Measuring the impact of university-business cooperation

Final Report

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Measuring the Impact of
University Business Cooperation

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Final Report

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1. Introduction

1.1 Measuring the outcomes of University-Business cooperation in the field of education

Cardiff University, in association with Newcastle University and Imperial Consultants, is pleased to present this report on Measuring the Impact of University-Business Cooperation to DG Education and Culture (DG EAC).

Both the business sector and higher education institutions make an important contribution to sustainable economic growth, employment and prosperity in the EU. They do so directly as employers and producers of goods and services, and through their role in promoting innovation and future capacity for growth, such as by developing a more skilled and knowledgeable workforce. Promoting and developing cooperation between higher education and business is a core element of the EU's Agenda for Modernising Higher Education, and the potential to enhance this contribution further, through increased levels of collaboration, is now firmly recognized within EU policy circles and in Member States, most recently with the publication of Europe 2020 and the related Flagship Initiatives.

This potential has been most explicitly developed in the area of research and innovation. There are now numerous examples of initiatives seeking to encourage university- business collaboration in this area, with an associated consideration of what works, and what does not. In contrast, the promotion of business-university collaboration in the field of education has been relatively underplayed. This is unfortunate as it is through people, as students, graduates and employees, that knowledge exchange can often most effectively be embedded in both universities and businesses, relevant skills developed and the conditions for future innovation and economic growth laid.

In recognition of the potential benefits to be realized through increased cooperation between businesses and Higher Education Institutions (HEIs) in the field of education the European Commission launched the Knowledge Alliance pilot initiative to create new multidisciplinary curricula to promote entrepreneurship within education as well as developing other transferable skills. This initially funded a small number of pilot projects in 2011 and 2012 before embedding the initiative in the Lifelong Learning Programme in 2013. From 2014 Knowledge Alliances will be part of the Erasmus+ programme. Knowledge Alliances must "be a truly two-way process: higher education and business joining forces to design innovative, sustainable ways of increasing human capital"[1]. Similarly, the Commission has also developed a second approach, known as Sector Skills Alliances, which are intended to bring together education and training providers; sector-specific expertise, and bodies involved in education and training systems to jointly design and deliver joint curricula and methods to provide learners with the skills required by the labour market.

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[1] http://ec.europa.eu/education/higher-education/knowledge_en.htm (accessed July 2013)

There are many other examples of university-business collaboration in the field of education across the EU, many of which have been underway for several decades. These are often bilateral agreements between individual companies and HEIs with no involvement of public sector bodies. The focus of these activities can vary widely, depending upon the aims and objectives of each particular example (as identified in the Wilson Review in the UK[2]). In a recent report, eight types of cooperation were identified of which five are particularly relevant to collaboration in the field of education, although all may play a role (Science-to-Business Marketing Research Centre 2011).

Figure 1.1 Types of University Business Cooperation

1	Collaboration in R&D	Joint R&D activities, contract research, R&D consulting, cooperation in innovation, joint publications with firm scientists/ researchers, joint supervision of theses with firm scientists/ researchers in cooperation with business and student projects in cooperation with business.
2	Mobility of academics	Temporary or permanent movement of professors or researchers from HEIs to business; and employees, managers and researchers from business to HEIs.
3	Mobility of students	
4	Commercialisation of R&D results	Commercialisation of scientific R&D results with business through spin-offs, disclosures of inventions, patenting and licenses
5	Curriculum development & delivery	The process of collaboratively creating a learning environment with members of the business community including creation of a fixed programme of courses or planned experiences.
6	Lifelong learning	Lifelong learning refers to all learning activity undertaken throughout life through a HEI, whether formal or informal.
7	Entrepreneurship	Actions within or involving HEIs towards the creation of new ventures or developing and innovative culture within the HEI in cooperation with business.
8	Governance	Cooperation between HEI and business at a management level of the HEI or firm.

(8 Types of UBC)

Source: Science-to-Business Marketing Research Centre (2011) p.43

Yet, despite the resurgence in business-university collaboration, research reports consistently find that cooperation practices are highly fragmented and uncoordinated, particularly when it comes to the educational offer. Evidence from SBMRC also suggests that cooperation in the field of education is much less common than levels of R&D collaboration, with the exception of cooperation in the mobility of students. Furthermore, there is a very limited literature on assessing the benefits of cooperation activity on the educational offer, with most attention focusing on cooperation and collaboration in the field of research and innovation.

One of the challenges in assessing the benefits of university-business cooperation in the field of education is, quite naturally, the question of benefits to whom? Benefits can commonly be described as accruing to students, to the HEI, to participating businesses, to the academics involved and to the wider society (see for example Science-to-Business Marketing Research Centre, *op cit*). Other challenges also exist, including the time-scale over which benefits might arise; whether they are directly or indirectly attributable to the cooperation activities

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[2] Wilson, T. (2012) A Review of University Business Collaboration.

undertaken, and the need to distinguish between tangible and intangible outcomes.

Developing a more systematic understanding of the outcomes and impacts of cooperation activities in the field of education, and the means of measuring these, is essential if we are to assess potential initiatives *a posteriori* and monitor their evolution and ongoing value for the purposes of adjustment and improvement. A more systematic assessment of current approaches to measuring the benefits of cooperation activities in different circumstances may also serve to increase our knowledge of potential approaches in this understudied field and contribute to the development of a better understanding of the factors enabling the cooperation between higher education and business.

