

Space precludes a detailed discussion of the above schemes. Suffice it to say that despite the plethora of initiatives, little success was achieved. The reasons for this may lie in the fact that there were simply too many such initiatives with little coherence and coordination between them in such a short space of time. Moreover, the government's belief that the market could deliver the desired objectives in training and education proved misplaced as many of the courses/training offered proved of an inadequate standard, barely reaching GCSE grades in the bands A* to C or equivalent via a National Vocational Qualification (NVQ) at level 2.[11] In essence these education and training policy initiatives did little to enhance the low esteem accorded to technical and vocational education, and may well have been more to do with social engineering to massage the youth unemployment figures than to address the real lack of manufacturing skills in a coordinated manner (Evans, 2011; Pemberton, 2001).

Originating in 1994, under John Major's Conservative government, Modern Apprenticeships (MAs) were introduced for 16-24 year olds and were designed to make industrial and vocational education more structured and formal. This was to be achieved by ensuring that both general transferable skills and specific company skills were included in training and educational programmes. The key driver was that skills could be improved and increased to a higher level on a national scale. As McIntosh

---

[10] Essentially the impact of YTS, TVEI and similar programmes was to set up the state as both the key driver and purchaser of skills training rather than the employers, which in itself is a reflection of the weak position of employers in the education system (Unwin, 2010).

[11] It has been argued that the possession of an NVQ at level 2 of itself does not necessarily mean that the owner has progressed what skills they had prior to embarking on the programme (Pemberton, 2001; Unwin, 2010).

has pointed out, one further important objective was to rehabilitate and improve the image of work-based learning and to offer an alternative way to a solid career for appropriately qualified school leavers without having to take a university degree or equivalent. The basic course on offer was of two years duration after which the student would become a qualified apprentice. Upon the successful completion of a third year, the qualification of Advanced Apprentice would be awarded (McIntosh, 2007).

Much of the thinking behind MAs was predicated on the German model of vocational education, but as Ryan and Unwin have shown, even then some of the early training was of poor quality and was broadly similar to earlier Youth Training Schemes (Ryan and Unwin, 2001). Fortunately, weaknesses were recognised and courses improved over time to an appropriate standard. In recent years with the increase in University fees, a rising number of young people have chosen to opt for the MA route and in 2011 the automotive industry was able to recruit 14,000 apprentices. Some 64 % of firms involved in the industry provided training with 58 % recruiting 16 year olds from school and 11 % from Higher Education with demand for places exceeding supply (CBI, 2013). Indeed, all of the major assemblers and manufacturers run their own internal apprenticeship courses in line with national guidelines. Ford, for instance, recruits 450 apprentices per annum on four year courses, whereas JaguarLandRover offers both four and six year courses for advanced and higher apprenticeship qualifications respectively. It should also be emphasised that since 2010 the MA scheme has been extended to older workers to allow them to train and upgrade their skills and hence their productive capacity in the industry (SMMT, 2012; CBI, 2013).

A more recent and now concurrent initiative has been the inauguration of University Technical Colleges (UTC). Engineering as a subject per se is not widely taught in English state schools. This is due partly to the lack of fully qualified mathematics and physics teachers in these establishments. Similarly, careers teachers/advisors often have little knowledge of engineering and so the subject is marginalised when discussing future careers with pupils. It was to counteract these deficiencies that UTCs have been set up to encourage 14 year old boys and girls to specialise in engineering and the sciences in general while at secondary school. In addition to mathematics and English, students focus on two science subjects drawn from engineering and from a range of other sciences, as well as studying design technology and ICT (Department of Education and Schools, 2013).

By the end of 2015 there will be 45 such colleges throughout England, with each college being sponsored by industrial firms, a university and a Further Education College. Of these UTCs, it is intended that six will work closely with automotive firms. Burton and South Derbyshire UTC in Burton-on-Trent for example, is sponsored by Coventry University, Toyota and South Derbyshire College; whereas Science UTC, Oxfordshire, will be sponsored by Oxford and Cherwell Valley College, BMW, Culham Science Centre and Rutherford Appleton Laboratory, a truly glittering array of partners (Department of Education and Schools, 2013). The most recently designated UTCs to be established that have close ties to the automotive sector include two colleges, led by Warwick Manufacturing Group (WMG) with the support of JaguarLandRover, King Automotive Systems, Prodrive, Dassault Systems and Automotive Insulation. These are based in Coventry and nearby Solihull (Reid, 2012; University of Warwick, 2012). Though in principle these two initiatives are praiseworthy, they are too recent in origin for a detailed evaluation to have been made.

