learning and skills development agency

Encouraging higher recruitment to technician engineering training

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research report

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Project final report

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Introduction

The issues at the heart of the project

This project, which ran from October 2000 to July 2001, has related to certain fundamental issues concerning training for entry to engineering at Level 3. These issues are summarised in the following extract from *An assessment of skill needs in engineering* (DfEE 2000):

> *There is a continuing, substantial need for training provision in engineering despite long term decline of parts of the sector. But this provision needs to match changes in type of demand. Course content, curriculum and qualifications need to reflect changes in skill needs, including the new ranges of specific and technical skills as well as personal and generic skills. The industry needs to respond by improving work placement opportunities, improving in-company training and working on enhancing the attractiveness of the industry.*

These comments represent the conclusions reached by education and training partners in the engineering sector after wide consultation with employers. They reflect a need for reciprocal changes in engineering training and the industry itself as part of the drive towards increased competitiveness.

The background to the project

The project had originated through concerns expressed by industrial, professional and educational bodies about the levels of recruitment of technician engineers in the light of changes in the industry. Specifically, the project took note of the publications listed below.

- *A new millennium of learning for engineering* (Engineering Employers' Federation 1997), in which changes in the ratio of skills required were forecast alongside the reduction in numbers employed.
- *Labour market survey of the engineering industry in Britain* (EMTA 1998), which elaborated on the difficulty of recruiting technician engineers.
- Two reports from the FEFC (2000a, 2000b), which interpreted the significance of these points for colleges and providers.

How the project was conducted

The project was guided by a steering group with members from the Engineering and Marine Training Authority (EMTA) together with members from the former Further Education Funding Council (FEFC) and the former Training Standards Council (TSC) until March 2001. From April 2001 the representation was from the Adult Learning Inspectorate (ALI) and the Learning and Skills Council (LSC) respectively.

The main stages of the project were:

- a literature survey to establish the forecast employment trends
- the investigation of recruitment and other trends using the database resources of the FEFC and TSC
- visits to FE colleges and training providers, and to a careers service, to meet with managers, trainees and students
- the presentation and discussion of some initial findings at an expert seminar (this seminar was attended by representatives from the Institute of Incorporated Engineers, the Engineering Council and the Engineering Employers' Federation, as well as by the colleges and training providers who had participated in the project, other providers and members from the organisations represented on the steering group).

The aims of the project

The aims of the project were:

- to assess the match between the current volume of training provision and changing employer demand nationally and regionally
- to identify trends in direct recruitment on to Level 3 engineering training
- to investigate the reasons for these trends
- to suggest models of best practice for promoting the uptake of engineering technician training.

Background

Engineering employment

The following background data and information for this project draws heavily on *An assessment of skill needs in engineering* (DfEE 2000). That assessment, referred to in the Introduction, was developed as a partnership between the two major engineering national training organisations (NTOs), associated employers, the government and other stakeholders.

Engineering continues to make a significant contribution to the UK economy, including to exports. Total engineering industry output is valued at around £55bn, representing 8% of the total GDP. The industry accounts for more than one-third of total UK exports, with mainland Europe the main customer. Some 2.5m people are in jobs with some engineering content, and 1.3m in dedicated engineering occupations.

The last 30 years have seen major changes in the industry. It has considerably reduced in size, and 1.5m jobs have been lost since 1971, although the rate of decline slowed in the 1990s. Since 1981, however, output has grown by 45% and productivity has more than doubled. Across the industry, the performance of different sectors varies widely. For example, aspects of electronics are fast growing and high performing, but the metals manufacturing, moulding and fabrication sector is a weak performer. Regional differences are important too.

The shape and structure of the industry has changed, with major implications for the skills needed. The workforce is now more highly skilled and educated. Jobs are more demanding at all levels. Working as parts of production cells or teams is more common and requires different skills. There are fewer large firms, and fewer employed in those firms. Mergers of large firms mean more global elements in operational and investment decisions. Many component parts are now obtained from outsourcing to smaller autonomous units or small and medium-sized enterprises (SMEs). Small firms are taking on higher-level and complex jobs within the supply chain and this changes the skills required from their employees, and the companies' relationships with suppliers and customers.

