Improving performance through HEI–industry engagements in the built environment

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Abstract: *The poor performance and inefficiencies of the construction industry are well recognized and documented. Through a variety of combined industry and government initiatives there has been a continual expression in the UK over the last decade of the urgent need to address the fragmented nature of the industry to improve its performance. A major challenge is for education and industry stakeholders to create closer and more effective relationships with each other to facilitate greater mutual understanding. 'Accelerating Change in Built Environment Education' (ACBEE) is a sponsored initiative designed to encourage the closer working together of industry, education and professional bodies to provide more relevant training and education. This paper introduces ACBEE, along with an evaluation framework for measuring the performance of engagements at various levels. This is followed by an analysis of the application of this performance measurement framework through case studies of industry–education engagement. A number of case studies were identified as operating at the grades of 'strategic alliance' and 'partnership' (as classified in the ACBEE evaluation framework). The analysis of these cases focuses on the drivers behind and the purpose of the engagement, and how these are aligned with the business strategy of the collaborating organizations and measurement of the activity. Evidence of meeting the explicit business needs and strategic objectives and the contribution to good practice knowledge are also discussed.*

Keywords: *strategic alliance; partnership; engagement; measurement performance framework; ACBEE*

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Successive UK governments have seen employer engagement with education as an important element in addressing the skills agenda to increase industrial performance. The Leitch Review's main recommendations highlighted actions that would provide a means for the UK to become a world leader in skills (Leitch, 2006). The key recommendations (and messages) relating to the higher education system include:

> 'a rebalancing of the priorities for HE institutions to make available relevant, flexible and responsive

provision that meets the high skill needs of employers and their staff' (Leitch, 2006, p 68).

Industry and higher education can both gain by working together (Williams, 2005). Indeed, both the *Lambert Review of Business–University Collaboration* (Lambert, 2003) and the White Papers on skills (DfES, 2003, 2005) highlight the need for collaboration and closer working relationships. Also, over the last decade, various combined industry and government initiatives – see, for example, Latham (1994) and Egan (1998, 2002) – have focused on the performance of the construction industry.

These initiatives have all resulted in a continued call for dramatic improvement in the efficiency and effectiveness of the construction industry's performance to meet increased client expectations, improve business processes, encourage collaboration and a change in culture, and deliver better value to the supply chain and stakeholders. Furthermore, the ConstructionSkills (2006) *Network Report* forecasts that an average of 87,000 new recruits will be needed per year for at least the next five years to meet expected demand.

Education providers have a major responsibility in helping the industry to meet these challenges: they must develop more effective links with industry to ensure a greater understanding of the sector's requirements and of how to fulfil them. Higher education institutions (HEIs) and industry need to work in partnership to develop a workforce that can deliver the necessary improvements.

How, then, can HEIs best expand the nature and extent of their demand-led, flexible and responsive provision? The growing importance of skills priorities and HE provision was recognized again in strategic documents of the Department for Innovation, Universities and Skills (2007) and HEFCE (2007).

ACBEE

Accelerating Change in Built Environment Education (ACBEE) is an initiative sponsored by the Construction Industry Training Board (CITB) and ConstructionSkills. It was established in 2003, following a number of earlier initiatives that had focused on the decline in applications for built environment courses in UK higher education (CITB, 2001; ConstructionSkills 2004). ACBEE is concerned with the need for the built environment sector and higher education to attract and appropriately educate enough graduates for an ever-changing industry working with more demanding clients (ACBEE, 2004; 2005). Its aim is to encourage the closer working together of HEIs, firms and professional bodies to provide more relevant training and education in response to the challenges set by the Latham and Egan reports cited above.

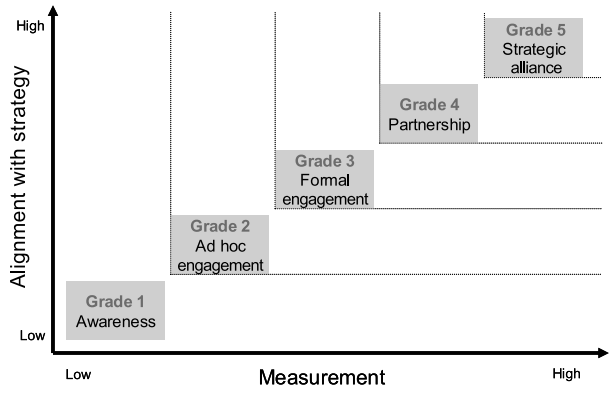

Figure 1. Framework of engagement.