To date the initial results of the UTC initiative as a whole have been mixed. The number of pupils who have availed of the opportunity to attend these colleges remains lower than anticipated with some being filled to only 30 % capacity according to Whittaker and Cooney (2014). Additionally, very few of these new schools have been subjected to inspection by the Office for Standards in Education (Ofsted), which poses difficulties in evaluating their progress to date. Of the UTCs inspected, the reports have had contrasting results. JCB Academy UTC and Aston UTC have been rated as 'Good', whereas The Black Country UTC and Hackney UTC were both deemed as 'Requires Improvement' and are currently in the process of closing down (Ofsted Reports, 2014; 2015). In the case of the Black Country UTC, for example, the decision to close was explained by falling student numbers, financial challenges, weak staffing levels and a poor inspection report (Tift, 2015). Lastly, Central Bedfordshire UTC has been ranked as 'Inadequate' and faces significant problems which need to be overcome if it is to survive (Ofsted Reports, 2015).[12]

In terms of higher education many universities have formed close relationships with automotive and related firms. Often they work independently or in consortia in joint research projects through Knowledge Transfer Partnerships (KTP) and in undergraduate and postgraduate course development to enhance both engineering and management education and skills (Higher Education Funding Council, 2013). Good examples of these are the Universities of Warwick, Coventry,

[12] Ofsted inspection reports judge the performance of schools using the following grades: Grade 1 = outstanding, Grade 2 = good, Grade 3 = requires improvement and Grade 4 = inadequate.

Loughborough and Derby with their work with JaguarLandRover, MG Rover, Ford and Rolls Royce (KPMG, 2013).

In light of the above, and in an attempt to further develop a more integrated triple helix of government, business and academia, the then Secretary of State for industry, Dr Vince Cable, announced a new initiative known as the Advanced Skills Accreditation Scheme (ASAS) in June 2012 (Etzkowitz, 1997; UKCES, 2012a). The scheme was supported by the Government's Growth and Innovation fund to boost high level engineering skills with an initial investment of £1 million. The programme is controlled by JaguarLandRover in partnership with the Universities of Warwick, Coventry and Loughborough and are open to candidates right across the automotive supply chain. It is envisaged that 2000 companies will eventually participate in the scheme with some 5000 modules being studied to Masters Level. JaguarLandRover itself envisages 3000 of its own staff taking the programme. Pronouncing on the scheme Cable noted:

> "This is the sort of innovative idea that will help address the crippling shortage of trained engineers in the UK. It is fantastic that JLR [JaguarLandRover] sees benefit not just of making itself competitive but also collaborating across the sector to help make British advanced engineering increasingly competitive… The best solutions are found when business, universities and government work together and this is an excellent example of partnership working to face future challenges." (UKCES, 2012b).

Finally, the role of the Motor Industry's Research Association (MIRA) is noteworthy. For several decades MIRA has been charged with carrying out basic R&D in the industry, but now it appears on the verge of expanding its activities by launching its own training academy and a technology park which is intended to create 2000 new jobs by 2020. The target market will be the training of MIRA's own staff, those from its growing number of clients and customers and other industry related organisations based on the site. Over 100 training courses will be offered to support the company's existing Apprentice and Graduate Development Scheme, as well as sponsoring M.Sc and Ph.D candidates carrying out advanced research. Additionally work experience placements will be offered to encourage candidates with STEM qualifications as an encouragement to enter the automotive sector (MIRA, 2014). How successful such a scheme will prove remains open to question.

Conclusion

The origins of this paper lie in the previously referred to KPMG and CBI reports on the British automotive industry which stated that skills shortages could act as a barrier to future developments in the industry. Both of these reports echo long-standing concerns within the automotive industry. It is clear that such shortages exist at all levels and processes across the industry and its accompanying supply chain. Moreover, the situation may well be aggravated by the fact that so many workers will be leaving the industry in the near-to-medium future due to retirement. This adds a degree of urgency in labour recruitment and in upgrading the skills of the remaining labour force. Indeed, with the spectre of future technological change, the introduction of new materials and methods of working, this will become an imperative.

For several decades such weaknesses have been appreciated by government and employers, leading to a number of initiatives to improve the availability and quality of skilled labour in engineering generally and within the automotive industry in particular, especially from the late 1970s. Early schemes such as YTS and TVEI, for example, proved inadequate due to structural weaknesses in the programmes before being superseded by Modern Apprenticeships and more recently by the introduction of UTCs. At the higher education levels much more emphasis is now being placed upon cooperation between universities, industry and government. This latter initiative is still in its early stages. Perhaps as indicated above greater efforts should also be made to improve the image and status of engineers by the employers themselves. Included in this, for example, more emphasis should be laid upon widening the appeal of automotive engineering so that it would also attract female applicants to improve the gender imbalance in the industry; however, this needs to begin at school level if traditional stereotyping in terms of careers guidance is to be avoided. Additionally, efforts should also be directed at government to ease non-EU overseas recruitment restrictions on university graduates with manufacturing related degrees. Lastly, perhaps the term ‘engineer’ should be defined more precisely to raise its status and bring it more in line with its usage in continental Europe.