To advance knowledge in this field, DG Education and Culture launched a study to Measure the Impact of University-Business Cooperation. The study had three specific objectives:

- To analyse existing and identify emerging types of university-business cooperation in Europe and their drivers;
- To identify, demonstrate and assess tangible and intangible effects of university-business-cooperation;
- To develop an assessment methodology and relevant qualitative and quantitative indicators for measuring the outcomes and impact of university-business cooperation, and in particular of Knowledge Alliances

The intended outcomes of the study were expressed as follows:

- A review and analysis of existing and emerging types of university-business cooperation beyond R&D in Europe. This to include an analysis of methods used for the assessment of outcomes and impact, including the strengths and weaknesses of the identified approaches
- Proposal for an assessment methodology and relevant indicators of the outcomes and impact of the cooperation between higher education institutions and companies.
- Development of at least 10 in-depth case studies of university-business cooperation.

The purpose of the assessment methodology, or framework, is to provide a tool, which can be adapted according to the particular needs and interests of different parties. The framework has a number of potential uses, as summarised below:

1. It can be used by DG EAC and the Education, Audiovisual and Culture Executive Agency (EACEA) in the management of the Knowledge Alliance programme. In this respect it could have value as a means for:
   a. Supporting the assessment of applications for funding
   b. Monitoring the progress of individual projects
   c. Evaluating the success of the programme as a whole

2. It can also be used by Universities or Businesses involved in cooperation activities, providing a guide for self-assessment or monitoring of their own activities

3. It could be used by other third parties involved in the facilitation of university-business cooperation exercises in the field of education

Although there are different ways in which an assessment methodology might be used, from evaluation[3] through performance management to the appraisal of applications for investment of funding support, the principles largely remain the same. The aim is to ensure that proposed initiatives are well-designed; that the planned actions meet their desired objectives and that these actions lead to desired outcomes. In our work we have taken an outcomes-based approach rather than adopting a narrower framework focused on measures of efficiency and effectiveness. Whilst partners will be able to use the framework to assess these considerations our primary concern has been to identify the range of outcomes for consideration on order to ensure that positive outcomes are not lost simply through their not being identified in the development stages of a project.

The purpose of a monitoring and measurement framework is thus to help parties to shape well-designed initiatives; to make on-going judgements as to whether they are performing as expected, and to make decisions between competing investment choices. Whilst, measurement and monitoring arrangements are often portrayed as mechanisms for controlling expenditure, particularly regarding previously agreed commitments, they should also be about stimulating learning and the development of improved practices (Turok, 1991).

The remainder of this report is structured as follows:

- Section 2 introduces the emerging forms and drivers of cooperation in the field of education, drawing on secondary data sources
- Section 3 sets out current approaches to measuring the outcomes of university-business cooperation activities, acknowledging that this is predominantly focused on research collaborations
- Section 4 presents summary findings from ten cases of university-business cooperation in the field of education
- Section 5 develops a scorecard-based approach to assessing the outcomes of university business cooperation activities in the field of education
- Section 6 builds on this work to present some further methodological considerations
- Section 7 presents some final conclusions to the study

1.2 Study Approach

The study has been undertaken through a review of existing literatures and the generation of findings from a selection of case-studies, which were, in turn,

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[3] Evaluation can also take place at different stages, from the *ex ante* evaluation of a project prior to implementation, through mid term (or *in itinere*) evaluation to assess progress, to the *ex post* evaluation of a completed project.

derived from a long-list of examples of University-Business Cooperation in the field of education.

A starting point for the research was to identify what was meant by the term cooperation (or collaboration, which is used interchangeably in this report) in the context of this study.   The approach taken has been to distinguish between different *Modes* of cooperation which can be identified as underpinning .   These can vary from strong formal cooperation at a corporate level to more ad hoc informal arrangements.   We divide these into three basic modes.

Mode 1 are those highly institutionalised cooperation arrangements which often appear akin to legal Joint Venture vehicles, such as where a university and one or more businesses cooperate to offer higher degrees (such as through private universities), through institutionalised arrangements, such as the dual learning system in Germany, or newly-emergent models such as the Virtual Campuses being established with the support of Banco Santander in Spain.

Mode 2 operate at a level below this, where a variety of approaches deliver different elements of the educational offer.   These involve a formal cooperation arrangement, often with agreed levels of inputs or activities, operating over a defined period of time.   Most involve the development, or enhancement, of curricula and curricula delivery.   One area where there is strong business engagement is in the field of entrepreneurial education, for which numerous examples can now be identified. A range of cooperation models can be identified, which enhances the complexity of an already complex field. Five basic models of cooperation have been identified, which can be summarised as:

- Cooperation between one HE and one firm
- Cooperation between one HE and multiple firms
- Cooperation between one firm and multiple HEs
- Cooperation between multiple firms and multiple HEs
- Cooperation between firms and HEs but led by a third party

At one remove again are more ad hoc and often quite informal examples of cooperation, which we term *Mode 3*. These will typically be very locally focused and involve one University department, or just one course in a department, and one or more, often local, businesses working together. Examples might include the placement of students in work-places as part of their studies, or the involvement of external experts in lectures, based on the personal contacts of individual academics rather than more formalised arrangements. This form of interaction can be viewed as high volume transactional relationships or the base of a pyramid of university business linkages through education whereas mode 1 & 2 are likely to be more transformational in terms of both business and the wider society

Companies themselves often identify these modes as different levels of cooperation, regarding some more ad hoc arrangements as precursors to the development of more strategic, formalized cooperation arrangements. Figure 1.2 draws on the experience of one multinational, which divides its activities into five 'phases' beginning with simple awareness raising activities and culminating in

strategic partnerships. It describes the early stages as "Traditional Engagement' and the latter stages as 'Holistic Engagement', capturing the greater breadth (and depth) of engagement in these latter cases[4].