Since 2003 two phases of the initiative (ACBEE, 2004; 2005) have promoted:

- successful case studies that demonstrate engagement between industry and HEIs which is aligned with key industry themes;
- the development of courses that demonstrate improved industry performance;
- the organization of workshops, debate sessions and conferences; and
- a methodology for measuring the performance of engagements (the framework of the engagement).

This paper discusses part of the work undertaken in the third phase of the initiative, concerned with demonstrating the application of the performance measurement framework developed in the previous phase (ACBEE, 2005; Allen and Williams, 2005). This is done through case studies of collaboration between HEIs, industry and professional bodies at the 'grades' of 'strategic alliance' and 'partnership'.

Generic engagement framework

A key output from phase two of ACBEE was the development of a framework to facilitate the evaluation and categorization of engagements between industry, HEIs and professional bodies according to predetermined criteria (ACBEE 2005). The framework was refined after feedback from various stakeholders (Allen and Williams, 2005; Williams, 2007).

Figure 1 shows the qualitative framework that starts the process of classifying an engagement: the classification then provides the basis for measurement and subsequent quantitative evaluation. The framework takes into account the nature of the engagement and the extent of its strategic alignment with the participants' objectives.

Table 1. Categories of engagement.

Level	Description
Grade 1: *Awareness activity*	Concerned with providing information (push/pull) with no agreement and no form of evaluation beyond the recording of the activity taking place.
Grade 2: *Ad hoc engagement*	Focus on a specific operational need. There may be an informal agreement and any evaluation would also be informal.
Grade 3: *Formal engagement*	Driven by operational requirements; explicit objectives are agreed and set down in a formal agreement. There will be an explicit evaluation process.
Grade 4: *Partnership*	Driven by business needs; shared objectives are agreed and set down in a partnership agreement. There will be a formal evaluation procedure detailing how, when and by whom the evaluation will be conducted.
Grade 5: *Strategic alliance*	Driven by business strategy and designed to satisfy the specific strategic business needs of the partners. The strategic objectives are agreed and set down in an over-arching alliance agreement (memorandum of understanding). There will be a clear and documented measurement process that includes targets, success criteria, feedback and forward planning.

Within the framework, engagement activity is categorized at various levels, intended to embrace all forms of engagement, whether considered from both HEI and industry perspectives. A generic description of each category is provided in Table 1. For each engagement, two characteristics need to be considered. The first relates to the drivers and purpose of the engagement, and how these are aligned with the strategies of the collaborating organizations. The second relates to the measurement of the activity. In identifying what is measured and how it is to be measured, it is necessary to take into account what kind of evidence would demonstrate positive outcomes and what nature of performance evaluation should be undertaken. Collecting and examining the evidence base for each engagement in this context thus facilitates the categorization (Figure 2).

During the evaluation process the necessary 'evidence' is collected to enable a qualitative assessment. In addition to this means of classification, a quantitative 'weighted' assessment can also be made by considering the aspect of 'scale', which needs to be measured for each case. An overall measure for the particular engagement is produced by combining the two.

The following factors are used to map the engagement activities of six case studies at the grade of 'partnership' and seven at the grade of 'strategic alliance'. These categorization tools were formed through a series of internal brainstorming sessions and content analysis of case study data:

Title	ACME Corporation			
Description	An arrangement whereby ACME Corporation determined to enter into an agreement with the Centre for Construction Innovation and the University of Salford for bespoke training that leads to the attainment of Master's qualifications with an emphasis on Rethinking Construction.			
Grade	**Alignment to Strategy**		**Measurement**	
5	Are there explicit strategic business objectives set down in a formal agreement (eg MoU)?		Does the evaluation process include target setting, control, evaluation, feedback and planning components?	
4	Are there explicit and shared business objectives set down in a formal partnership agreement?	✘	Is there a formal mechanism for measuring quality that is informed by input from all partners?	
3	Are there explicit objectives set down in a formal agreement?	✓	Is there a formal mechanism for measuring quality?	✘
2	Is there a specific operational need identified?	✓	Is there any assessment of the quality of the engagement?	✓
1	Is there a stated purpose?	✓	Is a record kept?	✓
	Summative grade	**2**	**Impact measure**	**8 Delegates for 90 credits**

Figure 2. Engagement scorecard.

Table 2. Case study information on partnership/strategic alliance engagements.

