

INDUSTRY ENGAGEMENT IN UK BUILT ENVIRONMENT HIGHER EDUCATION COURSES

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The paper presents the initial findings of research being carried out in the UK as part of the Accelerating Change for Built Environment Education (ACBEE) initiative that is sponsored by Construction Skills. An investigation has been carried out to capture the inputs through which industry engages with Built Environment learning and teaching and how these add value to the parties involved. An initial outline framework has been developed comprising a taxonomy of the type and form of engagement. This framework is currently being validated and tested through the collection of information on case studies that demonstrate high quality in higher education / industry engagement. These range in nature from whole courses down to individual modules taught at both undergraduate and postgraduate level. A key thrust of this paper is how industry and HE can move forward and help built environment education progress through partnership.

Keywords – assessment; engagement, higher education (HE); industry relevance.

INTRODUCTION

HE/Industry Engagement in the Built Environment and the Role of ACBEE

Several government reports have explored the performance of the construction sector including *Constructing the Team* (Latham 1994), *Rethinking Construction* (Egan 1998) and *Accelerating Change in Construction* (Egan 2002). A common theme is the requirement for fundamental change to increase effectiveness and efficiency in the performance of the sector. These are key factors in attracting investment and talented people into the industry so as to keep the UK at the cutting edge.

This UK based study results from a number of earlier initiatives designed to tackle the decline in applications for built environment HE courses and were caused by:

- A 45% decline in building and construction course applicants (1994 to 2000) (UCAS). Indeed, this is corroborated by a figure of 40-50% suggested by the CITB over a four year period (CITB 2001).
- A decline in the standard of applicants for these courses. 43% of Construction Professional Services (CPS) firms believe that the quality of newly recruited graduates has declined over the past 5 years (ConstructionSkills 2004)
- A decline in the number of graduates entering and staying in construction (HESA)
- An acknowledged complexity relating to HE funding issues for BE education

The 'Making Connections' seminar in January 2001 initiated a campaign to improve the recruitment, education and retention of graduates. This led in November 2002 to a workshop in Leeds on 'Rethinking Construction Education'. From this a representative group was formed to find a way forward in Accelerating Change in

Built Environment Education (ACBEE). The partners are ConstructionSkills, Constructing Excellence, and the HE Academy subject centres for built environment (CEBE) and engineering (LTSN Engineering). Indeed, both the Lambert Review of Business-University Collaboration (2003) and the White Paper on The Future of Higher Education (DfES, 2003) highlight the need for collaboration.

The ACBEE case studies demonstrate that industry and HE can all gain by working together. Universities gain from better alignment of the built environment curriculum with the world of work so that they are able to orient themselves to industry. Industry can benefit from universities getting their knowledge out into industry. However, in order for this to happen on a more structured basis there is a need to improve dialogue.

The aim of the study was to conduct a preliminary investigation into the nature, characteristics and scope of the engagement between HE and industry in the UK built environment subject discipline. This preliminary study is part of a wider study aimed at establishing the factors that affect the engagement and how it adds value to the parties involved. The specific objectives of the study were:

To establish a set of characteristics for the engagement.

To examine the nature of the engagement.

Thus, this paper explores the rationale behind high quality case studies in an attempt to inform others who are considering adopting such interactions. At the heart of this is how we encourage effective dialogue, engagement and collaboration between between the construction industry and HE.

METHOD

The method is based upon a qualitative investigation into case studies that demonstrate good engagement between HE and industry. A workshop was held at which representatives of industry, professional bodies and HE considered possible characteristics. These were then incorporated into a set of criteria for case studies. Universities and industry were invited to submit brief summaries of proposed case studies, which were then reviewed and those selected were required to submit a full description against the stated criteria.