Figure 1.2 Levels of Engagement Activities
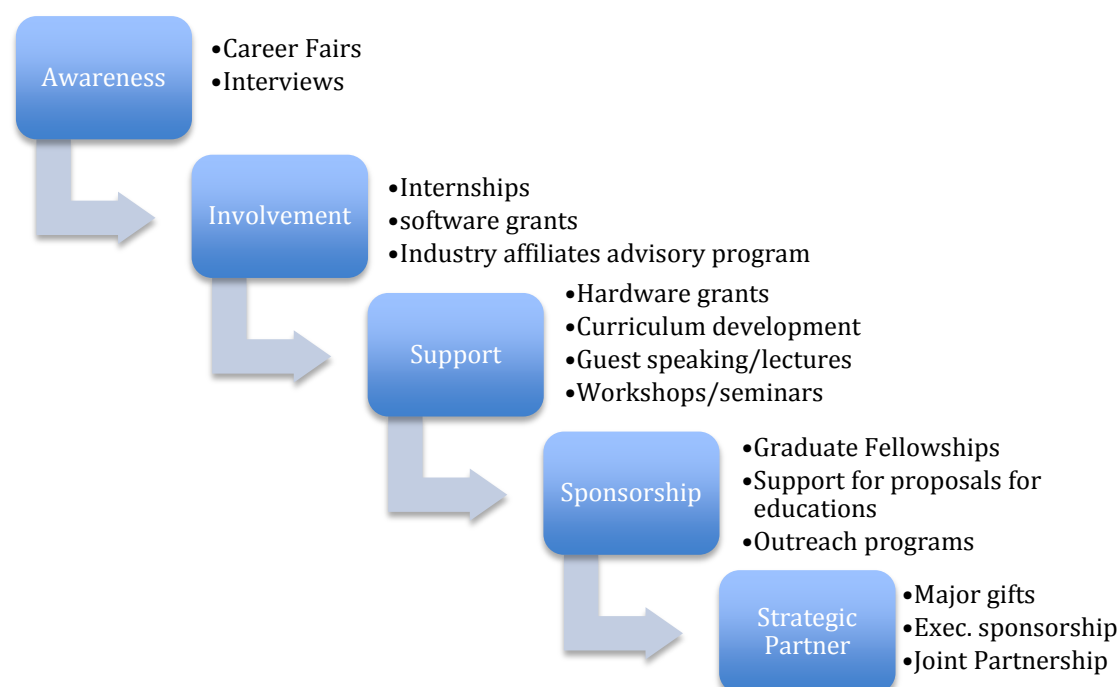
Source: adapted from Hewlett-Packard presentational material (n.d)

The study focuses on cooperation arrangements that fall into the Mode 2 model (focused around the support phase in Figure 1.2 but with elements of involvement and sponsorship), as these are most typical for actions such as the Knowledge Alliance projects and are most likely to include, or benefit from, consideration of stronger monitoring and assessment arrangements. Highly formalised, strategic alliances lie beyond the scope of this work, whilst informal ad hoc arrangements are more likely to be subject to personal discussions rather than strong considerations of wider outcomes and impacts.

In developing a long-list of projects, the study sought to draw on examples from across Europe and the countries eligible to participate in the EU's Lifelong Learning initiative.   The study team used web-based resources and existing references to good-practice examples as well as drawing on the knowledge of experts in the field. The Terms of Reference required the identification of up to 40 examples, suggesting that these should cover at least 9 countries participating in the EU Lifelong Learning Programme, from which 10 cases could be selected for further study.   In practice, the study identified 41 cases drawn from 16 countries. These can be broadly divided according to the following geography:

- ▪ Scandinavia   6 examples
- ▪ West and Central Europe   16 examples
- ▪ Southern Europe   5 examples

[4] Derived from Hewlett Packard publicity and presentational material

- Eastern Europe   6 examples
- Multi-country coverage   8 examples

What is particularly interesting is the number of multi-national cooperation arrangements which have been identified. This seems, partly, to be a consequence of the number of EU-facilitated arrangements picked up by the approach. However, it is also symptomatic of the approaches taken by some leading firms that are developing corporate engagement approaches in more than one country. It is an important feature for consideration as it may have significance for measurements of cooperation outcomes.

The long-list exercise also provided an insight into the most prevalent forms of university-business cooperation in the field of education (Table 1.1). Most were focused on the design and/or delivery of course curricula. Exchange and mobility activities and entrepreneurial education activities were the next most numerous. None of the examples identified involved collaboration between businesses and universities in the field of Continuing Education, although this does not mean that they do not exist.

Table 1.1 Cooperation forms in cases longlist

Form of cooperation	Number of examples
Curriculum design, development and delivery	28
Exchange and Mobility programmes	12
Entrepreneurship and Entrepreneurial education	7
Bespoke course development	4
Continuing education and Lifelong learning	-

The examples identified also cover a range of different sectors. Most are of a general nature or focused on enterprise development with no specific specification. However, there are clusters of activity in fields such as ICT, energy and environment, engineering and business/finance. Table 1.2 below sets out the broad categories identified.

