SKILLS ISSUES IN THE ENGINEERING SECTOR IN BOURNEMOUTH, DORSET, POOLE AND SOMERSET

A report to
LSC Bournemouth, Dorset and Poole

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CONTENTS

1. Introduction

1. BMG Research has been commissioned by LSC Bournemouth, Dorset and Poole to assist the LSC to develop its policies and programmes in respect of eight local sectors. These are….

- Health
- Engineering
- Construction
- Hospitality
- Retail
- Financial services
- Childcare
- Social care

2. These sectors are regarded as current priorities for the LSC on a number of grounds. They each employ significant numbers of people in Bournemouth, Dorset, Poole, and Somerset. Several of them have significant local focus (in the sense of employing above-UK average proportions of the workforce in the local area). They have an importance to local economies which extends beyond direct employment – generating wealth externally to the local area which is 'imported' into the local area for distribution as local incomes and wages; supporting or linking with other key activities; or providing fundamental services (in house building or social welfare, for example) which are essential underpinnings of an effective society and economy. There is also significant prima facie evidence to suggest that these sub-sectors face a substantial challenge to maintain the flow of labour and skills which they need to secure an optimal level of efficiency. This is not to say, of course, that other local sectors do not have these properties. But, with limited resource, the LSC's intent is to seek progress in *some* sectors rather than dissipate resources too widely. Attention will turn to other areas of the economy in due course.

3. The essence of each study is broadly to undertake a desk review of available information on the sector which describes each local sector, recognises how the sector is developing and the challenges each sector faces, considers how this change process affects skills needs and supply, and, thus, identifies a set of 'skills issues' on which the LSC and its partners may focus with recommendations for appropriate action.

4. This report is the output of a study of the local *engineering sector*. Because of the recent re-configuration of LSC activity in the South West Region, the study, whilst originally commissioned by the local LSC for Bournemouth, Dorset and Poole, now reports and applies to the new LSC sub-region which combines *Bournemouth, Dorset, Poole and Somerset*. For convenience, we will refer to this new operating area as 'the BDPS area' in the remainder of this report.

5. The report's chapters consider:

- The structure and character of sector delivery in the BDPS area.
- Key skills and labour demand indicators.
- Skills supply into the sector.
- Skills issues and recommendations.

2. Engineering sector employment in the sub-region

Defining the sector

6. In terms of Standard Industrial Classification (SIC), the 'engineering sector' (as defined by SEMTA, the Sector Skills Council for the engineering industry) covers the SIC categories of 25.11, 25.12, and 27-35. Thus, the sector includes:

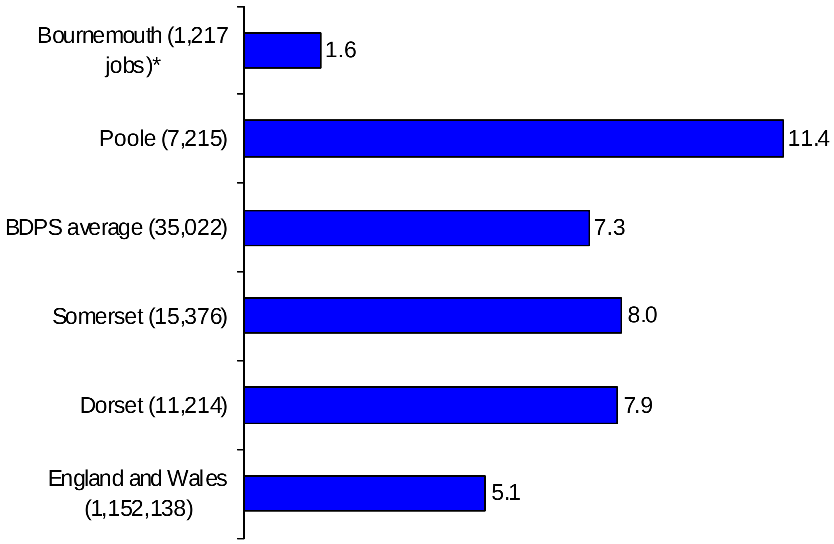
- Tyre manufacture
- Manufacture of basic metals
- Manufacture of fabricated metal products
- Manufacture of machinery and equipment
- Manufacture of electrical and electronic machinery
- Manufacture of medical, precision and optical instruments
- Manufacture of motor vehicles and parts
- Manufacture of other transport equipment, including ships and aeroplanes and their parts

Employment in the sector

7. Using this definition, one estimate (Annual Business Inquiry 2004) is that the BDPS area employs 35,022 people in 1,769 engineering establishments (excluding the small related sub-sector of metals wholesaling and scrap merchants which together employ around 500 people in the BDPS area).

8. It can be seen that the sector is more significant to the economy of most of the BDPS area than it is to the national economy as a whole. This is particularly the case for *Poole*, where engineering sector employment has over twice its national average share. Only in Bournemouth is engineering of only minor significance in generating employment:

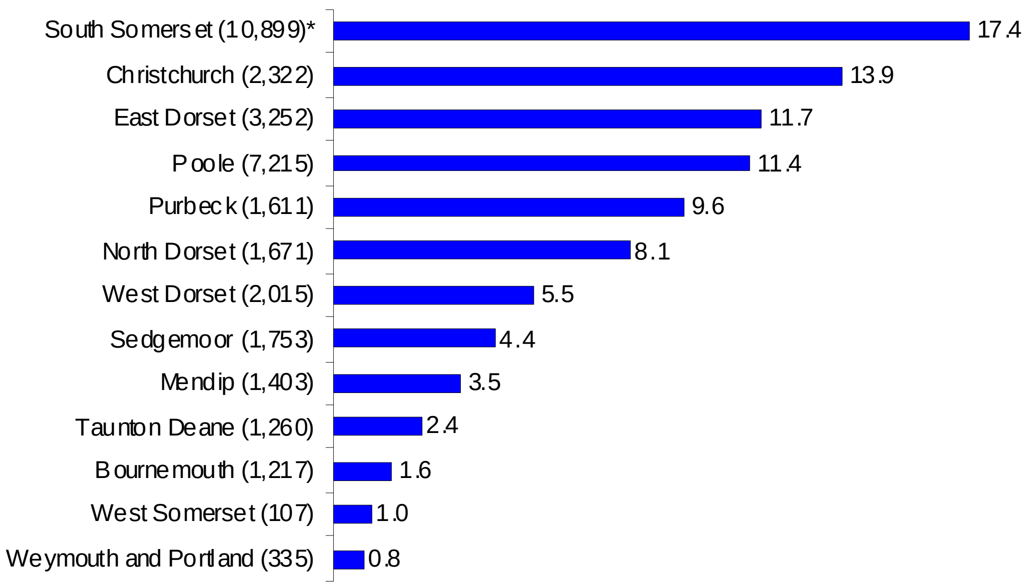
Figure 1: Percentage of all employment in each County/Unitary Authority which is in the engineering sector



Source: ABI 2004
* Actual numbers of engineering jobs in brackets

9. The percentage of engineering jobs in local economies can be seen in more detail in the following chart. It can be seen that engineering employment is concentrated in two areas of the BDPS sub-region. Firstly, in South Somerset where the Westland helicopter plant at Yeovil generates a large number of jobs. And secondly, in and around the Bournemouth/Poole conurbation where, except in Bournemouth itself, there are significant numbers of jobs in Poole, East Dorset, Christchurch and Purbeck Districts:

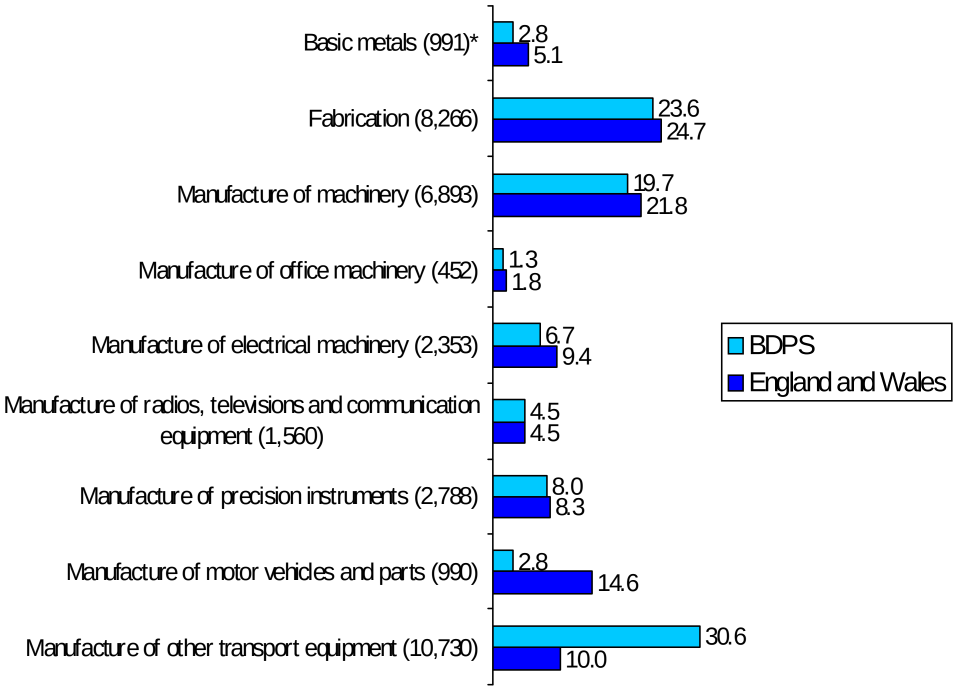
Figure 2: Percentage of all employment in each District/Unitary Authority which is in the engineering sector



Source: ABI 2004
* Actual numbers of engineering jobs in brackets

10. The local distribution of engineering employment by *sub-sector* shows a broad similarity to the national picture in several sub-sectors. However, it can be seen that the BDPS area is significantly under-represented in the motor vehicle engineering sub-sector but is, contrastingly, over-represented in 'other transport equipment', reflecting the significance of Westland Helicopters, other aerospace producers, and boat-building to the sub-region:

Figure 3: Percentage of all engineering employment in engineering sub-sectors



Source: ABI 2004

11. Given, as above, that the sector employs around thirty-five thousand people in around 1,800 establishments – an average of 20 people per establishment – it is not surprising that many engineering establishments are small – three-quarters (74%) employ 10 or less people. However, it can also be seen that the BDPS area hosts over 120 establishments employing at least 50 people and 34 establishments employing 200 or more:

Table 1: Numbers of engineering sector establishments of different sizes in the BDPS area

	1-10 employees	11-49 employees	50-199 employees	200+ employees	Total
Bournemouth	116	11	3	1	131
Dorset	514	123	37	12	686
Poole	242	69	23	9	343
Somerset	442	126	29	12	609
Total	**1,314**	**329**	**92**	**34**	**1,769**

Source: ABI 2004

12. Thus, whilst the majority of establishments are small, two-thirds of the workforce (66%) is employed in the 126 establishments employing 50 or more people whilst 42% is employed in just 34 workplaces. Somerset, with the statistics heavily influenced by Westland's operations, shows the highest concentration of jobs in large establishments:

Table 2: Employment in engineering establishments of different sizes in the BDPS area

	1-10 employees		11-49 employees		50-199 employees		200+ employees		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Bournemouth	322	26	220	18	295	24	381	31	1,218	100
Dorset	1,684	15	2,852	25	3,082	27	3,596	32	11,214	100
Poole	872	12	1,516	21	2,226	31	2,601	36	7,215	100
Somerset	1,629	11	2,988	19	2,802	18	7,957	52	15,376	100
Total	**4,507**	**13**	**7,576**	**22**	**8,405**	**24**	**14,535**	**42**	**35,023**	**100**

Source: ABI 2004
Note: Percentages add horizontally

Other employment characteristics

13. Employment is strongly biased towards male employees. 82% of the workforce (28,600 people) is male and only 18% (6,219 people) female. The workforce is also mainly employed on full-time terms, with only 5% of the workforce (around 1,300 women and 500 men) working part-time, as against 33,200 who work full-time.

Trend in employment

14. Nationally, engineering sector employment has fallen substantially in recent years. The Annual Business Inquiry shows the loss of just over 400,000 jobs from a national total in 1998 of around one and a half million between 1998 and 2004 – a loss of 26%. All sub-sectors showed significant falls with the greatest numerical falls occurring in machinery manufacture (-91,000 jobs) and the manufacture of electrical equipment (-54,000 jobs) but with the greatest proportionate fall occurring in basic metals manufacture (-43%) with the decline of the UK steel industry.

15. Locally, the ABI shows that the sector has been much more resilient in the BDPS area. Employment actually *grew* in Bournemouth whilst job loss in the other sub-areas was much below the national average rate:

Table 3: Employment change in the engineering sector in the BDPS area, 1998-2004

	1998	2004	Actual change	Percentage change
Bournemouth	1,019	1,217	+198	+19
Dorset	12,060	11,214	-846	-7
Poole	7,812	7,215	-597	-4
Somerset	17,153	15,376	-1,777	-10
Total	**38,044**	**35,022**	**-3,022**	**-8**

Source: ABI 2004 and 1998

16. As with geography, the overall figure for change in employment conceals sub-sectoral changes on a quite marked scale (though it should be noted that the Annual Business Inquiry is not a complete census of employment and apparent changes may be exaggerated). The ABI records minor growth in the small 'basic metals' sub-sector, decline in employment in most other sub-sectors but significant growth, counter to the national trend, in the 'other transport equipment' sub-sector:

Table 4: Employment change in the engineering sector by sub-sectors in the BDPS area, 1998-2004

	1998	2004	Actual change	Percentage change
Basic metals	760	991	+231	+30
Fabrication	7,348	8,266	-918	-12
Manufacture of machinery	8,631	6,893	-1,738	-20
Manufacture of office machinery	766	452	-314	-41
Manufacture of electrical machinery	2,908	2,353	-555	-19
Manufacture of radios, TV and communication equipment	2,113	1,560	-553	-26
Manufacture of precision instruments	4,703	2,788	-1,915	-41
Manufacture of motor vehicles and parts	1,198	990	-208	-17
Manufacture of other transport equipment	9,615	10,730	+1,115	+12
Total	**38,044**	**35,022**	**-3,022**	**-8**

Source: ABI 2004 and 1998

Future employment in the sector

17. Against a background of declining employment in recent years, the LSC's Working Futures forecasting model (Working Futures II, Institute for Employment

Research, Sector Skills Development Agency, 2005) suggests that employment will decline further.

18. An overall fall of 19% of employment is forecast for the BDPS area in the decade 2004 to 2014 [with a slightly faster rate of decline (23%) in Somerset than in Bournemouth, Dorset and Poole (17%)]. If this overall forecast were to prove accurate then the BDPS area would lose around 6,700 jobs from its 2004 total, to leave around 28,300 jobs by 2014.

Summary: engineering sector employment in the sub-region

19. A review of engineering sector employment in the BDPS area reveals:

- Around 35,000 people were estimated to be employed in the engineering sector in the BDPS area in 2004.
- This total was declining but not at so fast a rate as nationally. The slower rate of decline was due to the area's greater share of employment in the manufacture of 'other transport equipment' – boats and aircraft. Whilst this sub-sector declined nationally between 1998 and 2004 it did not do so as fast as some other engineering sub-sectors and in the local area it actually managed to grow.
- The forecast is that employment in the sector will continue to decline overall.
- Within the sub-region, engineering employment is particularly important to South Somerset District (Westland Helicopters at Yeovil) and in an arc around Bournemouth including Purbeck, Poole, Christchurch and East Dorset Districts. It is less important, of course, in the more rural parts of the BDPS area and in mostly non-industrial Bournemouth itself.
- The greater part of employment in the sector – around two-thirds – is concentrated in a small number of plants employing 50 or more people. There are around 30 or so plants employing 200 or more people which in total employ over 4 out of 10 of the total engineering workforce.
- Employment in the sector is strongly biased to male employment and very few people in the sector work on part-time terms – just one employee in 20 is a part-time worker.

3. Key sector drivers

Introduction

20. Before examining the skills demand and supply position for the sector in more detail, it is helpful to give a brief general description of the pressures which engineering is under and of the directions in which the sector is going.

21. This description is a national one but it can be assumed that its broad outlines apply in the BDPS area as elsewhere in the UK.

Pressures on the engineering sector

22. The sector, of course, as all others in the economy, faces a variety of challenges to its performance and prosperity. Many of these challenges are highly specific to the particular circumstances (market orientations, structure of competition, levels and types of technology employed, etc.) of individual enterprises. However, the general pressures which the sector as a whole faces, and which are likely to impact on most engineering companies in the BDPS area to some degree or other are well-known. As general background to the study, they can be summarised here.