Early case studies were the subject of further investigation in the form of interviews and the sample consisted of six in the ACBEE programme. Each case study partner was interviewed to provide triangulation of the workshop results and further depth on the engagement itself. Wherever possible, general feedback was elicited from students that had directly experienced the benefits of the engagement to get a more complete picture on its value. The interviewees were given advance warning of the questions to be discussed. Interviews were digitally taped and transcribed being subsequently sent for comment and agreed with the interviewees. The interviews consisted of asking a series of similar prompt questions in the same order to both the academic and industry partner so as to enable direct comparisons to be made.

The evaluation is based upon a qualitative analysis of the interview transcripts. The transcripts were annotated, labelled and responses categorised within each question to enable further analysis. As a result, mind maps were produced for each question based upon underlying themes emerging. The analysis centres on the responses to the questions posed in the interviews and verbatim quotations from these are used to highlight significant points.

ANALYSIS, DISCUSSION AND FINDINGS

The Characteristics of a Case Study

The ACBEE programme has involved the production of a number of case studies. A template was produced following a workshop that examined the characteristics of case studies of high quality in HE/industry engagement. The set of characteristics is:

- Active partnership/collaboration of industry, HE and/or institutional partners
- Clearly defined objectives and potential benefits for each partner that are defined before commencement and which can be readily measured
- Inclusion of a clear industry subject or theme with wide built environment appeal
- Approaches and ideas that are replicable and transferable and that include well-structured modular learning elements
- Relevance and value to students and appropriate to real industry activities
- Inclusion of recognised best practice approaches
- Commitment to the case study being tracked and measured over time

ACBEE Analyses of the Early Case Study Interviews

Early case studies were largely written up on the basis of an investigation of the contribution they made to HE / industry engagement. These interviews were intended to elicit understandings of HE, industry and/or professional body engagement, which would inform the ACBEE programme and highlight areas where further, more detailed exploration might be required. An analysis of the interviews was subsequently carried out focusing upon the following issues:

- Student attractiveness / industry relevance
- What will students learn / key industry themes
- What measures could be tracked over time (say 5 years)
- Success of course / module and difficulties encountered
- Five most important issues to promote innovative engagement

In the ACBEE case study interviews that were conducted, a number of areas were explored and the principal outcomes of these are given below:

Student attractiveness / industry relevance

Industry Input - Some form of enquiry-based learning in the curriculum, which is informed by industry, is deemed very important for the development of the students. For example, on the 'Constructionarium' element of the MEng group design project at Imperial College it was decided to deepen student learning through building scale models (on-site) of a dam, pre-cast and cable-stay bridge. Students were exposed to a learning environment with a real site (donated by industry) and materials to make the whole experience as authentic as possible. This links the theory taught in the classroom through a 'hands-on' design situation via the site experience which makes the module unique. Also, this helps students gain an increased appreciation of the implications of theory on the design of structures and relevance of their chosen career.

The ACBEE case studies are testament to the range and breadth of areas covered utilising this authentic ‘hands-on’ experiential learning approach where students apply their knowledge to practical problems. An interesting point is made by Prof Chris Wise in that industry benefits from this approach.

“Students needed to have some reality injected into their course and the people who needed to do that were those who then stood to receive maximum benefit from the exercise. (Clients/ Consultants/ Contractors)”

Prof Chris Wise, Constructionarium, Imperial College London

Built environment education should not forget that we seek to educate students to operate within a practically based profession. There are many things that you would not be able to teach in a classroom. The opportunities for more closely mirroring the real world through engaging with industry should be regarded as an important stimulus to enable deeper learning. Feedback from the case studies has indicated that an awareness of the environment in which construction companies operate increases student motivation and encourage students to remain within the industry.

Guest industry lecturers are seen as a vital ingredient in the curriculum to allow students to learn from differing perspectives. This is especially important for undergraduates who are often taught in disciplines so that they can gain this rounded information before they graduate. In essence this gives students a broader ‘world view’ to complement their education. When interviewed Simon Smith, Edinburgh University, comments on the value of industry input through real world examples:

“AWG construction provide case study materials & examples / guest lectures on the module which brings the real world to the classroom. Thus, curriculum content is from industry for industry.”

