

# The implications of the UK government's agenda for workforce development on engineering education.

C.J Arlett<sup>1</sup>, R. Dales<sup>2</sup>

<sup>1</sup> The Higher Education Academy Engineering Subject Centre, UK, (carol@engsc.ac.uk)

<sup>2</sup> The Higher Education Academy Engineering Subject Centre and Coventry University, UK

## Abstract

This paper discusses the issues for engineering education in the UK in response to the government's drive for higher education to work more effectively in partnership with employers to provide the work force with the skills needed for economic productivity and growth. Many engineering departments are unsure about the implications as they work with employers in the development of new courses and are required to enhance their capability to deliver innovative work-based learning (WBL) solutions.

The findings are presented from the 'Engage' project led by the HE Academy Engineering Subject Centre, that aimed to facilitate dialogue between employers, academics and other key stakeholders and to develop a common understanding of the skills agenda relating to engineering and physical sciences in HE. The project used a novel approach involving elite stakeholder personnel as project partners, who were involved in determining the direction and execution of the project. The paper will cover the four areas of concern identified by the project partners: work-based learning; building partnerships; levers and enablers; and change management. It will review the tensions and awareness issues between academia, industry, and professional bodies that hamper progress with this agenda, while highlighting aspects of good practice and resources that would be useful in promoting enhanced employer engagement.

*Keywords: employer engagement, work-based learning, skills*

## 1 INTRODUCTION

### 1.1 THE EMPLOYER ENGAGEMENT AGENDA IN THE UK

Since 2003 the Government, through its two White Papers on skills [1] [2] has promoted the need for post-16 provision to become more responsive to employers. For HE this has resulted in a stronger focus on 'employer engagement' in enhancing learning and teaching through, for example, the expansion of 'Foundation' degrees [3]. The Leitch Review of Skills [4] launched in December 2006 considers the UK's long term skills needs, in order to maximise productivity, economic growth and social justice. It sets out a radical vision for 40% of adults to have a degree-level qualification by 2020. With the changing demographics (a decrease in the numbers of 18 year olds and the 'greying' of the workforce), adult workers already in employment that will need to update their skills. The Government's response to the Leitch Review in July 2007 [5] endorses the need to increase the number of employees attaining higher level skills and the recommendation that a proportion of HE funding be delivered through demand-led mechanisms. All higher education institutions (HEIs) are being encouraged to develop models and their capacity for delivering higher level skills that meet the needs of employers and employees in ways that are adapted to their missions.

A review by Madeleine King of the evidence on employer demand [6] identified the considerable potential for HEIs to penetrate the market for training and development of about £5 billion annually, of which it estimated HEIs could capture some £300 million. The review found evidence that more flexible provision and processes of accreditation and assessment of work-based learning will be needed by HEIs if the employer engagement agenda is to be realised. In particular small businesses will generally only buy bite-sized chunks of learning.

The Higher Education Funding Council for England (HEFCE) has been tasked by the Government to develop a new funding model and to introduce the principle of employer demand-led funding, as outlined in its strategy to

support links between higher education and employers on skills and lifelong learning [7]. A number of initiatives have already been funded such as Lifelong Learning Networks (LLNs), Higher Level Skills Partnerships and research projects. Some HEIs, for example the University of Hertfordshire, have taken clear strategic decisions to be 'business-facing' and have long term strategies to address the skills agenda, where other HEIs are still grappling with the implications and trying to understand the 'fit' with their current profiles. However it is clear that "*The HE sector must do its business of teaching and learning significantly differently if it is to achieve a step change in the delivery of higher education to the workforce market that is recommended in the Leitch Report.*" [8]

As the HE sector moves to a new phase in working with employers, the Sector Skills Councils (SSCs) are seen to have an important role. There are 25 Sector Skills Councils (SSCs) forming the Skills for Business Network and each one is an employer-led, independent organisation and provides information about employment and training needs for their sectors (there are ten SSCs that are relevant to engineering [9]). Whilst noting that universities are responsible for developing and delivering their own courses, Leitch points out that employers and their SSCs will have to develop direct relationships with universities. The professional bodies will also need to collaborate with SSCs and HEIs to influence higher level provision.