1st characteristic	2nd characteristic	
Drivers for engagement	**Partnership (Grade 4): formal evaluation procedure**	**Strategic alliance (Grade 5): measurement process**
Collaboration.	What procedures are in place?	What measurement process is in place?
Explicit business needs/strategic business objectives that have been identified and set down.	How were they formulated, tested and validated?	What are the targets, success criteria, measurement methods?
Process by which they were identified and set down in a formal partnership/alliance agreement.	What is evaluated and what results from the procedures?	How is the process formulated, tested and validated and how are the targets, success criteria and measurement methods identified?
Evidence to demonstrate the engagement is meeting the explicit shared business needs and strategic business objectives.	How often are the procedures conducted and who undertakes them?	How do the results of the measurement process feed into strategic planning?
Process to ensure the engagement is continuously reviewed and updated to align it with the shared business needs and strategic business objectives of all partners and alliances in the engagement.	How are the results from the procedures applied?	How is it ensured that the measurement process is continuously reviewed and updated?

- the nature of the engagement and learning process;
- the drivers and purpose of the engagement;
- the evaluation procedures/measurement processes in place to facilitate continuous improvement;
- evidence that shows that the explicit shared business needs and/or strategic business objectives of the engagement are being met; and
- good practice advice arising from the engagement.

Research methodology: case study approach

As has been noted, one objective of the third phase of the ACBEE project was to demonstrate the application of the measurement framework that had been developed in the second phase. This was to be done through a series of case studies of collaborations at the grades of 'partnership' and 'strategic alliance' (ACBEE, 2005). The development of the case studies depended on generic as well as specific information on partnership ('Grade 4') and strategic alliance engagements ('Grade 5').

The first stage was to undertake a quick initial assessment, using the above framework and a scorecard to select from a variety of identified types of engagement in order to establish those cases that seemed to be operating at the grades of strategic alliance and partnership. These were then developed into extended case studies with information elicited through a series of semi-structured interviews with each collaborating partner: the aim was to ensure a complete and coherent representative case study.

The interviewees were given advance warning of the questions to be discussed. Interviews were digitally taped and transcribed and were then sent to the interviewees for comment and approval. This 'chain of evidence', the creation of a case study database and multiple sources of evidence were used to test the validity of the evaluative construct and the reliability of its design. Furthermore, in the interviews similar prompt questions were posed in the same order to the academic and industrial partners so that direct comparisons could be made. Content analysis was used to code the textual data gathered from the interviews, and cognitive mapping was used to display and identify the relationships between concepts derived from the interviews and observations. As a result, cognitive maps were produced for each question based on the underlying themes identified.

A partnership-level engagement is driven by shared business objectives and needs that are agreed and set down in a partnership agreement. From the measurement perspective, there will be a formal evaluation procedure detailing how, when and by whom the evaluation will be conducted. An engagement at the grade of strategic alliance is driven by business strategy and is designed to satisfy the specific needs of the partners, which will be agreed and set down in an over-arching alliance agreement. With regard to measurement, there will be a clear and documented

measurement process that will include targets, success criteria, feedback and forward planning. As a result, the case studies focused on eliciting information relating to these elements (Table 2).

'Partnership' engagements (Grade 4)

From the initial assessment, six case studies were identified as demonstrating engagement at the Grade 4 (partnership) level. In the following discussion of the cases, we demonstrate the rationale for the engagements and why they operate at the level of partnership.[1]

Nature of the engagement and the learning process

These case study partnership engagements operate at different educational levels. There are postgraduate Master's programmes in the Interdisciplinary Management of Projects (IDMP) and the Environmental Design of Buildings (BUiD) and a fast-track route to a professional qualification programme in Construction Cost Management. At the undergraduate level, there are industry-sponsored BSc (Hons) courses in Construction Engineering Management (Gibb, 2005) and Construction Management and a Higher National Certificate (HNC) in Contracting Management.

The courses are delivered on a part-time basis, which provides for the further development of people based in industry through block release and attendance (such as in the cases of the IDMP and Construction Cost Management programmes), through distance learning (as in the case of the HNC in Contracting Management), or through full-time study. Delivery methods range widely, from conventional lectures, workshops, seminars and tutorials to team-based projects, live projects, research, site visits, residential/exchange activities, work-based learning and industry-structured training programmes.

Similarly, the methods of assessment include conventional examinations, assignments, projects, dissertations, case study analysis, work-based projects, industry training reports, hands-on project management work of students by previous students, and so on. The various collaborating partners from education, industry and professional bodies engage in the procedure according to the assessment method in question – thus conventional assessment is undertaken by the academic partner, while the industry partner becomes involved in the assessment of work-based projects, training reports, etc, and professional bodies focus on the assessment of professional practice elements.