Qualities/Skills developed - The majority of industry and HE partners highlighted the significance of a number of ‘soft’ skills or qualities developed within their case studies. These have been categorised under three main themes namely project management skills, integrated thinking and personal outcomes. ‘Project management skills’ were seen as group work, working to time, materials scheduling, economics of a project, decision making, project structure and communication. ‘Integrated thinking’ included interdisciplinary working and the linking of construction and design elements of teaching which is often perceived as a gap by the industry partners. As a consequence of these the ‘personal outcomes’ of the individual student were realised through the potential to enhance career development. HEFCE is working to ‘integrate the skills and attributes which employers need, such as communication, enterprise and working with others, into higher education courses, on a subject-by-subject basis’ (DfES, 2003: 44).

Sponsorship - Courses that were sponsored were deemed more attractive to both students and industry as it implies a tacit endorsement of the course. Sponsorship ranged from initiating whole programmes to individual modules of study and indicates an industry driven curriculum. Indeed the Interdisciplinary Design for the Built Environment (IDBE) course at Cambridge University was started with funding from The Ove Arup Foundation and recently obtained expansion funding from the former, The Happold Trust and Newton Trust. At module level, the ‘Constructionarium’ takes place over six-days and costs £60,000, being sponsored by the John Doyle Group and match funded by Imperial College, which work as out at around £1000 per student.

Steering Committee - A practitioner liaison group was seen as key to inform professionally accredited courses in the light of current developments in practice. It is deemed necessary to have a representative balance to steering committee membership which includes not only industry but also sponsors (not necessarily financial), university academics, current students and alumni. The representatives on the liaison groups can act as a formal channel of communication between HE and industry.

What will students learn / key industry themes

Interdisciplinarity - A common thread throughout the case study interviews were is the fact that ‘problems don’t come in disciplines’. Undergraduate level courses often group students by discipline which re-enforces the ‘silo’ mentality experienced within some parts of the industry. Exposure to other disciplines throughout a programme of study helps break down these barriers and raise awareness of discipline specific problems. This is corroborated from the ACBEE prospectus (2003) that expressed concern at the nature of interdisciplinary education and teamwork.

To design and successfully solve ill-structured and ‘messy’ problems in the ‘real world’ students need a grounded appreciation of a range of discipline specific factors. However, as one course leader pointed out, it is not enough merely to grasp a problem but that there is a need to communicate the elements of each solution in a manner that each specialism understands. Thus, specialism is still seen as fundamental within a true interdisciplinary perspective.

“There needs to be a respect for the criteria of which their co-professionals are the advocates. In an ideal world the specialists would be generating solutions to their part of the problems that also contribute to solving the problems of everyone participating. They should not doggedly defend their own turf at the expense of the broader picture. Leapfrogging to next solution because they already have in mind what will satisfy other members of the team. A good idea can come from anywhere; the testing of the idea should come from specialism.”

Paul Kirby, IDBE Course, Cambridge University

Learning Outcomes - Built Environment and Engineering are both vocational in nature and the learning outcomes within HE are driven to some extent by industry requirements. Notwithstanding this, there is a tension between education and training when attempting to strike a balance between theory and ‘hands-on’ practical activities which are alien to many students. The interviews revealed that the learning outcomes are largely related to:

- Managing projects (How to put projects together / site structure)
- Work in teams (Teamwork)
- Meet project deadlines (Time)
- Evaluate project economics (Cost)
- Respect environment / materials (Sustainability)

Embedded within the learning outcomes from the case studies was the need for HE to educate students of the importance of understanding how a construction project is put together and how this will affect the design process and construction. There need to be such opportunities within courses so that students gain experience in these areas. Many of the above skills are acquired in practice and industry expects a certain level of capability in students which they expect to develop and nurture on Graduation.

Stephenson's idea of capable people is termed 'capability' which looks at the 'integration of knowledge and skills and personal qualities and understanding used appropriately and effectively..' (1998: 2).