23. Clearly, the sector has suffered significantly in recent years both at home and in respect of exports because of the strength of sterling and the competitive disadvantage this gives in pricing. Additionally, the sector faces strong competition from the Pacific Rim Countries and Eastern Europe where labour is considerably cheaper. This has led to a number of cost-reduction strategies both in work organisation and structure and in the development of products in order to be able to compete. However, employers are aware that they cannot compete solely on price and cost-reduction strategies are reinforced by strategies to increase quality, reduce wastage and increase customer satisfaction.

24. Correspondingly, global competition has led to increasing strategic alliances and mergers within the industry to achieve economies of scale and rationalisation of overheads. This effect has been particularly strong in the aerospace, automotive, shipbuilding and electronics sectors, with the knock-on effects of downsizing of sites and employment. Globalisation has profound effects on management decisions about the location of key business functions and hence the location of the requirements for particular skills. Obviously, relocation of manufacturing outside the UK has led to a reduction in the UK requirement for the associated skills. On the other hand, inward investment into the UK from foreign companies has led to occasional localised surges in skills demand.

25. Technological development brings further pressures. The engineering sector is at the forefront of technological development, both as designers and producers and also as users in the development of products and processes. Robotics and Computer Aided Engineering have automated production lines. Products of all types increasingly make use of embedded microchip and other electronics technology. Keeping pace with innovation brought about by technological development is becoming increasingly crucial to survival and leads to shorter product life cycles as well as to reduced production costs.

26. All parts of the engineering and technology sectors are affected. For example, the growth of genetics and bioscience and the development of nanotechnology has been rapid over recent years and scientists from different disciplines are required to develop corresponding new skills. The aerospace industry has seen

the greater use of electrical 'fly-by-wire' systems (in place of hydraulic and pneumatic systems), and optical fibre technologies, and electronic components.

27. Similarly, the automotive sector is subject to many technological changes, including significant dependence on electronic control systems. Alternative materials such as plastics, composites and aluminium, have been used increasingly over recent years. The changes in the use of materials and electronics has also had an effect in the mechanical equipment sector, much of which acts as suppliers to the automotive and aerospace sectors. The ship and boat building/repair sector is subject to similar changes in the increased use of electronics systems and components and in the use of new materials, the latter particularly in boat building.

28. Pressures to reduce costs and improve quality and the implementation of technological development have led and will continue to lead to changes in working practices and in the structure of companies. Thus, another major development in the automotive, aerospace, ship and boat building/repair and electronics sectors is outsourcing and devolution of responsibilities down the supply chain. Original Equipment Manufacturers (OEMs) are increasingly passing the production of components, assemblies and sub-assemblies, which in the past they manufactured in-house, to their suppliers. This has moved the locus of demand for the associated skills from the major employers to their smaller suppliers.

29. The need to control costs and increase output and efficiency has led to flatter organisational structures and shortened career ladders. In particular, the now-widespread use of team and cell working, just-in-time and lean manufacture has led to requirements for flexible skills and multi-skilling, with a reduced requirement for traditional supervisor skills, but more widespread need for team leader skills. For scientists and technologists, in particular, there is a need to develop stronger partnership working skills, such as communications and project and team management, which have not traditionally been thought of as skills needed in these occupations.

30. Apart from the generally increased requirements for Health and Safety and Environmental legislation, the key regulations affecting engineering are increasingly stringent requirements on emissions, noise reductions and the disposal and recycling of materials. Positive action has already been taken by companies to meet the requirements of ISO 14001. The climate change levy has affected the competitiveness of many firms. In the automotive and aerospace sectors, regulations have led to considerable changes and advances in engine design. Technologies are also being developed to encourage the development of safe and sustainable energy production. Throughout the sector, environmental legislation will lead to greater demand for skills in basic environmental assessment and product life cycle analysis.

31. However, whilst these broad pressures apply to the sector as a whole, it should be recognised that 'engineering' is a broad area of activity and, within it, different segments of the sector face their own pressures. Drawing on SEMTA Sector Skills Agreements analysis, these can be summarised for a number of sub-sectors, including electronics, automotive, and aerospace engineering and for boat-building.

The electronics sub-sector

32. According to the DTI, the UK electronics industry is worth approximately £23 billion a year and is now the fifth largest in the world in terms of production. The UK has maintained a leading position in the global marketplace for future

technologies due to its high skills base and strengths in research and development (R&D), design, and high value manufacturing focused on quick turnaround, low volume business. A secure culture and legal infrastructure make the UK attractive for the design and manufacture of products with high intellectual property (IP) content, especially in sensitive areas such as defence. Low skill jobs in high volume electronics manufacturing are gravitating to Eastern Europe and the Far East, impacting on assembly, fabrication and components industries, and their supply chain. These companies will have difficulty surviving over the next 2/3 years due to their high cost base, a diminishing UK market and low priced imports.

33. World semiconductor sales have returned to growth. Some 40% of European semiconductor design revenue comes from the UK and it is also home to 40% of Europe's design houses. With an overall market of US$46 billion and production of US$39 billion, the UK is first or second in nearly all electronics sectors for both market and production. Electronics manufacturing is maintaining significant activity and renewed growth is expected as electronics move up the value chain and the market improves. UK market recovery has led electronics companies to invest in emerging Systems-on-Chip (SoC) technology.

34. The UK is at the leading edge of development in 3G mobile communications with handset manufacturers and other 3G-related companies locating R&D facilities in the UK to capitalise on existing technical knowledge. Analogue radio frequency design is particularly relevant to communications applications and SoC technology.

35. The UK leads the world production of fibre optic systems and components and many advances in flat panel displays occurred in the UK.

36. The UK is a centre for global electronics development companies with major R&D or manufacturing bases. Many OEMs are situated in the UK for manufacturing, distribution and product development across multiple sectors such as defence, IT and automotive electronics.

37. However, with the shift of volume employment to the Far East and increasing productivity in the home industry, employment in electronics in the UK has fallen in recent years and is expected to decline further. The 263,000 electronics jobs in 2004 are expected to fall to 240,000 by 2010.

38. The key factors which impact on the sub-sector can be summarised as:

- The pervasive nature of electronics
- Rapid technological change
- The cyclical nature of the sector
- Globalisation of the supply chain
- Shorter product life cycles
- Intensification of competition

39. In response to these business trends, companies have adopted a number of strategies to increase productivity:

- Searching for added value – focusing more on the higher value end of the market such as product design and systems integration.

- Batch rather than mass production – producing fewer, more bespoke products.
- Disintegration – a clearer split between designing, marketing and producing products, including moving manufacture to off-shore locations.
- Automation of production – to increase efficiency, reduce waste, create shorter production runs and allow complex specification changes.

40. All of the above trends have led to increased demand for higher-level skills.

The automotives sub-sector

41. Ahead of European competition, the modern UK automotive sector has not only survived but thrived, fully embracing the challenges and opportunities of globalisation. At vehicle manufacturer and first tier component level the industry is based almost entirely on inward investment, in sharp contrast to France and Germany. Some inward investors such as Ford and GM have very long histories of manufacturing in the UK. Toyota, Nissan, Honda and BMW are more recent arrivals but are now an integral part of the UK automotive industry.

42. Altogether eight companies manufacture cars in volume in the UK, together with six truck, van and bus manufacturers and many of the world's major component manufacturers. No other European country has this number or range of automotive manufacturers. The UK exports some 68% of its vehicle production. Supply chains have also become much more multinational, so that the UK content of cars made here has declined but the volume of parts exported has increased.

43. Globalisation brings risks as well as opportunities, and the UK has suffered from rationalisation and much-publicised closures. However, the UK automotive industry has been remarkably resilient, based on continuous development and openness to world markets.

44. The UK has a number of other global strengths including a motorsport cluster, an automotive design engineering sector, a 30% share of European internal combustion engine production and a No. 2 world ranking for premium car production. It has the fourth largest retail automotive market in the world and is the only advanced country to grow strongly this decade.

45. Volume car producers that manufacture in the UK are BMW, VW, Ford, Honda, Nissan, PSA, Toyota and GM. Britain also has a wide range of specialist producers serving niche markets such as sports and track day cars, classic replicas and even amphibious cars. Car production peaked in 1999 at 1.8 million, the highest for 25 years. In 2004, nearly 1.65 million cars were produced, 72% which were for export. UK automotive exports, including cars, commercial vehicles and a wide range of components, generate more than £20bn annually in overseas sales. The automotive sector is the UK's biggest manufacturing export sector.

46. The aftermarket is that part of the automotive components industry that provides services and equipment – parts, accessories, consumables etc. – for the motor vehicle after it has gone into use. In 1998 there were around 2,000 UK component manufacturers supplying the aftermarket industry through approximately 2,500 distribution outlets and 55,000 retail outlets. Over a thousand automotive component suppliers manufacture in the UK. The UK

automotive components industry is characterised by large internationally-owned manufacturers at the top of the supply chain, many UK and foreign-owned companies directly supplying vehicle manufacturers (the first tier component suppliers), and a large number of mainly small and medium-sized second and third tier suppliers. Leading global players include Delphi, Bosch, Visteon, Federal-Mogul, and TRW. UK-owned component manufacturers like GKN, Unipart and Pilkington are among the most renowned in the world. Top Japanese suppliers, including Ikeda, Yutaka Giken, Denso and Calsonic have been attracted to the UK, mainly following in the wake of Japanese-owned vehicle makers. The first tier suppliers are the primary force in the UK; the turnover of the top ten companies is equivalent to 70% of the industry's total sales. The UK is an increasing force in engine production thanks to major investments. BMW's new Hams Hall facility aims to produce almost 50% of the company's engines when up to capacity. Ford will source 25% of their global engine supply from the UK, following expansion at Bridgend and Dagenham. UK engine manufacturing output is increasing and estimated at almost 3 million units in 2003.

47. The factors which combine to shape the UK's position in global vehicle production and markets can be summarised as:

- Global competitive pressures – vehicle manufacturers have consolidated, leading to increased joint venture work on standardisation of common platforms to support diverse final products.
- Rapid technological change – the increasing sophistication of vehicle technology and the pressure on suppliers to take more responsibility for research and development means that innovative production technology and control techniques are becoming increasingly important as a source of competitive advantage.
- New Product/Process Development and Implementation (NPPDI) – increased customer demand for new models with greater styling, quality, performance and reliability, in a shorter lead-time.
- Cost reduction throughout the whole supply chain – this has been met through increased use of SCM, e-business procurement systems and lean manufacturing techniques.
- Global quality standards – TS 16949.
- Regulation – environmental legislation to reduce emissions and increase fuel efficiency, increased safety requirements and better, more effective recycling.

The aerospace sub-sector

48. The UK's aerospace and defence industries are key players in world markets and major contributors to the UK economy through manufacturing and research into new technologies. Major UK aerospace companies include Rolls-Royce, BAE Systems, Marshall Aerospace, Bombardier Shorts, Airbus UK, GKN and Smiths.

49. In 2003, UK-based aerospace activity stood at £17 billion (a rise of 3.5% in real terms on 2002) and its contribution to UK GVA was just under £6 billion. The UK aerospace industry (UKAI) is one of the UK's major export sectors, generating a trade surplus of just over £2.5bn in 2003. The UKAI's share of the aerospace world market rose from 6.5% to 10% between 1992 and 2001. In terms of size,

this puts the UK aerospace industry second in the world behind the USA. Approximately half was civil turnover and half military turnover.

50. Only the USA, UK and France have design and development capabilities to produce a complete range of aerospace products and related equipment. European aerospace activity is mostly centred on a limited number of very large programmes designed and produced by international partners.

51. The industry continued the recent trend of significant growth in R&D spending. In real terms R&D investment increased by almost 18% to £2.1bn, and employment in R&D increased to over 17,700, an increase of over 15%. Turnover invested in R&D now is 12.3%, the third consecutive strong increase in the last three years; in comparison with 2001 it was only 8.2% of sales.

52. UK Maintenance Repair and Overhaul (MRO) activity continues to grow and turnover in MRO increased by 13% between 2000 and 2001 and by 2003 generated approximately £1.9bn. MROs are very diverse, ranging from small specialist workshops doing repairs to large international companies involved with the design, manufacture and maintenance of integrated systems. MRO operations occur in a variety of organisations, including aircraft operators, third party maintenance companies and OEMs and general aviation companies. Trends show OEMs have started to incorporate MRO activity into their business activities.

53. Included within MRO are five primary market segments:

- Engine overhaul.
- Airframe heavy checks.
- Component maintenance.
- Line maintenance.
- Major airframe modifications (including airframe conversions, avionic and in-flight entertainment retrofits, and interior modifications).

54. Growth markets for the UK aerospace industry include:

- Research and development. The UK's strength in aerospace R&D, particularly expertise in aerodynamics, allows the UK to play a leading role in wing, engine, weapon and rotor design within international consortia. Aerospace companies are diversifying into other complementary sectors such as automotive and electronics by exploiting intellectual property, acquired through aerospace research, which additionally safeguards employment by spreading the risk associated with sole reliance on aerospace activities.
- Project management for the coordination of design, technology, delivery and support at a global level.
- Composite materials technologies leading to lighter structures, reduced fuel consumption and the carrying of heavier loads.
- Computer modelling and simulation used for Finite Element Analysis (FEA), crash testing, Computational Fluid Dynamics (CFD) and ergonomics.

- Electronic components and systems due to the increased demand for complex, integrated network systems, particularly for the defence sector.
- More efficient, quieter engines to respond to increasing fuel costs and increased environmental regulation on air pollution and noise.
- Mechanical and electrical sub-systems for incorporation in the new aircraft and engines.
- Space systems for telecommunications, military, earth observation and navigation satellites (UK currently has 9% of the world market).
- Aerostructures for regional and business jets.
- MRO activity for civil air traffic, predicted to grow at 5% per annum in the longer term, which will provide increased opportunities in the total value chain of the civil aerospace life cycle.
- The aerospace industry is at the forefront in developing new technologies including:
    - Replacement of pneumatic and hydraulic systems with electrical equivalents.
    - Fly-by-wire and optical fibre technology.
    - Blended wing body.
    - Unmanned Arial Vehicles (UAVs).
- The demand for 800 seat airliners, next generation space shuttles, and stealth aircraft will ensure that technology continues to develop.

55. However, there are threats to the UK's position:

- Significant challenges that damage the international market – security, air traffic capacity and environmental impact.
- Major new competitor enters the market – a number of Far East nations have been steadily building aerospace capability at a subsystem and assembly level and have stated aspirations to enter the complete civil airliner business.
- Large companies move offshore – UK aerospace companies are now highly globalised and strong shareholder pressure requires them to demonstrate value for money in terms of R&D location decisions. Foreign governments are funding technology capture as a way of gaining market share.

56. Overall, the sector possesses an unusual combination of characteristics that drive the industry and to some extent set it apart from other forms of manufacturing. These are:

- Low volume high value added products.
- Long development and payback cycles for investors.

- High levels of international collaboration in design, development and manufacture.
- Safety critical products.
- Associated long service and support life.
- Central role of government as sponsor, customer and regulator.

57. The events of September 11th 2001, combined with a cyclical downturn in the world economy, took its toll on the civil market place and this was reflected in UK Aerospace export production. Recovery through 2002-3 was modest due to increased domestic and global defence spending (although civil aerospace revenue fell during the year). Between 2002 and 2003, defence exports and domestic orders rose by 12% and employment rose by 4%.

58. Defence sales increased due in part to several programmes gaining momentum, particularly the Typhoon and Merlin programmes. In the coming decade the F-35 programme looks to be especially beneficial to the UKAI (which has 24% of the contract value thus far).

59. Despite the importance of defence contracts, as a total proportion of aerospace, defence production has fallen from 65% in 1981 to 50% in 2003 (although the defence: civil ratio with European customers is 70:30). This shift is partly due to the increasing success of UKAI firms supplying to the major civil programs of Airbus and Boeing, which have the A380 and the 7E7 going into production in the near future. According to the SBAC, the UKAI has secured 50% and 35% by value, respectively, of the order for their aircraft.

Boat-building

60. Boatbuilding production is concentrated in Europe and the US. Italy has the world's largest boatbuilding sector, with the US second. In Europe the UK's main competitors are Italy, Germany and France. International competition is greater than ever, spurred on by the weakness of the US dollar and a number of key players pursuing a strategy of acquisition and consolidation. The industry also has to withstand the high costs of raw materials such as steel (due to increased demand in developing countries).