Drivers for the engagement

As defined by the framework, the first characteristics to be considered in determining the grade of an engagement are its drivers and purpose, and the degree to which these are aligned with the strategies of the partners. In the case of partnerships, these characteristics relate to the shared business objectives set down in the formal agreement. Among the partnership-level case studies, the most common collaboration is between an HEI and a sponsoring industry organization, sometimes (as in the BSc programmes) with a professional body providing accreditation. In other cases, such as the postgraduate programme in Construction Cost Management, the professional body is actively engaged in the provision of training towards a corporate professional qualification. For the HNC in Contract Management, the professional body collaborates with further education institutes (FEIs) to deliver a specific accredited programme.

In the main, the case study partnership engagements (BSc and the postgraduate IDPM and Construction Cost Management programmes) were initiated and driven by industry to address identified needs, and were then subsequently formulated through working parties or steering committees comprising representatives of both partners.

The shared business objectives of the BSc and the Construction Cost Management programmes are predominantly to address over the long term the shortage of professionally-qualified graduates in a specific discipline. The aim is to provide students with the required work skills (such as technical competence, presentational skills and management skills) so that they emerge as 'work-ready' graduates. The IDMP has similar shared business objectives, but here the goal is to develop a new breed of 'interdisciplinary' leader/manager with a strategic perspective, vision and leadership skills. Through a partnership-type agreement, the collaborating firms recognize that they are able to engage actively in aligning the content of academic programmes with their specific business needs.

In the case of BUiD, the driver was an international government initiative to deliver a British standard qualification in the Middle East. To an extent, the shared objectives are similar to those above – specifically, to increase the technical knowledge and skills of the collaborating firms' workforce staff and to enhance the added value skills set. However, there is also a research element in this programme, which aims to influence research fields and thus to achieve the benefits associated with publication.

The foundation of the HNC in Contract Management was driven by a professional body wishing to fill a gap in the industry, initially identified by its members. Here the aim is to provide the firms' technically competent engineers and project managers with management skills.

The resulting accredited programme was formulated and developed in collaboration with selected FEIs.

Although shared business needs and objectives have been identified and have driven the engagement in all of these six cases, they were not formally set down. The processes by which the engagements have evolved have been very informal, and success has depended on the building of substantial trust among the partners. The partners believe that any attempt to articulate formally shared business objectives and needs would undermine that trust and would ultimately have a negative effect on the collaboration.

Evaluation procedure and continuous improvement

As defined by the framework, the second characteristic to be considered is the measurement of the activity. In the case of partnership agreements, this relates to the formal evaluation procedures for measuring the quality of the collaboration that has been agreed by all the partners. Among the six case studies, those engagements involving UK universities are in the first instance evaluated by the university's own internal quality assessment (QA) procedures, which monitor the quality of teaching and content. These procedures entail periodic and annual reviews, student feedback and staff–student committees. These engagements are also evaluated through industry or consortium committees established as part of the collaboration. The outcomes of the universities' internal QA procedures thus feed into the partnership committee meetings and *vice versa*.

In the cases of the professional qualification programme in Construction Cost Management and the undergraduate industry-sponsored BSc (Hons) programmes in Construction Engineering Management and Construction Management, the evaluation procedure is enhanced through industry training/CPD components, during which the performance of the student is internally monitored and evaluated by the sponsoring organization. In some instances, the evaluation is fed back to the partnership committee to assist in the future shaping and development of the programme.

In the case of the HNC, in addition to the FEIs' internal QA systems, the course is formally evaluated by the accreditation authority's QA procedures. This involves an annual verification process to determine whether the course is being delivered as expected in terms of both content and quality and a validation process every five years to review the course's relevance (undertaken by a Validation Committee consisting of representatives from the accreditation authority and the English and Scottish Electrical Contractors Associations). The reports from the verification and validation processes feed into the FEIs' internal procedures, providing where appropriate recommendations and requirements for change.

The nature of the complementary formal evaluation procedures in place in each case thus ensures that there is an element of continuous improvement built into the partnership agreement.