These trends are likely to continue. Employees will need skills of a higher level and broader range. There will be increasing use of advanced technology. New materials will be available and new processes developed in manufacturing. Higher levels of personal and generic skills will be needed in all work areas. The role of line manager or team leader will be increasingly critical, and will demand advanced technical and high-level communication skills. Employees will need to adapt to new working practices, and pay increasing attention to the needs of internal and external customers. Organisations, and their workforces, will increasingly operate in a global market.

Trends in employment and recruitment

Trends in employment

An assessment of skill needs in engineering (DfEE 2000) suggests that the next 10 years will see a further overall reduction of about 5% in the numbers employed in engineering. The greatest reductions are likely to be in the traditional areas of mechanical engineering and basic metals. By contrast, employment in the electrical equipment and electronics sectors is expected to rise.

Very different trends in the overall demand for different occupational levels are forecast (Table 1). The table shows the expected shift towards workers with higher skills. The data reflects the expected growth and decline in different engineering sectors, and the proportion of employers working in them in the different occupations.

Table 1. Engineering occupational projections 1998–2009

Occupation	% change per year
Engineering professionals	+2.1
Technicians	–0.4
Metals related trades	–2.2
Assemblers and routine operatives	0.0
Plant and machine operatives	–1.7

However, these trends in overall employment do not reflect recruitment needs. These needs are dominated by the demand for replacing those leaving the industry through retirement and other causes. In all the occupational categories with forecast declining overall demand, the replacement demand leads to a positive net requirement overall. This includes technicians. For example, a recent article from EMTA (Berkeley 2001) suggests that the recruitment of engineering Modern Apprentices needs to rise by about 50% to supply demand.

Trends in recruitment to Advanced Modern Apprenticeships

Table 2 shows the trends in recruitment to Advanced Modern Apprenticeships in engineering. The first full year of recruitment to these was in 1997–8. Under this framework, apprenticeships last for 4 years.

Table 2. Starts on Advanced Modern Apprenticeships: Level 3 engineering trainees (within the EMTA Modern Apprenticeship Framework)

	Total
April 1997 – March 1998	6337
April 1998 – March 1999	6567
April 1999 – March 2000	6530

The national rates for successful completion of the full framework are only 32% – though this is better than in most sectors (Engineering Employers' Federation 1997, paragraph 3.1). The output of fully qualified apprentices to the industry is thus nearer 2000 per year. However, many of the non-completers actually achieve the NVQ Level 3, which is the main constituent of the framework, and remain employed in the industry. The precise number of these is not known.

Trends in recruitment to full-time further education courses at Level 3

Recruitment statistics from the FEFC detail enrolments on over 900 engineering qualifications. The great majority of new entrants to engineering at Level 3 are recruited to full-time GNVQ Advanced (now AVCE) and national diploma courses. These courses are generally expected to be of 2 year duration. Table 3 shows the trends in recruitment to these courses.

Table 3. Starts on full-time Level 3 engineering courses

	Total (GNVQ and precursors)
1996–7	4545
1997–8	5104
1998–9	4983

On these programmes, the successful rate of completion is only around 35% of those starting (FEFC benchmark statistics), so that the total pool of those entering industry at technician level, and/or going on to higher education, is unlikely to exceed 1700 annually.

Issues concerning progression

There is at present no systematic or comprehensive tracking information that might give insights as to the proportion of full-time Level 3 completers going on to higher education. The largest projected demand for engineering is at Levels 4 and 5, entry to which may be through a full-time engineering course at Level 3. The industry has traditionally offered and promoted success at Level 3 as leading not only to worthwhile employment with career progression but also to higher engineering education.