61. Between the main boat building nations there are major differences in the type of boats built, although the market trend is towards bigger and more technically advanced craft. The Dutch and Italian yards are the key competitors for boats over 24 metres in length (the 'superyacht' sector). A number of EU naval yards including VT and DML, are diversifying into this market segment. In France and the UK there is a dominance of smaller boat building. Germany, France and Italy are the main competitors in the building of sail and power craft less than 24 metres. The US remains a powerful player, with the Brunswick Group and Luhrs/Hunter organisations firmly placed in Europe as well as continuing to push into new markets such as the Middle East and South East Asia, as direct competitors.

62. In 2003 UK leisure boatbuilding (excluding supply chain, repair etc) accounted for approximately 14% of European workplaces, 16% of European employment and 15% of European revenues in the sector. The UK is the largest producer of inboard stern drive motorboats over 12 metres, with internationally recognised brands. Canal boats are included within this category. The 51 canal boat builders in the UK employ 350-400 people, with a turnover of £17 million per annum.

63. The British Marine Federation has launched a series of projects on competitiveness. The first phase is a supply chain project to push skills and business improvement techniques down the supply chain and in some cases learn from suppliers who have excellent business techniques. Driven by the need to make the transition to world class producers, the leading boat-builders realize that they can learn from sectors like automotive and aerospace, where a set of manufacturers cooperates as a group with their shared supply chains in a supplier development programme, in order to upgrade the capabilities of the entire cluster of firms.

Summary: key pressures on the engineering sector

64. In *summary*, a range of inter-related pressures on the sector can be observed, which have interlinked consequences for types of output, organisation of work, and labour and skills required. The major pressures are….

- The relative competitiveness of the 'cost of production' package which the UK offers vis-à-vis that of overseas producers (with sterling fluctuations having mostly marginal, but sometimes severe, impacts on the balance but with relative employment costs being particularly significant).
- Globalised production and markets, with decreasing numbers of multinational operations increasingly deciding where engineering takes place.
- Rapid technological development in products and processes with consumers increasingly accustomed to wide and rapidly changing product variations.
- National and international regulation and imposition of standards impacting on product characteristics and design and on the processes which deliver them.

65. The combined impact of these changes is to reduce employment overall, to substantially eliminate high volume, low-margin production, to drive UK production towards low-volume, high margin products (except in selective areas such as motor vehicle production) and, consequently, to raise the skill and quality demands of the sector as a whole.

4. Demand for labour and skills in Bournemouth, Dorset, Poole and Somerset

Introduction

66. Thus far, we have reflected on the size of the engineering sector in the BDPS area, on the trend in employment, and on the major factors which drive both the overall level of employment and the changing nature of skills required in the industry.

67. In this chapter, the nature of labour and skills *demand* in the sub-region is considered in more detail.

Occupational structure

68. At the simplest level, 'labour demand' can be considered just as the necessity to fill the 35,000 or so jobs which are offered by the sector in Bournemouth, Dorset, Poole and Somerset. However, the nature of those jobs can be more clearly understood by reference to their occupational structure.

69. It is not possible to quantify the occupational structure for the BDPS area in *exact* terms, since no data source is available for this purpose. However, projecting the national structure of employment on to total employment in the BDPS area allows an estimate which is probably reasonably robust:

Table 5: Estimated occupational structure, BDPS area, 2006

	%	Nos
Managers	13.7	4,800
Professional engineers	7.3	2,550
Technicians	9.1	3,200
Admin./clerical staff	9.9	3,450
Skilled crafts	25.0	8,750
Personal services	1.3	450
Sales staff	3.6	1,250
Operative and assembly	21.0	7,350
Other low-skilled manual	9.2	3,200
Total	**100**	**35,000**

** Analysis projects national sector employment structure (Working Futures II) on to the BDPS area's sector employment total (ABI)*

70. This data suggests that key occupational groups in the sector comprise:

- Managers (14% of total employment);
- Professional and technical staff (16% of total employment):
- Skilled and craftspersons (25% of total employment); and
- Semi-skilled and low-skilled manual staff (30% of total employment).

71. These groups are supported by a significant number of people in clerical, administrative and sales functions.

Occupational change

72. We noted (in Chapter 2) that the sector was forecast to lose around 1 in 5 jobs between 2004 and 2014.

73. However, the change is expected (by the LSC's employment forecasting model, Working Futures II) to impact differentially across different occupations.

74. Of the key manual groups, unskilled workers are forecast to decline most (by 40%) followed by skilled trades (down by 25%) and by semi-skilled operatives (down by 18%).

75. However, the number of people in managerial, professional, administrative and clerical occupations is forecast to remain broadly stable, as is the number of technicians in the industry.

76. There is also forecast to be some increase in the absolute number of sales staff as competitive pressures force companies to place greater emphasis on product marketing.

77. The Institute for Employment Research (Warwick University) estimates national rates for the combined effect of occupational change and replacement needs in the sector (Working Futures II). These can be projected on to the local occupational structure. Of course, it cannot be assumed that these effects are wholly consistent across the UK but the estimates give a broad guide to the likely scale of recruitment necessary to maintain the workforce at the required level:

Table 6: Recruitment need in the engineering sector in the BDPS area, 2006-2014

	Total estimated recruitment need 2006-2014*	**Annual average recruitment need 2006-2014**
Managers	1,300	160
Professional engineers	630	80
Technicians	740	90
Admin./clerical staff	1,100	140
Skilled trades	910	110
Personal services	180	20
Sales and customer service staff	640	80
Operative and assembly	1,230	150
Low-skilled manual	-150	-20
Total	**6,580**	**820**

* Includes effects of occupational changes and replacement need
Source: Working Futures II, national estimates projected on to the local workforce

78. Thus, it can be seen that the combined effect of occupational change and replacement needs may generate a need to recruit around 6,600 people into the sector over the next 8 years or so. This implies an average annual recruitment requirement of around 800 people concentrated in higher level (managerial, professional, and technical) jobs, in intermediate administrative, clerical and sales jobs and in skilled and semi-skilled manual grades.

Changing skill needs

79. There is, thus, a picture in which absolute levels of employment fall but replacement needs still generate a significant recruitment demand; and in which the occupational pattern is somewhat shifted towards higher levels as the numbers of shopfloor staff decline. But what of changing skill needs?

80. Beneath the somewhat crude survey-based approximations and forecasts discussed above, some more specific skill drivers can be observed.

81. The move to the higher level occupations and a decline in the craft and operator occupations has already been mentioned. A major factor here is increased demand due to the introduction of *new technology*, particularly the use of electronics and ICT systems and components in products and processes throughout the industry. The automation of assembly, particularly in the motor vehicles sector, has caused a move from traditional craft skills to operator/ assembler skills. Team and cell working and the move to batch processing rather than mass production in some industries is leading to a greater demand for team working, team leader and project management skills. This change in work organisation and the use of new technology are leading to greater demands for flexible working and multi-function and multi-disciplinary employee teams. The increased focus on quality improvement and customer service is leading to a requirement for the *majority* of employees to be skilled in these areas.

82. *Outsourcing* of work from OEMs in motor vehicles, aerospace, the ship and boat building/repair sector and electronics is causing responsibility for design and manufacture of components and sub-assemblies to be undertaken by small and medium sized first and second tier suppliers. This requires the latter to have a much wider range of technical, project management and customer service skills than was the case in the past. In the electronics and electrical sectors, the move of the manufacturing/assembly arm of work largely to Asian and Eastern European countries has led to a reduction in the need for operators and assemblers in these companies and an increase in requirements for design and electronics engineers.

83. There are also rising demands for *generic skills*. Employees in all engineering occupations require a high level of numeracy due to the technical and mathematical basis of the occupations in the sector. The applications and level of numeracy required differ with the type of sector and the level of the job. Numeracy requirements are reflected in learning programmes and qualifications at appropriate levels. Similarly, many working in these occupations require the use of ICT, which again varies with the type and level of the job. Some applications are extremely specific and advanced, for example CAD and CNC programming; whereas others need mainstream IT professional skills; or need competence in the use of IT for business or administrative purposes. Communication skills and the ability to work in teams are important in most occupations, particularly as cell and team working increases and the traditional supervisor role is increasingly replaced by team leader roles. Problem solving and diagnostic skills are important in a wide range of occupations.

84. Other generic skills which are required by some occupations in the sector are customer service, project management, commercial awareness and organisational skills.

85. In *summary*, some key foci of changing skill demands are….

- Increasing use of *CNC/CAD* skills – already in wide use, many studies in the industry have confirmed that further growth will be needed.
- Increasing *technical skills* to operate new technologies in robotics, automation, welding and manufacturing control.
- Increasing *IT skills* with basic keyboard skills and the ability to operate computerised processing technologies in production; and, at higher levels, in design processes.
- Further encroachment of *multi-skilling* with flexibility of staff between mechanical, electronic and data processing functions and with shop floor staff being required to operate several machines simultaneously.
- '*Adaptability'* and *'change management'* skills – the ability of all staff to cope with organisational and process change; for managers, to lead and manage fundamental changes in working practices and technology; and at all levels an ability and willingness to learn.
- *Personal and generic skills* – the increasing importance of 'broadening skills' with a special focus on communications, team working, self-management, problem solving and diagnosis, taking responsibility, and organisation and management.
- *Commercial awareness* – as businesses become tighter and leaner it is important that employees at all levels have increased understanding of costs and efficiency aspects of their work.
- *Customer service* skills to increase responsiveness to customer needs, to be able to communicate with customers, and to be able to respond appropriately under customer audits.

86. These requirements, of course, though important at all levels have a different emphasis for different occupational groups, for example:

Group	Key skills in growing demand
Managers	Generic skills
	Commercial awareness
	Customer relationship skills
	Change management skills
Team leaders	Motivational skills
	Leadership skills
	Communication skill
	Training skills
Professionals and technical staff	IT/CNC/CAD skills
	Communication skills
	Teamworking skills
	Commercial awareness
Production staff	CNC skills
	Multi-skilling
	Teamworking
	Technical skills

Summary: labour and skills demand

87. Thus, the engineering sector's demand for labour and skills can be summarised:

- Basic demand is for sufficient people to fill the 35,000 or so jobs which the sector generates in the BDPS area.
- This demand has been falling for some years and is forecast to fall further – the sector is anticipated to lose a fifth of its jobs total over the 2004-2014 decade.
- The main falls will be within the larger occupational groups of craft and semi-skilled shopfloor workers as the sector loses further low added-value production overseas and as productivity requirements shift processes from worker-delivered to technology-delivered.
- However, whilst absolute job numbers decline, replacement needs ensure that around 800 workers per year will continue to be recruited into the industry.
- Both existing and new workers will require to have higher level skills than previously with particular stresses on CNC/ CAD and other technical and IT skills, on the need for flexible, multi-skilled workers able to adapt to and manage change, on better business and customer service skills, and on a range of personal and generic skills which support team-working approaches, dependent as those approaches are on devolved decision-making and local problem-solving.

5. Supply of labour and skills

Introduction

88. The previous section of this report considered labour and skills demand – the numbers of people with particular abilities which the financial services sector in the BDPS area needs, now and in the near future, to operate its services at an efficient level.

89. This chapter moves on to consider the ability of the local area to supply those requirements. However, as context we first set out a brief consideration of some national supply characteristics.

90. Broadly, there are four areas of *external* 'delivery' which are important to the engineering sector. These are….

- *Secondary education* which mainly delivers the foundation subjects in mathematics and science which underpin further training and study in engineering more specifically.
- *Further Education* which delivers engineering-related subjects, mainly between Levels 1 and 3.
- *Higher Education* which delivers degrees in engineering and related specialisms, at Levels 4 and 5.
- *Professional education* which delivers 'Chartered Engineer' status based on post-graduate development and experience.

91. Recent analysis of the situation in respect of national skills supply at these four levels suggests, in essence, that:

- Mathematics, Science and Design and Technology are widely studied at GCSE. However, only around half of those who study these subjects get a grade C or above. Further, the sciences are only infrequently studied as single, specialist subjects. When this happens, a much higher proportion of students get a higher grade.
- At 'A' Level, against the general rising trend in participation, there has been a decline in the number studying core 'engineering preparation' subjects (maths, physics, chemistry) but an increase in students taking Design and Technology and other sciences.
- In FE, the majority (70%) of awards in engineering subjects are at Level 2. The number of these has remained fairly constant in recent years. Level 3 registrations have fallen but Level 1 registrations have risen.
- The number of University students studying engineering and related technologies has increased but not so fast as the number of students in general. As a *proportion* of all students, those studying engineering have fallen quite sharply. The volume of HND awards has remained constant but the output of engineering degrees has fallen.
- The number of professionally-registered engineers is falling and their average age is rising.

92. Generally, there is a sense that the external structure for engineering skills development is more-or-less maintaining *numbers* at most stages – GCSE, 'A' Level, FE and University – but that some of the excellence which traditionally attended the industry – study for single-subject pure sciences at GCSE and 'A' Level, Level 3 preparation in FE, numbers of successful apprentices, and degree awards – may have reduced somewhat. At graduate level, for example, it has been observed that the average 'A' Level points for engineering entrants have tended to be much lower than those in respect of other professions.

93. *Internal to the firm*, SEMTA reports (2002 Labour Market Survey) that almost two-thirds of engineering firms had *funded or arranged training* for their employees in the previous 12 months, a figure which was the same as in 1999. This suggested that, in spite of a generally less buoyant industry, training activity had not been affected. The proportion of companies training increased considerably with size of establishment. Only just over 60% of small companies trained, compared to 93% of companies with 250 employees or more. The basic metals and metal products sectors had the lowest incidence of training and aerospace the highest, followed by motor vehicles. There was a correlation with size of establishment, but also a reflection of the need for aerospace and motor vehicles to have a very high quality workforce, for both safety and quality reasons. The National Employer Skills Survey for 2005 suggests that the overall rate of training has changed little. 62% of engineering firms trained staff in the year prior to survey interviews (undertaken in the Summer of 2005).

94. Employers also funded or arranged training for employees across a variety of occupational groups. 52% of employers funded/trained operators, 37% managers and 35% craftspersons. The high incidence of operator training was a reflection of the fact that operators tend to be frequently recruited and then given fairly short periods of induction training.

95. 28% of engineering establishments were found to employ apprentices or recognised trainees in 2001, a significant fall from the figure of 38% in 1999. Again, there are differences between the different sizes of establishments, with less than a quarter of small sites employing apprentices and trainees, compared with almost half of medium-sized sites and almost two-thirds of large sites. The aerospace sector had the highest incidence of trainees (almost 50%), followed by motor vehicles (with over 30%) and metal products, mechanical equipment and other transport equipment, including shipbuilding with almost 30%.

96. However, whilst engineering companies are widely concerned about the levels and quality of the qualifications held by applicants seeking to enter the sector, in fact, the *qualifications profile* of the industry has risen substantially as the least qualified have been 'shaken-out' and as higher levels of participation by young people in Higher Education and other post-16 education feed through into the engineering workforce (as into employment generally):

Table 7: Percentage of UK engineering workforce with different levels of qualification

	1988	2004
Degree	8	11
Intermediate (apprentice/Level 3)	35	42
Basic (Level 1 and 2)	7	9
A Level	4	4
O Level	12	15
None	35	18
	100	**100**

Source: LFS

97. The trend towards higher levels of qualification is expected to continue. SEMTA believes that the move in employment towards higher level professional and technician occupations and a decrease in the craft and operator/assembler occupations means that there is a growing need for people qualified as graduate engineers and higher level technicians with HNCs, HNDs and Foundation degrees. The ubiquity of ICT and electronics in products and processes in all sectors means that there is an increasing demand for graduates and sub-graduates in these disciplines across economy.

98. The engineering *Apprenticeship* has the largest number of apprentices in training of all sectors in the economy at Advanced level. England has approximately 8,400 starts per year on Advanced Apprenticeships (AAs). There are around 6,800 starts per year on Apprenticeships.

99. In the recent years, there has been a shift from Advanced Apprenticeship starts to Apprenticeship starts. This is concerning (to SEMTA) as skills needs analysis indicates a need for higher-level skills over the next ten years. However, research has identified that significant numbers of Advanced Apprentices have started on Apprenticeships and then upgraded to Advanced Apprentices purely for funding reasons.

100. Apprenticeship provision in England broadly falls into three categories: Employers (mostly large) who have direct contracts with either their local Learning and Skills Council or with the LSC national contracting unit, Group Training Associations (GTAs) – a network of 65 organisations that deliver training for small employers – these are involved in engineering apprenticeships either directly via a local LSC contact or indirectly through colleges who use their off-the-job services; finally there is a network of engineering colleges (approximately 225) that have local LSC contracts for the delivery of engineering apprenticeships and provide off-the-job training for employers and Group Training Associations.

101. Given the strong tradition of training apprentices in engineering, technology and manufacturing, it is not surprising that Advanced Apprenticeships in this field have been more successful than in other areas of learning.