Evidence of the engagements' success

The measurement framework described here should not be taken as suggesting that a collaboration operating at a higher 'grade' is better than one at a lower grade: a formal engagement (Grade 3), for example, may be just as effective as a partnership agreement (Grade 4) in delivering what it aims to deliver. However, we do suggest that a higher grade of engagement is likely to bring increased benefits to the partners. In the case of the six partnership agreements considered here, there is clear evidence, in various forms, that they are meeting the business objectives of the collaborating organizations and reaping those increased benefits. One key benefit is that of maintaining or increasing both student numbers and collaborating organizations, while also increasing the retention rate on the academic course. Furthermore, there is evidence of the improved quality of students and graduates, resulting in better-quality work (providing strategic benefit to the firm), improved employability and a higher success rate in gaining professional qualifications and career progression. Further evidence is provided by the formal recognition of students with a variety of prestigious awards.

Good practice

When setting up a partnership, the resources (financial, people, time, etc) that will be required for the project should not be underestimated. The mutual naivety of industry and academia with regard to each other's nature and operational practices should also not be underestimated: there is a lack of understanding about the different decision times, priorities and institutional versus industrial organizational processes. It is essential to bring together a group of committed collaborators who can share ideas and objectives and establish a means of achieving them. The success of an engagement is very much related to the building of trust and acting honourably.

Strategic alliance engagements (Grade 5)

Following the initial assessment, seven cases were identified as operating at the grade of 'strategic alliance'. The following discussion examines the rationale for these engagements and why they operate at the level of strategic alliance.[2]

Nature of the engagement and the learning process

These engagements included, at the postgraduate level, an Engineering Doctorate Programme (EngD) and, at undergraduate level, a Foundation Degree in Building Services. These programmes focus on work-based learning: the EngD provides a vocationally-oriented programme strategically aligned with the sponsoring organization, and the Foundation Degree in Building Services provides specialist education and the development of personal and professional competencies for employees of a building services organization. Also at the undergraduate level, two of the other programmes are collaborative industry-focused projects tied into the final year. The European Challenge (Nunnington and Eilander, 2005) is an international project that links professional institutes, HEIs and commercial organizations from across Europe and focuses on a contemporary and strategic real-estate 'relocation' problem. The Constructionarium (Ahearn *et al*, 2005) provides MEng Degree students with an opportunity to act as main contractors building a consulting engineer's design through a week-long course.

Incorporated into both undergraduate and postgraduate programmes is the APEX Reflective Practice for Housing Practitioners corporate qualification (practical experience) for the Chartered Institute of Housing (CIH). The 'Educational Supply Chain – Building Awareness' project is an initiative of a major UK contracting organization focusing on schools and FEIs with the object of raising awareness of the construction industry among young people. Finally, the Styles & Wood Academy is a staff development programme designed to raise the standards of professionalism and service across all areas of the business.

Methods of delivery include conventional lectures, seminars, laboratory work, workshops, tutorials, research, group activity, and so on, with the exception of the Building Awareness initiative, which uses work observation (through site visits), curriculum enrichment, work experience, work shadowing, sixth-form scholarships, gap-year placements, sponsored degrees, National Vocational Qualification (NVQ) and apprenticeship opportunities, high-profile events and an engagement toolkit for schools and the supply chain. The European Challenge also includes site visits to a number of locations across Europe short-listed by the client. The Foundation Degree in Building Services and EngD embrace work-based learning, while The Constructionarium adopts the replication of a site-based construction project.

Assessment methods vary from conventional examinations, continuous assessment, dissertations and theses, presentations, projects, and so on, to the 'Reflective Portfolios' before professional interviews used by APEX. The Building Awareness initiative focuses on an annual review of targets for work experience placements, school-based events, the number of schools contacted, sponsored sixth-formers and NVQ, day-release and graduate recruits within the contracting organization and the wider supply chain. The Styles & Wood Academy concentrates on individuals' personal development.

Drivers for the engagement

According to the framework, a strategic alliance type of engagement is driven by business strategy and is designed to satisfy the specific strategic business needs of the partners. Among the strategic alliance case studies identified, the drivers ranged from the strategic objectives of the industrial partner(s), to those of a professional body, to those of the academic partner(s). In the case of the Foundation Degree in Building Services and the Styles & Wood Academy, the industrial collaborator approached an academic institution to initiate an educational/training programme that would align with its specific business strategy (respectively, achieving competitive advantage through employees learning faster than their competitors and changing and formalizing the delivery of continuous professional development to keep up with the progress of the sector). The Styles & Wood Academy evolves on an annual basis, and provides a business plan for the next three years to the academic collaborator so that it can develop and deliver course material that responds to the plan's aims and objectives. The Building Awareness initiative was led by a large contracting organization, and was driven by its ultimate strategic objective to increase turnover year-on-year with double-digit growth in the future by engaging the educational supply chain to source the long-term staffing needs of the growing business. The company's strategic approach to its educational suppliers is to form close relationships with a small number of partners, thus enabling the development of a strategic approach to the skills agenda with the key partners. The Constructionarium goes beyond the strategic objectives of individual organizations towards strategic industry altruism, with its philosophy that 'what is good for industry ultimately is good for society but also for individual organizations and academic institutions'. The strategic driver came from a key industrialist (also working in academia) who challenged the industry to increase its influence on undergraduate education rather than using academia as a knowledge superstore for technical development. The Constructionarium attempts to change the culture of the industry's relationship with engineering undergraduate