However, the *Review of the supply of scientists and engineers* (Roberts 2001), which is concerned with employment at Levels 4 and 5, opines that:

> *…highly-skilled scientists and engineers gain much of their formal knowledge through higher education; there is not thought to be a significant vocational (non-HE) route into top-level science and engineering research activity.*

In considering the supply of potential engineers and scientists from the education system, the above-mentioned review looks at examination results at GCSE and A-level in English, mathematics and various sciences only. There is no exploration of the Engineering Advanced GNVQ or national diploma figures nor any reference to progression from them to higher education. This view of progression possibilities suggests the notion that the study of Level 3 in engineering, whether full-time or otherwise, is an end stage rather than an opportunity, and that a career at Level 4 or 5 would have been reached via a programme of non-vocational A-levels.

Match of supply and demand

Available statistics suggest that recruitment through the work-based apprenticeships and full-time FE routes may be insufficient to meet even the requirement for replacing those leaving employment. Significant skill shortages are developing in some industries.

Main findings from fieldwork and expert seminar

Findings from fieldwork

The colleges and training providers visited all had successful records of recruitment at Level 3. Each had scored a good or outstanding grade in a recent national inspection, or was held in particularly high regard by the local Training and Enterprise Council (TEC – predecessor to local learning and skills councils).

Providers and young people involved in the training identified what they saw as the main barriers to increasing recruitment. The barriers identified were:

- the public image of engineering as insecure employment
- a lack of understanding of career possibilities and qualifications
- insufficient access to schools
- the cultural pressure for academic rather than vocational study
- the belief that engineering is too difficult
- schools' over-emphasis on IT and simulation
- embedded issues relating to equal opportunities.

The public image of engineering as insecure employment

The negative effects of the many high-profile redundancy and closure programmes in the last 10 years was the most often cited reason for an engineering career being unattractive.

> One visit was to a training company supporting a large programme of training for shipyard welders through Modern Apprenticeships. Trainees were pleased to have work in an area of high unemployment, though several said engineering would not have been their first choice. Within a fortnight of the visit the national press announced the yard was to close.

Many contributors also mentioned the persistent 'oil and dirt' image of engineering as a factor.

A lack of understanding of career possibilities and qualifications

Many of the students and trainees felt that they had not been given sufficient idea about possible career paths, wider opportunities and possible salaries once their training was completed.

> One trainee compared this lack of information unfavourably with that provided by the armed forces and police in terms of careers. In both these cases he had been able to establish what he might be doing, his possible responsibilities and salary at age 25 and age 30.

Young people said that their teachers did not seem to know much about engineering as a career. Other research has illustrated that teachers too often rely on their own experiences and are often suspicious of the motives of those encouraging careers in industry (Foskett and Hemsley-Brown 1998).

Managers spoke of the problems caused by the plethora of engineering qualifications, and a lack of understanding of the qualification structure by teachers, careers advisers and employers.

Some contributors suggested that the qualification and professional structure was suited only to large firms. In smaller firms, modern technicians also needed new skills such as communication, team leadership and problem solving. This needed to be better understood by advisers, and might attract some better calibre recruits. Many technicians now had to be skilled across engineering disciplines and this should feature positively in recruitment.

Insufficient access to schools

Staff of colleges and training providers in areas where schools had sixth forms said that there were barriers put up preventing access to year 10 and 11 pupils to anyone who might offer career choices that would mean pupils leaving the school at age 16. Such barriers are reported widely (eg Ofsted 2000). Where schools take pupils only from ages 11 to 16, access and cooperation is generally good.

> Eleven out of a group of 12 students on a national diploma in engineering had heard of the course through the local careers service, and one through an adviser from the armed forces. None had heard of the programme through their schools.

The cultural pressure for academic rather than vocational study

Managers in training providers said that both parents and schools encouraged young people to think that the ‘best’ route post-16 was to continue in full-time education. In colleges, managers and students said that there was parental and peer pressure to take a non-vocational route rather than vocational because it was considered more prestigious. Several contributors said that these views were particularly strong in families of Asian origin. As a result, many pupils who had performed well at age 16 continued in full-time education on non-vocational courses.

> A major engineering employer in Peterborough reports that they recently tried to recruit 12 Modern Apprentices. Only 10 applications were received and only four of these were considered of the right calibre. A major car manufacturer found it impossible to recruit sufficient high quality Modern Apprentices nationally for its service network.