102. However, Apprentices on 'Apprenticeships' and NVQ learners do no better in engineering, technology and manufacturing than in other areas. Few employers that manage their own Advanced Apprenticeship scheme offer Apprenticeships or

NVQ-only training. It is suggested that the success of Advanced Apprenticeships is the result of their dominance among the best providers.

103. Completion rates for the engineering apprenticeship framework in England in 2003/04 were disappointing at 30%. However, there are two significant factors to be taken into consideration. First, training providers were penalised for transferring trainees from the Apprenticeship programme to the Advanced Apprenticeship programme in that transfers were coded as non-completers. This has now been resolved and transfers are coded differently by the LSC. Secondly, with the loss of 'Other Training' (NVQ training only), training providers were 'nesting' trainees in the apprenticeship programme with no intention of their completing the framework.

104. Completion rates for the Advanced Apprenticeship were 51%, according to LSC data for 2003/04. [It should be noted, however, that local completion rates in more recent years are considerably above these earlier national ones; see Table 10 below for more recent data for the BDPS area].

105. The use of *National Vocational Qualifications* (NVQs) in engineering has become more firmly established over the last few years. Research shows that employees at 16% of engineering establishments had gained an NVQ in 2001. Large companies were considerably more likely to have had employees gaining an NVQ than small companies. The aerospace and motor vehicles sectors reported highest use of NVQs and electronics the lowest. The next generation of engineering occupational standards have been produced covering all five occupational levels and new qualifications based on these have become progressively available since 2003.

106. All sectors in science, engineering and technology are concerned at the steady decline in the relative number of A/AS Level passes in mathematics and physics. Also of concern is the perceived drop in the level of mathematics both at GCSE level and A/AS Level.

Local skills supply

107. Turning now from the national context to the local position, labour and skills supply in the BDPS area depends, broadly, on two factors. Firstly, the general availability of labour and, secondly, the scale and success of mechanisms to generate relevant skills.

Broad labour supply

108. Thus, a first issue concerns the availability of labour in general. Of course, the engineering sector is in competition with other sectors for the supply of labour – particularly at lower levels and for generic skills which are readily transferable between sectors. The question is one of whether the local labour market is 'tight' (ie. fairly competitive for labour or skills) or not.

109. There are a number of indicators of 'tightness' in Bournemouth, Dorset and Poole.

110. Firstly, the working age employment rate in Dorset and Poole is higher than in England and the SW as a whole though Bournemouth has a lower rate than both. Since 2001/02, the rate has grown in Dorset, but fallen in Poole and in Bournemouth. The national rate has remained static, and the SW rate has fallen slightly:

Table 8: Employment rates in Bournemouth, Dorset and Poole

Percentage of working age population	Jun 01-May 02	Jun 04-May 05	% point change
Dorset	79.4	80.9	+1.5
Bournemouth	73.0	68.1	-4.9
Poole	80.3	77.2	-3.1
South West	78.9	78.8	-0.1
England	75.1	75.1	0

Source: ONS Quarterly Labour Force Survey 4th quarter average May 05

111. Thus, although there has been some slackening, local employment rates in Dorset and Poole (though not Bournemouth) remain higher than national levels – suggesting that the number of people available to enter the labour market is lesser than elsewhere.

112. Secondly, the latest annual unemployment rates are 3.9% for Bournemouth, 2.4% for Dorset and 2.3% for Poole (SW: 3.6%, Eng: 4.7%). Bournemouth's 12-month average claimant count rate of 1.7% is higher than the South West average of 1.4% The rates for Dorset (0.9%) and Poole (1.0%) are below. All are less than the England rate (2.4%). Again, therefore, labour market tightness is evident. Unemployment rates (though recently moving upwards) remain very low in historical terms and local unemployment may be reduced to the minimum of people in 'transitional' unemployment – between jobs – or who are difficult to employ because of low abilities and/or low motivation.

113. If these factors suggest that local labour supply is constricted, then data on *house price* data emphasises the difficulty for prospective applicants for lower paid/lower skilled occupations to move into the area.

114. Thus, in Q3 of 2005, the average house price in Poole (£254,959) was the highest (out of 15) among SW county and unitary authorities, and was 29.3% above the English average (£197,201). (SW: £202,396). Dorset had the third highest average house price in the region (£230,261), and Bournemouth the ninth highest (£196,367).

115. More particularly, lower quartile housing affordability ratios show that lower quartile house prices are approximately 9.1 times lower quartile resident earnings in Bournemouth, and 9.6 times in Poole (SW: 8.5, England 6.8). For Dorset districts, ratios range from 9.2 (Weymouth and Portland) to 11.9 (Christchurch). The latter is the highest lower quartile ratio of any local authority in the South West. *(House Prices: OPDM Mean House Prices Q3 2005 (provisional)/ Affordability: HM Land Registry house prices Q1-Q2 2005/ONS Annual Survey of Hours and Earnings 2005.*)

116. Data on *Somerset* is less comprehensive but it can be noted that:

- Somerset's economic activity rate (81.6) remains higher than that of the South West (80.8) or the UK (78.1)

- Unemployment (claimant count) is lower in Somerset (1.4) than the South West average (1.7) or the UK average (2.6).
- House prices are below the average for England and Wales. However, because of relatively lower wages, their affordability is also less than average.

117. Overall, these statistics, for the BDP area and Somerset, suggest that the labour market in both sub-regions is still quite tight and that the engineering sector has to find advantages to maintain its workforce levels in quite competitive labour market conditions.

Work-based learning (WBL)

118. Statistics for WBL participation in the BDPS area show that 660 Apprentices ended a period of training within the engineering sector in 2004/05. These were distributed by age and gender as:

Table 9: Age and gender of WBL trainees who left training in engineering in the BDPS area, 2004/05; numbers

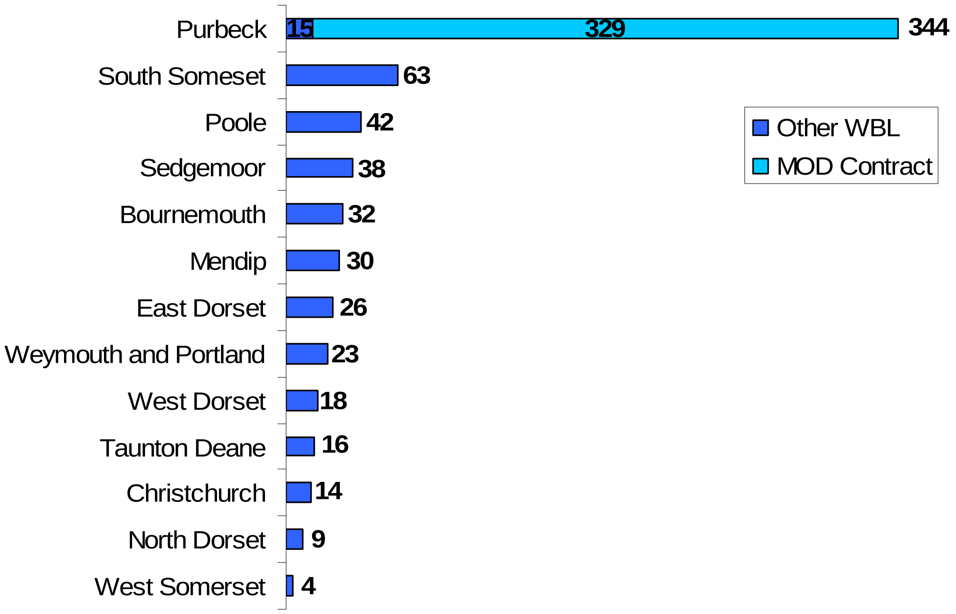
	F	**M**	**Total**
16-18 years	3	450	453
19-20 years	2	131	133
21-24 years	1	73	74
Total	**6**	**654**	**660**

Source: ILR 2004/05

119. It can be seen that the structure of Work Based Learners strongly perpetuates the bias towards male employment in the sector.

120. Locationally, Apprentices were resident in all BDPS Districts/UAs but it is notable that there were a very high number of trainees registered as resident in Purbeck District. *However, this is a technical factor which reflects the fact that a large number of people are registered to a Ministry of Defence contract in the area. Excluding these, the figure for Purbeck is of 15 'true' resident Apprentices*:

Figure 4: Numbers of WBL trainees who left training in engineering per District/UA, 2004/05



Source: ILR 2004/05

121. The majority of WBL trainees were Apprentices at Foundation level (73%; 480 cases) but a minority trained at Advanced level, Level 3 (27%; 180 cases).

122. In 2004/05 success rates were reasonably high. In 2005/06, achievement rates rose at Level 3 but fell back a little at Level 2:

Table 10: Success rates in WBL in engineering in the BDPS area, 2004/05 and 2005/06

	2004/05		2005/06	
	Some achievement	**Full framework completion**	**Some achievement**	**Full framework completion**
Apprenticeship (Level 2)	72%	65%	67%	53%
Advanced Apprenticeship (Level 3)	67%	58%	73%	70%

Source: ILR 2004/05 and 2005/06

Further Education

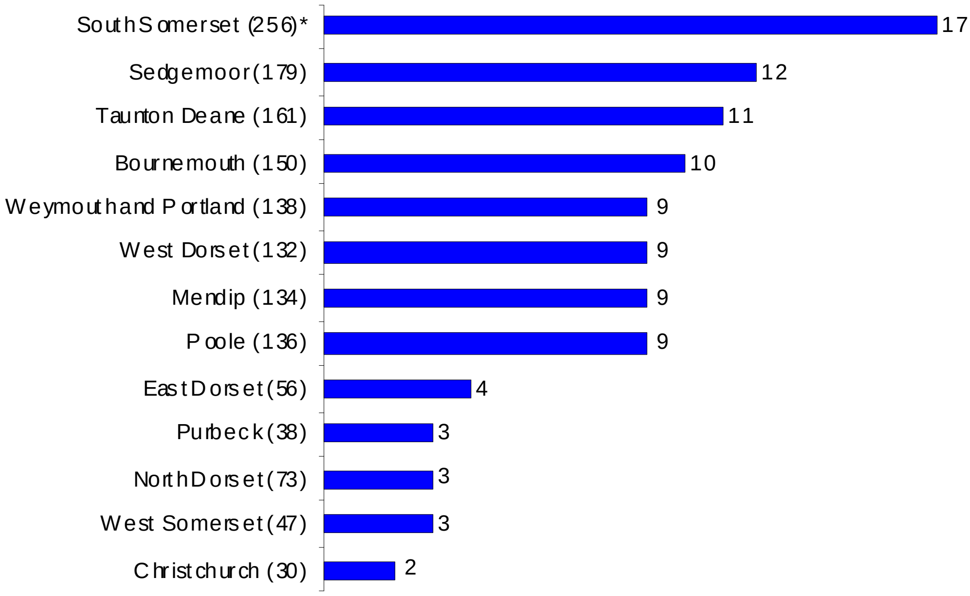
123. In total, 1,506 engineering-related learning aims were pursued by people resident in the BDPS area in Further Education during 2004/05. Of these:

- 688 (46%) were pursued by people aged 16-18, 818 (54%) were pursued by people aged 19 or over.

- 57 (4%) were pursued by female students and 1,449 (96%) by male students.

124. These students were resident in all Districts and Unitary Authority areas in the BDPS area:

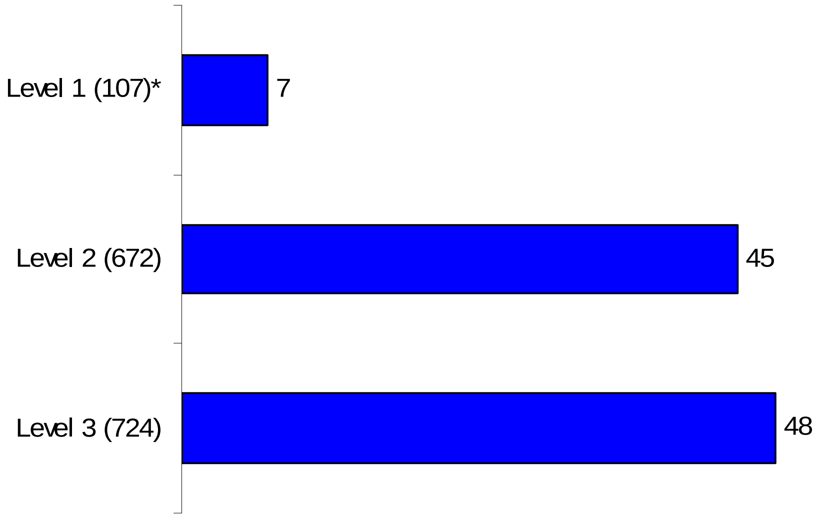
Figure 5: Place of residence of those with learning aims in engineering, 2004/05; percentages



Source: ILR 2004/05
* Actual cases

125. The *levels* at which students pursued learning aims were:

Figure 6: Level of learning aims pursued by BDPS area students, 2004/05; percentages



Source: ILR 2004/05
* Actual cases

126. The learning aims pursued by *16-18 year old* FE students were:

Table 11: Learning aims of 16-18 year old FE students; numbers and percentages

Advanced VCE (Double Award) in Engineering	34	4.9
Advanced VCE in Engineering	14	2
Basic Training of Engineering Craftsmen Certificate	14	2
BTEC First Diploma in Electronics	13	1.9
BTEC National Award in Engineering	1	0.1
BTEC National Certificate in Electrical/ Electronic Engineering	16	2.3
BTEC National Certificate in Mechanical Engineering	14	2
BTEC National Diploma in Aerospace Engineering	10	1.5
BTEC National Diploma in Electrical/Electronic Engineering	40	5.8
BTEC National Diploma in Mechanical Engineering	14	2
Certificate in 2D Computer Aided Design	33	4.8
Certificate in Computer Aided Design	8	1.2
Certificate in Electrical Technology Engineering	6	0.9
Certificate in Electrotechnical Technology	93	13.5
Certificate in Engineering	5	0.7
Certificate in Inspection and Testing of Electrical Equipment	2	0.3
Certificate in the Requirements for Electrical Installations (BS 7671 June 2001)	2	0.3
CG 2351 Knowledge of Electrical Installation Engineering	12	1.7
CG 6958-01 Progression Award: Electrical and Electronic Servicing (Consumer/Commercial Electronics) (Level 2)	7	1
GCE A2 Level Electronics	14	2
GCE AS Level Electronics	42	6.1
GNVQ in Intermediate Engineering	5	0.7
National Diploma in Engineering	1	0.1
NVQ in Fabrication and Welding Engineering	2	0.3
NVQ in Performing Engineering Operations	240	34.9
Progression Award in Applying Engineering Principles	34	4.9
Progression Award in Electrical and Electronic Servicing: Consumer/Commercial Electronics	10	1.5
Progression Award in Production Engineering: Fitting	2	0.3
Total	688	100

Source: ILR 2004/05

127. It can be seen that the range of engineering qualifications being pursued is quite wide but there is an emphasis on the NVQ in Performing Engineering Operations

(35% of all learning aims), on the Certificate in Electrotechnical Technology (14%), and on a group of BTEC awards.

