

ACBEE

Accelerating Change in
Built Environment Education

Phase IV
November 2009

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Mel worked in private practice as a quantity surveyor for nine years before taking up a full-time position as a lecturer in 1985. Since then, Mel has designed several degree courses in the field of construction and surveying and undertaken significant research activity in project management and industry engagement. In 1996, Mel completed a course in arbitration, winning the David Lawrence prize at the College of Estate Management.



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In addition to his involvement in various other research projects, Niraj also lectures in Construction Management and Quantity Surveying at the University of Salford. In the last 7 years, he has undertaken work-based teaching modules for BSc and MSc students, encouraging learners to apply their knowledge to practical industry problems. His research interests include employer engagement, pedagogical strategies, construction partnering, leadership and culture.



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He has a track record of successfully leading on several employer engagement projects with funding bodies including: HEFCE; Higher Education Academy; ConstructionSkills; GMSA Lifelong Learning Network, EU and NW Higher Level Skills Partnership. As the Director of the Construction Knowledge Exchange (CKE), and co-chair of the Employer Engagement Facilitation Group within the Higher Education Academy, he has completed applied research in partnership with key industry collaborators.

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Foreword



When I was asked to provide this foreword for the Phase IV report of 'Accelerating Change in the Built Environment' (ACBEE), I was delighted to agree. But this was not only because of the high regard the industry has for ACBEE and the wider work of the Centre for Education in the Built Environment. I felt it most apposite at this time. Since its inception in 2002, ACBEE has given an entirely appropriate lead to thinking in the Built Environment higher education community, by promoting better dialogue with the industry and professional bodies. ACBEE has done this by example, through its extensive verified case studies, and in principle, by the development of Key Performance Indicators for engagement between industry and higher education. The network developed through ACBEE's case study work has proved invaluable as ConstructionSkills and colleague Built Environment Sector Skills Councils set out, about a year ago, to drive on improving communications and relationships with higher education. Phase IV of ACBEE went on to helpfully elaborate the Key Performance Indicators by establishing Key Process Areas, and suggested a quantitative measure for engagement. Both these developments reflect broadening and deepening of beneficial dialogue.

ConstructionSkills and colleague Built Environment Sector Skills Councils truly appreciate ACBEE's carrying the flag for employer engagement, though we are aware that not all of the messages here have been universally popular. But this is why it is timely that the view of the largest Sector Skills Council operating in the Built Environment is the first the reader sees of this report, reflecting the thinking of the majority of the industry's employers. While the UK construction industry remains one of the strongest in the world, the economic situation over the last two years has hit hard. There are signs of improvement, but none of us can ignore the realities. Higher education has a major role to play in carrying the industry towards a better future. This is recognised by Government, recent policy statements have made that clear. A change in leadership seems most unlikely to shift this focus, the centrality of employers and employment within the vision for higher education will be maintained. It has to be, for the continuing health of both industry and higher education. ACBEE provides robust models of how good relationships between industry and higher education work. The application of these models will be looked to in coming months and years by ConstructionSkills, and across Built Environment Sector Skills Councils, to help gauge success and quality of engagements objectively in support of developing relationships with higher education for all employers in the UK's industry.

Nick Gooderson
Head of Education, Training and Qualifications
ConstructionSkills

Executive Overview

The fourth phase of the ACBEE (Accelerating Change in Built Environment Education) programme has been one of progress and further development.

The programme aims to foster and develop engagement between industry and Higher Education Institutions (HEIs) and, through this engagement, promote a better

quality experience for students and a higher level of skills for industry and practice.

This phase of ACBEE focuses on two key aims:

→ Establish Key Process Areas and practices to understand engagement between industry and HE and its progress to deeper engagements

→ Develop a quantitative measure for industry - HEI engagement; with an intellectual capital perspective

ACBEE case studies provide a rich source of information regarding industry-HEI engagement (www.acbee.org). These were used as foundation to build a guide regarding its key processes and practices.

Phase One – 2003-2004

- **Prospectus** – a detailed statement of ACBEE purpose, nature and overall objectives
- **Workshops** – bringing together industry, institutions and higher education to investigate the issues of measuring performance in industry-university engagement
- **Debate** – a major debate on the issues facing the industry and its educators. It shaped subsequent workshop content and guided the overall investigation
- **Case Studies of Excellence** – Twenty three case studies were identified, interviewed and written up
- **Website** – launched to promote ACBEE and the case studies
- **Phase One Report** – launched by Peter Rogers, chair of the Strategic Forum in June 2004

Phase Two – 2004-2005

- **Case Studies of Excellence** – a further 19 case studies have been identified, written up and are available on-line (www.acbee.org)
- **ACBEE Conference** – a national industry-education conference held in London, June 2005, to coincide with publication of this report
- **Methodology for measuring performance** – a 'Framework of Engagement' has been developed, tested and implemented, with pilot cases and performance measures
- **Phase Two report** – on ACBEE's findings and the application of its engagement framework to the phase one case studies
- **Regional development** – Exploring the value of regional engagement, building on work undertaken in the South-East region



This guide can be used as a complement to the ACBEE framework and scorecard. This progressive step launches ACBEE to its applied research dimension.

terms of intellectual capital knowledge transfer. As such, an evidence based model is proposed to quantitatively benchmark performance of industry - HEI engagement.

Another initiative in this fourth phase considers industry-HEI engagement as a knowledge transfer activity. This encourages Higher Education (HE) to measure its output to the industry in

Phase Three – 2005-2006



Phase Four – 2008-2009

- ➔ **Case Studies of Excellence** – a further 13 case studies have been identified – seven at grade 5 and six at grade 4, these are available on-line (www.acbee.org)
- ➔ **BEECON Conference** – a national symposium as part of the Built Environment Education Conference to be held in London, September 2006, to coincide with publication of this report
- ➔ **Methodology for measuring performance** – a proposed set of Key Performance Indicators has been developed
- ➔ **Phase 3 report** – on ACBEE's findings and the application of its proposed set of KPIs.
- ➔ **Regional development** – Exploring the value of regional engagement, building on work undertaken in the South-East region

- ➔ **Case study Analysis** – 11 ACBEE case studies have been subjected to analysis. Published in Industry & Higher Education journal
- ➔ **Engagement guide** – A process guide has been developed together with CKE (Construction Knowledge Exchange) partners
- ➔ **Delphi Workshop** – bringing together industry, institutions and higher education experts to examine the issues of measuring performance in industry-HEI engagement.
- ➔ **Methodology for measuring performance** – a simplistic regression model has been developed to measure performance
- ➔ **Phase Four Report** – on ACBEE's findings and the application of engagement guide and quantitative measure



Introduction



ACBEE was established in 2003 to focus on the need for the built environment industry and higher education to attract and appropriately educate sufficient graduates for an ever changing industry working with more demanding clients.

ACBEE aims to encourage industry, higher education institutions (HEIs) and professional bodies to work together to improve dialogue and provide more relevant training and education. It was established in 2003 in response to the culture and process changes facing the industry and higher education in implementing the ideas put forward by the Latham and Egan reports that propose a more collaborative and integrated industry.

ACBEE promotes the need for courses and teaching programmes to align with current industry themes and demonstrates positive examples of university, industry or institutional partnerships that are measurable in ways that illustrate how they contribute to the advancement of the industry and the society it serves.

ACBEE aims to achieve this by:

- Successfully promoting case studies that demonstrate engagement between industry and HEIs; aligning to key industry themes
- Developing methods of measuring success
- Encouraging the development of courses that demonstrate improved industry performance

The ACBEE programme has benefited from the views of many leading educational, industry and institutional observers, whose wider issues and opinions will continue to be taken into account. ACBEE is funded by ConstructionSkills, and forms part of the Accelerating Change agenda endorsed by the Strategic Forum.

Where are we now?

ACBEE aims to encourage the closer working of HEIs, industry and professional bodies to provide more relevant training and education in order to deliver true demand-led education.