education, especially with regard to the practical contracting segment.

APEX was driven by the strategic objectives of the CIH and was designed in particular to address the problem that students completing their professional qualification were then not progressing on to APEX. This was frustrating to both the professional body and academic institutes. The CIH (following lobbying from the academic institutes) decided to encourage students to complete their whole professional accreditation by offering APEX as part of their academic studies, delivered by the academic institute rather than the CIH. Following the success of pilots of this incorporation of APEX into the curriculum, all academic institutions delivering CIH qualifications were encouraged to offer their own APEX equivalent.

The EngD scheme (funded by a UK funding council) was driven by the aim of the academic institution to provide research engineers with experience of leading-edge research in a business context by focusing on an area of research proposed by the industry sponsor and which addressed a specific business objective.

The European Challenge originated from the desire of one of the academic partners to provide a professional exposure component to its international semester and a mechanism that would provide students with more employment opportunities. In addition, the industrial partner was looking for a source of suitable employees and wanted the opportunity to observe students perform. A further impetus was provided by the aim of the Royal Institute of Chartered Surveyors to raise awareness of the potential role of surveyors in advising businesses. Following an initial meeting to develop the basis for the project, a working group involving several European academic institutions was established to develop the idea. Subsequently, the industrial partner agreed to provide funding: it learned about the idea after it had approached one of the academic partners with a view to establishing a closer working relationship to strengthen links and improve its recruitment in Europe.

As to whether or not the strategic objectives are set down in a formal agreement, a memorandum of understanding and a formal contract cover the agreement between a building services engineering organization and an academic institution for the Foundation Degree in Building Services. For APEX, a formal agreement is established through the accreditation process between the professional body and the delivering academic institutions. The Constructionarium has proceeded very much on the basis of an 'act of faith' between the partners, as the concept was entirely novel and it was therefore difficult to formulate a formal agreement. However, this initial informal agreement has since been replaced: the success of previous Constructionariums has provided experience and enabled a clearer set of objectives to be identified and the commitment to a further series of 'Constructionarium' events to be formalized.

Measurement process and continuous improvement

As with the partnership agreements, the measurement process of several of the strategic alliance agreements involves, in the first instance, adopting the academic institution's own internal QA procedures. For the Foundation Degree in Building Services, there is an annual review which includes all collaborating partners and HEI auditors. The purpose is to monitor the programme and its delivery and to identify actions that will help to maintain or improve its quality. The Styles & Wood Academy adopts the academic institution's formal internal QA procedure as it relates to links with external clients.

In addition, the Foundation Degree in Building Services holds formal Programme Committee meetings every 2–3 months which are attended by the industrial and academic partners (including all programme staff and student representatives) and play a key role in assuring the quality of programme delivery, taking into account academic coherence, resources, operation, proposed future development and action planning, student performance, external examiners' reports, management responsibilities, the views of internal and external accrediting bodies, software issues, among other things. This Foundation Degree is also audited externally by a professional institute and internally by the industrial collaborator to BSI requirements. The Styles & Wood Academy also uses course evaluation for delegate feedback on key learning and benefits, presentation style, relevance and duration. This helps it to assess whether the sessions have met their intended objectives and in turn to propose appropriate improvements for future programmes.

The measurement process for the European Challenge involves a combination of formal/informal student feedback mechanisms (including video feedback of discussions with students during and following the Challenge), monitoring student progress in terms of their employability, and assessing whether the initiative has made a positive contribution to the job seeking of past students. These, together with tutors' comments, feed into a formal two-day review meeting which results in the development of an action plan, and this in turn is developed into a subsequent planning meeting for the forthcoming Challenge.