What measures could be tracked over time (say 5 years)

Alumni - The need to promote an Alumni association is seen as a cross-programme measure that clearly has tangible benefits. From a course perspective past and current students can be promoted as success stories or ambassadors through their career progression and development. Increasingly Alumni are seen as 'friends' of universities and used for income generation through sponsorship or donations akin to the American model. Indeed, the EngD course (CICE) at Loughborough University hopes to develop relationships using Alumni to sponsor research students and encourage partners to become more receptive to the idea of industry led research.

The ACBEE case studies indicated that where possible Alumni should be evaluated as part of the whole learning, teaching and assessment process. Rolling feedback on the difference the course has made to the students' careers should be used to inform educational decision making thereby providing a quality loop. Those suggested have largely focused on student impressions of courses and mechanisms used include questionnaires and interviewing in some cases. This process would test the assertion in many courses of whether their students become leaders within the industry. Prospective students would benefit from clearer market signals through departmental graduate destinations data including employability and pay (Lambert, 2003).

An interesting paradox is that at part-time post-graduate level in particular a survey of course Alumni indicated that they had got a lot out of the course and felt it was worthwhile, though they couldn't say what change it had made to their careers as they knew no different! Also, it was seen as difficult from an employer perspective to measure and quantify the contrast between employees which have (and have not) been through a course of study. This point is echoed by one course leader, who believes that even though a course may make a profound difference there is still the difficulty of eliciting 'concrete' evidence. Notwithstanding this, feedback of this nature is considered essential by many interviewees in an attempt to measure changes in behaviour through shifts in attitudes/culture.

Recruitment/Retention - Interviewees saw this as a multi-faceted issue in that it covered students, graduates and the construction industry. A key theme was the need to reduce the decline in students wanting to enter the construction industry. Dainty (2002: 773) argues the need for industry/HE engagement through a sustained promotional campaign. However, on unpacking the recently published HESA statistics (2002/03) it is evident that part-time student numbers are not falling.

Student progression on courses and retention within the industry is seen as 'two sides of the same coin' in that if the curriculum is made more relevant from the start of their programmes through industry engagement this is seen to increase motivation. Consequently, an aspiration is 100% graduate participation into the industry with the caveat that there needs to be a broader balance of disciplines. The corporate university courses claimed that staff retention is an important indicator in terms of running a more customer focused business. If people within the industry are better able to carry out their role, understand their job and the needs of the business then they will be more contented and there will be less prospect of staff churn.

Business Drivers - From a business perspective the learning obtained from innovative corporate university courses can lead to better relationships and customer retention. The corporate programme initiatives stress the need for commercial outputs. Both industry and HE partners from these case studies believe that direct tangible benefits arise from business through a more client centred approach.

“If there is an improved relationship with customers and clients jobs should run more efficiently than before and thus more profit should be achievable.”

Andrew Mitchell, Styles & Wood Academy, MBS

Understanding what clients really want and communicating this is an important issue that Manchester Business School consider must be tracked. An expected by-product of this is increased productivity, sales and profit although these are seen as difficult to measure directly.

Success of course / module and difficulties encountered

This question ascertained the success and difficulties of running a course with industry engagement and perceived benefits from an industry partner perspective.

Success - Most interviewees were of the opinion that their course had been delivered successfully and feedback received from students indicated that the content was both interesting and stimulating. Post-graduate courses actively encouraged their students to reflect within their work environment and implement their learning so that it may permeate the culture of their organisation. It is evident that the need for a close association between courses and industry is of benefit to departments within Universities. This viewpoint is corroborated by Mel Lees, Lecturer on the BAE Project Management Corporate Course at Salford University.

“The University’s viewpoint is positive as it demonstrates very close relationship between programme design/ delivery and industry need. Any programme that does that has to be viewed positively. All courses within BE and construction are part of larger supply chain that satisfies clients – we are all on same side”

A collateral benefit of HE-industry engagement is seen as keeping and improving status with professional institutions through course accreditation. This is looked at favourably as positive outcomes can be used for public relations and recruitment.