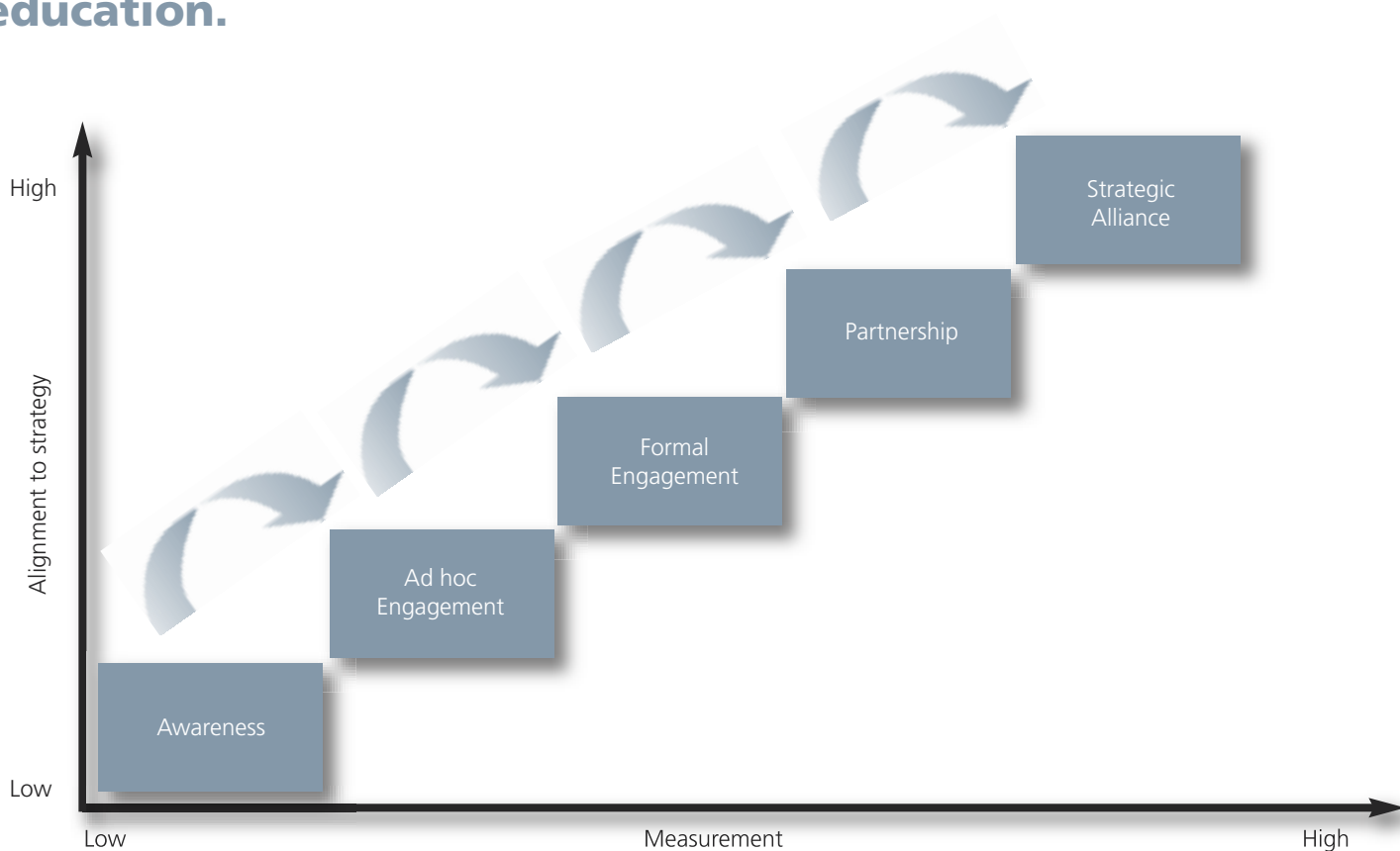


Figure 1: Framework of engagement

The responsiveness of education providers in meeting these challenges is a major contributor towards a greater understanding of industry's needs and articulating their requirements. Such effective engagement requires closer collaboration between HEIs and industry developing in partnership in order to deliver true 'demand-led' education. There is a need to bridge the gap between what education providers deliver and what is required by the industry.

ACBEE Framework – a driver for change

A key output from phase 2 of ACBEE is the development of a framework (figure 1) that facilitates an evaluation and categorisation of the engagement between industry, education and professional bodies based on predetermined criteria (ACBEE, 2005). This is a qualitative framework that starts the process of classifying an engagement which then forms the foundation for measurement and subsequent quantitative evaluation.

The framework considers the nature of the engagement and how strategically aligned the activity is with participant(s) objectives. Within the framework, engagement activity is categorised at various levels. The framework is intended to embrace all forms of engagement and can be considered from both the perspective of an HEI or its industry participant(s). A generic description of each category of engagement in the spectrum represented by the framework is provided in Table 1:



Type	Description
Awareness Activity	Concerned with providing information (push / pull) with no form of agreement between the parties involved and no form of evaluation beyond the recording of the activity taking place.
Ad-hoc Engagement	Focused on a specific operational need. There may be an informal agreement and evaluation.
Formal Engagement	Driven by operational requirements and explicit objectives are agreed and set down in a formal agreement. There will be an explicit evaluation process.
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.
Strategic Alliance	Driven by business strategy and designed to satisfy the specific strategic business needs of the partners. The strategic objectives will be 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, measurement, feedback and forward planning.

Table 1: Categories of engagement

The purpose of the framework is to establish an objective measure of the nature and type of an engagement between industry and higher education. The principle embodied in the framework is that the higher the level of engagement, the more benefits may accrue to the partners. It is important to establish here that the framework is not intended to measure the quality of the engagement; as all engagements have the potential to be successful. However, the higher level engagements do have the potential to provide more sustainable benefits. Therefore, an organisation that has established a strategic alliance will be seen as highly engaged and enjoying the significant benefits that flow from those engagements. Hence, the framework should be seen as a driver for deepening engagement.

It is clear that we need some way of measuring the performance of higher level engagements and that this mechanism needs to be objective and capable of allowing organisations to

benchmark their activity. Hence, a set of Key Performance Indicators (KPIs) were proposed in ACBEE phase 3. These KPIs have been developed by drawing on the work of ConstructionSkills and interpreting it into a higher education/industry application. The driving force for the development of the KPIs is the search for value for money and making a positive impact upon the student learning experience, in effect identifying those activities that can be encouraged and resourced in the knowledge that there will be a mutually beneficial impact upon the industry and the HE sector.

In phase four, workshops were held with academics and industry practitioners which highlighted the interest from all parties in developing a clear understanding of engagement practices and building quantitative measures that could assist them in evaluating their performance. Capacity for wealth creation of a company is based on the knowledge and capabilities of its people.

Therefore, 'value adding' is achieved by capturing this within knowledge management systems. This focus of the human resource as a central strategic resource will facilitate companies achieving strategic competitive advantage in the business environment.

ACBEE in its phase 4 sets out two key aims to improve industry - HEI engagements.

- ➔ Establish Key Process Areas and practices to achieve deeper engagements
- ➔ Develop a quantitative measure with an intellectual capital perspective

Consultation process

Since its inception the **ACBEE process has been inclusive, working with the people who can make a difference to how built environment education is provided and ensure the industry has a readily available and appropriately skilled and knowledgeable workforce.**



Throughout this process ACBEE has set out to work with and to consult industry as widely as possible. This has been achieved through input to steering committees, workshops, seminar sessions and consultation documents.

Industry/Intermediaries

Opportunities have also been taken to present ACBEE to industry audiences, such as:

- ➔ North West Construction & the Built Environment Provider Network, May 2008, Warrington.
- ➔ Higher Level Skills in the North West: Leitch Follow up event, Feb 2008, University of Manchester.
- ➔ Keynote, Centre for Education in the Built Environment (CEBE)-ConstructionSkills event, Nov 2007, Manchester.
- ➔ Centre for Education in the Built Environment (CEBE) – Salford Centre for Research & Innovation (SCRI) Forum, Feb 2007, Salford.
- ➔ Industry and Higher Education Journal, February 2009
- ➔ Associated Schools of Construction (ASC), International Conference at the University of Florida, USA, April 2009
- ➔ University Vocational Awards Council (UVAC) Annual Conference, November 2008, York
- ➔ Higher Education Academy (HEA) Annual Conference, Employment, Entrepreneurship and Recruitment session, July 2008, Harrogate
- ➔ The Building Education and Research (BEAR) Conference, Feb 2008, Sri Lanka
- ➔ Built Environment Education Conference (BeeCon 2007), September 2007, London
- ➔ CIB World Building Congress, May 2007, South Africa
- ➔ National Construction Knowledge Exchange (CKE) Network Spring Conference, Feb 2007, London
- ➔ The 2nd European Real Estate Society Education (ERES) Seminar, Dec 2006, Germany

By spreading the message in this way we believe that industry and intermediaries can be made aware of the opportunities that can be developed in working with universities.

Education

ACBEE has been engaging with the academic community, education professionals and funding bodies by submitting their work and ideas for peer review and challenge. As a result a number of book sections and journal, conference and workshop papers have been presented including:

Hands on workshops were conducted as a part of employer engagement series hand books and case studies (www.cebe.heacademy.ac.uk/employereengagement). Many ACBEE case studies have been showcased at these events helping to inform as wide an audience as possible about ACBEE and the benefits of engagement.

International links

In the past year the team also began to internationalise the ACBEE concept by dialogue with change agents around the world who are interested in improving built environment education. Contacts made in Europe, the US, India and Sri Lanka were developed into informal networks to work on knowledge transfer and academic excellence.



Industry - HEI engagement practice guide

Employer engagement has been seen by successive governments as an important element in addressing the UK skills agenda to increase the performance of the sector. The Leitch Review's main recommendations set out areas for consideration that will provide a framework for the UK realising its ambitions to become a world leader in skills (Leitch, 2006). One of the key recommendations regarding HE system includes:

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 [pp. 68]

Industry and higher education can all gain by working together and stand to gain through the contribution of the other (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. Over the last decade, there has been a number of combined industry and government initiatives such as Latham (1994) and Egan (1998; 2002) that have focused on the performance of the construction industry.

These initiatives have all resulted in a continued call for dramatic improvements in the efficiency and effectiveness of the performance of the construction industry, in order 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.

Education providers have a major responsibility in contributing to meeting these challenges by actively working towards developing more effective links with industry to ensure a greater understanding of their needs/requirements and in addressing them. Such links require the engagement of HEIs and industry working in partnership in order to develop a workforce that is capable of delivering the necessary improvements.

This begs the question of how can HE institutions best expand the nature and extent of demand-led, flexible and responsive provision? The growing importance of skills priorities and provision from higher education was recognised recently in both in the strategies of the Department for Innovation, Universities and Skills (2007) and HEFCE (2007). With earlier stages of ACBEE just answering that, it is essential to further explore the ways and means to successfully implement an Industry-HEI engagement. Especially, it is important to establish the Key Process Areas (KPA) and practices that assist progress to higher level engagements.