Table 1.2 Sector coverage of cases longlist

Broad sector	Number
General/unspecified	12
Enterprise	8
Business/finance	5
ICT	4
Engineering/manufacturing	4
Energy/environment	4
Media/communication/cinema	2
Chemical/bioscience	2

1.2.1 Case studies of educational cooperation

From the longlist of examples, ten cases of university-business cooperation in the field of education were selected for more detailed analysis. The ten cases, identified below, are described in more detail in Section 4 of this report, with the full cases included at Annex A:

- Educckate, multinational - led by the University College London in partnership with other EU Universities and their local companies to stimulate entrepreneurship in cultural and creative industries.
- EUEN, multinational – led by Coventry University with transnational academic and industry partners to promote entrepreneurial education.
- KnowFact, multinational – led by the University of Patras with industry partners from other EU countries to develop the Teaching Factory paradigm in manufacturing education.
- AppCampus, Finland – an innovative initiative between Aalto University and Nokia/Microsoft involving app. Development. National.
- Qatar Carbonates, UK – a collaborative arrangement between Qatar Petroleum/Shell and Imperial College London promoting post-graduate education. International.
- Newcastle University Subsea, UK – cooperation between Newcastle University and regional businesses developing sector relevant skills. Regional.
- Masters in Banking, Valencia, Spain – collaboration between Valencia University and regional banking bodies developing sector relevant skills. Regional
- HP, Bulgaria – Cooperation between Hewlett Packard and various Universities whereby HP trained university lecturers in specialised technologies and created the project curriculum. National.
- University of Merseburg, Germany – regional businesses endow professorial chairs at University of Merseburg to ensure industry relevant education.
- AKA, Prague – professional qualification (Certificate of Communication Agencies) developed by industry and delivered by University of Economics, Prague.

Each case study was undertaken by a local expert, with knowledge of both the context of the case study and able to work in the native language, as required by the Terms of Reference. The individual expert associated with each study is identified below (Table 1.3). To ensure consistency, experts were asked to follow a standard topic guide when undertaking the study. This is included at Annex B.

Table 1.3 Case study expertise

| *Cooperation*	*Country*	*Expert*
Hewlett Packard-University of Sofia	Bulgaria	Svetlana Avramova
KnowFact	Multinational (Greece)	Dimitrios Serpanos
Subsea North East	UK	Newcastle University

Qatar Carbonates	Multinational (UK)	Imperial Consultants
AppCampus	Finland	Imperial Consultants
Chemical industry-University Merseburg	Germany	Elisabeth Bublitz
EUEN	Multinational (UK)	Cardiff University
Educckate	Multinational (UK)	Cardiff University
Masters in Banking, Valencia	Spain	Jose Gines Mora
AKA Prague	Czech Republic	Milan Damborsky

1.2.2 Review of relevant literatures

To complement the case study assessment exercise a review of the existing literature on university-business cooperation in the field of education was also undertaken. This involved two elements. Firstly, an assessment of the drivers and forms of cooperation prevalent in the field of education. This was led by Newcastle University and forms the basis of Section 2 of this report. The second element of the work examined existing approaches to measuring the outcomes and results of university-business cooperation activities. This was led by Imperial Consultants and forms the basis of Section 3.

Taken together these two literature reviews, coupled with the case studies provided the inputs for the development of a framework that can be used for the assessment and monitoring of university-business cooperation activities in the field of education (as represented in Figure 1.3). This was developed by the study team and then shared with a peer group for comment and challenge.

Figure 1.3 Representation of the methodological approach
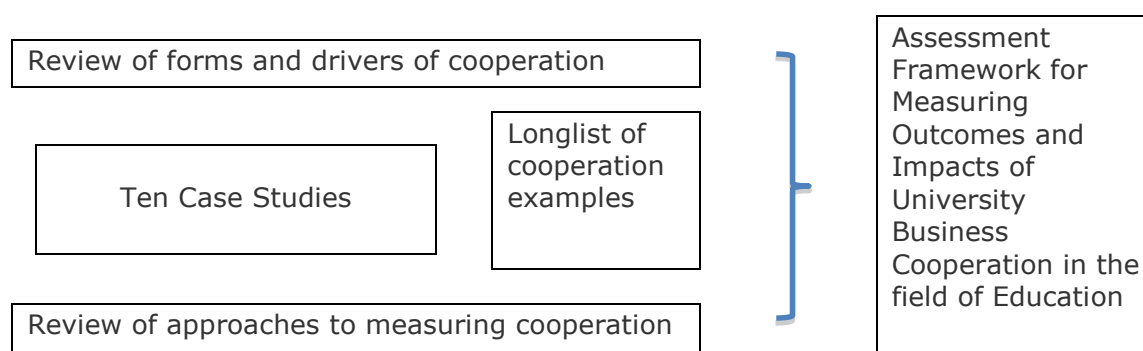
1.2.3 Peer Review

The peer group for the study consisted of five individuals who are particularly qualified to critique the emergent assessment framework. Individually each has a recognized expertise relevant to the subject area and, taken together, they provide a rich knowledge on which to base informed comment. The members of the Peer Group have been:

- **Gabor Boyar.** An Hungarian entrepreneur and founder of Graphisoft, an AEC (architecture, engineering, and construction) CAD company. Gabor founded the Aquincum Institute of Technology in 2010
- **Kathryn Walsh, Loughborough University.** Kathryn is Director of the Enterprise Office at Loughborough University and has a long-standing engagement with business-university collaborations.
- **Markus Lecke, Deutsche Telekom.** Head of the education policies for Deutsche Telekom. He is responsible for University Cooperations, the corporate roll out of the Bologna process and DT´s corporate University for applied sciences in Leipzig.
- **Maureen McKelvey, University of Gothenburg.** Maureen is currently director of RIDE research center, R&D, Innovation and Dynamics in Economies. She is a member of the advisory board for the 'Global Entrepeneurships Awards' which identifies the leading international scholars in entrepreneurship.
- **Paul Callaghan, Leighton Group.** Chairman of the Leighton Group and of the Board of Governors of Sunderland University, Paul was also Chairman of the North East Regional Development Agency, ONE North East, and acted as Chair for the English RDAs Group of Chairs.