The belief that engineering is too difficult

Several contributors suggested in discussion that engineering as a discipline was more academically demanding than most others. The mathematics demands of Level 3 college courses, and their compatibility with some of the GCSE syllabuses, was a particular concern. Examples were given of potential students being dissuaded by these perceived difficulties. Some suggested that these difficulties were simply indicative that engineering had difficulty attracting the brightest students.

Schools' over-emphasis on IT and simulation

The present curriculum in most schools was seen to lack traditional hands-on experience, previously gained in traditional wood craft, metal craft and technical drawing classes. Instead, students were said to be over-encouraged to use IT and to believe that simulation on a computer was a sufficient replacement for the real thing. Several managers expressed hope that the introduction of GCSEs in vocational subjects might lead to a reintroduction of skills-based courses in schools.

Embedded issues relating to equal opportunities

All contributors recognised that there are barriers to recruiting young women. The issue is well researched, and much discussed in employer and professional organisations. The participation by young women in engineering manufacturing and motor vehicle Modern Apprenticeships is only around 5% (DfEE 1999) and in FE engineering courses around 11% (FEFC 2000a). Depressingly, in some of the project visits, the comments of male students and trainees themselves reflected in-built prejudices against women in the industry. More hopefully, it was often the young people who were critical of these attitudes.

> At one training provider, apprentices suggested engineering was 'too mucky' for women, and that women would 'not be up to the hard work'. They said that conversations in the plant and in their group did get 'a bit crude' and that women 'would be intimidated'. In another, the trainees recognised a 'very sexist environment' in their firm because 'many of the men are over 50 and from a different era'. They felt that any woman would be the object of their crude jokes. At a college, the employed students said that their firms were 'in the dark ages'. One small company had no toilet or changing facilities for women – and one college had no such facilities in its engineering area.

A small number of contributors referred to prejudices against persons from ethnic minority groups. In colleges, the proportion of engineering students from such groups is below the average for all programme areas (FEFC 2000a). Most of these students are on full-time courses, rather than courses for employed trainees. Prejudices are reflected in employment rates following training.

‘Trainees from minority ethnic groups experience difficulty in obtaining employment on completion of their training. Although their NVQ achievement is proportionally higher, the rate of progression to employment is lower. This is a serious cause for concern’ - extract from Ofsted’s 16–19 area report for Derby (where the highest proportion of trainees is in engineering).

One college teacher of Asian origin reported that he had come into education to escape from the ‘relentless racial banter’ in industry. But he had recently taken a group of full-time students on an industrial visit and he reported that the group had been subjected to racial harassment as they toured the production floor.

Findings from the expert seminar

Contributors to the expert seminar made constructive suggestions on how some of the barriers listed above could be reduced. These included:

- greater promotion of engineering through its products
- improving careers advice to emphasise possible goals and the variety of opportunities
- funding levers to encourage schools to form partnerships with providers and engineering businesses
- proactive promotion of equal opportunities in the providers and in the workplace
- the importance of cooperation between training providers, colleges and industry relating to engineering as a career
- improved funding for providers and students/trainees
- greater recognition of the role and status of the technician engineer.

Greater promotion of engineering through its products

Managers and young people as well said that the many attractive products of engineering were insufficiently used in the promotion of engineering as a career. They thought, for example, that the engineering role in the design and manufacture of the latest recreational, domestic and medical technology was underused in attempts to attract young people. Similarly, the part that engineers play in improving the environment was not understood.

> Recent information pamphlets from EMTA use fashion clothing, mobile telephones, mountain bikes, medical scanners, marine craft and space travel to illustrate engineering applications.

Contributors to the expert seminar agreed that much could be done by industry itself to improve its public image, and to recruit directly using its products as a base.

> Examples were given of major national companies' advertising opportunities in engineering on the packets of popular domestic foodstuffs.

Several providers said that it was important that young people should have more chance to see and handle real engineering products when they were considering possible careers.

> One college motor vehicle section always takes vehicle parts to recruitment events and encourages young people and their parents to work on them at the stand. They report that their stand often attracts crowds round it compared with others.