Research Methodology

This research is aimed to interpret and increase the understanding of Industry-HEI engagement practices. This is largely theory building which requires in-depth study. It involves the investigation of complex interaction between key stakeholders of Industry-HEI engagement and processes. Hence, a qualitative research approach was undertaken to devise a process guide for Industry-HEI engagement.

Industry-HEI engagement interactions and practices were captured within the existing ACBEE case studies (www.acbee.org) and they are useful in understanding and defining these practices. The first stage undertook a qualitative content analysis of 6 strategic alliance and 5 partnership case studies collected in phase III of ACBEE project. They provided the initial framework for setting HEI-Industry engagement stages. However, further investigation required contemporary case studies. With the initial framework, an interview protocol was developed to collect data from 5 contemporary Construction Knowledge Exchange (CKE) projects (appendix 2). These projects were subjected to case study research method to devise Key Process Areas and practices in industry - HEI engagement.

Analysis and discussion

Analysis from 11 ACBEE case studies reveals three interlinked phases of Industry-HEI engagement. Most of the cases showed that engagements can be divided into preparation, development and performance stages. Preparation is the initial stage where parties to the engagement set up an agreement and plan for the engagement. This is then followed by development stage where further development and execution of engagement activities take place. Whilst this stage comprises of organising and monitoring; performing is included in the third stage of the engagement. This, performance stage focuses on activities and processes related to delivery, continuation and sustainability of the engagement. The reason behind the decomposition of 'Industry-HEI engagement process continuum' into three stages is only to further understand the Key Priority Areas. This shouldn't be viewed as a fragmentation of these processes. Content analysis of the collected data from cases shows following Key Priority Areas of Industry-HEI engagement (figure 2).

The case studies have demonstrated collaborative engagements successfully operating at varying levels including undergraduate, postgraduate, school and life long learning. These are driven by industry and professional bodies aligning education with their strategic objective and to address the longer-term solution to the shortage of professionally qualified workforce. Underwood et al. (2009) produced a detailed analysis of these case studies in their research work titled 'Improving performance through HEI-Industry engagements in the Built Environment'. Case studies show a clear distinction between the types of activities carried out during each stage of engagement. Preparation stage in Industry-HEI engagement focused on activities related to formation of agreement, commitment and details of deliverables. Functions related to evaluation procedure, pedagogical strategy, continuous improvement and quality assurance were the centre of attention at development stage.



Furthermore, an element of continuous improvement was embedded in processes. Performance, the final engagement stage, centred on achieving selected performance indicators on sustainability of projects. A detailed cognitive map is provided in appendix 1.

The above depicted priority areas were then transformed into interview questions to provide an interview protocol for case study research. A list of cases used for case study research is provided in appendix 3. These projects are in operation for more than 3 years and data collection was conducted by semi-structured interviews and document analysis. Qualitative content analysis was utilised and following key process areas were identified.

- ➔ **Portfolio management:** process by which parties to the engagement explore further opportunities to develop and improve the HEI-Industry relationship.
- ➔ **Relationship management:** foster relationships between stakeholders to build strong collaborative working environment and improve performance. At the heart of this process is building trust and mutual understanding.
- ➔ **Knowledge management:** process through which value is generated from intellectual and knowledge-based assets. At the heart of HEI-Industry engagement is knowledge sharing. This process defines knowledge transfer by range of activities such as Knowledge Transfer Partnerships (KTPs), program development, ad hoc engagement etc.
- ➔ **Development management:** responsible for creating and maintaining the focus of Industry-HEI engagement. This process defines mutually beneficial objectives and determines whether they are to satisfy operational need or business requirements.
- ➔ **Performance management:** process by which targets/goals are set and delivered by HEI-Industry engagement. This also focuses on planning and monitoring performance. Hence, this incorporates measurement criteria defined in the ACBEE framework.

- ➔ **Resource management:** responsible for planning, co-ordination, procurement and monitoring of all financial and human resources.
- ➔ **Process management:** develops and operationalises the Industry-HEI engagement activities. This focuses on planning, organising, implementing and improving employer engagement events and activities.

These processes are further outlined for preparation, development and performance stages as defined in the earlier analysis. A framework of key processes and practices are shown below which allows a wide range of Industry-HEI engagement activities (figure 2). Knowledge management, development management and performance management are categorised as core process areas. These core processes represent ACBEE criteria; strategic alignment and measurement.

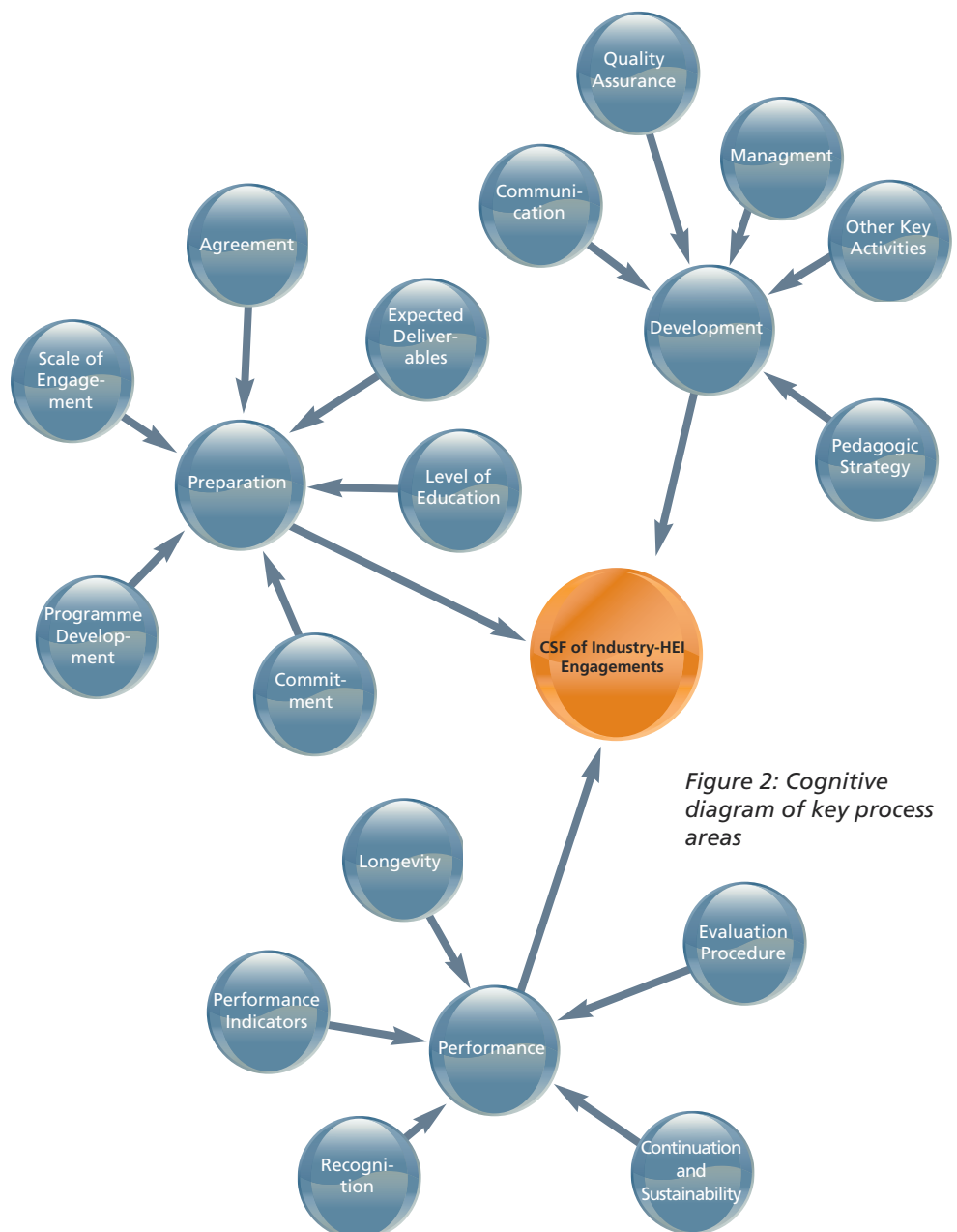


Figure 2: Cognitive diagram of key process areas



Strategic alignment embodies the drivers and purpose of the engagement and how these are aligned with the 'strategy' of the collaborating organisations. This is captured in knowledge management and development management. 'Measurement' corresponds to activities related to performance evaluation and this is exemplified in performance management.

This framework provided the foundation to further explore employer engagement activities in a structured manner and to define activities and processes relevant for highly mature engagements. The Industry-HEI engagement practice guide is a tool which can be used to assess the processes and practices that are required to improve engagement relationships (figure 3).

This can be used to complement ACBEE framework and scorecard. Development of process protocol is proposed as the next step of this process-centred practice guide. A process protocol for Industry-HEI engagement, in its generic form provides a framework for carrying out any Industry-HEI engagement. This provides engagement practices early in the process in a co-ordinated, well managed manner.