### **1.2 The challenges for engineering**

In 2004, engineering was identified by HEFCE as one of the 'strategically important subjects' due to its economic importance. A recent report by the Royal Academy of Engineering on Educating Engineers for the 21st Century [10] found that industry expects an increasing shortage of high quality engineers over the next 10 years and made some recommendations about how engineering education in universities should develop in line with the changing requirements of industry. The Sainsbury Review of the Government's Science and Innovation Policies [11] recommended a review of current approaches to engineering education and the development of 'experience-led' degrees which integrate technical, operational and business skills. There is also recognition that UK industries need to have the skills base to be competitive in global markets to avoid losing out to activity from other countries. At the same time there is a perception in industry that quality of output from HE is declining and if universities delivering engineering do not address this skills gap, then industry will be forced to seek high quality talent for their workforces from countries such as India or China.

A research project by the New Engineering Foundation in 2007 on *Work-based learning in engineering HE programmes* [12] found that the higher education sector generally and engineering in particular lack the capacity and incentives to engage in delivering courses linked to employer needs. The engineering educational community does not generally value the learning gained in the workplace, reflected by the findings that most industrial placements during an undergraduate course are not assessed. The research also showed that the level of staff development in universities with respect to supporting, delivering and assessing WBL in engineering is very limited.

The accreditation of degree programmes by professional bodies is a concern for many engineering departments. The professional formation of engineers has seen changes: recognition is now based on demonstrated competence that may require the integration of different components; educational requirements have been raised and old training structures have broken down. The accreditation of HE programmes is now based on output standards and there is no prescription about the delivery methods or programme structure. Hence, from the perspective of the Engineering Council (UK), the regulator of the UK engineering profession, there is nothing to inhibit joint HE and employer delivery. Professional bodies also have a role to play in supporting learning opportunities for continuing professional development and HE needs to be flexible and innovative in its response to these needs.

One recent example of a model of a flexible pathway to becoming a professional engineer is the MSc Professional Engineering developed by the Gateways to the Professions Project [13] with four HEIs and the engineering institutions working collaboratively to offer an innovative work-based learning approach to acquiring the competences that lead to professional status. It is aimed at those who cannot or are unwilling to undertake a traditional HE-based programme by providing routes to professional registration that integrates education (from Foundation Degrees to Masters level) with supervised work-based professional development. It aims to create a set of nationally approved WBL mechanisms that lead to professional status.

### **1.3 The role of the Engineering Subject Centre**

The Engineering Subject Centre (EngSC) is one of 24 centres forming the subject network of the Higher Education Academy, and has a remit to support learning and teaching in engineering across the UK, working in partnership with the wider engineering community. Since its inception in 2000, it has had well established links with the engineering professional bodies and when the Centre was encouraged in 2005 to establish links with SSCs it was well placed to set up an 'Engineering Network' to support collaborative work between the SSCs, professional bodies and others with an interest in engineering education at HE level. The mission of the Network has been to bring together agencies representing employers, academics and professional bodies to look

at individual and shared agendas across the HE sector and to exchange ideas and practice. After some initial wariness and misunderstandings of the roles of parties involved, the group has worked hard to build partnerships and was well placed to respond to the opportunity to work together on an employer engagement project.

As part of HEFCE's response to the 'employer engagement' agenda it made funding available for 2006/07 to the HE Academy to pump-prime a number of development projects involving the Subject Centres and relevant SSCs. The purpose of the funding was to enable the building of longer-term strategic relationships and to support HE institutions to respond to identified workforce development needs by developing discipline specific practice. The Engineering Subject Centre, in partnership with the subject centres for Physical Science and Materials, was successful in securing funds for a one year project: *Facilitating Dialogue between Employers and Engineering, Physical Sciences and Materials Academics in Higher Education*; known as the 'Engage' project.

## 2 THE ENGAGE PROJECT

### 2.1 The aims of the project

- To facilitate constructive dialogue between employers and academics in higher education;
- To develop a common understanding of the skills agenda relating to engineering, physical sciences and materials disciplines in higher education.

### 2.2 The approach taken

The Engage project started in February 2007, successfully bringing together 20 individuals representing 13 project partner organisations covering academia, SSCs, professional bodies, industry, careers services, and other stakeholder groups. An initial meeting of these project partners, with some facilitation, identified key priorities and defined the remit for four working groups. The working groups established were: work-based learning, levers and enablers, management of change, and building partnerships. The leaders of the working groups were tasked with defining the outcomes for their respective groups, expanding the membership with other key stakeholders as appropriate, and for organising four meetings over a nine-month period. During this brief one-year project these groups have worked together well to set their own directions and define their own goals. This has similarities with other research processes that are governed by steering committees but this project is possibly unique in having relatively senior, expert personnel conducting the research process as well as defining its agenda.