Improving careers advice to emphasise possible goals and the variety of opportunities

Contributors wanted more information on the range of salary levels reached by technician and incorporated engineers as they progressed, and more use of case studies illustrating promotion and travel opportunities. They felt that major companies often had a rigid classification and understanding of a technician role, but this did not relate to the many opportunities in smaller companies. Young people had little idea of the breadth of activities and career possibilities in this sector.

> One college engineering section had set up an association to bring together the parents and teachers of their students. Parents who were employed in engineering had volunteered to accompany teachers to careers events, and were able to contribute their first-hand knowledge of the opportunities now available.

Funding levers to encourage schools to form partnerships with providers and engineering businesses

All managers said that the most effective lever to improve access to young people in schools was appropriate funding.

> All training providers had taken teachers for 'work experience' in schemes supported by Education Business Partnership (EBP) funding. As a result, one provider had recruited at least one trainee from each participating school from which none had previously been attracted. The same provider operated a midweek GNVQ course for 120 pupils released from years 10 and 11 at school, again partly funded through the EBP scheme.
>
> A consortium of employers and a college had successfully applied to the DfEE for £20,000 funding for an engineering challenge project in six local schools. Year 10 pupils worked on the challenge in the evening, developing equipment to use in a nuclear emergency. Each school team was supported by two engineers from a local company and by a teacher from the college. In total, 96 pupils took part – including 25 girls – and the competition raised considerable local media attention.

Contributors also said that funding levers could overcome some other difficulties, for example the release of teachers from colleges for periods in industry and increasing the opportunities for students to experience the latest equipment in industry.

Proactive promotion of equal opportunities in the providers and in the workplace

All college and training provider managers agreed on the importance of equal opportunities, and all ensured that their own promotional material featured young women and young people from ethnic minorities. However, it was evident from interviews (see above) that they had variable success in inculcating the principles of equal opportunities within their own organisations.

One training provider had been particularly proactive in promoting equal opportunities, and had a zero-tolerance disciplinary code for any poor practices. Trainees spoke maturely about equal opportunity matters. They discussed the issues, and the organisation's stance, sensibly and intelligently. This provider had been awarded a grade 1 for equal opportunities in its recent inspection. Of all the colleges and providers visited, it had the highest proportion of female trainees.

Other examples of good practice are recorded in *Dare to be different: challenging gender imbalances in Modern Apprenticeships* (DfEE/LGNTO 1998).

Most contributors agreed that much was still to be done within industry itself to make engineering a more attractive career for women, for example through improving the working environment and conditions, having more flexibility in working hours, and providing more opportunities for retraining and career breaks. The practical difficulties of implementing this kind of change were argued by one expert as problematic, but others felt that the consequences of failing to change were more dire.

The importance of cooperation between training providers, colleges and industry relating to engineering as a career

Colleges, training providers and industry are usually recruiting from the same limited group of school pupils. This can give mixed messages to the pupils and lead to confusion. Some of the most successful recruiting seen in the project resulted from cooperative strategies.

In a northeast town visited as part of the project, the previously dominant steelworks had closed some years ago. The resultant job losses left a lingering distrust of engineering as a career. Since then, regeneration has seen the considerable growth of fresh industries, often based on new technology. A group of local employers and the college, supported by the council, set up an 'engineering forum' to solve the immediate and developing skill-shortage problems which they could see would impede further progress. The forum successfully bid for £750,000 from European funds, and invested this in the college's engineering facilities. All publicity and information materials, and recruiting activity, is joint. The college is also the town's major training provider. As reported on the NFEC website (2000), enrolments to full-time and part-time courses have more than doubled and 18 Modern Apprentices are in their first year in the college's training arm.

The visits also revealed some excellent cooperative work in researching issues relating to recruitment.

One college financed an initial study with local industry on the future needs for technician engineers. The work was taken up and further supported by Business Connect locally. As a result, a local multinational employer contributed funding to subsidise the wages of Modern Apprentices from small companies in their first year.

> Another college is working with local schools, employers and the university on a careers pathways project. This will track 50 youngsters, who have shown an initial interest in technology, from age 14 to age 20. It hopes to determine the quality of advice and guidance they received though this period, what choices they had, and what barriers they encountered.