Figure 3: INDUSTRY-HEI ENGAGEMENT PRACTICE GUIDE

	Planning	Progress	Performance
Portfolio management	<ul style="list-style-type: none"> Responding to national and regional and institutional initiatives Seek funding and match in kind resource 	<ul style="list-style-type: none"> Awareness of potential benefits Remaining accessible 	<ul style="list-style-type: none"> Generation of new ideas Activities that allow for continuation and sustainability Future collaborative opportunities
Relationship management	<ul style="list-style-type: none"> Champions and heroics Development of networks Building upon existing communications 	<ul style="list-style-type: none"> Relationship facilitation Development of mutual trust Mutual respect and understanding Remaining responsive 	<ul style="list-style-type: none"> Senior management support for collaboration Celebration of good practice
Knowledge management	<ul style="list-style-type: none"> Articulation of need Diagnose the initiative Credible partners Setting the agreement 	<ul style="list-style-type: none"> Passage of information Utilisation of networks Informal dialogue Training and Upskilling 	<ul style="list-style-type: none"> Diffusion of knowledge Flexible approach to new KT ideas Embedding of new approaches
Development management	<ul style="list-style-type: none"> Mutually beneficial objectives Senior management recognition 	<ul style="list-style-type: none"> Flexible approach Shared and open priorities Focus on mutual goals 	<ul style="list-style-type: none"> Tracking and refining objectives Focus on partners needs
Performance management	<ul style="list-style-type: none"> Identification of mutually beneficial outcomes 	<ul style="list-style-type: none"> Realistic targets and activities Achievement of performance targets Quality assurance 	<ul style="list-style-type: none"> Return on investment Increased income/profits Annual business plan
Resource management	<ul style="list-style-type: none"> Competent staff 	<ul style="list-style-type: none"> Staff member embedded in organisation 	<ul style="list-style-type: none"> Dedicated Resource
Process management	<ul style="list-style-type: none"> Effective planning 	<ul style="list-style-type: none"> Appropriate scheduling of activities Event management Regular meetings 	<ul style="list-style-type: none"> An effective system for events planning, delivery and feedback



HEI-Industry knowledge transfer: intellectual capital perspective

The UK construction industry is one of the strongest in the world, with output ranked top amongst top global construction industries (DTI, 2006). The industry contributes roughly 8% of the national GDP and employs in excess of 1.8 million people. Nonetheless there is a deep concern about industry skill shortage and under achievement. Globally the education system is identified as not delivering the required number of specialists across project management, engineering, estimating, surveying and contract management (KPMG International, 2008).

A considerable amount of attention and effort has been directed in number of disciplines to address the industry's poor performance level. In addition to traditional cost focused management tools, this necessitates the understanding of external competitive forces which has to be supplemented by an understanding of organisations' resources and how they can be combined to provide better value (Marr and Spender, 2004).

There is an emerging importance placed on Human Resource Management in the construction industry, as one of labour intensive sectors of the economy, which is still considered to be an uncharted territory (Kululanga and McCaffer, 2001) within construction organisations. Nesan & Holt (1999) argued that the critical role that employees play in fostering an effective construction business has often been overlooked. According to Cooke-Davies (2002), "it is people who deliver the projects and not processes and systems", which gains increased validity in the context of labour intensive construction industry. Hence, it is a prerequisite to define more appropriate and realistic employee selection and HEI-Industry engagements for the creation of knowledge-centric construction industry.

Intellectual Capital (IC), as a bundle of knowledge assets, represents an essential factor in enhancing this organisational performance improvements (Marr and Schiuma, 2001; Schiuma and Lerro, 2008). Part of this intellectual capital, Human

Capital is developed in HE and it is very important to provide appropriate knowledge assets which industry demands. Present demand for professionally qualified personnel requires changes in curriculum which heavily depends on an understanding of the relationship between organisational performance and human intellectual capital.

Organisational performance and intellectual capital

It is argued that business performance is the result of an organisation's ability to manage its business processes. Besides, the effectiveness and efficiency of performing organisational processes are based on organisational competencies (Moustaghfir, 2008). Intellectual capital enables organisations to grow and develop the appropriate organisational competencies which can lead to competitive advantage (Cardy and Selvarajan, 2006). Hence, it places intellectual capital at the heart of business performance and value creation (Carlucci and Schiuma, 2006; Schiuma and Lerro, 2008). With 'knowledge worker' concepts (Porter, 2004), intellectual capital is further seen as a vital ingredient for survival of organisations and their performance. They take the centre stage in explaining organisational assets that continually create value over and above physical and financial resources (Polanyi, 1967; Ulrich, 1998).

According to Marr (2008), intellectual capital can be split into human capital, relational capital and structural capital. Interestingly, of these various categorisations of intellectual capital, human capital is regarded as the most valuable asset (Brennan and Connell, 2000). The advocates of the human capital approach emphasise that many of the assets that individuals bring to the organisation are intangible, premised in individual, tacit knowledge rather than the more explicit, explicated, formal, routine and standardised knowledge (Edvinsson and Malone, 1997; Garavan et al., 2001; Marsick and Watkins, 1999). The capacity for wealth creation of a company is based on the knowledge and capabilities of its people (Savage, 1990). Therefore, the value

addition is done in organisations by installing such personnel knowledge into systems that organisations create and use. This focus on human capital as a strategic resource central will help organisations to achieve competitive advantage in business environment. It also represents an alternative way in which to understand employee selection and evaluation.

The contemporary employee selection and evaluation is a complex decision-making process for placing the right employees in the right jobs at the right time (Golec and Kahya, 2007). Organisations frequently spend considerable resources making an effort to engage employees who are well suited to the positions that should be filled. Engaging employees may be subjected to a trial time, but in case of poor or disappointing employees, there are often substantial costs associated with the engaging, training, and firing before realising that an employee is inadequate. Therefore these painstaking decisions can be very significant at the beginning about whom to engage (Baron and Kreps, 1999).

Individual competency is anything that an employee brings to a job or acquires along the way throughout a carrier that ultimately contributes to the success of entire organisation (Kennedy and Dresser, 2005). This includes relevant skills, knowledge, abilities, formal education and experience gained on the job. Perhaps, one way of looking at this is by understanding various 'human intellectual capital measures', which represents the areas where personal knowledge can add value to an organisation to achieve competitive advantage in business environment.



Measurement of intellectual capital is mainly concerned with finding the best metrics to use for the purpose of measuring human intellectual capital. Skandia navigator developed by Edvinsson and Malone (1997), the balanced scorecard by Kaplan and Norton (1996), Sveiby's intangible assets monitor (Sveiby, 1997) are a few of them, currently being used under the intellectual capital measurement domain.

Based on these models various authors have looked into different types intellectual capital measures to help organisations to strengthen and improve their competitive advantage by measuring and recuperating intellectual capital.

Table 2 provides a list of measures used by various commentators to evaluate employee competence/human capital. This list only provides the concerned factors mentioned by the

researchers in their research article. From this analysis is it evident that qualification and work experience are perceived as the most important factors in determining employee competence/human capital. Most of the authors in this area agree with the importance of these two factors and suggested other factors which would also help the organisation in improving its culture and competitive advantage.

	Armstrong and Baron (1998)	Caddy (2002)	Edvinsson and Malone (1997)	Golec and Kahya (2007)	Guthrie (2001)	Kennedy and Dresser (2005)	Petty and Guthrie (2000)	Sveiby (1997)	Turner and Cox (2002)
Qualification	✓		✓	✓	✓		✓	✓	
Work experience		✓	✓		✓			✓	
Training and education	✓	✓	✓	✓				✓	
Rewards and recognition		✓							
Communication skills	✓			✓		✓	✓		
Innovative capabilities			✓	✓					✓
Leadership qualities	✓		✓	✓					✓
Salaries and benefits		✓						✓	
Involvement in projects								✓	
Value and attitude	✓			✓				✓	

Table 2: Sources of reference for various human intellectual capital measures

Informal communications conducted with academics and industry practitioners suggest that employee selection and evaluation based on qualification and work experience is found to be very common in practice.

However, there is a concern over the class of qualification, decay of 'knowledge from qualification' over the years, relevance of the qualification, relevance of the work experience and relative importance of work experience to qualification.

Research has attempted to incorporate these factors in forming a simplistic, quantitative model. Having these in mind, this research proposes measures for human intellectual capital transfer. These measures are formed by exploring and understanding criteria for employer selection and evaluation.

Research Methodology

This research is aimed to develop a model to measure human intellectual capital for employee selection and evaluation. This is largely a model development/theory building by quantitative research methods using primary data gathered from employers' opinion. As shown in Table 3, the exploratory, first phase of the research focused on establishing and understanding

components of human intellectual capital. This further informed significant components in addition to ones found from the literature review. The second phase of the research concentrated on quantifying and scaling of components. For this, a survey method was adopted to collect quantitative data which was analysed with regression analysis.

Quantitative relationship between knowledge and variables such as qualification and experience was developed by regression analysis between these variables.

Phase	Research type	Research method	Research techniques
1	Exploratory research	Expert opinion	Workshop and content analysis
2	Model development	Survey	Questionnaire survey and regression analysis

Table 3: Research Methodology

Components of human intellectual capital

Representatives from industry and HEIs provided rich information regarding factors affecting employee selection and evaluation in a half day workshop. Experts divided these factors into two categories, Company Specific and Employee Specific. Company Specific factors such as size, cultural fit, market condition, team composition, internal competency judgement, project type and size were considered unique for each company and a 'relevance factor' was proposed to adjust relevant human intellectual capital. Figure 4 provide a cognitive diagram portraying factors affecting employee selection and evaluation.

Employee Specific factors were categorised into competency, potential and traits. Traits are personal characteristics of employees preferred by employers for a chosen employment. These are very subjective and socially constructed. Hence, interaction and communications are the best means to evaluate this component. As shown in the literature review, competence forms a major part in employee evaluation.