While all of the efforts discussed here are essential and laudable in themselves, the flaw in these initiatives appears to lie in their fragmented nature, meaning that there is no single overarching body that oversees the entire automotive industry. Indeed, the impression imparted is one of a possible duplication of effort rather than one of coordination. For instance will

JaguarLandRover find itself in competition with MIRA at some point? Perhaps the time is ripe for a more dirigiste approach to automotive skills problems with consideration being given to forming a longer-term, consistent industrial policy, with both national and Local Economic Partnership (LEP) support rather than relying on ad hoc solutions possibly with the Automotive Council and its constituent bodies offering a stronger leading role in pointing towards the future.

References

Ashton, J (2014) Ann Dowling - interview: 'Engineering should be central to society'. *The Independent*. 3 November.

Automotive Council (2013) *Driving Success – a strategy for growth and sustainability in the UK automotive sector*. London, HMSO. Available at: https://www.gov.uk/government/publications/driving-success-uk-automotive-strategy-for-growth-and-sustainability

Bailey D (2013) Drivers of Change in the Global Motor Industry. *Professorial Lecture* Coventry Business School. 12 April.

Bennett R (2013) MPs call for culture change to engineer better jobs for girls. *The Times*, 20 June.

Coffey D and Thornley C, eds. (2003) Industrial and labour market policy and performance: issues and perspectives. Oxford: Routledge

Christian, D (2014) Apprenticeships offer the next generation a great way forward. *The Times*. 18 December.

Confederation of British Industry (CBI) (2011) *Full Speed Ahead: an industrial strategy for the UK automotive sector*. London, CBI. Available at: http://www.cbi.org.uk/media/2008476/cbi_full_speed_ahead.pdf

Deloitte Touche Tomhatsu (2009) *A New Era: Accelerating towards 2020: An automotive industry transformed*. London, Deloitte Global Services. Available at: http://www2.deloitte.com/content/dam/Deloitte/mx/Documents/manufacturing/a_new_era_2020_12oct09.pdf

Deloitte Touche Tomhatsu (2011) *Unplugged: Electric vehicle realities versus consumer expectations*. London, Deloitte Global Services. Available at: http://www2.deloitte.com/ch/en/pages/manufacturing/articles/unplugged-electric-vehicle-realities-vesrus-consumer-expectations.html

Department of Business, Innovations and Skills (2012) *A brief history of apprenticeships*. London, HMSO. Available at: http://www.publications.parliament.uk/pa/cm201213/cmselect/cmbis/83/8304.htm

Department of Education and schools (2013*) Information about university technical colleges (UTCs)*. London, HMSO. Available at: http://www.education.gov.uk/schools/leadership/typesofschools/technical/a00198954/utcs

Devlin, H (2014) Army of New Teachers to raise standards in maths and science. *The Times*. 8 December

Donnelly, T, Barnes, S and Morris, D (2005) From Mechanical to Electronic Platforms: the telematics revolution in the automotive industry. *International Journal of Automotive Technology and Management* 4 (1): 62-73.

Donnelly T, Barnes S and Morris D (2005) Restructuring the Automotive Industry in the English West Midlands. *Local Economy* 20 (3): 249-65.

Dyson, J (2009) Let engineers make Britain great again. *The Observer*, 8 February.

Editorial (2013) The best and The Brightest. *The Times*, 22 June.

Engineering UK (2013) The state of engineering. London, Engineering UK. Available at: http://www.engineeringuk.com/research/Engineering_UK_Report/

Engineering UK (2015) The state of engineering. London, Engineering UK. Available at: http://www.engineeringuk.com/EngineeringUK2015/EngUK_Report_2015_Interactive.pdf

Etzkowitz, H (1997) The Triple Helix: academy-industry-government relations and the growth of neo-corporatist industrial policy in the US in Campodal-Orto, S (ed) *Managing Technological Knowledge Transfer*. EC Social Sciences, COST A3 (4) Brussels: EC Directorate General Science Research Development.