128. The learning aims of *19+ year old* students were:

Table 12: Learning aims of 19+ year old FE students; numbers and percentages

Advanced Award in Synchronous Digital Hierarchy	2	0.2
Advanced Diploma in Engineering Technology (Progressive)	1	0.1
Advanced VCE (Double Award) in Engineering	6	0.7
Advanced VCE in Engineering	2	0.2
Assisted Private Study Course in Quarrying (Foundation)	2	0.2
Assisted Private Study Course in Quarrying (Professional)	1	0.1
BTEC First Diploma in Electronics	1	0.1
BTEC National Certificate in Aerospace Engineering	12	1.5
BTEC National Certificate in Electrical/ Electronic Engineering	27	3.3
BTEC National Certificate in Mechanical Engineering	9	1.1
BTEC National Certificate in Telecommunications	1	0.1
BTEC National Diploma in Aerospace Engineering	2	0.2
BTEC National Diploma in Electrical/Electronic Engineering	14	1.7
BTEC National Diploma in Mechanical Engineering	1	0.1
Certificate for Domestic Electrical Installers	14	1.7
Certificate in 2D Computer Aided Design	32	3.9
Certificate in Boat Building, Maintenance and Support	10	1.2
Certificate in Computer Aided Design	42	5.1
Certificate in Electrical Technology Engineering	3	0.4
Certificate in Electrotechnical Technology	158	19.3
Certificate in Engineering	11	1.3
Certificate in Inspection and Testing of Electrical Equipment	32	3.9
Certificate in Inspection, Testing, Design and Certification of Electrical Installations	14	1.7
Certificate in the Requirements for Electrical Installations (BS 7671 June 2001)	269	32.9
CG 1619 Maintenance Engineering Skills (Customer Specific)	2	0.2
CG 1820-01 Sound Engineering Competences Part I	4	0.5
CG 1820-02 Sound Engineering Competences Part II	4	0.5
CG 2301-01 Computer-aided Engineering Competencies Part I	1	0.1
CG 2351 Knowledge of Electrical Installation Engineering	10	1.2
CG 2590-02 Aeronautical Engineering Competences Part II	8	1
CG 6958-01 Progression Award: Electrical and Electronic Servicing (Consumer/Commercial Electronics) (Level 2)	5	0.6
GCE A2 Level Electronics	1	0.1
GCE AS Level Electronics	2	0.2
GNVQ in Intermediate Engineering	1	0.1
Intermediate Certificate in Engineering and Technology	3	0.4

National Certificate in Engineering (Electrical/Electronic)	1	0.1
NVQ in Electrotechnical Services	19	2.3
NVQ in Engineering Maintenance	14	1.7
NVQ in Fabrication and Welding Engineering	4	0.5
NVQ in Installing and Commissioning Electrotechnical Systems and Equipment (Plant)	5	0.6
NVQ in Installing Electro-technical Systems	1	0.1
NVQ in Land-Based Service Engineering	1	0.1
NVQ in Performing Engineering Operations	34	4.2
NVQ in Technical Services	1	0.1
Progression Award in Applying Engineering Principles	5	0.6
Progression Award in Electrical and Electronic Servicing: Consumer/Commercial Electronics	4	0.5
Progression Award in Electrical and Electronic Servicing; Domestic Electrical Appliances	22	2.7
Total	818	100

Source: ILR 2004/05

129. It can be seen that around a third of learning was driven by the Certificate in the Requirements for Electrical Installations (the electricians' 'licence to practise'). The other major single qualification sought was the Certificate in Electrotechnical Technology.

130. Of 16-18 year FE students, 72% either completed their learning aim or were continuing working towards it; 27% failed to complete. Of 19+ year old students, 86% either completed their learning aim or were continuing working towards it; 14% failed to complete.

131. Key FE providers for *16-18 year olds* are:

- Bournemouth and Poole College (20% of learning aims)
- Yeovil College (20%)
- Bridgwater College (18%)
- Weymouth College (13%)
- Somerset College of Arts and Technology (13%)
- Strode College (7%)

132. Key FE providers for *19+ year old FE students* are:

- Bournemouth and Poole College (28% of learning aims)
- Bridgwater College (22%)
- Weymouth College (16%)
- Yeovil College (12%)
- Somerset College of Arts and Technology (8%)

WBL and FE in engineering

133. What this data suggests is that in broad numerical terms, the supply of engineering skills looks approximately in balance with demand.

134. In a previous chapter, it was suggested that around 800 new recruits were required by the local sector each year. Data shows that around 660 people ended an Apprenticeship in 2004/05. The figure for 2005/06 was around 820 people. Around 7 out of 10 of those do so with the achievement of a recognised output. In addition, around 1,500 'learning aims' in engineering are pursued each year, with three-quarters of those 'learning aims', around 1,100 cases, being achieved. Although 'learning aims' as identified by the ILR cannot be translated into numbers of people (because some people pursue more than one 'aim') it appears that the number of people being trained via WBL and FE at least matches the number of people which the industry needs to recruit. But, of course, simple numbers of trainees do not guarantee that supply of skills is in fact adequate – that depends on the match of the level and areas of training which people undertake to industry needs; and, of course, many trainees in the 'engineering' area will not go into engineering manufacturing at all. Many are simply building their skills as self-employed domestic electricians and many will move into a wider manufacturing sector not engineering per se.

135. Two other particular features of the data are notable:

- Firstly, it is clear that, despite industry attempts to make engineering a destination for women, those attempts have had little success below professional engineering level. The proportions of women in WBL or FE training are negligible.
- Secondly, the data reveals that an extraordinarily high percentage of WBL trainees – over 50% - are registered in Purbeck District. However, this is a technical factor which is accounted for by a large number of Apprentices registered to a large MoD contract in the area.

136. And, of course, it is important that the teaching available in the institutions offering engineering-related courses is of high quality. This latter issue can, to a degree, be assessed via Ofsted inspection reports of relevant departments in local Colleges and via the Adult Learning Inspectorate inspection report of a major local Work Based Learning provider. Where these reports are available, we set out relevant extracts below whilst noting that, in some cases, the inspections took place some time ago:

Bournemouth and Poole College: inspection date March 2003

Overall provision in this area is **good (grade 2)**

Contributory grade for work-based learning is **satisfactory (grade 3)**

Strengths

- good achievement on most courses
- good teaching in practical lessons
- wide range of programmes with good progression
- very effective leadership and management
- recent significant improvements in management of work-based learning.

Weaknesses

- declining retention rates on some courses
- insufficient industrial updating for staff
- poor retention rates and pass rates for work-based learners.

Scope of provision

There is a wide range of provision, which includes courses in mechanical engineering and manufacture, electrical and electronic engineering, automotive studies, welding and fabrication, and computer-aided engineering. Full-time courses are offered in engineering at levels 1, 2 and 3. An extensive range of part-time and short courses are also offered at these levels. There is good progression to part-time and full-time HE courses within the college and also to degree programmes at universities. In 2002/03 there are 412 engineering students, of whom 228 are aged 16 to 18 and 184 students are aged 19 or over. Of these, half are full-time and half are part-time day-release and evening only students. The department is responsible for the management of 51 work-based learners in automotive studies and mechanical engineering and manufacture. Of these 8 are on NVQ programmes, 12 are on FMAs and 31 are on AMAs. There are strong links with local schools, with applied GCSEs in engineering and manufacture provided in college for school students.

Achievement and standards

The pass rates on motor vehicle studies foundation and City and Guilds computer-aided engineering courses are excellent. Those on national certificate in engineering and advanced GNVQ and AVCE engineering courses are good. In December 2002, engineering students sat 102 external examinations. The overall pass rate was high at 82%. Retention rates on the City and Guilds computer-aided engineering course are poor and on many courses retention rates are declining. Most students are working well and are on target to achieve their intended goal. Students are industrious in their work and demonstrate high levels of competence. They show good levels of practical skill backed up by theoretical understanding. For example, electronics students quickly designed and tested a circuit board.

Retention and achievement rates for work-based learners are poor but with an improving trend. Since 1998 there has been no achievement of the full framework by NVQ and FMA students. Retention rates are low but improving for these learners. Retention rates increased from 0% in 1998, 1999 and 2000 to 75% in 2002 for NVQ students. For the same period, retention rates of FMAs rose from 0% to 89%. There was a slight improvement for AMA learners in this period, but retention and achievement rates were poor and below the expected level for this vocational area.

A sample of retention and pass rates in engineering, 2000 to 2002

Qualification	Level	Completion year:	2000	2001	2002
City and Guilds 2240-01 electronics servicing	1	No. of starts	23	34	19
		% retention	61	**	100
		% pass rate	86	**	58
City and Guilds 2301-04 computer aided engineering	2	No. of starts	67	38	40
		% retention	94	100	68
		% pass rate	100	94	100
Advanced GNVQ/AVCE* engineering	3	No. of starts	41	33	9
		% retention	56	79	89
		% pass rate	96	96	88
National certificate in engineering	3	No. of starts	39	38	27
		% retention	82	**	70
		% pass rate	69	**	84
National diploma in engineering	3	No. of starts	21	20	25
		% retention	52	**	68
		% pass rate	82	**	71

**AVCE in 2002*
***data unreliable*
Source: ISR (2000 and 2001), college (2002)

Quality of education and training

Most teaching is good. The majority of schemes of work and lesson plans are well prepared with aims and objectives clearly stated. The best lessons were practical lessons or where theory was linked to practical work. For example, in a welding lesson, the teacher gave a clear demonstration of the use of penetrant spray on a welded joint to identify cracks. The students repeated the process on other welded test pieces. Learning was then reinforced in a theory session, which promoted a lively discussion about welding defects. In an electronics practical lesson, students constructed an alarm circuit using a previously-designed printed circuit board. Working independently, the students demonstrated good skills in testing the operation of the circuit and analysing and correcting faults. Learning materials are well designed and used effectively in many lessons. In workshop lessons there is strict adherence to health and safety practice. Key skills are well integrated with main courses. On-the-job training is good and is well supported by employers. Students effectively use evidence from the workplace to build their portfolios.

Accommodation and resources across engineering disciplines are satisfactory. The motor vehicle workshop is spacious, clean and tidy and contains suitable equipment. However, there are insufficient modern vehicles and associated diagnostic test equipment. The mechanical workshop is well organised, with dated but satisfactory machine tools. The welding and fabrication practical area is spacious and well resourced. In electronics there are suitable levels of test equipment. Students have good access to IT facilities within engineering. Two rooms have recently been allocated for the delivery of key skills. These have adequate IT resources and support materials. Resources in the workplace are good and learners use them well to gain the required skills. There has been little updating by staff of their industrial skills and experience. Most staff have been in education and training for considerable lengths of time and lack current industrial experience. This has been alleviated to some degree by the appointment of two instructor assessors directly from industry.

Assessment of students' work is fair and accurate. Qualified assessors assess work-based learners in the workplace. Good use is also made of witness testimony for assessment purposes. Reviews are carried out in the workplace every three months, but health and safety and equality of opportunity issues are not promoted sufficiently with students. Targets set are short-term and not always realistic. Support for students is generally satisfactory, though some tutorials are poorly attended.

Leadership and management

Engineering is well managed with a clear management structure and good overall co-ordination. Data collection and management are well organised. Managers regularly review the range of courses offered, deleting some and introducing others to meet the needs of the community. Areas where improvement is necessary have been identified and action initiated. There have been significant changes in the management of work-based learning which have had a positive effect on students' achievement. For example, a key skills co-ordinator has been appointed in engineering. There is now good management of key skills in the department.

Bridgwater College: inspection date February 2002

Overall provision in this area is **good (grade 2)**

Strengths

- good teaching
- good retention and pass rates in 2001
- consistent and significant improvement in pass rates
- good workshop facilities
- strong links with industry and schools
- effective teamwork and management.

Weaknesses

- unsatisfactory target setting for some work-based trainees
- missed opportunities to use IT in a few lessons.

Scope of provision

The inspection includes full-time and part-time engineering craft courses at foundation, intermediate and advanced level, including an AVCE engineering programme and GCE A-level design and technology. At the time of the inspection, there were 44 work-based trainees, 38 on advanced modern apprenticeships and 6 on foundation modern apprenticeships. The college also acts as a sub-contractor for a further 15 work-based trainees. Work-based trainee numbers are increasing, whereas full-time enrolments are generally decreasing.

Achievement and standards

In 2001, retention and pass rates on college courses were good. All were above national averages. All students who completed the national diploma in engineering and NVQ level 2 engineering manufacture achieved the qualification. GCE A-level design and technology had few students, but the retention rate was 100% in both 2000 and 2001. Pass rates on the City and Guilds mechanical production competences course were poor in 1999 and 2000, but improved significantly in 2001. The overall trend for retention and pass rates on college courses is one of improvement. There have also been improvements in work-based trainees' achievements, although too many trainees do not complete by the expected end date. Of the modern apprentices with end dates in 2001, 71% were retained, but only 29% completed the full framework. Current work-based trainees are making good progress with the acquisition of key skills. Most students produce good quality practical work in the engineering workshops.

Sample of retention and pass rates in general engineering, 1999 to 2001

Qualification	Level	Completion year:	1999	2000	2001
City and Guilds basic engineering competences	1	No. of starts	*	20	12
		% retention	*	80	100
		% pass rate	*	81	75

City and Guilds mechanical production competences	2	No. of starts	19	13	22
		% retention	95	77	86
		% pass rate	13	20	94
NVQ engineering manufacture	2	No. of starts	27	22	14
		% retention	96	77	86
		% pass rate	62**	76**	100
National diploma in engineering and production technology	3	No. of starts	16	15	14
		% retention	75	80	71
		% pass rate	73	100	100

Source: ISR (1999 and 2000), college (2001).
** course did not run*
*** college data*

Quality of education and training

Most teaching is good or better. Lessons are well planned. Opportunities to acquire and assess key skills are indicated with in lesson plans. Students' interest is effectively maintained in most lessons. For example, in one lesson, students were split into groups to make short presentations on polymer forming processes. Learning was then consolidated using a quiz based on the production of a number of commonplace moulded articles. In an engineering drawing lesson, cardboard cut outs were used to simulate sheet metalwork shape development. Students are well motivated in lessons and there are good working relations between staff and students. The industrial experience of work-based trainees is often used effectively in lessons. Teachers place appropriate emphasis on health and safety issues in practical lessons. In a few lessons, the teaching was unimaginative and there were missed opportunities to use IT in the classroom. Written assignments are generally clear and grading criteria is properly identified. Most staff provide appropriately detailed and constructive feedback on written work, although poor spelling is often not corrected.

Work-based trainees are visited by the engineering section's NVQ assessor every two weeks. The purpose is to conduct on-the-job assessments and to review progress against previously set tasks. Evidence is drawn from witness testimonies and photographs of students' work. A clear pro-forma is used to record assessment visits. The trainee and the employer both grade on a range of parameters, such as timekeeping and enthusiasm. The framework for the assessment of work-based trainees is appropriate. It involves the setting of both short-term and long-term targets. However, some long-term targets set for trainees' achievement of NVQ and key skills units are not sufficiently demanding. In addition, some assessment plans in trainees' portfolios lack sufficient detail.

Teaching staff have appropriate qualifications, although some lack recent industrial experience. The engineering equipment and facilities are very good. The college has recently invested in new hydraulic and pneumatic testing equipment, milling machines and computer aided design equipment. However, old lathes adversely affect the quality of students' work. Most theory lessons take place in modern accommodation that is enhanced by the posters and displays of students' work. Some of the older rooms, used for design and technology are unnecessarily cluttered.

Leadership and management

The engineering staff are an effective and well-led team. Every day, there is a short staff meeting before lessons start. Problems are tackled promptly; imaginative solutions are often found. Appropriate consideration is given to comparison of performance against targets. Curriculum development and staff development are well managed. There are strong links with local schools and employers. For example, the college has worked with schools to encourage more girls to enrol on engineering courses. Last year, 20 girls from 5 local schools came to the college on a one-week `women into science and engineering' programme. There is an active advisory group of employers. The section works effectively with the college's business development unit in relation to work-based trainees. Responsibilities for interviewing and assessing potential trainees for established achievement of targets and contractual issues have been clear.

Weymouth College: inspection date November 2004

Overall provision in this area is **satisfactory (grade 3)**

The contributory grade for work-based learning is **satisfactory (grade 3)**

Strengths

- high retention rates on many courses
- good teaching in practical lessons
- high-quality resources in vehicle workshops.

Weaknesses

- low pass rates on many level 2 courses
- too much unsatisfactory teaching in theory lessons
- weak planning of training for work-based learners.

Scope of provision

The college offers a range of full-time and part-time courses in engineering and motor vehicle engineering at levels 1 to 3. They include advanced electronic, mechanical and motor vehicle engineering. There are 77 apprentices, of whom 60 are advanced apprentices on electrical installation programmes and 17 are apprentices on motor vehicle and motorcycle programmes. There are 234 students on college programmes, of which 18% are adults and 5% are female. The provision also includes GCSE engineering for pupils from local schools.

Achievement and standards

Retention rates on level 2 electrical installation and engineering courses are high, particularly for electrical installation part 1 (theory) and general national vocational qualification (GNVQ) intermediate engineering. Retention rates for work-based learning programmes in electrical installation are also high for the cohorts that started in 2002/03 and 2003/04, at 83% and 100% respectively.

Pass rates on many engineering and electrical installation courses at level 2 have been low over the last three years. These include a computer-aided design (CAD) course, with a pass rate well below the national average over the past two years. However, some pass rates have started to improve recently. The pass rate for the GNVQ intermediate course increased from well below 50% in previous years to 88% in 2003/04. The pass rate for full-time level 1 motor vehicle courses was 7% in 2001/02; during the last two years the pass rate was over 90%.

The standard of practical work is satisfactory for both college-based and work-based learners. The wide range of learning opportunities in the workplace enables work-based learners to develop appropriate skills. NVQ portfolios are well structured and include a wide range of evidence. Students on motor vehicle and motorcycle develop good practical skills in assembly, service and disassembly. They are able to demonstrate good diagnostic and fault-finding skills.