The complex nature of competence was comprehensively scrutinised in the workshop and links were formed among experience, academic qualifications, professional qualification and potential. Initial knowledge gained from

qualification is considered to be decaying over a period of time and personal knowledge/human intellectual capital increases with experience. The 'Knowledge decay' concept, where initial knowledge gained from qualification decays over a period of time was confronted with the provision of Continuing Professional Development (CPD) provided by professional institutions. Hence, experts believed that people with professional qualification who attend CPD sessions shouldn't be subjected to knowledge decay. Experts also expressed their focus on employee potential which could be measured by their progression and grade.

This raises concerns about the level of qualification, decay of 'knowledge from qualification' over the years, relevance of the qualification, relevance of the work experience and relative importance of work experience to qualification.

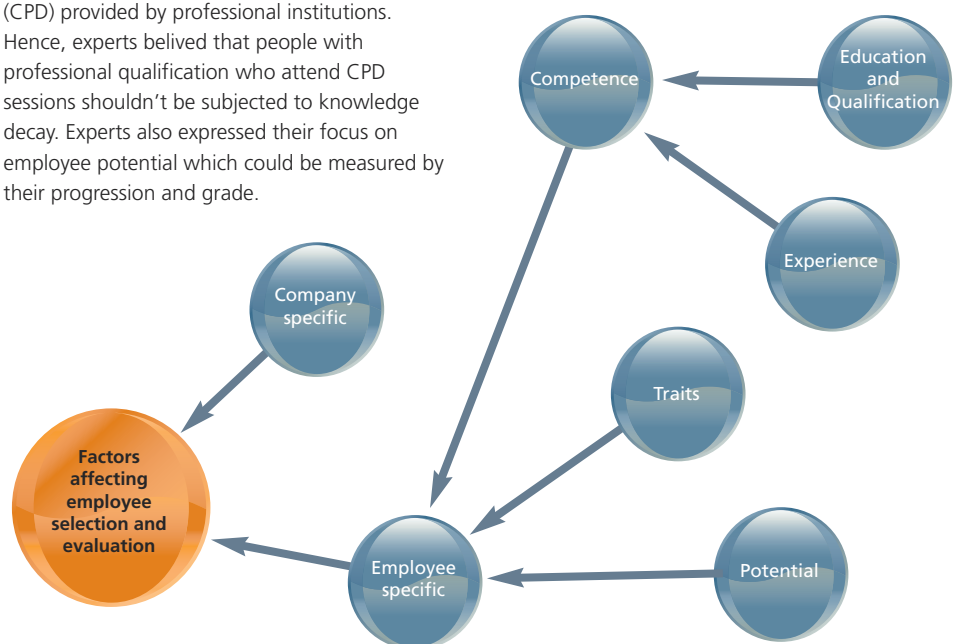


Figure 4: Cognitive diagram of factors affecting employee selection and evaluation



Development of a simplistic model for competency based employee selection and evaluation

This approach emerges from the notion of separately calculating the knowledge components from qualification and experience. While initial knowledge gained from qualification decays over a period of time personal knowledge/human intellectual capital increases with experience.

To bring this concept into context, an approach very similar to 'unit theory of learning curve' is adopted. Here, total output is articulated by multiplying initial input and learning rate. Using a similar approach, existing knowledge from qualification can be calculated as shown in equation 1 (figure 5).

Very similar to this, equation 2 indicates present knowledge after a period of experience. These two components are combined together to represent human intellectual capital.

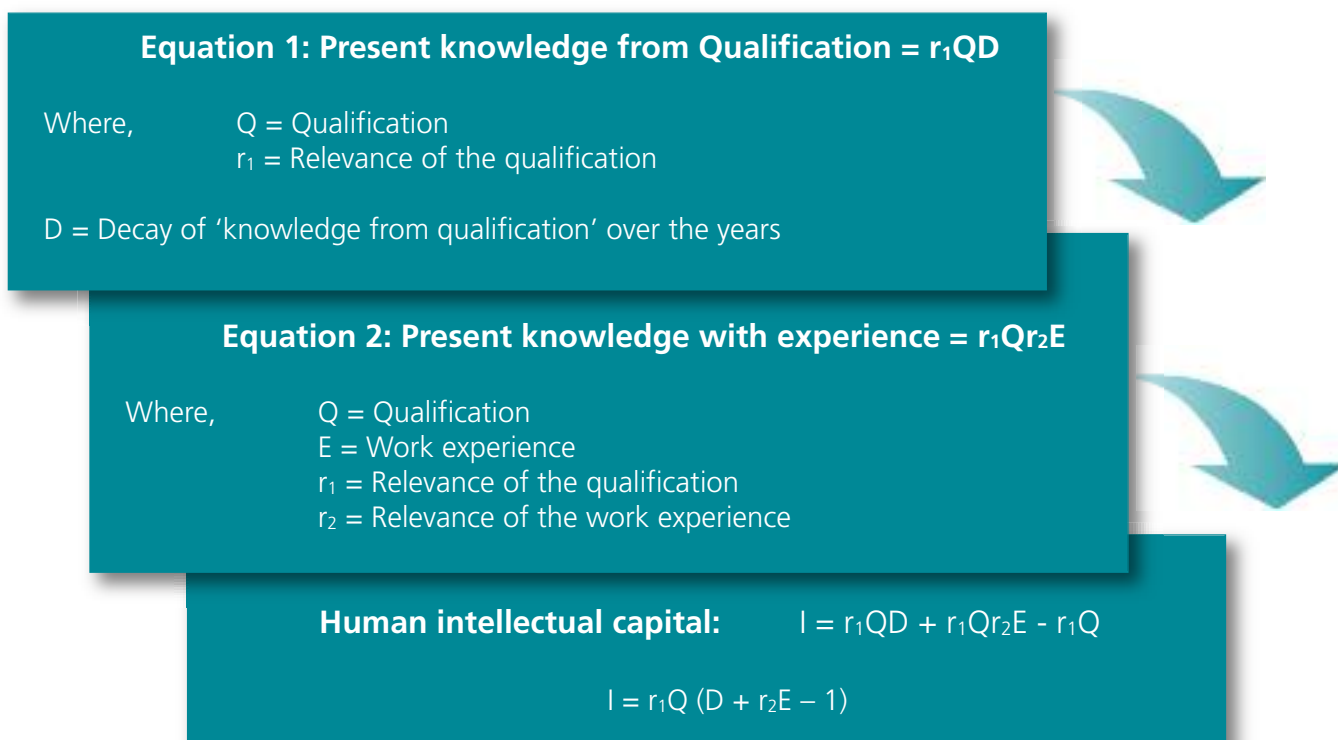


Figure 5: Human intellectual capital model

This model is proposed to be measured in units which would help to determine human intellectual capital transfer from HEI to Industry. As mentioned earlier, relevance of the qualification (r_1) and work experience (r_2) are very subjective and they are left for the management/decision maker for suitable employee selection and evaluation.

However, it is a prerequisite to quantify qualification (Q), work experience (E) and Decay of knowledge (D) in order to be able to measure human intellectual capital.

Regression model development

In the second model development phase, data has been gathered through a survey of 20 industry practitioners and academics to formulate the influence of qualification (Q), work experience (E) and decay of knowledge (D) to human intellectual capital. Online questionnaires were used to gather this primary data, which had two main sections.

Whilst the first section of the questionnaire (appendix 4) sought out the opinion of industry practitioners and academics on intellectual

capacity against various qualifications, the second section surveyed the behaviours of intellectual capacity for work experience (E) and decay of knowledge (D) over the years of experience. From this survey, each component of human intellectual capital (Q , E and D) was quantified individually and integrated to a single unit measure. This construction of quantitative relationships between these individual components and intellectual capital was carried out by regression analysis.

Human intellectual capital: $I = r_1Q (D + r_2E - 1)$

$$I = r_1 (-0.026x^4 + 0.275x^3 - 0.659x^2 + 8.44x + 28.90) [(113.773 - 7.719t + 0.281t^2 - 0.003t^3) + r_2 e^{5.106-1.053/t} - 1]$$

Where,

- x = Total credits
- t = Number of years
- r_1 = Relevance of the qualification
- r_2 = Relevance of the work experience

Figure 6: Human intellectual capital formula



As shown in figure 6, evaluated patterns / equations of the individual components were integrated, which resulted in the above mentioned human intellectual capital formula. Total credits earned from higher educational qualification and years of experience were considered as independent variables in this equation. It is found from regression analysis that each component has a significance level of 60-70%.

The research reported here is an initial attempt to construct a simplistic model which could lead towards customised formula for each industry employers, especially for HEI-Industry engagements. This research points out that a quantitative model could be constructed with increased validity and reliability by using a neural network with additional data collection and training. Importantly, to increase its credibility and to further generalise, this research needs additional data collection. With additional data, it would be possible to construct a neural network to model the complex non-linear multi-criteria relationships between human intellectual capital transfer and components such as qualification and experience. Furthermore, definition of relevance factors for qualification and experience could be developed based on the availability of data for training a neural network.

Next steps



There is an emerging importance placed on human resource management in the construction industry, as one of labour intensive sectors of the economy. The capacity of a company to create wealth is based on the knowledge and capabilities of its people, particularly in professional services. Industry-HEI engagement encourages higher education institutions to develop better graduates by improving the curriculum through the industry participation. This requires better guidance towards developing interaction between industry, higher education and intermediaries. Benchmarking performance of employer engagements remains elusive in the absence of credible, independent and quantitative measures.