1.2.4 Additional external perspectives

The draft assessment framework was also shared with officials of the European Commission, including the Executive Agency. Their valuable comments assisted in the preparation of a revised framework, which was then shared with representatives of Knowledge Alliance projects and other interested parties at a workshop held in Brussels in December 2013.

As part of the open engagement process underpinning this project, the contractors also facilitated a workshop at the 5th Business University Forum held in Brussels in May 2013. This session was chaired by Prof. John Goddard and involved Dr. Adrian Healy, Mr. Markus Lecke, Mr. Gabor Bojar and Mr Roope Takala and Mr. Pekka Sivonen from AppCampus. The session addressed the question of measuring and assessing the outcomes of cooperation and proved to be a fruitful and valuable discussion with universities and businesses attending the Forum.

2 Forms and drivers of University–Business collaboration

2.1 Background to University-Business Collaboration

While there has historically never been a singular accepted European model of higher education, the Humboldtian principle which emphasises the 'union of teaching and research' in academic work was dominant in German speaking Europe and highly influential in parts of Eastern Europe from the late 1800s to the 1950s. This principle can be summarised as follows: *"The function of the university was to advance knowledge by original and critical investigation, not just to transmit the legacy of the past or to teach skills."* [5] This philosophy of higher education arguably led to the emphasis on collaborative and applied research for the benefit of industry, the military and wider society in places that adopted the Humboldtian model. This was in contrast to the 'Anglo-Saxon' model (as advocated by Cardinal Newman) which emphasised a liberal education, separated from commercial or professional training, and which advocated a distinction between 'discovery' and 'teaching' or the 'Napoleonic' model that dominated in Southern Europe, where higher education was regulated and controlled by the state. This has acted to separate educational learning from the local economy.

The establishment of the 'civic' universities in England (Goddard, 2009) and the Land-Grant colleges in the US (McDowell, 2003) during the 19th Century specifically at the behest of, and to meet the needs of growing industries such as agriculture and manufacturing heralded a move away from the Newman model of higher education. The **primary function** of these universities was to provide a skilled workforce for the new professions that were emerging as a result of the industrial and agricultural revolutions (Delanty, 2002).

Since the middle of the 20th century, the centralisation of higher education policy and increased public funding for research (Goddard, ibid) saw universities move away from the specific purpose of meeting the skills needs of their local economies, while in the US decentralised higher education and the dependence of public and private universities on local sources of funding meant that collaborative research relationships with industry became increasingly common (Mowery, 1999). Thus the focus of UBCs in the second half of the 20th Century has tended to be centered around the exploitation of research with the approach being an assisted linear model based on technology 'push' (European Commission, 2011).

This approach to UBCs has resulted in a considerable emphasis on the so-called 'triple helix' (Etzkowitz, 2008), which emphasises how the links between university, industry and government can drive innovation. In this framework, the stress has been on the role of research, particularly in scientific and technological fields. The emergence of the high tech industry centred around Silicon Valley on the West Coast of the US was seen as the embodiment of the success of this

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[5] http://www.hepi.ac.uk/files/FifthAnnualHEPILectureProfessorYvesMeny.pdf

approach and one that policy makers around the world have sought to replicate (often with little success). This has led to a concentration of effort and resources on supporting collaborations between businesses and universities which generated 'hard' outputs such as patent applications and business spin offs, often to the neglect of developing the potential for 'softer' impacts such as human capital and social development (Science|Business Innovation Board 2012).

2.3 University-Business Cooperation in Europe

While the landscape of higher education in Europe remains heterogeneous, not least in respect of UBCs, the last 10 years following the Bologna initiative have seen significant changes in cooperation between universities and business (Technopolis, 2011) and there is a growing acceptance across member states of the "new relevance" of universities to social and economic development (EUA, 2006). This is underpinned by the Europe 2020 Growth Strategy and especially the developing 'smart specialisations' strategies across the European Union in preparation for the next round of structural funds, which gives increasing prominence to the role of universities not only in terms of the supply side (i.e. of research and skills) but also in supporting the demand side through capacity building and supporting the governance of regional innovation (Goddard et al, 2013).

In their study for DG Education and Culture (DG EAC) in 2011 which looked at fifteen case studies of UBCs across the member states, Technopolis found a very strong linkage between these kinds of collaborations and regional development policies, particularly those supporting regional innovation. Therefore the geography of the interventions tended to be focused on local and regional actions rather than taking an international approach. While the over 200 regions across Europe tend to be highly heterogeneous, there has been an increasing trend over the past decade to include universities more explicitly in regional strategies, and for universities themselves to adopt a more formal role in the region as expressed in their mission statements. In terms of the types of interventions, Technopolis found that the emphasis was on technology transfer, and though there was some evidence of universities widening the nature of the collaborations to include teaching and learning, this tended to be implicit in the project rather than the primary focus.