The overall reflective evaluation and future planning processes of The Constructionarium occur through steering committee meetings (involving the various collaborating parties) which take place every eight weeks. Staff meetings and 'on the spot' feedback every

evening of The Constructionarium also influence the planning process. In addition, a sociological evaluation focuses on the educational impact on students and on whether or not there are discrepancies between the expectations and perceptions of the stakeholders. Finally, student feedback is obtained in pre-programme and post-programme motivation surveys.

The Building Awareness initiative employs a scorecard approach, which is undertaken annually by an external consultant. The scorecard assesses the number of BA mentors, construction ambassadors, events in schools, site visits, pupils contacted, sponsored sixth-formers, and, ultimately, the number of recruits along with the educational establishments and industrial personnel engaged and the total investment in delivering the programme's social sustainability strategy. A more sophisticated Web-based system for evaluation is being developed, which will be tied into the initiative's balanced scorecard and its EFQM (European Foundation for Quality Management) model. Furthermore, a six-monthly external audit by the consultant reviews progress and core themes in the context of what is happening more generally in the context of the skills agenda, assesses the targets and their relevance, examines the levels of engagement of the various partners, and looks at other organizations and projects that might be brought on board. There are also external measures, such as the Business in the Community (BiTC) PerCent Club.

The academic centre responsible for delivering the EngD scheme has a management committee comprising stakeholders such as industrial representatives and representatives of funding bodies and other construction advisory groups. The committee meets twice yearly and is responsible for the policy and strategy behind the course development, advising the centre on the conduct and content of the programme, and making annual reports to the funding body. These annual reports comprise a brief statement on the centre's particular mission within the overall scheme and an overview of the year, including progress made towards fulfilling the aims of the scheme. In measuring the overall performance of the students – the research engineers (REs) – and the centre, the committee has identified several key performance indicators (KPIs). In the case of the REs, their performance in the research and taught components of the EngD is examined, as is evidence of publications and the number of them who find employment in industry on completion of the course. The centre's performance is judged in terms of the number of REs, course evaluation feedback, the number of industrial sponsors and new links with industry, international recognition and external income generation. The overall performance of the REs is measured through regular EngD Progress and Programme Board Meetings, supplemented by monthly meetings between REs and their supervisors and quarterly meetings between REs and all the academic and industrial supervisors. In addition, REs have to provide an end-of-year report and the supervisors submit progress reports. An end-of-year interview conducted by a third-party academic with each RE provides the centre and supervisors with additional information about the students as they progress into the subsequent year. The funding body undertakes periodic assessments of the centre to ensure the programme meets the requirements set out in its EngD guidelines.

The measurement of APEX is done via the academic partner's annual monitoring process, which informs the reviews carried out by the professional institute to benchmark the programme against new expectations in the professional qualification specification. Module feedback is collected from all participants with regard to content, delivery, learning support and tutors.

In these seven cases, the process of continuous improvement is facilitated through an annual or periodic review or monitoring meeting, which involves a reflective evaluation that influences future planning. These meetings are informed by the variety of measurement processes that have been adopted (such as the feedback mechanisms) and, in the majority of the cases, involve some form of formal steering, management or working committee made up of representatives of the collaborating stakeholders. In the case of the Styles & Wood Academy, the nature of the collaboration ensures that the course material continuously evolves in alignment with the annual strategic plan of the industrial partner. The process of continuous improvement is also evident in the case of the European Challenge: its EU funding body imposes the requirement that the initiative must be applied to different sectors every three years.

Evidence of the engagements' success

That the strategic alliance engagements examined here are meeting the strategic business objectives of their collaborating organizations, and thereby producing the benefits achievable at that level of engagement, is evident from various indicators. First, a key benefit is demonstrated through increases in the number of collaborating partners, corporate membership, the numbers of students and by the adoption of similar collaborations by others. In the case of The Constructionarium, the increasing numbers of collaborating partners has led to the launch of a national Constructionarium to act as a broker for academic institutions and sponsoring partnerships.

There is evidence too of improvements in the performance, motivation and professionalism of students and this is coupled with evidence of improved career progression and increased earning power.

As regards the industrial partners, there is evidence that they have improved their recruitment and retention rates and have been able to employ more qualified people.

Further evidence of the success of these collaborations is provided by the formal recognition through prestigious awards and rankings achieved not only by programmes and students but also by individual partner organizations.