To further develop this industry-HEI engagement practice guide and the model, ACBEE plan to:

- ➔ Develop and review industry-HEI process protocol to foster better collaboration between industry, higher education and intermediaries
- ➔ Design and launch a detailed neural network which models complex non-linear multi-criteria relationships between components of human intellectual capital transfer to quantify industry-HEI knowledge transfer
- ➔ Organise, manage and present series of workshops on industry-HEI engagement to influence strategy for developing employer engagement
- ➔ Inform the academic community, policy makers and other stakeholders of the findings through project report, project web site, workshops, conference presentations and journal articles

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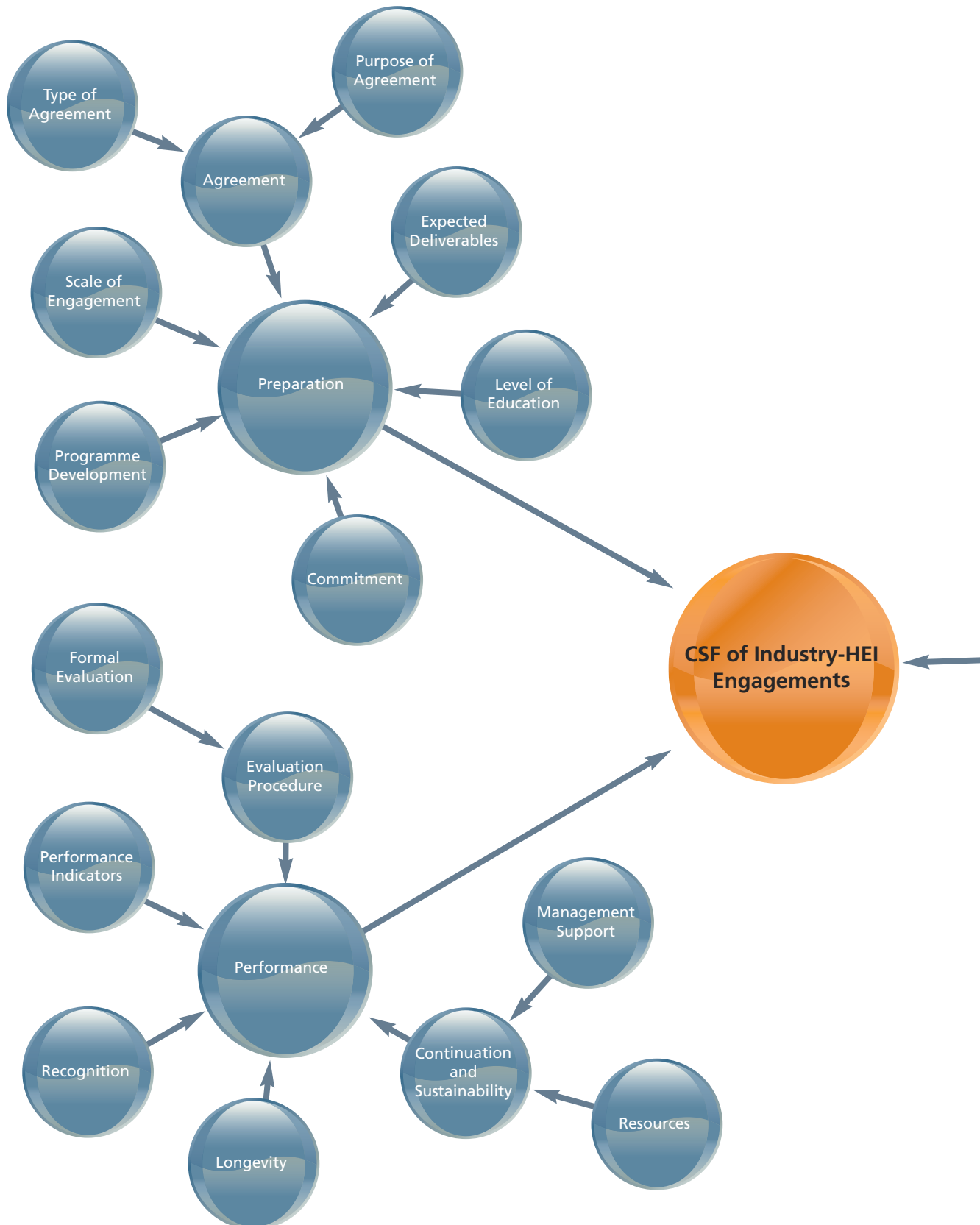
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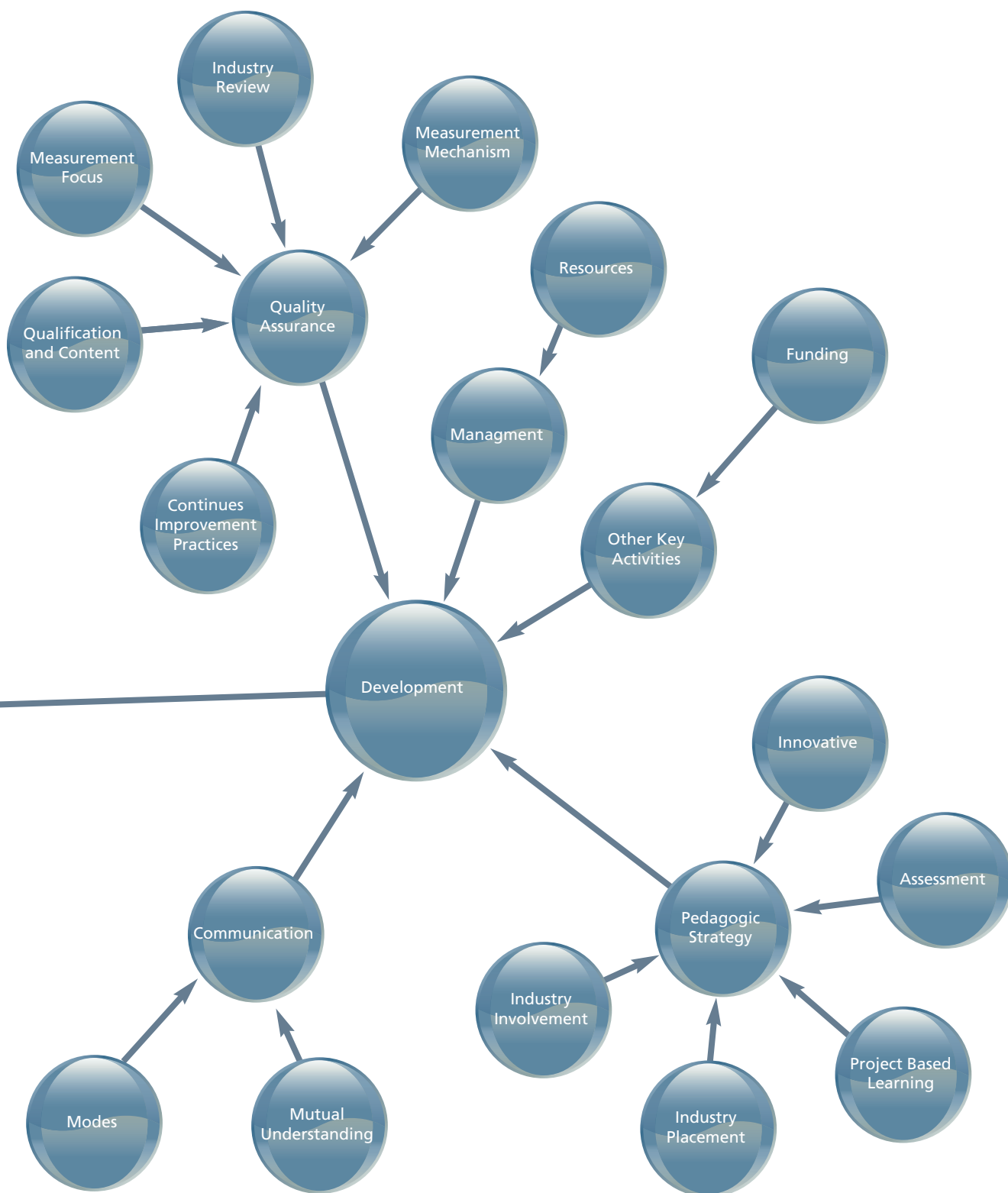
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Appendix 1





Appendix 2

South West - University of the West of England and Constructing Excellence South West The School of the Built and Natural Environment (BNE) at the University of the West of England and Constructing Excellence South West (CESW) are working together to improve the performance of the construction industry in their region. What commenced as a bilateral engagement has developed into multi way collaborations with the variety of CE members. This engagement incorporates strategic planning and operational management activities with particular emphasis on collaborative working, continuous improvement and up-skilling the industry. The partnership, which emanates from the industry-focused strategy of CESW reinforced by the academic expertise of BNE, demonstrates how the industry can utilise academic expertise and vice versa. The engagement has resulted in the development of a regional network enabling construction companies and professionals to exchange best practice, participate in research projects and engage in continuous professional development. This has been achieved through the delivery of the CE demonstration programme for the South West, the development and support of task-focused innovation circles and a series of training events focusing on sustainability, business management and health and safety.

North West - University of Central Lancashire and Lancashire Construction Best Practice Club

UCLan & Lancashire Construction Best Practice Club (LCBPC) are working together to improve performance of the construction sector in Lancashire. This collaboration brings together UCLAN academics with businesses in the region, trade associations and public bodies such as Business Link. UCLan's engagement with the Lancashire CBPC is vital to the club's aim of increasing membership by 300% in 2009. This multi way exchange of knowledge has resulted in the CKE at UCLAN working through the CBPC Steering Group to organise a programme of seminars events and workshops. UCLan's involvement has also raised awareness in the construction sector in the region about the benefits of CKE and the Lancashire Construction Best Practice Club. In return LCBPC members provide feedback on courseware, training and research areas and give access to experts from industry who can offer students a valuable insight into the construction industry. The regional

network has been enhanced as a result of UCLan working alongside LCBPC. It has enabled the exchange of best practice, industry participation in research projects, and enhanced CPD activities. This has been achieved through collaborative delivery of relevant workshops and a series of training events focusing on sustainability, planning and waste.