However, it was obvious from the project visits that there are considerable misgivings in some training providers about the provision in their local colleges (none of those visited), and these need to be addressed if the two sectors are to work closer together.

> One major training provider has stopped using any local college to provide off-the-job training because of the perceived undisciplined ethos of staff and other groups of students at the college. Complaints included the dress code of teachers, the quality of their teaching, and organisation that allowed full-time students to attend 17 hours per week only. This provider employs its own teaching staff to deliver off-the-job training (up to HNC level) on its own premises.

Similarly, some colleges expressed concern at the minimal levels of off-the-job training allowed to trainees at some providers. They claimed that the trainees were limited to the minimum requirements of their NVQ Level 3, and that this would hinder their progression once they had left their apprenticeship. All the training providers involved in this project were observed to be fully encouraging their trainees to reach their maximum potential.

Improved funding for providers and students/trainees

A common concern of college and training provider managers, and frequently mentioned by students and trainees, was the level and stability of funding. College managers were concerned at the overall level of funding for engineering courses, and also about aspects of the funding regime that made it difficult to operate an integrated full-time programme within which a number of qualifications could be achieved. Managers in training providers thought that the funds attached to Modern Apprenticeships were too low to provide the best training experience. They also considered that they should have had earlier access to quality-related funding similar to the Standards Fund and the Centres of Vocational Excellence initiative in the college sector.

Students in colleges believed that they should have an allowance for staying in education, like apprentices. Where Education Maintenance Allowance schemes were operating, college managers reported an increase in enrolments. Some Modern Apprentices thought it unfair that the level of their remuneration was so dependent on their employer. The income of those interviewed, who were all in the first or second year of their apprenticeships, varied by a factor of four.

Greater recognition of the role and status of the technician engineer

The seminar views about the image of engineering in general and the role of the technician engineer in particular revealed that changes are taking place.

There are differing ideas of what a technician engineer does: in large firms the traditional concept remains, but smaller firms (of which there are many) need new skills – team leadership, problem solving, higher skills. There is a need to be wary of ‘over-academicising’ the role of the technician. There was also a view that engineering technician could be a qualification in itself, and that the current pyramid of Chartered and Incorporated Engineers could be upturned as a result.

At the same time, the trend is towards greater professionalisation, with the Institute of Incorporated Engineers obtaining a Royal Charter, and the concomitant desire to accredit work-based training leading to professional registration.

The constituents of a good education/training experience

In the discussions held during the project visits, participants were also asked what features made for the best engineering training/education experience. Managers and young people largely agreed. They suggested:

- a high proportion of hands-on learning
- the quality of the instructors/teachers
- schemes which strove for higher than minimum standards.

Those involved with work-based training particularly valued:

- the opportunity to learn and gain qualifications while earning
- the disciplined, adult atmosphere of the training environments.

A high proportion of hands-on learning

The importance of hands-on learning was emphasised by all teachers, instructors and managers. Students and trainees agreed; it was clear that the most effective learning took place in a practical environment or where practice and theory were so closely integrated as to be indistinguishable.

The quality of the instructors/teachers

Students and trainees most valued teaching or instruction from those who had clear, first-hand experience of the work being covered. They valued the use of up-to-date examples relating to their workplace, and opportunities given to them to explore practices in their workplace as part of discussions. Such qualities were considered more important than polished teaching techniques or the personal charisma of their teacher/instructor. Managers largely reflected these views. College staff pointed out the difficulties they have in entering industry for a refresher experience.

Schemes which strove for higher than minimum standards

All the colleges and training providers visited as part of the project were chosen because of their recognised high quality. All had designed programmes, and set expectations, higher than the minimum required for their main programme. Managers suggested that this equipped students better for later life, and implied that the basic programme standards were too low. Students and trainees were generally appreciative of these opportunities, and the higher expectations set of them.

All the colleges included a NVQ Level 2 course as part of the students' programme in addition to the GNVQ Advanced or national diploma. Some also included City and Guilds courses in CAD, and several offered students the opportunity to take GCE A-level Mathematics.