There have been a few drawbacks with this approach but the benefits have far outweighed these. Elite-level interaction was a necessity if project partners were to appreciate fully each others' perspectives on the employer engagement agenda and develop a meaningful network. This has been a highly successful aspect of the Engage project in that the network established is, of itself, a highly valuable resource. The inclusive and co-operative working of executive-level partners has had strong and positive implications for the quality of their contributions and of their wider contact networks that they could draw on for information, conference contributions and resources. It should be stressed that partners' time was given freely to the project, which given their seniority within their respective organisations, was a substantial investment in the project. The value of the project partner network and the quality of its activities over a one-year period was really appreciated at the culminating conference: *Higher Education and the Workplace - supporting employer engagement in engineering and physical science*, held in London on 15th January 2008. Much of the information from this successful one-day event is available on the Engage conference website (<http://www.engsc.ac.uk/engageconf/>).

## 3 DISCUSSION OF THE KEY ISSUES

This section describes the activities of the four working groups with general project findings on these key areas.

### 3.1 Work-based learning

The group set out to clarify the different views and perspectives of WBL; make sense of academic accreditation and QAA requirements; and explore channels for effectively promoting flexible and responsive provision of learning in the workplace.

The Working Group used the following definition as the basis for their discussions:

*"A Work Based Learning Programme is a process for recognising, creating and applying knowledge **through, for and at** work which forms part (credits) or all of a higher education qualification."* [12]

Recognising the fact that workplace learning is ultimately about effecting positive change and improving productivity of learners and their employers, the Working Group identified the following three key factors as the main pillars upon which the workplace learning can be expanded and strengthened .

1. Engaging the target audience

Employer engagement can involve educational provision that is employer-designed (e.g. foundation degrees), employer-funded (usually through support for student fees), and employer-delivered (in the workplace). In certain sectors such as healthcare, where the employer in question is a large public sector organisation – the employer’s funding contributions to undergraduate programmes are obviously mainstream, as a major investment in workforce development. In other sectors such as physical sciences and engineering, however, employer funding of HE is minor.

The work by the WBL Working Group showed that employers and universities will not engage in WBL if they do not see convincing case-studies demonstrating the benefits of WBL programmes. Universities also need to appreciate the potential value and benefits of WBL, for example by increasing their share of the CPD currently delivered by private training providers (e.g. by accrediting employers’ existing in-house training, supplying various services such as accreditation of prior experiential learning [APEL], curriculum design and assessment).

The Working Group also found that advice and guidance on WBL in general is not very easy to obtain, and for physical sciences and engineering it is even worse. However, a limited number of portals such as Learndirect’s Learning *through* Work offer excellent opportunities for engaging employee learners in professional and educational development.

## 2. Delivering and Supporting WBL

In developing WBL programmes, there needs to be multiple access points of learning for learners to engage. For example, the student/employee should be able to attend some structured lectures, undertake e-learning modules, undertake self-directed study, attend one to one tutor discussions and take part in mentor-assisted e-forums.

In developing a WBL programme, the Working Group felt that a good starting point could be the development of the learning contract. This is the document that identifies what the learning project is, what the activities will consist of, and what the learning outcomes will be. It is an agreement between the learner/student, the employer and the university. It makes sure that all parties know what they have to provide to deliver on the contract. The creation of the learning contract often carries credits that go towards the credit requirement for the WBL programme. In LearnDirect’s *Learning Through Work* Contract, the structure is provided in an easy format and establishes the parameters for study and expected outcomes, but it does require discussion and deep consideration on the part of the student to complete it. A learning contract will be a combination of negotiated, independent, standard modules and APEL.

At the Engage Conference, John Blundell, a Principal Design Engineer with Alstom Power Ltd, gave his view from his experience of successfully completing a work-based learning Masters degree in Combustion, Fuels and Performance Modelling with the University of Derby using the *Learning Through Work* Contract. A case study detailing the course of study and issues arising is available [14]. He believes that there was benefit to his company as the content of his course was relevant to its business needs and at the same time he was able to investigate new design and technological concepts. He described potential areas for conflict between the company and the student, such as the employer’s approach is ‘solution based’ (often within a team structure and meeting specific targets), whereas the university’s approach is ‘process orientated’ (problem solving is an individual abstract intellectual process). John stressed the importance of the role of the university tutor as well as his mentor within the company and described the potential for conflicting deadlines of the company and the university.