Difficulties - An increasing amount of content is being incorporated into Built Environment courses. A potential problem is that of ‘curriculum creep’ where courses cram in more and more content which means just too much information for students to digest. Biggs (1999: p41) gives the analogy of the curriculum as a rectangle, where the product of breadth times depth remain constant. Ramsden suggests that ‘we should strive to include less, but to ensure that students learn that smaller part properly’ (2000:137). This is supported by Race (1999:58) who stresses the importance of balancing assessment to deepen and enrich students’ learning experience thereby supporting their future lives and careers. Consequently, for each new module something has to give and there is a balance to be struck between the subject and the ‘fit’ within the content of the relevant curriculum areas. Also, the level of prescription by some professional bodies can further complicate matters.

Many enquiry-based site projects are seen as valuable to the students as it increases their awareness of real world problems. Indeed, a major challenge on the ‘Constructionarium’ site based project were the staffing demands. The main problem was that staff with limited experience in this field of activity were not able to play an

active role. This was overcome through the participation of personnel from John Doyle Group who were knowledgeable in this area. Another issue with this site based project was that of locating a suitable venue annually. However, this has been overcome with a permanent home being found with ConstructionSkills. Also, this has been made available to any other University wanting to mirror the activity.

Industry Partner Benefits - An illustrative example would be the Constructionarium involving Imperial College and the John Doyle Group. The industry partner direct benefits are seen as intangible to some extent by Peter Goring at John Doyle Group, although there are indirect benefits that become apparent:

- Positive coverage
- Recruitment of students to 'sponsor firm'
- Students are future clients
- Graduate retention in industry

On the EngD Course at Loughborough, government subsidies (ESPRC) were seen as a conduit which increased industry participation from companies who would not normally have been able to participate as a sponsor. The ability to have a research engineer embedded within their own company and culture looking at solutions to industry problems has been hailed as a big success. A change in behaviour was an aspiration to many industry partners although difficult to quantify.

Five most important issues to promote innovative engagement

Many factors were teased from the interviewees whose responses ranged on a continuum from tangible to intangible issues related to industry engagement.

HE can achieve things on limited resources - Industry believes that academics are achieving much on limited resource but insist that they are able and willing to assist to help Universities achieve things through engagement. This help does not necessarily need to be financial in that industry can provide a live learning environment and assist with resources to help deepen students learning. An example of this would be worked examples of industrial projects and site visits as these can provide a 'plank' for learning. Peter Goring from John Doyle Group suggests the importance of a practical course bias to raise awareness of what students will actually be doing in practice:

"Ensure that Universities should be aware not only of theories but of the issues that are important to construction companies. Things like people issues, like making sure the graduates understand what they are going to be looking to when they graduate what the environment is they will be working in..."

Mentoring schemes with industry - The need to keep University staff up to date with current developments in industry is a factor which virtually all the industrialists commented upon. Academic secondments were seen as a valuable way to keep academics at the cutting edge and inform the curriculum in light of their industry experience. ARUP have found that academics who have returned from being seconded to industry have benefited from the experience. Conversely, one academic proposed that in order for industrialists to gain Fellowship of a professional body they should have to demonstrate educational engagement. This could be through recruiting students into the industry, teaching or contributing materials to University courses.

Accountability - Interviewees strongly believe that industry should be driving innovation in the curriculum as they are the end users of the Universities' products.

This raises the question of whether industry is in a position to inform the content of the curriculum? The professional bodies should be accountable in that they should be acting as stewards and monitoring Universities fulfilment of their industry engagement. However, there is the strong proviso that it should be up to the individual Universities to decide how best to meet these criteria in the way deemed most appropriate to their context. This is seen as a positive mechanism for professional bodies to encourage innovation within accredited courses thereby allowing the level of industry engagement to be tracked.

Medium required to facilitate engagement - There needs to be some arena to enable dialogue between industry, Universities and professional bodies to get together both regionally and nationally. All parties agreed that there is the need to plan to enable industry engagement on a regional basis. There is a role here for an intermediary to become the conduit and develop short, medium and longer-term objectives to make things happen. Lambert (2003) identified the key recommendation that industry needs to use the new Sector Skills Councils to engage more fully with HE and exert some influence over university courses and curricula.