A sample of retention and pass rates in engineering, 2002 to 2004

Qualification	Level	Completion year:	2002	2003	2004
City and Guilds electrical installation part one (theory)	1	No. of starts	21	37	30
		% retention	90	89	87
		% pass rate	74	58	88
City and Guilds motor vehicle/motorcycle (full time)	1	No. of starts	20	17	25
		% retention	75	65	84
		% pass rate	7	91	95
City and Guilds computer-aided engineering competencies	2	No. of starts	23	18	*
		% retention	78	89	*
		% pass rate	89	81	*
City and Guilds computer-aided draughting and design	2	No. of starts	45	76	34
		% retention	89	75	91
		% pass rate	45	67	81
GNVQ in intermediate engineering	2	No. of starts	15	19	*
		% retention	80	79	*
		% pass rate	17	40	*
AVCE in engineering	3	No. of starts	18	30	19
		% retention	89	80	89
		% pass rate	75	71	88

Source: ISR (2002 and 2003), college (2004)
** fewer than 15 starters enrolled*
Quality of education and training

Most teaching is good or better. The majority of lessons are well prepared and planned. In the better theory sessions, the pace is controlled by teachers' good use of questions. In many workshop lessons, teachers consistently question students to check their understanding of the tasks they are performing and to prepare them for the next practical activity. For example, in a good lesson on binary counters, the teacher reviewed and consolidated prior knowledge before the students carried out practical work to demonstrate the operation of increasingly complex circuitry. In another practical lesson for motorcycle engineering students, the teacher developed the concept of test and diagnosis through discussion, and then consolidated this through practical testing and diagnostic exercises using specialist equipment. However, in some theory lessons, students are inadequately involved. In such lessons, explanations given by teachers are often not understood by students. Students' understanding is not checked before moving on to more complex topics. In one lesson, the teacher spent much time writing notes on the whiteboard, which students copied. Confirmation of learning was limited to an inadequate general question.

There are high-quality resources in the vehicle workshops including a wide range of cars and motorcycles. There is an extensive range of industry-standard equipment and tools. These include vehicle ramps and specialist diagnostic testing tools such as temperature measuring devices and stethoscopes. Resources and equipment in the electrical installation workshops are satisfactory and include bays to practice installation work. Most classrooms are satisfactory, but a computer-aided engineering room has a suite of computers on benches with no suitable chairs. Resources in the workplace are satisfactory. Employers provide relevant health and safety equipment to apprentices, and specialist tools and equipment where they are required.

Assessment is satisfactory. There is comprehensive assessment during practical sessions, including formative assessment of practical tasks which are also thoroughly inspected and reviewed on completion. Effective guidance to improve the standards of workmanship is provided by experienced and qualified staff. Full-time students are well briefed on the assessment criteria for assignments. Some assignments are broken into stages and on the completion of each stage the student is given a formative assessment and further guidance on how to progress. Assessment of apprentices' competence is carried out in the workplace by college assessors. This is carried out on tasks which are taking place at the time of a visit rather than within a planned programme of training and assessment.

The range of courses provided is satisfactory with some entry level courses introduced this year. Staff have good links with local employers in the vehicle trades. There is little provision, and currently a low demand, for part-time courses in general engineering at levels 2 and 3. Managers have agreed a strategy for improved engagement with local engineering employers. There are satisfactory links with schools through school taster courses and the GCSE option, with good progression to mainstream college provision.

Initial assessment for full-time programmes includes a good diagnostic test in engineering skills. Progress reviews take place regularly, but do not always include specific short-term targets. Individual learning plans for full-time students are not individualised and are not adequately used to plan and record training and progress. Students are very positive about the vocational and pastoral support and guidance provided by vocational staff. Work-based learners value the close support provided by college assessors.

Leadership and management

Leadership and management are satisfactory. Course teams meet regularly to discuss a range of issues including the progress made by individual students. Communication between college tutors and vocational staff is poor. The course management process and records are comprehensive and include analysis of student questionnaires and data on retention and pass rates. Self-assessment reports are developed with participation from all staff. These are used to inform the strategic plans for the programme areas.

Although there have been recent improvements, work-based learning is insufficiently planned and co-ordinated. Individual learning plans do not include target dates for all aspects of the framework. They are not used effectively to inform apprentices and employers of progress made or to plan further training. On-the-job training takes place, but is not adequately planned to help apprentices complete the framework in good time. There is insufficient co-ordination of on-the-job and off-the-job training. There are no formal arrangements by college staff to monitor implementation of equality of opportunity practices at each employer. Work-based learners have only a rudimentary understanding of equality of opportunity issues

Somerset College of Arts and Technology: inspection date May 2003

Overall provision in this area is **good (grade 2)**

Contributory grade for work-based learning is **satisfactory (grade 3)**

Strengths

- good teaching and learning
- high pass rates on the national diploma and certificate courses
- thorough assessment
- effective support for students
- good involvement of employers in work-based learning.

Weaknesses

- low achievement of modern apprenticeship frameworks
- poor retention rates on the first diploma
- poor pass rates for additional qualifications.

Scope of provision

The college provides automobile, mechanical, electrical and electronic engineering courses from levels 1 to 4. Most students study at level 3. Work-based learning programmes are provided in motor vehicle service and repair, and in engineering at foundation and advance level. Adult students generally attend courses alongside younger students, but some welding and computer aided design courses are offered in the evening and these attract predominately older students. At the time of the inspection, there were 268 students, of which 104 were full time. Eleven of the full-time students and 129 of the part-time students were aged 19 or over. There were 45 students on work-based learning programmes.

Achievement and standards

Pass rates on the national certificate and diploma courses have been consistently high for the last three years. Retention rates for these courses are also good. However, retention rates for the first diploma course have been consistently below national averages and at 45% in 2002 were unsatisfactory. Full-time engineering students undertake additional qualifications, but the pass rates on most of these courses are unsatisfactory. Work-based learning programmes are currently producing poor outcomes and many work-based learners are failing to complete within the expected time frame.

All engineering students work safely and many produce work of a good standard, particularly in practical lessons. National diploma students working on a project were able to apply scientific and design skills to manufacture a model land yacht. Mechanical engineering students used the measurements of machine tolerances to complete a spreadsheet for data manipulation and statistical analysis as part of an integrated key skills assessment. Most motor vehicle students in a mathematics lesson were able to transpose the subject of algebraic equations. In electronics lessons, students applied theoretical principles to the practice of testing components in circuits. Students operate engineering machinery and equipment safely and demonstrate good practical skills in welding and motor vehicle repair work.

A sample of retention and pass rates in engineering, 2000 to 2002

Qualification	Level	Completion year:	2000	2001	2002
NVQ in vehicle maintenance -service replacement	1	No. of starts	10	16	21
		% retention	30	69	43
		% pass rate	100	86	39
NVQ in engineering manufacture (foundation 2 year)	2	No. of starts	22	24	22
		% retention	82	71	86
		% pass rate	56	41	31
City and Guilds 4351-01 computer-aided draughting and design using auto-CAD (1 year)	2	No. of starts	58	35	21
		% retention	59	91	71
		% pass rate	82	81	93
First diploma in engineering	2	No. of starts	22	15	20
		% retention	23	67	45
		% pass rate	60	100	78
National certificate in engineering (2 year)	3	No. of starts	43	32	16
		% retention	77	75	81
		% pass rate	89	77	83
National diploma in engineering	3	No. of starts	54	48	45
		% retention	63	67	71
		% pass rate	67	81	85

Source: ISR (2000 and 2001), college (2002)

Quality of education and training

Teaching and learning in this area are good. Lessons are carefully planned and schemes of work are comprehensive. Most lessons build on previous work, which is usually recapped at the start of the lesson. Teachers use a variety of aids including handouts, overhead projectors and slide projectors, which are sometimes connected to a computer. In the best lessons, teachers make frequent checks on learning through the use of questions directed at individual students. Teachers often draw on their own and their students' experiences to illustrate points. They emphasise the relevance of the topics under discussion to the workplace. In a very good electronics lesson, the teacher used a projector, well-prepared notes and a whiteboard to help the students understand the characteristics of zener diodes. The teacher asked relevant questions and used many illustrative examples. Teachers praise good work, which encourages the students to improve their performance. In many lessons, students are encouraged to work at their own pace but insufficient additional learning material is provided to allow the more able students to progress faster.

Assessment practices in the engineering programme area are thorough. Most performance criteria and assignment briefs are clearly stated, internal verification is rigorous, and feedback to assessors makes a significant contribution to improving the quality of the courses. Assignments are well marked. Punctuation, grammar and spelling are corrected and feedback to students is challenging but supportive. Some employers involved in work-based learning programmes have their own accredited NVQ assessors. In such cases, assessment, and the recording and tracking of learners' progress, are particularly effective. One employer issues internal certificates to students when they achieve an NVQ unit, which helps to motivate them. Work-based assessment carried out by college assessors is also good.

Teachers are well qualified, both professionally and vocationally. Many have recent industrial experience and benefit from a good range of staff development and training opportunities. An appropriate number of technicians and administrators support the teachers and students. There is suitable access to good computer resources and many staff make effective use of IT to produce good learning material and assignments. Accommodation in the new technology building is excellent and provides a stimulating working environment. The machine and welding workshops are unsatisfactory and do not conform to industry standards, but new workshops are to open in September 2003. The integrated learning centre contains a good range of books, periodicals and electronic media materials. Engineering students are making increasing use of this resource. The engineering programme area is well equipped, but the motor vehicle stock is old and does not reflect modern technology.

There is a good range of learning opportunities for technician students at level 3 in motor vehicle, mechanical and electronic engineering. Many of these students progress to the level 4 courses offered at the college. Full-time and part-time students are able to study for additional qualifications and there are some good enrichment activities such as visits to a large company manufacturing excavators. The staff have developed strong and mutually beneficial links with employers. For example, a surplus computer-controlled machine has been loaned to an employer. Students have the opportunity to train on the machine in a real working environment and college staff have enhanced their industrial experience.

Support and guidance for students in engineering are effective. An initial assessment of basic skills is carried out during the first two weeks of a course. When students are identified as needing additional support, this is provided and their teachers are kept fully informed of their progress. Tutorial support is well planned and timetabled to ensure that teachers meet with students individually at least once each term. Employers make an effective contribution to the support of work-based learners and contribute to the regular progress reviews carried out by college staff. Work-based learners are given a wide range of on-the-job learning opportunities. One student is undergoing training on cars, motorbikes and quad bikes. In the larger engineering companies, students have formal training plans and structured training, and they benefit from working with well-qualified and experienced people.

Leadership and management

Management is good and staff work effectively as a team. Staff appraisals are regular and effective. Teachers keep up to date and develop their skills and professional practice. Teams meet regularly to monitor students' progress, oversee teaching and learning and ensure effective administration of the courses. Student perception surveys and focus groups contribute to ensuring the quality of the provision. Inspectors agreed with much of the college's self-assessment of the engineering programme area.

Yeovil College: inspection date February 2005

Overall provision in this area is **satisfactory (grade 3)**

The contributory grade for work-based learning is **satisfactory (grade 3)**

Strengths

- high pass and retention rates on most courses
- good framework achievement in work-based learning
- good development of skills in industry-standard facilities
- good academic and pastoral support for students.

Weaknesses

- low pass rates on performing engineering operations NVQ level 2 and City and Guilds 2050 courses
- a significant minority of unsatisfactory teaching
- poor attention to safety in some teaching areas
- insufficient use of direct observation in the assessment of work-based learners.

Scope of provision

There is a good range of full-time and part-time courses in aerospace, electrical, electronic, mechanical and manufacturing engineering. Part-time courses are also offered in welding and computer-aided design (CAD). Courses range from foundation level to foundation degree level, reflect the needs of local industries and employers including the armed services, and offer comprehensive opportunities for progression. Full-time NVQ programmes provide progression to apprenticeships. There are work-based NVQ, apprenticeship and advanced apprenticeship programmes in engineering and manufacturing. Enrolments on college-based courses have declined over the last three years although there has been significant growth in work-based learning and level 4 provision. The college has a CoVE for advanced engineering in which the focus is CAD and manufacture, numerical control, composites and process control. There are good links with schools and provision is developing for school pupils aged 14 to 16.

There are 643 students enrolled for this area of study.

Achievement and standards

Pass and retention rates are better than the national averages and are significantly better in some cases. Retention rates on most courses have been above national averages for three years, but pass rates for NVQ level 2 performing engineering operations and City and Guilds 2050-01 courses have dropped to below national averages. The proportion of higher grades achieved by students on AS-level and GCE A-level courses in electronics and design and technology have declined consistently over the last three years.

The retention rate of apprentices on work-based learning programmes is good: 87% for advanced apprentices starting since 1999 and 53% for apprentices starting since 2000. There is good achievement of the framework for advanced apprentices. Of those who started after 1997/98, 85% achieved all aspects of the framework. Many students interviewed had completed the mandatory technical certificate and were studying at a higher level. Key skills achievements have improved significantly over the past two years.

Students' work is of a consistently high standard, as is evident from CAD drawings, job cards, parts lists and digital images. There is high achievement of regional awards for excellence and these are rightly celebrated. A female student was apprentice of the year for the Southwest in 2003.

A sample of retention and pass rates in engineering, 2002 to 2004

Qualification	Level	Completion year:	2002	2003	2004
NVQ performing engineering operations	1	No. of starts	*	24	39
		% retention	*	100	95
		% pass rate	*	96	89
Basic training of engineering craftsmen certificate	1	No. of starts	37	26	34
		% retention	95	88	94
		% pass rate	86	96	91
NVQ performing engineering operations	2	No. of starts	34	27	27
		% retention	91	85	85
		% pass rate	94	87	65
National certificate in engineering/ aerospace engineering	3	No. of starts	84	73	42
		% retention	86	75	98
		% pass rate	89	91	93
City and Guilds 2301 computer-aided engineering competences parts 2&3	2	No. of starts	53	36	29
		% retention	89	97	90
		% pass rate	91	100	**

Source: ISR (2002 and 2003), college (2004)
** course not running*
*** data incomplete*

Quality of education and training

Much teaching is unsatisfactory and many lessons that were judged satisfactory contained examples of ineffective practice. Lessons are sometimes poorly prepared, dull and lack pace. Too many lessons are teacher centred with an overuse of dictation and little variety. There is scant appreciation of differentiation to meet the diverse needs of everyone and the better students are not challenged. Teachers miss opportunities to make stimulating use of visual aids or ILT. Practical sessions are generally better taught than theory lessons. In some better lessons, students respond well to teachers' enthusiasm and good subject knowledge, and there is some effective use of gapped hand-outs to provoke students' thinking.

There is poor attention to health and safety in some teaching areas. Students were observed changing pulley speeds on a pedestal drill that had not been isolated. In one workshop, there were no prominent signs to reinforce good practice.

Students' skills are well developed using industry-standard facilities. The standard of equipment within companies is outstanding. Students have good exposure to modern equipment such as co-ordinate measuring machinery, sophisticated electronic equipment and high-quality CNC machines. The college delivers the foundation elements of some apprenticeship programmes in a well-equipped unit on a local industrial estate. This realistic working environment is much favoured by employers. An engineering workshop in the college is well resourced with a good range of conventional equipment. There is a very good learning centre which contains a substantial range of modern engineering texts. A virtual learning environment enables students to gain remote access to course materials and information, although much of this material is as yet underdeveloped.

Staff are well qualified and vocationally experienced. Some are still working towards their teaching qualifications. Recent staff shortages have had a negative impact upon the curriculum. For example, welding lessons have been cancelled, and the progress of students on a GCSE course has been impaired. However, the college is currently resolving many of these problems.

There is insufficient use of direct observation in the assessment of work-based learners and too few assessors to meet the needs of current students. Most of the assessment is based on students' portfolios. Assessment is often poorly planned and there is too much reliance on assessment towards the end of courses. Recent actions have been taken to address some of these weaknesses, although it is too soon to evaluate their impact: more assessors are now registered and a new assessment schedule was introduced this year.

The college has excellent links with local industry. There is an active engineering advisory committee. The college's award of a CoVE for advanced engineering was developed after thorough consultation with local companies. Some company-specific courses are run to meet the needs of a major local aeronautical company. Apprenticeship frameworks are specifically designed for the aerospace industry with specialised units. There has been a significant increase in the numbers of students aged 14 to 16 attending the college to undertake an engineering course.

There is good support for students. Full-time students are well supported by tutors although there is some uncertainty about the process of progress reviews. Some parts of tutorial files are poorly kept and the quality of staff comments is variable. Part-time students also receive tutorial support, but less formally and consistently. Workplace visits are regular with much emphasis placed upon pastoral issues. There is good commitment from all of the companies visited to the training of young people in engineering.