The SBMRC (2011) study, which looked at the state of UBCs across Europe, provided a comprehensive overview of the nature and extent of cooperation within European universities. It found that it was the institution rather than individual academic which tended to place an emphasis on cooperation, and for both academics and institutions the emphasis tended to be on activities with direct income earning opportunities (e.g. commercialisation of R&D, consultancy) or direct benefits to students (e.g. mobility programmes). However, the same study suggests that whilst institutional management promotes cooperation, the realization of this depends strongly on the personal interactions of individual academics and their business contacts:

"*Many of the experts stated that HEIs are increasingly tending to create longer-*

term relationships with business. It is also remarked that despite efforts at top level to coerce relationships, the relationships between HEIs and business often commences from more personal interactions involving a researcher around mutually beneficial topics of interest." (SBMRC, 2011 p.45)

It is, of course, possible that this is more strongly the case in the field of research than education, though the evidence on this is not strongly explored. One reasons for this may be that, whilst there are some exceptions, cooperation between HEIs and business in Europe is still in the early stages of development. The DG EAC study found that European UBC is influenced by a large number of factors including the *perception of benefits* coming from UBC as well as *barriers to* and *drivers of UBC*.

The need for closer cooperation between academia and the business world is underscored by the Europe 2020 strategic plan, the Lisbon agenda and the modernisation agenda of Europe. The European community has recognised the vital contribution to Europe's competitiveness of University-Business Cooperation (UBC) to provide an array of benefits for HEIs, students, business and society alike.

While the level of co-operation varies considerably between different countries, universities and academic disciplines, there are many examples of successful co-operation between academia and industry throughout Europe. We highlight some examples below.

The **dual education system**, where students combine school and work based learning, is practised in several countries in Europe, but is probably most developed and embedded in Germany. An OECD Review in 2010 found that the system was deeply embedded and highly valued in German society, allowing for flexible training and learning across a wide range of professions in ways that are responsive to the changing demands of the labour market. They also reported that employers were highly engaged and there was a well resourced capacity for research to support improvement and innovation in the system.

European Business Innovation Centres (BICs) are support organisations for innovative small and medium sized businesses (SMEs) and entrepreneurs. Their mission is to contribute to the overall economic and social development of the regions through the implementation of support services to entrepreneurs, helping them to transform their innovative business ideas into reality, as well as delivering services to existing SMEs, supporting them to modernise and innovate. Many BICs are closely linked to universities, acting as a gateway to their key research centres. There are currently more than 150 BICs across Europe. One example is **Promotech** in France (www.promotech.fr) , which founded in 1980 by two faculty members as a spin-off from the Department of Innovation Management of the National Polytechnical Institute in Lorraine. Initially their focus was on education, training and coaching of potential entrepreneurs in business skills and processes. Since then Promotech has evolved into a user-driven, living lab for the promotion of entrepreneurship, and advocates the use of open innovation techniques in incubating new, market driven, businesses.

Creating physical spaces where businesses, students and researchers can come together is embodied in the 'factory' concept practised in several Finish universities. One example is the **Design Factory at Aalto University**, which started in October 2008 (www.aaltodesignfactory.fi). The Factory aim is to support interdisciplinary and international co-operation between parties interested in design and development by providing a constantly developing collaboration environment for students, researchers and business practitioners. It has become an innovative environment for finding, incubating and realising new ideas together with leading scholars, top future talent, and a mixture of other companies.

Student placements are a common way of promoting cooperation between universities and industry for mutual benefit. These can range from a few weeks to work on a short term, focused project to year-long placements. This is found throughout the European Member States and there are a wide range of examples. The **PR Academy in the Czech Republic** includes a one month placement in a PR firm. The **Sussex Talent Pipeline** sponsored by American Express at Sussex University in the UK aligns the needs of the company with a two year placement of part time Masters Degree students. The **Siemens/University of Transylvania IT** course includes a summer placement under the joint supervision of a Siemens expert and an academic. Siemens also encourage the mobility of academics through participation in a number of shared initiatives. Another example is the **Shell STEP scheme** in the UK which is a nationwide initiative funded by Shell and the UK government to place undergraduates into small and medium sized companies to undertake specific business or technology projects driven by the needs of the host business.

In terms of mobility of academics into businesses, **Knowledge Transfer Partnerships** (KTPs) are a tool primarily employed in the UK, where they have attracted significant national government investment. KTPs enable businesses with a strategic need to access a University's expertise and knowledge to improve their competitiveness, productivity and performance. The scheme involves a high calibre graduate (KTP Associate) working in a company with academic supervision. This often results in strategic advantages for the company; academic benefits to the University and valuable industrial experience to the Associate. Depending on the needs of the organisation and the desired outcomes, KTPs can vary in length from one to three years.

The European Commission is also working to stimulate University Business Cooperation, as a part of its approach to the modernization of University structures across the EU. One example of this is the **Knowledge Alliance** initiative**. This is the name given to a new pilot project within the framework of the University–Business Cooperation initiative intended to stimulate the development of human capital through a process of two-way cooperation. The project encourages transnational cooperation (composed at least of 2 universities and 2 businesses from at least 3 participating countries) structured, result-driven cooperation ventures between universities and companies, bridging the gap between the two sectors to create new multidisciplinary curricula to promote entrepreneurship within education as well as developing other transferable skills such as real-time problem solving and creative thinking.