London/SE - London South Bank University and Construction Skills

London South Bank University has established a working relationship with Construction Skills in London to liaise directly on the number of large scale National Skills Academy Projects that encompass working relationships with local authorities, academic staff, construction professionals and schools. LSBU has established training provision to the London-based National Skills Academy for Construction projects and developed regional networks to facilitate knowledge exchange. In 2008, LSBU signed a Partnering Memorandum with the London Construction Providers Partnership, which will enable the University to become an approved provider of courses to employers and their respective projects. The collaboration allowed the School of Property, Surveying and Construction's annual Employment Fair to be promoted to companies across the region. Recruitment and training activities have been jointly developed to encourage those from non-traditional backgrounds into engineering roles on major projects including Cross rail and Cross River Tram. LSBU has developed its capacity to deliver approved Skills and Training plans for London NSAfC projects, giving the workforce access to significant knowledge and experience and a sound route into the learning in the workplace market for LSBU.

West Midlands - University of Wolverhampton and West Midlands Centre for Constructing Excellence (WMCCE)

The School of Engineering and the Built Environment (SEBE) at the University of Wolverhampton currently leads the West Midlands Centre for Constructing Excellence (WMCCE). This has allowed the development of a number of multi directional engagements to develop under the umbrella of the WMCCE organisation. SEBE is assisting the regional built environment industry to become more competitive with the support of Advantage

West Midlands and the European Regional Development Fund. Seminars have been held on a range of subjects, including urban design, ICT and research services available from HEIs. Training events have been held with considerable success: a series of these on technology training delivered skills to over 700 regional industry practitioners between 2004 and 2008. The linkage between SEBE and WMCCE centre has provided both industry input and engagement of academics across a range of disciplines. The WMCCE has recently won continuation funding and has established a further 3 years of operation. As a result, linkages with the School and the University Knowledge Exchange activities are now embedded within the School ethos and industry engagement has been adopted as a KPI for departments within the School.

Yorkshire & North East - Leeds Metropolitan University and Association for Environment Conscious Building

The School of the Built Environment at Leeds Met has actively been engaging in activities related to sustainability with the Association for Environment Conscious Building (AECB). This is a two-way exchange of knowledge but, given the breadth of AECB membership, it has potential to extend to multi-layered engagement. Through an iterative dialogue, Leeds Met University has worked alongside AECB to develop a regional network that enables the university, the AECB and its members to share information and to discuss issues relating to sustainable construction. The potential to develop joint research opportunities and involve larger enterprises in the work of the AECB was seen as a key aim that Leeds Met University could help the Association to address. Working with the AECB, Leeds Met has organised a number of events and research projects including regular seminar sessions and both the Low Carbon Housing Learning Zone and the Sustainable Housing Learning Leeds Met has gained the benefit of access to industry professionals who are engaging in the area of sustainability within the built environment. And, in return, Leeds Met has provided knowledge and expertise to help them to meet the challenges thrown up by an ever changing landscape. This engagement has been strengthened by the signing of a memorandum of collaboration between the school and the AECB in November 2007.

Appendix 3

Name:

Organisation:

Collaborative Activity:

Preparation

1. Which parties were involved in setting up this collaborative relationship?

2. Why did the collaboration begin?

(What was the most significant factor that contributed to the collaboration?)

3. How was the collaboration initiated? *(Please tick appropriate box)*

- | | |
|---|--|
| <input type="checkbox"/> Joint needs established through dialogue | <input type="checkbox"/> Previous collaborations |
| <input type="checkbox"/> Recommendation via intermediary body | <input type="checkbox"/> Other (please specify) |

4. Was the collaboration initiated in response to specific incentives/policy? *(Please tick appropriate box)*

- | | |
|--|--|
| <input type="checkbox"/> Regional funding | <input type="checkbox"/> Educational grant funding (inc research grants) |
| <input type="checkbox"/> National policy drivers | <input type="checkbox"/> Privately funded by stakeholders |
| <input type="checkbox"/> Other (please specify) | |

5. What activities were identified at the outset to deliver joint aims and objectives?

(Can a level of engagement be identified? e.g. individual, organisational)

6. What did both parties perceive as the benefits of working collaboratively, at the outset? *(Please tick appropriate box)*

- | | |
|---|--|
| <input type="checkbox"/> Improved training/ skills for existing staff | <input type="checkbox"/> Profitability |
| <input type="checkbox"/> Sustainability | <input type="checkbox"/> Improved outreach/knowledge |
| <input type="checkbox"/> Other <i>(please specify.....)</i> | |

7. In your opinion, what are the success factors in setting up the collaborative working relationship with the partner organisation?

Development

Management of the Collaboration

8. Do you have sufficient resources to deliver the aims and objectives? (e.g. finance, staff, technology)

- Yes No(If no, please specify which and why)

9. What measures are in place to effectively manage your collaborative relationship with the partner organisation?

10. Have there been significant changes required in managing the project (e.g. bringing in additional partners, recognising new aims and objectives?)

11. In your opinion, what are the success factors in managing the collaborative relationship with the partner organisation?

Appendix 3

Communication *(Please tick appropriate box)*

12. What methods of communication are most effective in your collaboration?

- e-mail dialogue scheduled meetings ad-hoc meetings
 Other

13. What methods of communication do you make use of to share information beyond collaboration partners?

- Events Web Page Press/ Newsletters (approx monthly)
 Other (please state)

14. Has the depth/level of communication between you and the partner(s) changed as a result of the engagement?

15. How has working collaboratively improved the mutual understanding of each others commitments and goals? (Is this relevant to specific areas of activity? If so, please specify.)

16. In your opinion, what are the success factors in achieving effective communication in your collaborative working relationship with the partner organisation?

Performance

17. What are the performance measures for the activity? What is being evaluated?

18. Were these measures in place from the project outset or developed as project activity has evolved?

19. How and when do you reflect on your activities(procedures, results, successes?) Is this something that is done informally or could you elaborate on any formal evaluation procedures you have in place?

20. How is continuous improvement ensured and measured?

- Collection of feedback External Evaluation
 Performance reviews Celebration of successes (e.g. events, presentations)
 KPI's or benchmarking Other (Please state)

21. Have you adopted changes in practice as a result of your evaluation? What is it specifically that has changed? eg increased profit, output, efficiency etc

22. In your opinion what are the success factors in evaluating the collaborative working relationship with the partner organisation?

23. Do you envisage continuation of this collaborative working relationship beyond its present funding? How?

24. What resources do you feel would be required in order for this activity to be sustainable?

- Funding Staffing Technology/Equipment
 Time Other (please state)

25. In your opinion, what factors are critical to continuing your collaborative relationship with the partner organisation?

Appendix 4



PREAMBLE

The aim of this study is to understand expectations of various stakeholders of higher educational institutes on academic knowledge transfer and capacity building. This will further focus on rethinking educational activities to suit requirements of stakeholders.

Definitions of the following terms are applicable for this study.

Certificates of Higher Education - It is awarded after one year full-time study (or equivalent) at a university or other higher education institution. They certify that a student has achieved a minimum standard in 1st year Degree courses, equivalent to 120 credits.

Diploma of Higher Education - It is awarded after two years' full-time study (or equivalent) at a university or other higher education institution. They certify that a student has achieved a minimum standard in 1st and 2nd year Degree courses, equivalent to 240 credits.

Bachelors Degree - Bachelor's degrees with Honours, Graduate Certificates and Graduate Diplomas. This specifically applies to Degrees at Honours level, equivalent to 360 credits.

Masters Degree - A Masters degree is a qualification of academic study. It can be research based, a taught course, or a mixture of both, and will take at least 12 months of full-time study to complete.

Doctorate - Undertaking of an original piece of research. Usually takes at least three years of full-time study to complete.

INSTRUCTIONS

Assume that higher education qualification/award holders come from the most suitable course/programme for the considered employment.

There is no right or wrong answer. Please indicate the answers you feel best represent your opinion.

SECTION A - PERSONAL INFORMATION

Age	<input type="text"/>
Position	<input type="text"/>
Sector	<input type="checkbox"/> Industry <input type="checkbox"/> Academia
Qualification	<input type="text"/>
Work experience in built environment sector	<input type="text"/> years

Appendix 4

SECTION B – OPINION ON EMPLOYEE EDUCATION

Higher Education Qualifications

1. Do you see a difference in knowledge capacity between Higher Education Diploma holders and Masters Degree holders?

Yes

No

A. If yes, please indicate your opinion on relative knowledge capacity, exhibited from following award holders. Express your opinion in the scale of 1-100, where 1 being the lowest and 100 being the highest.