Leadership and management

Leadership and management are satisfactory. There is clear strategic direction. A head of department has been appointed recently. Roles and responsibilities are being clearly re-defined. The college has experienced difficulties in the recruitment and retention of specialist staff, and this has contributed to the delays in meeting targets. The CoVE is managed satisfactorily. There have been delays in the new building and the installation of specialist equipment, but these have now been resolved and the centre is fully equipped. Students are now using the facility and courses have been run for external clients.

137. *Paragon Training* is also a significant provider of training with a significant number of young people in Apprenticeship training. The company was inspected in 2003 by the Adult Learning Inspectorate and given a 'Satisfactory' rating for its engineering provision. The inspectors commented that:

'There is very good training from employers and subcontractors. Paragon Training contracts with a wide range of employers covering a wide range of engineering and manufacturing processes and practices. Employers provide good learner support and assist in the learning process. Learners are moved between jobs, to help them complete specific training elements that satisfy all of the NVQ criteria. On-the-job training resources are very good and employers' sites are well equipped. Learners are encouraged to learn new skills on a wide range of modern machinery. Most employers update machinery and equipment on a regular basis and update the skills of learners on this equipment. One learner has been trained to use specialist design software. Paragon Training's assessors are helping two learners to complete their qualification early by making additional assessment visits before their employer closes down.

Resources for off-the-job training are good. Subcontractors' staff are well qualified and have very good occupational competence. The engineering workshops for off-the-job training are well equipped with industry-standard machinery and hand tools. Computer equipment is available for learners to use. There is a good computer-aided manufacturing system in place that learners are also trained to use although this is beyond the requirements of their framework. Subcontractors providing technical certificate qualifications are also very well equipped.

Assessment practices are good. Staff visit learners frequently in the workplace. They carry out progress reviews and assess the learners' workplace skills. The assessors use a wide range of assessment methods including observation, written and oral questions, and witness testimony. Most assessments are thorough and learners receive constructive feedback.

Employers and learners have a poor understanding of equal opportunities. Relevant training is provided during learners' induction, but there is poor reinforcement and monitoring during assessments and progress reviews. Most employers do not have equal opportunities policies in place. They do not routinely update their knowledge relating to their equal opportunities obligations. At some employers' sites, inappropriate images are displayed in areas where learners work, prepare portfolios and receive progress reviews.

The internal verification process is inadequate. Many learners are not aware of the verification process and most have not been visited by an internal verifier. Most internal verification is completed at the end of the learning programme.

Additional basic skills support is ineffective. All learners take an initial basic skills test but most learners do not receive the results of the tests. Some learners are identified as needing additional support. Paragon Training has not provided some learners with effective additional support. One learner has failed the key skills communications examination twice and has not received appropriate additional support. Another learner with similar problems is receiving help from a subcontractor, but no formal support has been arranged by Paragon Training.

Retention and achievement rates have varied considerably from year to year with no particular trends emerging.'

Summary: local FE/WBL provision

138. Although, as we note, these inspection reports are dated, they suggest that engineering provision at the main providers in the BDPS area is at least 'satisfactory' (in 3 cases) and is frequently 'good' (in 3 cases). In addition, the inference of broadly successful provision in the area is reinforced by the award of CoVE (Centre of Vocational Excellence) status to Bridgwater College (in Automotive Engineering) and to Yeovil College (in Advanced Engineering). A significant private provider of Work Based Learning was rated as satisfactory.

Employer training

139. Some participation in public provision for engineering training (via FE and WBL) will be funded and arranged by employers in the sector. However, such participation cannot be distinguished from that which individuals undertake for their own purposes without employer direction or support. It is valuable, therefore, to consider employer training from another perspective – that offered by the 2005 National Employer Skills Survey (NESS 2005). Some key indicator data is set out below drawn from this survey (and its precursor in 2003). To avoid the 'small sample' problem, regional data is used as a proxy for the BDPS area:

Table 13: Employer training indicators: engineering sector in Bournemouth, Dorset, Poole and Somerset (SW Region data used as proxy), 2003 and 2005

	Engineering sector in SW Region 2003 (%)	Engineering sector in SW Region 2005 (%)	All-sector average for SW Region 2005 (%)
Has a business plan	61	68	55
Has a training plan	33	54	44
Has a training budget	28	39	32
None of staff have a formal job description	24	29	26
Formally assess skill gaps	46	57	46
None of staff have an annual performance review	46	42	42
Have funded staff training in last 12 months	60	68	65
Average expenditure per training establishment	N/A	£4,293	£2,661
Training establishments used FE Colleges	41	31	30
% of those dissatisfied with FE provision	N/A	8	8

Source: NESS03 and NESS05

140. Broadly, this data shows the engineering sector:

- One, as a reasonably strong training sector with almost all indicators showing significant advantage over the all-economy average.
- Two, as a sector which is *increasing* its training levels with significant gains between 2003 and 2005 on most indicators.

141. However, on one particular indicator – use of FE Colleges – it can be seen that the sector appears to have reduced its use of Further Education Colleges as a source of training. It is also notable that 56% of sector establishments in the

South West used a *private* provider compared with an all-sectors average of 50%.

Summary: supply of labour and skills

142. A review of labour and skills supply into the engineering sector at *national* level reveals a number of key points:

- The qualifications base of the sector has strengthened, particularly as less skilled workers have reduced in number more quickly than highly skilled workers as the sector has shrunk overall.
- However, there is concern within the industry that the infrastructure for training and the quality of trainees has grown progressively weaker – from the decline of maths and single subject sciences in schools to decline in the entry standard for engineering undergraduate courses and to the falling numbers of Chartered Engineers.
- Building on historical tradition, Apprenticeship in the sector is stronger in the sector than in most other sectors in the economy. However, according to the sector's Sector Skills Agreement, completion rates for Apprenticeships are 'disappointing'.
- NVQs are now widely established in the sector.

143. At *local* level:

- Broad labour supply remains competitive. Unemployment rates are low and house prices are relatively high. The sector needs to offer attractive opportunities, stability of employment, and competitive wages and conditions if it is to attract high-quality young people into careers in the sector.
- Broadly, the numbers of people studying or training in engineering via WBL or FE looks substantial. Around 450 people achieved recognisable success in WBL in 2004/05 (though many of these were attached to a single Ministry of Defence contract) and 1,500 people pursued learning aims in engineering in FE in that year, with non-completion rates of 27% for 16-18 year olds and of only 14% for those aged 19 or over.
- Superficially, this suggests that, in terms of absolute numbers, the supply of people with newly-acquired engineering skills should be sufficient to meet the need for the around eight hundred recruits which it is estimated that the industry in the BDPS area needs each year. Caveats, however, concern:
  - Location – a large proportion of WBL output is concerned with one large MoD contract in the Purbeck area.
  - Many FE students are studying a qualification which certificates domestic and construction sector electricians.
  - Level – there is a substantial volume of training at Level 2 or below (about 52% in FE and 73% in

WBL). It may be that, with movement in the industry towards higher levels of skill needs, this foundation training, although an obviously important step which forms the basis for entry and further progress in the sector, is not in itself sufficient to meet the sector's particular skill needs.

- Destination – though trained in engineering subjects it is not self-evident that FE and WBL trainees will necessarily work in the engineering sector. Many may be absorbed into manufacturing enterprises beyond those in engineering manufacture itself; and others, as above, may move into construction and self-employment.
- In terms of quality, however, as near as we can ascertain, provision is at least satisfactory and is frequently good. The area has two Centres of Vocational Excellence in engineering disciplines.
- Employers in the sector are shown to be above-average (when compared with all employers in the BDPS area) in supplying training to their workforces – they are more likely to have training plans and budgets, to offer training, and to spend more per workplace.
- However, there is some indication that their propensity to use *FE* when training is offered to staff is falling, whilst use of *private* provision remains above-average.

6. The balance between demand and supply

144. The key questions in respect of the demand and supply of skills are, basically, does skills supply currently meet the needs of the industry, and will it do so in future.

145. One method of assessing this would be to consider the demand for skills and set it against an account of supply. However, any attempt to match these two analyses against each other in a statistical sense is not possible. The problem has several angles:

- Firstly, data on demand is unreliable. Forecasting models cannot predict the future with any great precision; and the smaller the area to which they are applied, the less precise they become.

- Secondly, data on supply is hard to interpret. It is not known, for example, which skills WBL trainees are training in, nor what level of employability they reach, particularly amongst the significant proportion of trainees who do not complete the full framework. FE data is also imprecise in that it deals with 'learning aims' rather than numbers of individuals (some of whom may pursue more than one aim) and again it is not clear how many trainees proceed to full qualification and are delivered into the workforce.

- Thirdly, we have noted that a significant proportion of employers in the sector train their staff (around 88% in the most recent estimate). Around 1 in 3 of these use FE. What the remainder do is largely unknown. Some of the training may not be productivity-related at all. Health and Safety training, for example, and induction training, though essential, don't necessarily improve the overall level of skills employed in financial services activity as such. But amongst the remainder must be a significant amount of training which formally or informally improves worker performance. But the scale or nature of that improvement and its contribution to the overall skills equilibrium in the sector is not measurable.

- Fourthly, whilst people train towards and achieve qualifications, the quality of that training and the worth of the qualification is variable. Simply, we do not know how much of the training which WBL/FE delivers is regarded as adequate by the industry but it seems unlikely that all of it is.

146. Generally, therefore, *inferences* can be drawn from an examination of demand and supply. Some of these have been set out in previous chapters and will be extended in the final chapter of this report. However, a formal statistical account of the skills equilibrium, one which says, for example, that the area will need x people with formal engineering skills per year and is generating y people with these skills per year, cannot reliably or meaningfully be computed. Thus, whilst we have commented earlier that skills supply *superficially* appears to be adequate to meet forecast demand, this cannot be asserted with great confidence.

147. In order to comment on the skills equilibrium, therefore, we need to rely rather more on evidence of *disequilibrium* – that is, of skills shortage and skills gaps. The following table uses data from National Employer Skills Surveys to generate some broad indicators of such difficulties. South West regional data is used as a proxy for the BDPS area (to avoid the problem of small sample bases):

Table 14: Indicators of labour and skills deficiencies, South West Region, 2005; percentages of engineering establishments

	2005		2003
	All sectors	Engineering	Engineering
Have at least one vacancy	17	16	16
Have at least one vacancy which is hard-to-fill	7	8	7
Have a skill shortage vacancy	4	5	*
Have a skills gap	15	17	24

* Bases too small for reliability
Source: NESS05 and NESS03

148. What this data shows is that the sector faces levels of vacancy, recruitment difficulty and skills gaps in the workforce, which are fairly typical of the economy as a whole. However, the proportion of employers who are observed to have a skills gap reduced somewhat between 2003 and 2005.

149. The occupational distributions of vacancies, skill shortage vacancies, and skills gaps are also clearly different from the average for the economy as a whole:

Table 15: Indicators of skills difficulties; percentages of all difficulties associated with different occupational groups, South West Region, 2005

	% of vacancies		% of skill shortage vacancies		% of staff not fully proficient	
	All sectors	Engineering	All sectors	Engineering	All sectors	Engineering
Managerial	5	4	4	0	11	12
Professional	7	5	9	9	8	3
Technical	16	6	13	8	3	2
Clerical	12	12	8	12	11	23
Skilled trades	10	24	26	34	9	8
Personal service staff	9	0	11	0	6	*
Sales/customer service staff	16	1	9	0	25	4
Operatives	11	40	13	28	7	44
Elementary staff	15	7	7	9	21	3
	100	**100**	**100**	**100**	**100**	**100**

Source: NESS05
* Less than 0.5%

150. This data shows that most *vacancies* are for skilled and semi-skilled manual staff. Skill shortage vacancies are also strongly associated with these groups but with other skill shortages affecting professional and technical staff, clerical staff and low-skilled staff.

151. *Skills gaps* are most evident amongst semi-skilled operative staff.

Summary: the balance of demand and supply

152. This data shows that the engineering sector faces levels of recruitment difficulty and of skills gaps in the workforce which are fairly average (compared with the rest of the economy). Most of these difficulties are concerned with the requirement for staff with Level 2 or 3 skills, particularly in manual occupations. However, skills gaps are less prevalent than they were in a comparable survey two years previously and it should be appreciated that *skill shortage* vacancies (at the time of the NESS survey in 2005) account for only 1 in 280 jobs in the sector.

7. Discussion: skills issues in the engineering sector

153. A review of labour and skills demand in the engineering sector has suggested the following summary of key points:

- The sector is significant to the BDPS area's economy. It employs around thirty-five thousand people directly (around 1 in 20 of the total workforce) and, no doubt, supports other jobs indirectly.
- It is a quite concentrated sector with 126 establishments employing two-thirds of all engineering employees.
- The sector is under stronger competitive pressure than almost any other UK sector – from globalising markets and production which spotlight the ability of UK firms to produce at a competitive blend of quality and price. The effect is to drive up the use of technology, to demand changes in work organisation, and to seek to minimise labour inputs.
- In labour market terms, these changes drive up skill levels and reduce demand for large volumes of routine staff. Flexibility, multi-skilling, and team-working are just some of the adjustments required. Facility with computer-assisted and -controlled production is a virtually universal requirement and electronic maintenance and installation skills are at a premium.
- Overall, the workforce is shrinking but retirements and other failures to retain staff (particularly as 'flexible' working means that cohorts of workers are shed and then re-recruited as order books change) mean that there is a consistent, positive recruitment and training need.
- Some of the training need is met internally, typically by larger employers with a more structured view of industry. Externally, labour supply to the industry is shaped by the study of foundation subjects (science and maths) to GCSE and 'A' Level in schools, of engineering in FE (typically to Level 2) and Apprenticeship, and of engineering as a degree subject at Universities. Overall, there is some concern amongst employers that the 'external' mechanisms are not producing the volume and quality of recruits they require.
- The consequence is a pattern of reported skill shortage and skill gaps which appears to be fairly endemic in the industry – lessening somewhat when the sector is in retreat but not disappearing entirely and increasing when the industry, either as a whole, or in particular sub-sectors, is buoyant.

154. How can this summary be translated into a set of 'skills issues' with which the LSC and partners should engage? Our view is that key issues include:

Issue 1: skill shortage as a reflection of failures of strategic management

155. The first substantive issue starts from the perception that skill shortage in the sector seems to be a virtually endemic condition which has persisted throughout recent decades and in all areas of the UK. Many employer surveys undertaken over the last decade whether national, regional or local have identified shortages of engineering craft skills. And some case study approaches have identified

more subtle deficits often focussing on management and professional engineering skills.

156. The first question, of course, is why the industry apparently faces a continuous struggle to get an adequate skills equilibrium.

157. A key factor may simply be that the *process of change* which characterises the sector simply leaves skill formation permanently in arrears.

158. This argument is put forward by the Institute for Employment Research and the Warwick Manufacturing Group who undertook a case study analysis for the National Skills Task Force published in 1999.

159. The report argues that the engineering sector in the UK has been, and still is, going through major structural change. The changes not only carry implications for skill requirements, but also for geographical location of those skills, company support structures and the focus for change and developments in the future. The current position is one of turmoil as plants struggle to keep up with the speed of the changes forced upon them. These changes increasingly imply large-scale adjustments, either as a result of the impact on the establishment directly, or, indirectly through their position in a corporate organisation or supply chain that has to adapt to a changing global environment. Consequently, core strategic issues surround product and operational competitiveness and the changing mix of skills required at the establishment level in the UK.

160. However, the identification of management as having a central role in ensuring satisfactory skills supply is a particular feature of the (above-referenced) report's analysis. Thus, its authors further believe that it is evident that change needs to be continuous, and that the pace is increasing. In broad terms, it is those establishments and managers that appreciate and can rise to these circumstances that are clearly more likely to succeed; some skills deficiencies relate to the ability of managers and management fully to appreciate their situation, develop suitable strategies, and successfully implement them. Even if managers are able to develop satisfactory strategies likely to sustain the organisation in the long term, it is not always easy to capture and articulate the skills necessary for that policy to be put into effect.

161. It has been further argued (Engineering Skills Formation in Britain: Cyclical and Structural Issues, National Institute of Economic and Social Research, September 1999) that change does not only demand continuous adjustment but also drives skill needs upwards. The report's author proposes that a particular reason for concern about sustained weakness in long-duration engineering training in Britain is that in many different ways the skill requirements of engineering employers appear to be rising over time. Indeed, periods of recession, when cost pressures to cut back on training are at their strongest, are also likely to be periods when companies' internal skill gaps may widen due to increased competitive pressures in product markets. Several sources suggest that change in operations is driving needs for higher or, at least, broader skill sets amongst employees

162. One indicator of rising skill requirements is the changes over time in occupational structure which have taken place in the industry: in manufacturing engineering as a whole the shares of professional engineers and managers in total employment have steadily increased over the last 20 year while the employment shares of lower-skilled production operators and clerical staff have declined.