All the training providers exceeded the minimum requirements of the Modern Apprenticeship framework. Entrants with good GCSE results were expected to study for a national certificate, followed by a higher national certificate, as part of their off-the-job training. Most programmes included elements of team building such as outward-bound activities. One provider also included City and Guilds CAD and 3-D CAD.

The opportunity to learn and gain qualifications while earning

'Earn while you learn' was a publicity slogan used in recruitment by several of the training providers. All the trainees interviewed suggested this as one reason for them choosing an apprenticeship rather than continuing their education full-time. Generally, the higher the earnings, the more satisfied and motivated the trainees were. Many said that their companies had promised to maintain their support for progressive education and training beyond the apprenticeship, to higher national diploma or degree. Some teachers spoke wistfully of these opportunities. Several of them, who taught on higher national certificate courses, were earning less than some of the fourth-year apprentices in their classes.

The disciplined, adult atmosphere of the training environments

The training providers, in their attitudes to their trainees, tried to mimic the best of the industrial environments their trainees might encounter. Relationships were adult, but discipline strict. Absence and poor timekeeping were dealt with immediately, sometimes by withdrawal of privilege or part of wage. Managers considered this an essential part of the training. The apprentices agreed. They felt that they were entering an adult environment and were being trained to take responsibilities.

Managers in one training provider maintained a dress code for trainees depending on their activities. For 'shop-floor' training, good overalls and safety equipment were worn. When on 'office' or 'design office' training, 'shirt and tie, and no jeans' were required.

Conclusions

Variations in employment patterns

- It is clear from the findings and the available statistics that employment patterns within the engineering industry are subject to volatility. Contributory factors include an overall decline in engineering and manufacturing contrasted with buoyancy in particular subsectors and regions. In these conditions it is difficult to plan for provision which will match regional, local and subsectoral patterns of industry needs in volume terms. Furthermore, the uncertainty of employment itself is a factor impinging on the perception of engineering at many levels in the education and training system. This in turn impacts on the motivation and choice of individual students and trainees.

Funding and resourcing

- Training for engineering at the post-compulsory level tends to avoid over-provision, not least because of the extent of the resourcing needs such as workshops, equipment and materials. Funding is thus a critical issue, and a complex one. Levels of funding are important to get right, but the fundamental aspect of resourcing is the need to view the investment over a long-term perspective. The volatility in local employment referred to above calls for responses which are based on stability of resource.

Engineering as a subject

- In schools there has been a move away from the kinds of learning that traditionally formed a lead-in to engineering skills and knowledge. Our project has not been able to analyse in depth the factors involved in this since the finding is based on information reported by respondents. However, it has been echoed elsewhere, notably in a parallel project which examined skills needs and learning provision in the electrotechnical sector (Weiss 2002, and see also reports from LSDA Effective Practice Network in Engineering, 2001). One reported result of this change in curriculum is the reduced visibility of engineering: pupils, teachers and students have fewer points of reference for engineering either as a subject to learn or as a career path.

- Fewer students appear to have the opportunity to develop aspirations in engineering, and those that do are less likely to have developed familiarity with what it is about. There is a need for renewed interest in engineering as a valuable area of curriculum in its own right.

Attainment levels of students opting for engineering

- Project findings from qualitative sources indicate that the general educational attainment level of those entering engineering training at Level

3 is declining. Information from interviews and the seminar suggests that young people with attainment levels which in the past could have led them towards a career in engineering now opt for other full-time studies. This trend is matched with – and may be the impact of – the funding mechanisms for a range of post-16 full-time providers that encourage recruitment to less resource-intensive provision.

- Colleges and training providers are aware that they need to provide more support to the learners. Even so, some employers report that new employees and trainees fail to match up to expectations of being ready for the task. There were also perceptions reported that engineering is too hard and, evidently, not an exciting challenge.