2.2 The Current Drivers of University-Business Cooperation

The first decade of the 21st Century has seen an increasing emphasis on the role of universities in explicitly contributing to social and economic development, which can be attributed to a number of factors (Brennan et al, 2004), including:

- The global economic crisis which has ushered in an era of austerity in public finances in many countries and increasing expectations of the 'returns' that should derive from public investments, including research and higher education
- The emergence of global 'grand challenges' (e.g. climate change, ageing, terrorism etc.) which cannot be solved by government or business alone, but requires a multi-disciplinary and collaborative approach, including the mobilisation of universities and civil society (the so-called 'quadruple helix')
- Increased marketisation of higher education leading to greater competition between universities and an emphasis on the 'student experience' which demands a more rounded curriculum and opportunities for students to enhance their career prospects which requires more than a narrow pedagogical offering

This has resulted in a range of policies designed to encourage universities to build stronger links with business, suggesting that businesses should be (more) involved in designing curricula (including undergraduate, postgraduate as well as CPD and other training) and that universities should work more closely with industry partners to promote entrepreneurship, mobility (between business and academia) and lifelong learning. These policy drivers have led to a range of studies being commissioned over the past decade aimed at understanding and encouraging University-Industry collaborations, including (but by no means limited to) an examination of the state of UBCs in the EU (SBMRC, 2011), to most recently the government-sponsored Wilson Review in the UK (Wilson, 2012).

For individual firms and universities, the drivers will, quite naturally, vary. Most obviously these include the desire to attract more, or better, students by universities, to firms seeking more appropriately experienced graduates. Less obvious, may be the indirect benefits firms and universities seek through raising the skills of their existing employees. Deutsche Telekom[6], for example, identify six reasons for engaging in cooperation with universities in the field of education:

- Fulfilling internal demand for skilled labour
- Enhancing general levels of employability
- Retaining existing high-performing staff
- Enhancing the corporate brand
- Promoting a modern development philosophy
- Implementing the Bologna process

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[6] Identified by Markus Lecke at the 5th University Business Forum, Brussels, 2013

2.4 Challenges for Business-University Collaboration

Despite the increasing prominence given to the role of universities in social and economic development, research reports and academic studies consistently find that UBC practices are highly fragmented and uncoordinated, particularly when it comes to the human capital development aspect (EUA 2007). The research literature also tends to focus on the describing the nature rather than the impacts and outcomes of the cooperation being undertaken.

The OECD has reviewed the impact of higher education in city and regional development in over 30 countries (including many in Europe) since 2005. This has confirmed that universities can and do make significant contributions to social and economic growth and increasing globalisation (with the challenges and opportunities this presents) is a driver for cooperation between universities and other sectors.

These reviews have also identified a number of barriers/challenges to effective engagement and collaboration which are summarised in Figure 2.1, and highlights the multi-level aspects of the challenges, ranging from the national policy environment to internal institutional level issues.

Figure 2.1 Barriers to effective engagement
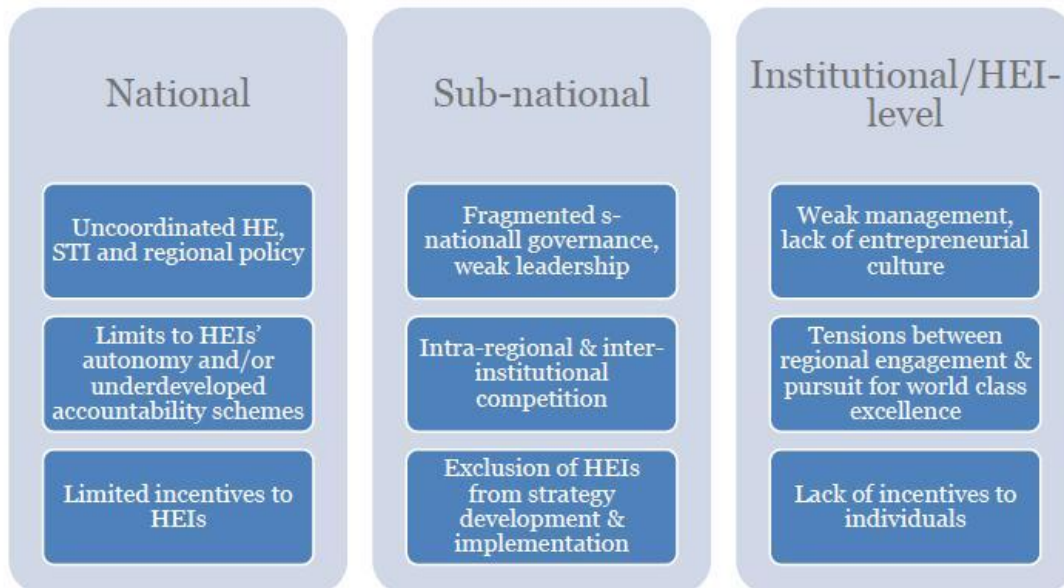
Source: Janna Pukka, OECD in a presentation to the OECD Roundtable on Higher Education and City/Regional Development September 2012

On the business side there are also multiple but different barriers. A report commissioned by the UK Dept. for Innovation and Skills in 2008[7] which looked at higher education in the workplace identified these as:

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[7] http://dera.ioe.ac.uk/8724/

- Identifying the right pathway (individual or organisation)
- financial (costs)
- credibility (demonstrable value to employer and employee)
- time (its availability)
- student support in the workforce (lack of)
- lack of relevance and outdated curricula

In terms of cooperation more broadly:

- lack of university flexibility and responsiveness (too slow, too static);
- university complexity (complicated systems and bureaucracy)
- poor communications - there is no common language or understanding
- different perceptions of timescales

2.5 University-Business Cooperation in the Field of Education

As already highlighted, the primary focus of many UBCs has been on research related projects, although the literature does show that there can be indirect impacts on teaching and learning (e.g. an academic may invite an industry collaborator to give a guest lecture, or host a field trip etc.).