Evans, R (2011) A Short History of Apprenticeships. *Technical Education Matters*. Online, Evans. Available at: http://technicaleducationmatters.org/2011/01/06/short-history-of-apprenticeships/

Finegold, D and Soskice D (1988) *The failure of training in Britain: analysis and prescription*. Oxford Review of Economic Policy, 4 (3): 21-53. DOI: 10.1093/oxrep/4.3.21

Foy, H and Murray-Brown, J (2013) JaguarLandRover's success exposes shortages in engineering skills. *Financial Times*. 13 June.

Gomes, E, Donnelly, T, Morris, D and Collis, C (2007) Improving merger process management skills over time: a comparison between the acquisition processes of Jaguar and of Land Rover by Ford. *Irish Journal of Management*. 28 (1): 31-58.

Gomes, E, Collis, C, Donnelly, T and Morris D (2010) Mergers and Acquisitions as Strategic Methods of Business Development in the Global Automotive Industry.0 Lampeter and New York, Edwin Mellen Press.

Gospel, H (1995) The decline of apprenticeship training Britain. *Industrial Relations Journal* 26 (1): 32-44.

Grove, J (2012) Spanner in the Works as Engineering Degrees lose Traction. *The Times Higher Education*. 16 November.

Henry, I and Scholfield, V (2012) *"Right skilling" the UK labour force for the automotive industry in the 21st century*. Sunderland, City Council Report.

Higher Education Funding Council (2013) *Recent History of Higher Education in England*. London, HEFCE. Available at: https://www.hefce.ac.uk/about/intro/abouthighereducationinengland/historyofheinengland/

Higher Education Statistics Agency (2013) *Students in Higher Education*, *Table F, percentage of students by mode of study and domicile*. London, HESA.

High Fliers Research [HFR] (2015) *The Graduate Market in 2015*. London, HFR.

Holweg, M (2009) *The Competitive Status of the UK Automotive industry*. Buckingham, Picsie Books.

House of Commons (2013) *Report of the House of Commons Committee on Business, Innovation and Skills*. London, HMSO.

House of Commons Library (2015) *Apprenticeship statistics*. London, HMSO. Available at: http://www.parliament.uk/business/publications/research/briefing-papers/SN06113/apprenticeship-statistics

Institute of physics [IOP] (2011) *It's Different for Girls - How can parents support the take-up of A-level physics by girls?* IOP, London. Available at: http://www.iop.org/education/teacher/support/girls_physics/file_58199.pdf

Keep E (2005) *Skill Shortages in the UK: issues, problems and ways forward*. Melbourne, Monash University. 20 September.

KPMG (2012) *Capturing Opportunity: an assessment of supply chain opportunities in the UK automotive sector*. London, Society of Motor Manufacturers and Traders (SMMT). Available at: http://www.smmt.co.uk/2012/09/capturing-opportunity-an-assessment-of-uk-automotive-supply-chain-opportunities/

Kroll, M and Carpenter, G (2007) *Car Innovation 2015: A comprehensive study on innovation in the automotive industry*. London, Oliver Wyman.

Leach, D (2013) *Full Speed ahead: An industrial strategy for the UK automotive sector*. London, CBI.

Leech, J (2012) *Capturing Opportunity: An assessment of supply chain opportunities in the UK automotive sector*. London, SMMT. Available at: http://www.smmt.co.uk/2012/09/capturing-opportunity-an-assessment-of-uk-automotive-supply-chain-opportunities/

Liautaud, A (2014) JaguarLandRover taps ex-military to combat skills shortage in UK auto industry. *Automotive News Europe*. 27 July. Available at: http://www.autonews.com/article/20140727/OEM01/307279998/jaguar-land-rover-taps-ex-military-to-combat-skills-shortage

Lightfoot, l and Saunders, J (2012) Britain loses its knack for engineering. *The Sunday Times*. 18 November.

McIntosh, S (2007) A cost-benefit analysis of apprenticeships and other vocational qualifications. Department of Education and Skills. Sheffield, University of Sheffield (and) London. Research Paper, RR834.

Mills, E (2013) She for one knows we need engineers. *The Sunday Times*. 30 June.

Motor Industry Research Association (MIRA) (2014) *Developing a smarter future*. Coventry, MIRA. Available at: http://www.miratechnologypark.com/technology-park.aspx

Office for Standards in Education (Ofsted) *School Inspection Reports: Aston UTC 2014; Black Country UTC 2014; Central Bedfordshire UTC 2014; Hackney UTC 2014; JCB Academy UTC 2014*. Ofsted, London.

Pemberton, H (2001) *The 1964 Industrial Training Act: A failed revolution*. University of Bristol, Economic History Society Annual Conference. 30 March.