(LOW) 1 --- 10 --- 20 --- 30 --- 40 --- 50 --- 60 --- 70 --- 80 --- 90 --- 100 (HIGH)

i. Certificates of Higher Education

ii. Diploma of Higher Education

iii. Bachelors Degree

iv. Masters Degree

v. Doctorate

Bachelors Degree

2. Do you see a difference in knowledge capacity between first and third class Bachelors Degree holders?

Yes

No

A. If yes, please indicate your opinion on relative knowledge capacity, exhibited from Bachelors Degree holders with following class awards. Express your opinion in the scale of 1-100, where 1 being the lowest and 100 being the highest.

i. First

ii. Upper second

iii. Lower second

iv. Third

Masters Degree

3. Do you see a difference in knowledge capacity between Masters Degree holders with Distinction and Merit?

Yes

No

A. If yes, please indicate your opinion on relative knowledge capacity exhibited from Masters Degree holders with following class awards. Express your opinion in the scale of 1-100, where 1 being the lowest and 100 being the highest.

i. Distinction

ii. Merit

iii. Pass

Knowledge Decay

4. Do you believe in knowledge decay over a period of time? For example, obsolescence of relevant knowledge in a particular area (acquired from a bachelors degree), because of technological advances.

Yes

No

A. If yes, assuming a Bachelors Degree holder has 100 units of knowledge, please indicate your opinion on the number of units he/she would hold after following years (only consider the effects of knowledge decay).

- i. After 2 years
- ii. After 5 years
- iii. After 10 years
- iv. After 20 years
- v. After 30 years
- vi. After 40 years

SECTION C – OPINION ON EMPLOYEE EXPERIENCE

5. Do you see a difference in knowledge capacity between Bachelors Degree holders with 2 years experience and 5 years experience?

Yes No

A. If yes, assuming a Bachelors Degree holder has 100 units of knowledge, please indicate your opinion on the number of units he/she would hold after following years of experience (only consider the effects of workplace learning).

- i. After 1 year
- ii. After 2 years
- iii. After 5 years
- iv. After 10 years
- v. After 20 years
- vi. After 30 years
- vii. After 40 years

SECTION D – FINAL COMMENTS

Please state any other comments, if any.

"YOUR OPINION MATTERS; THANK YOU VERY MUCH FOR YOUR KIND CONTRIBUTION – ACBEE TEAM"

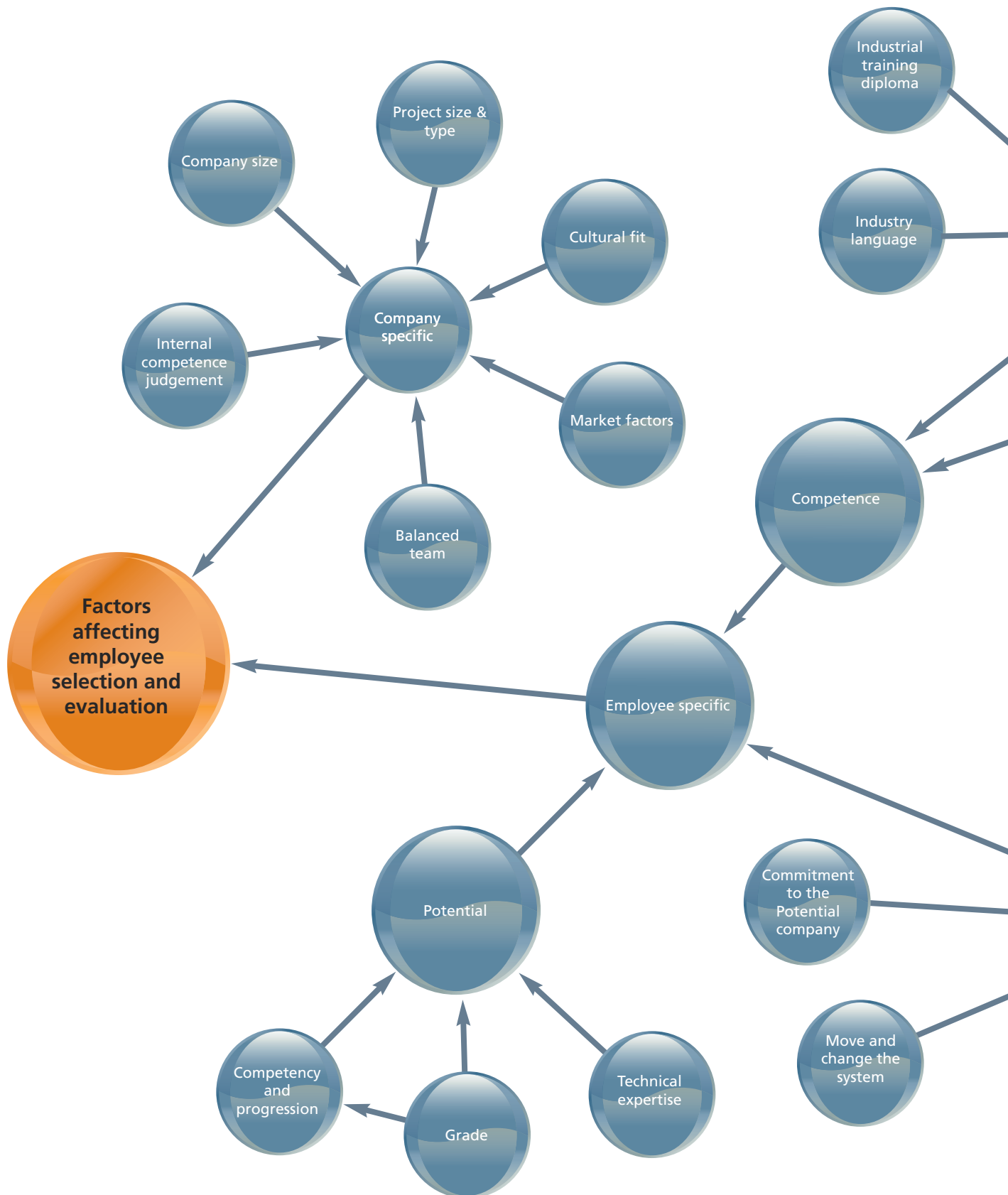
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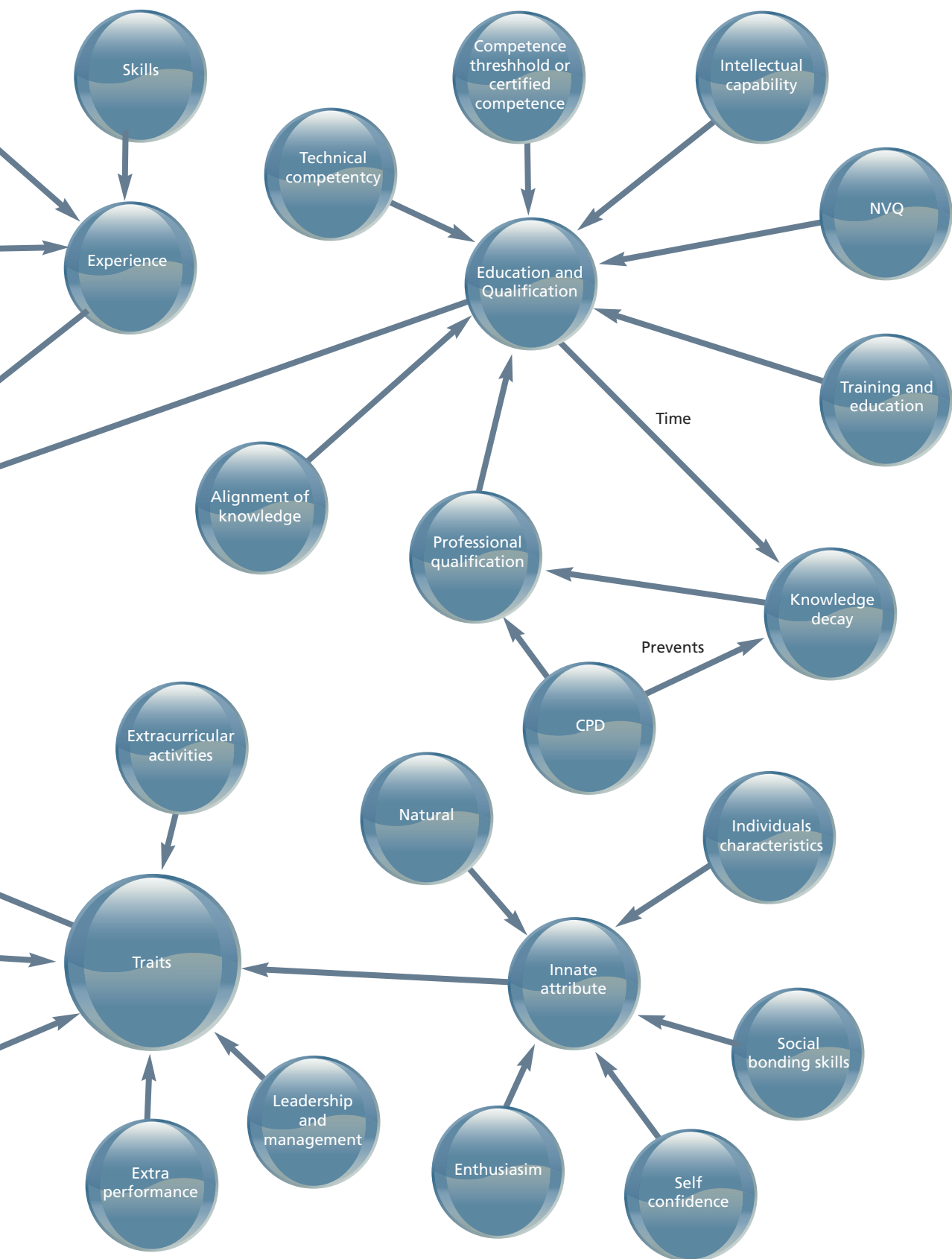
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Appendix 5





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