## 3. Recognising WBL

There continues to be a weak alignment between employers’ interest in competence rather than academic credit, and learners’ needs for portable qualifications. The Working Group identified the need for developing better recognition systems that enables the mix of academic qualifications, professional qualifications and workplace skills to be assessed and recognised to reflect the changing needs of future learners (on part-time, short, work-based and professional courses) in engineering and physical sciences.

The Working Group felt the need for much clearer QAA guidelines that will enable the Codes of Practice to include various forms of workplace learning and the development of audit methods that are responsive to innovative, work-based provision but maintain appropriate quality standards.

### 3.2 Building partnerships

Participants in this working group from academia and industry very quickly came to realise “How little we know of each other’s worlds”. As well as wanting to learn from each other from the process of debate, the group was keen to produce some tangible deliverables. As with the WBL group they saw the need for case studies of good practice in employer engagement in the engineering and physical science disciplines in the UK and developed two case studies of good practice in employer engagement with HE: one between Network Rail and Sheffield Hallam University and the other between Lloyd’s Register and both Liverpool and Liverpool John Moores

Universities. The group compared these activities with employer engagement processes in other countries, particularly Australia, Germany and the United States.

One area that this group particularly highlighted was the difficulty that employers have in the ‘how’ and ‘who’ to contact at an HE institution. University websites are not usually helpful in this regard, with the exception of attracting partners for developing ‘enterprise’ activities. To counter this perceived problem, the group developed lists of contact persons in UK universities’ departments of engineering and physical sciences disciplines. They also drafted some guidelines and helpful hints in a document: “*Working with a University*”.

It was acknowledged that building sustainable relationships between employers and HEIs takes a great deal of time and effort; it requires commitment on both sides yet differing strategic and operational drivers can make life difficult and these can change quickly and without warning. Developing a shared understanding between employers and HE institutions at the outset is critical but this requires all parties to overcome the language barrier. The baffling language issue could, in part, be demystified by the project’s glossary of acronyms.

The above points equally apply to establishing and nurturing partnerships between the organisations representing employers, higher education and the engineering profession. The experiences of the Engineering Subject Centre suggest that working with SSCs and facilitating links with higher education is resource intensive and requires the willingness of all parties to understand the environment in which the others operate.

### **3.3 Levers and enablers**

The activities of this group concentrated on assessing the motivators for getting HE institutions and employers to engage, including funding and accreditation issues. The issues for discussion included: funding structures and University’s costing models; engaging with HEI mission statements and their long-term strategies; student placements, WBL and portfolio-based learning; the benefits of drawing on practice from other disciplines (e.g. Health sciences); the different staff skills needed in HE; sustainability of courses; issues with open or closed courses; and the range and number of organisations involved and the tensions existing between some of these.

The project concluded that the funding criteria and the way in which HE institutions are resourced needs to change. Costing and pricing of programmes to meet employers’ needs can be problematic and the price to an employer may be prohibitive if full economic costings are taken into account. More simplistic costing models are required similar to those adopted by private sector consultancies. Industry will spend a lot of money on training if value can be seen in terms of improved productivity and currency, such as accreditation/qualifications.

Supporting more flexible modes of delivery including learning in the workplace and putting in place mechanisms by which an employer’s ‘in house’ learning and development (which might be provided by private sector consultancies) can be recognised and accredited is a necessity.

### **3.4 Change Management**

This working group decided to bring together a range of key stakeholders from higher education, employers and other key stakeholders in promoting HE/employer engagement who could provide a rich source of experience and insight into the issues around the ‘managing the change’ theme. The issues from an employer focus included: the potential for conflict between learner and employer needs; employer commitment is likely to vary as they need to respond to economic cycles; and the fragmentation of the employer community which is particularly relevant to small and medium enterprises (SMEs). From an HEI perspective the funding of provision and the need for sufficient student numbers to make a course viable and sustainable was a key issue. Also employers need to recognise that HEIs are subject to different drivers and demands such as the Research Assessment Exercise (RAE), teaching, business, and the community, and are not always able to respond as quickly or as flexibly as employers might like.

The group recognised that there is a wide range of key stakeholders who could support the ‘managing the change’ agenda. However, links between these organisations are not always clear and it would be beneficial to recognise these organisations and coordinate their contributions. It is recommended that all potential key stakeholders are identified and an overarching communication channel is created to maintain regular contact with such organisations.