Dangers of minimalist approach

- Alongside these problems concerning the match of provision to needs there is an apparent estimated numerical shortfall overall of entrants to the industry trained at Level 3. But this estimate is masked by problems with the statistics of completers. It is possible, and indeed is known to be common, that non-completers have a level of technical competence that renders them employable within the industry. Their statistical non-completion may relate to elements such as key skills. There appear to be patterns emerging in which training providers, colleges and employers are forced to take on young people with lower-than-previous attainment levels and yet, between them, fail to provide sufficient opportunity or motivation for individuals to improve beyond bare employable levels. This has poor implications for the long-term stock of skills in the industry.

- There are many identifiable examples of good practice where colleges and training providers have responded locally to particular problems. Initiatives found in this project that aim to upgrade information to schools about the exciting opportunities in engineering careers deserve greater resourcing and coordination. Similarly, the attempts to update teachers and trainers in the post-16 system would benefit from further impetus.

Principles of good practice

The following principles appear to underlie the good practice located in the example providers examined within this project:

- ongoing explicit partnership arrangements between schools, colleges, training providers and the industry
- partnership arrangements which are based on the design and practice of progression patterns beneficial to individuals and which meet the needs of industry
- provision and updating of information among partners, particularly the stimulation of interest in schools about the opportunities afforded by careers in engineering
- organised and well-resourced opportunities for vocational teachers to be kept up to date about current industrial practice
- information and awareness opportunities for all teachers about progression through vocational and work-based pathways
- provision of attractive information to potential engineering students and their parents about careers in engineering and how to access them via vocational and work-based routes
- high quality learning experiences based on skilled and devoted staff in well-resourced environments
- the extension of opportunities to groups of learners not traditionally associated with engineering, and the identification and removal of barriers to their participation
- assistance and support for learners, particularly in key and employability skills, to ensure they get the most out of engineering training and are equipped to progress further
- provision of extra-mural/extra-curricula engineering activities to stimulate interest and enjoyment
- overall patterns of learning provision having knowledge of major trends in engineering employment, but with appropriate interpretation of local or short-term fluctuations.

Update: developments in vocational education and training, 2001–2

Beginning with the announcement in 2001 by David Blunkett, the then Secretary of State, about the formation of a vocational ladder of qualifications,[1] a number of measures have been introduced which provide opportunities for some of the issues mentioned in this report to be addressed.

- EMTA has undertaken work with the LSDA Increased Flexibility Support Programme (IFSP) to develop a GCSE in engineering, which will be introduced in 350–400 schools, including specialist technology schools, over the course of the next 5 years. This is a tenfold increase over the current 40 schools delivering the existing Part One GNVQ (ESAG 2001).
- Following the report of the Modern Apprenticeship Advisory Committee,[2] greater resources will be directed towards the funding and promotion of apprenticeships, including those for engineering. EMTA has called on employers, the Learning and Skills Council (LSC) and Connexions (the careers advisory service) to work with them to provide better directed information about apprenticeship and vocational qualifications in tune with local labour market needs.
- EMTA's National Framework Strategy has priorities to:
  - develop frameworks to meet changing needs and optimise employer take-up
  - increase supply of suitable trainees at all ages to meet sector needs (10,000 Advanced Modern Apprenticeship entrants by 2005 identified in the Sector Workforce Development Plan)
  - provide support to raise quality standards of provision and improve retention and achievement
  - promote and support the enhancement of trainer skills and increase employer involvement in on-the-job delivery
  - raise the profile of work-based training for employability.
- The LSC sector-based approaches include a case study report on the automotive industry. Part of this work involves attracting new entrants through a Task Force consisting of EMTA, the Engineering Employers' Federation and employer/trade association partners.

These building bricks are being put into place in a coordinated and strategic way, and provide the opportunity for addressing some of the major issues. However, some funding and structural issues remain open and their early conclusion is needed to assist the solution of some problems highlighted in this report. At the time of writing, the nature and composition of the Sector Skills Councils (successor organisations to NTOs) in the engineering industry is not yet resolved. Improved funding levels for Technical Certificates (new off-the-job elements in Modern Apprenticeships) are being sought, driven by particular problems of sustainability within the training provider base.

Notes for update

1. Speech to the Institute of Economic Affairs, January 2001.

2. Commissioned by the DfES following consultations on Modern Apprenticeships and led by Sir John Cassels, October 2001.

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