Industry relevance of research - The Research Assessment Exercise (RAE) now drives many University departments. However, Universities need to raise awareness of the benefits of research within industry. A barrier to overcome is the industry perception of 'blue-skies research' even though funding councils now recognise the need to maintain a balance between academic and applied research of immediate practical relevance (HEFCE, 2004). One solution is getting research aware staff into companies and in attempt to provide a change in culture. The EngD course at Loughborough involves students working in their sponsored companies carrying out relevant and real world applied research.

CONCLUSIONS

This paper has attempted to unpack the rationale behind industry/HE engagement. As a result of the ACBEE case studies, interviews and workshop a number of pertinent issues have been raised. The key issue is how do we encourage industry/HE to work together to improve dialogue? The HE-Industry link could be solidified through liaison groups to inform the curriculum in light of developments in practice. Creating a more realistic environment for students to work could be afforded through industry based examples, projects and site visits. Industrial secondments would allow academics to keep their knowledge and skills at the cutting edge and inform the relevance of their research and currency of their teaching. Professional bodies could help through making contribution to education a mandatory Fellowship requirement.

Professional accreditation should be less prescriptive and allow innovation to flourish within the curriculum. The industry perception is that the professional bodies should be seen as 'stewards' as they are the main drivers and champions for industry to instigate changes to HE. There is a role for the new Sector Skills Councils to act as a conduit between industry, HE and professional bodies to drive changes in courses and curricula. Research should be packaged to allow industry to capitalise on innovation within Universities. In conclusion, industry partners involved have indicated that they have gained much from their interaction with HEIs although the benefits are largely seen as indirect.

REFERENCES

- Accelerating Change in Built Environment Education, Shared Problems – Shared Solutions (2003). Available online at <http://www.cebe.ltsn.ac.uk/learning/acbee/>
- Biggs, J (1999) Teaching for Quality Learning at University. SRHE & Open University Press, Buckingham.
- CITB (2001), Construction Workforce Development Planning brief 2001-2005. Available online at <http://www.citb.org.uk/research/reports/default.htm>
- Construction Skills (2004), Built Environment Professional Services Survey 2003/04 Survey Results. Available online at <http://www.cic.org.uk/>
- Dainty, R.J. and Edwards, D.J. (2003). The UK building education recruitment crisis: a call for action. *Construction Management & Economics* **21**, 767-775.
- DfES (2003), White Paper The Future of Higher Education. Available online at <http://www.dfes.gov.uk/hegateway/strategy/hestrategy/>
- Egan, J (1998) Rethinking Construction: The report of the Construction Task Force, HMSO, London.
- Egan, J (2002) Accelerating Change: a report by the Strategic Forum for Construction (Chaired by Sir John Egan), Strategic Forum for Construction, London.
- HEFCE (2004) HEFCE Strategic plan 2003-2008 (April 2004/17), Available online at <http://www.hefce.ac.uk>.
- HESA (HE Statistics Agency), Available online at <http://www.hesa.org.uk>
- Lambert, R (2003) Lambert Review of Business-University Collaboration – Final Report. HMSO, London. Available online at <http://www.lambertreview.org.uk>
- Latham, M (1994) Constructing the Team, HMSO, London.
- Race, P (1999) Why Assess Innovatively?. In Brown S & Gasner A, eds, *Assessment Matters in Higher Education*. SRHE & Open University Press, Buckingham.
- Ramsden, P (2000). *Learning to Teach in Higher Education*. Routledge, London and New York.
- Stephenson J (1998) The Concept of Capability and its Importance in Higher Education. In Stephenson J & Yorke M, eds, *Capability & Quality in Higher Education*. Kogan Page, London.
- UCAS (Universities & Colleges Admissions Service), Annual Statistical Tables 1994 to 2000 entry, Available online at <http://www.ucas.com>.