Reid, L (2012) *Coventry Telegraph*. 30 May.

Richardson, KE (1972) *Twentieth Century Coventry*. Basingstoke, MacMillan.

Royal Academy of Engineering (RAE) (2010) *Engineering Graduates for industry, London*. London, RAE. Available at: http://www.raeng.org.uk/publications/reports/engineering-graduates-for-industry-report

RAE (2011) *The labour market value of STEM qualifications and occupations*. London, RAE. Available at: http://www.raeng.org.uk/publications/reports/the_labour_market_value_of_stem

RAE (2012) *Jobs and Growth: The importance of engineering skills to the UK economy*. London, RAE. Available at: http://www.raeng.org.uk/publications/reports/jobs-and-growth

Ryan, P and Unwin, L (2001) Apprenticeship in the British Training Market. *National Institute Economic Review*. 179 (99): 99-114.

Sandford, P (2014) Our Universities fall for the glitter of Foreign Gold. *Daily Telegraph*. 20 January.

Silke-Carty, S (2010) Auto industry may see labor shortage. *USA Today*. 4 June.

SMMT (2012) *Skills, apprenticeships and employment in the UK automotive industry*. London, SMMT. Available at: http://www.smmt.co.uk/wp-content/uploads/sites/2/SMMT-skills-apprenticeships-employment-in-UK-automotive.pdf

SMMT (2014) *Motor Industry Facts 2014*. London, SMMT. Available at: http://www.smmt.co.uk/wp-content/uploads/sites/2/SMMT-Motor-Industry-Facts-2014.pdf

Thoms, D and Donnelly, T (2000) *The Coventry motor industry: From birth to renaissance*. Aldershot, Ashgate.

Tift, D (2015) *Skills blow as Black Country UTC closes after just four years*. Business Desk.com, 16 April. Available at: http://www.thebusinessdesk.com/westmidlands/news/720665-skills-blow-as-black-country-utc-closes-after-just-four-years.html

Trades Union Congress and Young Women's Christian association (TUC and YWCA) (2012) *Apprenticeships and Gender: A joint TUC and YWCA Paper*. London, London

Trades Unions Congress. Available at: http://issuu.com/unionlearn/docs/apprenticeships_and_gender_tuc_form

UK Commission for Employment and Skills (UKCES) (June, 2012a) *Semta: Advanced Skills Accreditation Scheme*. London, UKCES. Available at: http://www.ukces.org.uk/ourwork/investment/portfolio/eif2-semta-advanced-skills-accreditation

UKCES (June, 2012b) *New scheme to boost skills of UK engineers*. London, UKCES. Available at: http://www.ukces.org.uk/news/articles/2012/jun/jaguar-boost-skills

UKCES (October, 2013) *Technology and Skills in the Aerospace and Automotive Industries, Evidence Report 76*. London, UKCES. Available at: http://webarchive.nationalarchives.gov.uk/20140108090250/http://www.ukces.org.uk/assets/ukces/docs/publications/evidence-report-76-aerospace-and-automotive-final-report.pdf

UK Visas and Immigration (2015) London, HMSO. Available at: https://www.gov.uk/government/organisations/uk-visas-and-immigration

University of Warwick (2012) *WMG academy for young engineers at the University of Warwick*. 29 May [Press Release]. Available at: http://www2.warwick.ac.uk/fac/sci/wmg/mediacentre/wmgnews/?newsItem=094d43d537929f8c013797b628bb471b

Unwin L (2010) *Learning and working from the MSC to New Labour: Young people, skills and employment*. London, National Institute Economic Review. 2010212 (R49-R60). Available at: http://ner.sagepub.com/content/212/1/R49

Wagner, S (2010) SEMTA Report warns of engineering skills shortages. *The Engineer*. 20 April. Available at: http://www.theengineer.co.uk/channels/skills-and-careers/news/semta-report-warns-of-engineering-skills-shortage/1001821.article

Weiner, M (2004) *English Culture and the Decline of the Industrial Spirit, 1880-1980*. Cambridge, Cambridge University Press.

West, K (2013) £1 billion injection will rev up car Industry. *The Sunday Times.* 23 June.

Whittaker, F and Cooney, R (2014*)* UTCs struggled to reach 30 percent capacity last year. *Schools Week*. 20 September. Available at: http://schoolsweek.co.uk/utcs-struggled-to-reach-30-per-cent-capacity-last-year/

Wright, M (2014) *Making the UK a globally competitive investment environment: The Wright Review of advanced manufacturing in the UK and its supply chain*. JaguarLandRover, Coventry. Available at: http://thewrightreport.net/index.html