163. The report also identifies that the effects of technological change on workforce skill levels are likely to vary between individual enterprises according to management decision-making about product strategies and work organisation. But in most branches of British engineering, managerial choices have been constrained by competition from mass producers of standardised goods in lower-wage countries which has applied gradual pressure over time to shift production towards small- and medium-batch production of more *skill-intensive*, higher value added products.

164. There is, thus, an important strand of analysis which argues that one key skill shortage in the sector is at strategic management level, with some engineering managements simply not being sufficiently adaptive to competitive conditions – a general failure which encompasses the specific one of failing to deliver the skill enhancements in the workforce which are needed *as part of* wider product/ process adjustments.

165. This argument is supported by SEMTA's recent Sector Skills Agreement. This document proposes that managers need to be upskilled in commercialisation, financial management and lean principles and they must know how workforce development improves competitiveness. The document argues that companies suffer because their workforce development is not globally competitive and that skill needs within occupations change due to constant innovation in product and process.

166. And below management level, SEMTA also suggests that team leaders and front line supervisors, competent in high performance working, are vital to support globally competitive lean operation and Process Excellence. There is a need for a better supply of vocationally qualified team leaders. Skills gaps among managers extend across all the sectors in terms of knowledge management, project management, financial management, supply chain management and negotiation skills. The automotive, aerospace and electronics sectors have all prioritised management and engineering management skills specifically. Electronics has particularly highlighted entrepreneurial management skills.

167. Moving below the 'strategic management' level, however, then other, more prosaic skills issues arises with which local interventions may engage.

Issue 2: skill shortage as a failure to attract sufficient young entrants

168. The first of these is simply that the flow of high quality young entrants into the sector is too restricted. Broadly, young people have come to view manual work, with which the sector is associated, as second-class employment; and, secondly, the long-run employment decline in manufacturing employment generally and engineering specifically, is sufficient to make them wary of going into the sector.

169. This proposition raises a number of subsidiary or related issues concerning entry to the sector:

- Image of engineering – improving the way engineering careers are viewed by young people to accelerate the number and quality of young people who consider the sector. SEMTA's sector skills agreement argues quite baldly that 'schools, colleges and universities are not providing the quantity or quality of recruits that the engineering sectors require'. Industry image is a basic stumbling block to a higher quality of young entrants.

- Extending the attractiveness of the industry to women – the employment of women in engineering has remained at around 20% for many years, with the majority employed in clerical and operator roles. Considerable efforts have been made by the industry over the past 25 years to increase the numbers of women employed in core engineering occupations. The Women Into Science and Engineering (WISE) Campaign was launched as long ago as 1994 to promote science and engineering as a suitable careers for women, helping them to progress in their careers and ensuring their retention within the profession. However, the programme has clearly not broken down the prevailing attitude (perhaps shared both by men and women) that engineering is a 'male' profession. Local figures for entry to WBL and FE training confirm that little progress has been made locally in this respect.

- Better careers advice and guidance – the industry is suspicious that careers guidance for young people has an in-built bias against manufacturing in general and engineering in particular with work-based routes into engineering, such as Apprenticeship, being presented as second best – only for those who aren't able to pursue academic/college routes. A change in this philosophy is regarded as a priority issue.

- Improving mathematics and science teaching in schools – and encouraging young people to make curriculum choices in these subjects is also important. Clearly if the education system effectively excludes a whole segment of young people from the basics from which a career in engineering eventually devolves, a large section of entrant labour supply is closed to the industry and a whole range of engineering employment options are closed to young people.

- The cost of engineering training – given the technical nature of the skills requirement, basic industry training through Apprenticeship and FE Colleges is longer and more equipment-intensive. There are concerns that funding streams discriminate against engineering trainees (because of their higher costs per unit); that FE courses are reducing in number; and that they are not supported by adequate technology.

Issue 3: the development of professional engineers

170. At *professional* level, it has been noted (NIESR report to National Skills Task Force) that most graduate engineering recruitment difficulties have far more to do with perceived shortcomings in the *quality* of graduates than any shortfall in the quantity. The exception is in electronic engineering where recruitment difficulties do appear to have a quantitative as well as qualitative basis. Indeed, data on both student admissions and graduate output show that – after allowing for the reduction in numbers of students enrolled for 'straight' electrical engineering courses – total student numbers in the combined group of electronic, electrical and combined electronic/electrical engineering have actually fallen during a period in which overall participation rates in higher education have more than doubled. The main reasons for this appear to be the opposing attractions of degree courses in computing/IT subjects and (as above) the limited numbers of young people leaving school with qualifications in both maths and physics.

171. Discussion about the quality of engineering graduates frequently centres on perceived weaknesses in the entry qualifications of university students in engineering as compared to new entrants in many other subject areas. Research suggests that roughly two thirds of home students admitted to engineering degree courses in a recent year held three A levels, a higher proportion than in computer science or business studies but below that in all other main subject areas. Of the A level entrants in engineering, about 26% had gained 26 or more A level points, below the equivalent proportions in maths, languages and humanities but much the same as in biological and physical sciences and in social studies and considerably higher than in computer science or business studies. However, further scrutiny of A level score distributions gives some cause for concern about the academic ability of some of the 'weaker' A level entrants to engineering.

172. Various studies of engineering entry qualifications suggest that students with relatively low A level entry grades are clustered in about a third of higher education institutions which would not be able to fill their courses without relaxing their entry criteria. In response to such concerns, the Engineering Council has introduced minimum entry requirements for university courses seeking accreditation as part of the educational base for registration of Chartered Engineers. The stated aim of specifying entry standards in this way is 'to ensure a cohort of sufficient intellectual capability to support a high standard of course content'.

173. SEMTA noted recently that engineering and science graduates, because of their knowledge and skills, appeal to more than just the manufacturing sector and are recruited into other sectors across the economy. They argue that the need to increase engineering and science graduate numbers should be reflected explicitly in the Government target for England of 50% going into higher education, in which the expansion of foundation Degrees will play a major part. SEMTA also believes that engineering graduates currently lack employability skills and need work experience to acquire lean, project management and team leadership skills. They report that employers have highlighted that graduates have skills gaps for at least the first 18 months of their employment. They are looking for a more integrated graduate programme that would result in graduates, with the appropriate in-company development, contributing to the company performance within about nine months. Continuous development of technical capability, particularly for aerospace, requires a range of specialist engineers, with high level competence in the use of complex, high integrity, safety critical systems.

174. It seems probable, therefore, that a continuing issue for engineering companies in the BDPS area when they look to fill their professional vacancies is a scarcity of high quality applicants, based initially on frequent low entry standards to degree courses. Of course, this is a national issue to which there is no immediate local solution. Where local input *is* relevant, however, would seem to be in encouraging more good students to enter maths and physics at A level as the basis for professional engineering development.

Issue 4: an effective engineering Apprenticeship programme

175. 'Apprenticeship' now has a significant history, perhaps more significant in the engineering sector than in any other. And yet a range of concerns (most clearly articulated in 2000 by the Cassels report) appear still to attach to the programme. Basically, these concern the numbers and quality of entrants, and the fit of the programme with employer needs. Can sufficient able young people be attracted to the programme as an alternative to the academic route towards high-level qualifications? (Encouragingly, the number of engineering Apprenticeships in the BDPS area rose in 2005/06 compared with 2004/05). Can the programme adequately deal with the pre-programme development needs of under-qualified

16 and 17 year olds? Can the programme achieve the satisfactory blend of task performance assessment (via NVQ) and rigorous accreditation of deeper understanding of engineering principles (via Technical Certificates) which will meet more employers' needs? Although completion rates are high in the BDPS area (compared with some service sector completion rates), the industry is concerned to find ways to improve completion rates on the programme and to prevent loss of young workers in the period after Apprenticeship completion.

176. SEMTA observes that, when reviewing apprenticeship supply, it is not sufficient to record past or current activity levels as these do not in themselves identify true capacity. For example, Group Training Associations or FE Colleges may be operating at reduced capacity because of a lack of:

- Suitable/able young people requiring an engineering apprenticeship.
- Employers in the locality offering to support an apprentice.
- Contractual ability from the funding organisation to fund capacity.

177. Thus, even if employers offer apprenticeship schemes these may be constrained by the lack of young people and the lack of contractual capacity from funders. These constraints are the true limiting factors as far as apprenticeship supply is concerned. Therefore, in order to fully restore the capability of the Advanced Apprenticeship in England and Wales to meet the demands of training high grade technicians, SEMTA recommends the following:

- Restore NVQ Level 4 as a funded pathway in England.
- Restore the HNC/HND as a 'proxy' technical certificate.
- Introduce a Foundation Degree as an alternative to a technical certificate for academically able candidates.
- Accredit all the above with the Institute of Industrial Engineers as meeting 'Technical Engineer' requirements.

178. However, SEMTA does also note that Apprenticeship has already been developed. As a result of employer demand, and in consultation with employers in the aerospace, automotive and electronics sectors, SEMTA has developed a Higher Apprenticeship in Engineering Technology in England and Wales. The aim of the apprenticeship programme is to increase the number of high-level engineering technicians and incorporated engineers by 1,000 per year for the engineering, manufacturing and technology sector. The requirement is to develop clear pathways to engineering technician and incorporated engineer careers and professional institution registration for school or college leavers, advanced apprenticeship achievers, direct entry adults and adults from the workforce. This will help to rectify the higher level intermediate skills shortage identified by the aerospace, automotive and electronics sectors. As well as trying to improve the already established links between larger employers and HE/ FE, it will also aim to engage SMEs in the employment and training of engineering technicians/incorporated engineers by establishing SME clusters around HE/FE and training provider establishments; it will also encourage the development of Foundation Degree programmes to meet learner, employer and sector needs.

179. A further improvement is that there will be a consistent and coherent overarching framework for engineering manufacture that allows candidates to enter and exit the framework at any point. For example, a candidate can enter an Advanced

Apprenticeship, complete the first two years and then step across onto the Higher Apprenticeship in Engineering Technology and achieve a Foundation Degree. This framework can be used for upskilling of the workforce and is a good vehicle for adult development. It provides accelerated entry into the workplace, saving costs associated with providing Advanced Apprenticeship and Foundation Degree programmes back to back and allows higher education, project, and work-based learning to be integrated.

Issue 5: engaging more employers in more workforce development

180. To this point this chapter has concentrated on a range of issues which mainly concern entry to the industry. However, analysis points to the need for more employers to undertake more staff development. It has been pointed out above that there may be a failure at a strategic level to recognise the issue adequately – but that analysis is perhaps dealing with a corporate issue, particularly significant to major industry players. *Beneath* that strategic perspective, there are a range of other perspectives, which perhaps generate a more practical agenda for local intervention. A number of these can be identified:

181. The industry is moving towards a structure in which the number of SMEs is increasing, as large firms downsize and outsource. But, of course, SMEs are less likely to train (for a variety of reasons to do with costs, attitudes, knowledge, and release of staff). Nor are small firms as likely to absorb graduates as larger ones (high level functions often being undertaken by owner managers). Engaging more SMEs in industry structures is regarded as an important issue for the industry. There is a clear need for co-ordination and coherence of function and for local strategic leadership.

182. There is a need not only to encourage cohesive, co-ordinated approaches to workforce development within the industry itself – in which Train to Gain skills brokerage activity will clearly play a part – but to improve linkage between the sector and external providers. We observed that the number of local engineering companies which use FE to supply their training appears to be in decline.

183. SEMTA notes, further, that, nationally, 64% of training providers say that they have excess capacity and capability, ie. that there are other courses they could provide, if there was demand. 48% have existing courses under threat from lack of demand. However, 44% have demand for courses that they cannot provide. IT specialist courses feature strongly, including CAD, CAM, 3D modelling and CNC programming as well as business improvement courses.

184. SEMTA also observes that fewer than half of employers find that training available meets their business needs completely or well. Some sources of provision, notably private and in-house, score more highly than does FE. (We noted earlier that in the BDPS area, use of FE was declining whilst use of private and in-house provision were both above all-economy averages). There is, therefore, a mismatch between the kind of training that businesses are demanding and that which is being provided. Industry must work with FE and HE to improve training in the practical and technical skills which employees need to develop.

185. They argue that FE provision should also make a contribution to upskilling on the key productivity and competitiveness themes within the sector, ie. lean manufacturing/continuous improvement, supply chain management and new product and process development and introduction. This will require a substantial improvement in the capacity and capability of FE providers. Such an increase in the quality of provision is essential if the FE sector is to more effectively meet the needs of the private sector.

186. Provision supported by the public funding and training that companies purchase themselves is different in two significant ways:

- Public funding expenditure is dominated by training for 16-19 year olds in certificated programmes that tend to be delivered over a longer period of time, off-the-job. A considerable proportion of this expenditure is for young people who have not yet entered the workforce.

- Industry purchases training across a wide range of activity much of which is job specific and ranges from short to long term programmes across the age profile of the workforce and predominantly delivered on site.

187. The implication of SEMTA's argument is that this division of function should be loosened and that public provision needs to become more responsive to industry needs.

188. Clearly, these national observations may not be wholly fair at local level. Particularly the establishment of specialist Centres of Vocational excellence at Yeovil and Bridgwater Colleges is likely to have substantially increased the FE sector's contribution to local employer needs. The need, perhaps, is for *more* engineering provision to move clearly and explicitly towards the delivery of skills of which the sector has greatest need.

189. A further serious issue for engineering employers is the retention of skilled staff. Engineering staff at all levels require long and expensive training and it is a considerable drain on resources if retention levels are low. Investors in People is regarded as an important tool to improve retention rates in the industry, giving more employees in more firms the confidence that the industry recognises their value to business performance and competitiveness (though, clearly, these perceptions have to be built against a history of retrenchment and restructuring job losses which does not dispose to employee loyalty).

190. The loss of many trained staff during the last recession has exacerbated skill shortages, which are frequently being met by using contract staff rather than appointing and training new staff. The use of contract labour and outsourcing of non-core functions have risen substantially in recent years. Skills gaps are a key issue for the engineering sector, especially for graduates with design, manufacturing and management skills and craft/ technical staff able to fill multi-skilled roles in response to the movement, driven by the requirement to reduce costs, towards lean manufacturing.

191. SEMTA observes that, with companies needing to move to higher value products to maintain global competitiveness, the proportion of operators in the industry will decline substantially, mirrored by an increasing need for skilled craftspersons, technicians and graduate engineers across the three sectors. In the aerospace sector it is envisaged that the proportion of graduates in the industry could rise to be as high as 50% by 2022. There has already been a substantial decline in the numbers of operators in the electronics, automotive and aerospace sectors. This trend will continue and will be replaced throughout the supply chain.

192. Other skills gaps include flexibility and the ability to deal with change, project management, commercial awareness, personal and generic skills, computer literacy and IT skills, customer service skills, communication skills and problem-solving skills. The need, which these gaps generate, is for an expansion of flexible and bespoke training able to deliver up-to-date short courses responsive to particular gaps, particularly in SMEs. The difficulty is, of course, in articulating

these needs and generating sufficient volume to justify a response by training providers. Again, therefore, the involvement of SMEs in industry structures is required to generate collaboration and to widen knowledge. But it is also important that the supply-side – key training providers in FE and HE sectors – are responsive to demands for flexibility; and that information resources which link employers to courses and funding are effective.

Summary: key issues in the engineering sector

193. Thus, in summary, a set of key issues are:

- Considering what support to enhanced engineering management development can be offered.
- Considering how local schools and local guidance services currently present engineering opportunities to young people and how their appeal can be widened.
- Considering how the local maths/science offer at GCSE and ‘A’ Level can be improved.
- Consider how FE/Centres of Vocational Excellence can raise quality and expand Level 3 outputs.
- Consider how the numbers of Apprenticeships in engineering can be maintained in an industry which appears to parents and young people to be in decline, how quality can be improved, and completion rates raised.
- Consider how more employers can be encouraged to develop their staff on a more frequent and structured basis – clearly Train to Gain is likely to represent the key mechanism available directly to the LSC.
- Consider how good practice human resource management can be encouraged in engineering businesses by devices such as IiP.
- Consider how local training systems can be encouraged to develop the flexibility which employers require.
- Consider how local sector cohesion and leadership – involving both the training demand and supply sides – can be improved.
- Considering how information flows within the sector (articulating employer needs and clearly and effectively conveying the availability of provision and funding) can be improved – a centralised source of information is implied.

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