Many employer and/or HEI initiatives rely on the efforts of a few dedicated and enthusiastic individuals. If these people leave post or retire the initiative is at high risk of collapse. It is recommended that such initiatives are formalised and supported appropriately so as not to rely on individuals but is integrated into the common practice of organisations.

Establishing frameworks that align academic, occupational and professional standards can help to build understanding of how an academic qualification meets the needs of industry. Progress has been made on this front but this is an area where more could be done.

Regionally-based, consortium approaches need to be developed. Groupings of both discipline-related HE departments and similar industries could provide ‘critical mass’ so that more flexible approaches could become

sustainable. This is particularly so for SMEs, where it has been shown that regional consortia can show altruistic behaviour, rather than be purely competitive.

Examples of good practice already exist, nationally and internationally, in engineering, materials and physical science related disciplines and these need to be captured as case studies and disseminated; they demonstrate how HE level learning can be negotiated, contextualised for the employer and tailored for the individual.

#### **4 RESOURCES AND CASE STUDIES**

The Engage project has produced a number of deliverables including an acronym buster, case studies, contact lists for engineering departments, and a mind map that highlights the journey of an individual wishing to pursue further studies through WBL. All these resources and other relevant links are freely available at the Engage conference website: <http://www.engsc.ac.uk/engageconf/index.php/resources/>

#### **5 CONCLUSIONS**

The employer engagement agenda is going to be key to the strategies of higher education in the UK over the coming years. The needs of industry for more engineers with higher level skills will continue to dominate discussions about the development and delivery of the engineering curriculum in higher education. The project has found that the playing field is a 'muddy' and complex one with a wide range of stakeholders all having an interest in the agenda; it is not always clear what the role and contribution of these stakeholders are and this makes partnership working difficult.

There is still room for debate about the extent to which the strategic intent of HE institutions matches with delivery objectives and other priorities can impact negatively on the workforce development agenda. Employers face a not dissimilar issue in relation to whether or not ongoing training and development is a priority.

The nature and extent of employer demand is fluid and highly dynamic, which creates problems for HE institutions in building a sustainable employer market that mitigates the risks involved in moving away from a more traditional market of full-time (generally) younger students. The extent to which staff working in engineering departments have the capacity and capability (and perhaps willingness) to work with employers is an ongoing issue for the sector.

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- Loughborough University – engineeringCETL and Careers Centre
- Engineering Council UK
- Engineering Professors' Council
- New Engineering Foundation
- Unilever UK
- EEF (The Manufacturers' Organisation)

#### **References**

- [1] DfES, 2003, *21<sup>st</sup> Century Skills – realising our potential* – White Paper, London, HMSO.
- [2] DfES, 2005, *Skills: Getting on in business, getting on at work-* White Paper, London, HMSO.
- [3] Foundation Degree Forward, *What is a Foundation Degree*, <http://www.fdf.ac.uk/files/INBRIEFWhatIsAFoundationDegree.pdf> [accessed Feb 2008]
- [4] Leitch, 2006, *Prosperity for all in the global economy – first class skills*, London: HM Treasury.
- [5] DIUS, July 2007, *World Class Skills: Implementing Leitch Review of skills in England*, London: HMSO.

- [6] King, M., 2007, *Workforce development: how much engagement do employers have with higher education?*, London: The Council for Industry and Higher Education.
- [7] HEFCE, 2007, *HEFCE strategy to support links between higher education and employers on skills and lifelong learning*, HEFCE.
- [8] Wedgewood, M. 2007, *Employer Engagement – Barriers and Facilitators*, report to DfES.
- [9] Engineering Subject Centre, 2007, 'Working with Sector Skills Councils?'  
<http://www.engsc.ac.uk/an/ssc/index.asp>
- [10] The Royal Academy of Engineering, 2007, *Educating Engineers for the 21<sup>st</sup> Century*, RAEng.
- [11] Sainsbury, J., 2007, *The race to the top – a review of the Government's science and innovation policies*, London: HM Treasury
- [12] New Engineering Foundation NEF, 2007, *The path to productivity: the progress of work-based-learning strategies in higher education engineering programmes*, London: NEF.
- [13] Engineering Gateways: Flexible Pathways to becoming a Professional Engineer,  
[www.engineeringgateways.co.uk](http://www.engineeringgateways.co.uk)
- [14] Young, D. & Garnett J., Eds, 2007, *Work-based Learning Futures*, Bolton, University Vocational Awards Council.