Good practice

As noted in the discussion of the partnership-level collaborations, a critical element in the success of strategic alliance engagements is ensuring that appropriate resources are made available. In addition, the enthusiasm of stakeholders will drive the engagement forward – but there is a challenge in capturing this for the wider benefit. The industrial client should be continuously involved throughout the programme to ensure that its requirements are fulfilled. The integration of the programme or initiative with existing business processes is the most effective method of engaging an organization in a project. There should also be greater awareness of cultural differences between countries when 'translating' practices: it is easy for UK organizations to be UK-centric: engaging in a European or worldwide activity takes a project to a higher level of cultural complexity.

A lifelong learning orientation allows for appropriate and demanding academic challenges to be set according to the level of individual attainment and encourages progression. The majority of the cases examined here are professionally accredited vocational programmes, in which the expectation of the professional body involved is that all graduates will become lifelong learners.

Students are encouraged by the prospect of membership of the professional institute in their field (the gatekeeper of professional standards), and the engagement with the professional body holds out this prospect, so promoting learning and the potential for lifelong learning. The involvement of the professional body should also help to ensure that the academic institution remains topical and relevant in content and delivery and that students are more readily employable in the sector.

In setting up an assessment model for collaborations at the level of strategic alliance, a facility for continuous reflection on both product and process should be included. The resourcefulness and professionalism of students when challenged should not be underestimated, and greater emphasis should be placed on the kinds of pressure applied to students to replicate the workplace and thus enhance the learning process by 'seeing, hearing, doing'.

Conclusion and future directions

Over the past two decades there has been a renewed call through various initiatives for improved efficiency and performance in the construction sector. The responsibility of education providers to help meet these challenges through more effective engagement with industry has been recognized, and their success in this respect will rely on their understanding of industry's needs and their ability to address them. Effective university–industry engagement requires closer collaboration between the two sectors so that they work as partners to deliver truly 'demand-led' education. There is still a need to bridge the gap between what education providers deliver and what industry needs. In a world of increasing complexity and change, HEIs must prepare students to apply their knowledge and skills effectively in their chosen vocation. This paper has discussed six case studies at the grade of 'partnership' and seven at the grade of 'strategic alliance' to illustrate how academic providers, through closer collaborative relationships with industry and professional institutes, can make their provision more relevant, flexible and responsive to employers' needs.

The case studies demonstrate collaborative engagements operating successfully at varying levels – undergraduate and postgraduate, secondary school, further education and employee training. These cases show industry and professional bodies aligning education and training with their strategic objectives and thus addressing a potential future shortage of appropriately qualified people. Although the evaluative framework specifies that the identified business needs and strategic objectives should be set down formally, the case studies demonstrate that success relies heavily on trust among the collaborating partners and honourable behaviour rather than on any contractual arrangement. A combination of methods, including the partners' own internal QA procedures and management boards and steering committees, have been adopted in the measurement and evaluation processes for the projects. Thus an element of continuous improvement is embedded in the programmes, because the outcomes of each procedure feed into other procedures.

The collaborations considered here have realized such benefits as increased sustainability in student numbers, more sponsoring and collaborating organizations, and improved retention rates. There are also indications that the quality of students and graduates has improved, as have standards of work and

employability. Students, projects and individual partner organizations have received formal recognition through prestigious awards. The success rate in gaining professional qualifications has improved and there is evidence of enhanced career progression.

The success of any such engagement depends on resources not being underestimated, on addressing the lack of mutual understanding between academia and industry and on sensitivity to cultural differences. The engagement of professional bodies is important in developing lifelong relationships between students and the academic institution. Most importantly, successful engagements are built on trust and on the achievement of sustainable relationships between committed partners with shared thinking and objectives.

In addition to amassing the case study evidence discussed here, the researchers organized workshops for academics and industry practitioners, so that the case study findings could be disseminated and discussed. The discussions highlighted the interest of both academics and industry representatives in building simple quantitative measures that could assist them in evaluating performance. As an engagement focuses on knowledge transfer between the HEI and its industrial partners, the intellectual knowledge capital transfer could be evaluated at various grades of the ACBEE framework to support and guide the engagement. A company's capacity for wealth creation is based on the knowledge and capabilities of its people. Thus value adding is achieved by capturing such knowledge within the knowledge management systems that the company uses. This focus on people as a central strategic resource will help companies to achieve strategic competitive advantage. Hence the ACBEE framework and the intellectual knowledge transfer model can make a significant contribution, especially in a knowledge-intensive industry such as construction. The next phase of the ACBEE framework development will launch an investigation into a single knowledge index model.

Notes

[1] Further information on these case studies is available at www.acbee.org.
[2] Again, further information on these case studies is available at www.acbee.org.

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