However growing skills gaps and global competition for the best talent are starting to see an increasing recognition among some forward looking companies (and universities) of the need to ensure the next generation workforce is equipped with the skills needed to cope in a globalised world of rapid technological change. Some of the most innovative of these partnerships have been explored by the Science|Business Innovation Board in a recent international study (Science|Business Innovation Board, 2012).

From the literature the key areas in which businesses and universities can and do cooperate in the field of education can be summarised by the following key headings[8]:

1. Curriculum Design, development and delivery
2. Bespoke course development
3. Exchange and mobility programmes
4. Continuing Education and Lifelong learning
5. Entrepreneurship and Entrepreneurial education

Each of these is described further below in terms of the typical nature of the intervention, potential impacts/outcomes and challenges that have been identified in the literature and case studies.

2.5.1 Curriculum Design and Development

Description   This type of collaboration involves universities and business working in close partnership to adapt existing or design new degree and postgraduate programmes, often based around

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[8] see also p.11

the overlap between a research or teaching specialism of the university and a particular industry or cluster. There is often a geographic basis to the collaboration and it may be supported by local or regional economic development organisations, though there are case studies of international collaborations.

Potential impacts	These initiatives can help support economic growth by ensuring strategic sectors will have the skilled staff they need for the future. Designing programmes which meet specific industry needs can help graduate employability as the employers are reassured that their requirements will be met. As businesses tend to be involved in some of the delivery of the programmes, contact between employers and students can also lead to opportunities for jobs. This in turn supports graduate retention in the local area.
	Depending on the industry, these collaborations can often involved complex and innovative partnerships. For examples, in very specialised industries where a 'pipeline' of potential students might not already exist this can lead to close links with schools, vocational institutions and other universities in order to 'pull through' students to the new course.
	Partnerships with business in this area can result in further business engagement with the university in other areas, e.g. research.
Challenges	Complex partnerships can be difficult to manage, and there may be competing agendas and drivers, with different perceptions of what 'success' may look like. Businesses may look for an emphasis on practical knowledge and skills while academics may want to deliver a wider programme which incorporates a more theoretical approach.
	Timescales can be challenging, particularly in terms of developing post graduate programmes as universities tend to have rigorous processes for approving new courses which may not be appreciated by business partners or funding bodies.
	There can be risks associated with linking university teaching too closely with demand in the regional economy, as this can change over time and also can leave the university vulnerable to economic shocks, plant closures etc. It may also affect the ability of the university to recruit students from other areas.

2.5.2 Bespoke Course Development

Description   This can include a range of tailor programmes such as higher level apprenticeships, In-company upskilling of employees and executive management courses. These are programmes which are designed to meet the needs of the employer (by meeting a current or future business need); the employee (in terms of their career progression and professional development); and the region (by ensuring the right skills exist to build regional advantage in line with smart innovation strategies). For this reason Universities need to be highly flexible in how courses are designed and delivered to ensure they are relevant for both the targeted industry and its employee.

Potential impacts   These programmes can have the effect of exposing people to skills and knowledge they would not otherwise have access to, improving links between universities and business and involving universities in the development of specific key sectors in the economy.

Connections with the university can help to raise the profile of specific sectors and clusters as they become more connected to the university and its networks.

As workers become more skilled they are more valued by employers – not only can this attract new companies to the local area but also makes them more 'sticky' as they are reluctant to lose the workers they have invested in training.

Challenges   Rapidly changing economic conditions can make ensuring the long term value of workforce development difficult, especially in areas of rapidly changing technology. Skills learnt today might be obsolete in a short space of time, making employers reluctant to invest.

There is a challenge in balancing the needs of individual employers and employees for tailored solutions with the need to achieve economies of scale. While there is a need to ensure that programmes are sustainable to deliver, they should not lose their relevance to the businesses. However, this point concerning scale only applies if the courses offered are publicly subsidized. Businesses often acquire bespoke course development and delivery, particularly on the post-graduate level, from universities, bearing the full cost themselves on market terms.

Ensuring the future skills needs are addressed is more difficult than responding to immediate needs, and requires a high

degree of public investment in intelligence gathering and forecasting, as well as means of persuading universities and employers to respond.

2.5.3 Exchange and Mobility Programmes

Description Mobility programmes are those which encourage movement of university staff and students between the university and the public and private sector. In some cases there may also be staff from other sectors posted to the university, but this is often rare and tends to be on a more 'ad hoc' visiting basis (e.g. some business schools have 'entrepreneurs in residence').

Potential impacts Mobility programmes can increase employability, particularly in the case of students, by giving them 'hands on' experience in the workplace. They promote knowledge transfer, and 'unlocks' some of the intellectual assets of the university for the benefit of the host organisation. They can also help to build 'boundary spanning' skills, especially among academics, which in turn can create opportunities for future collaborations by breaking down barriers between the university and other sectors.

KTPs are an important tool in disseminating research from universities into local businesses and communities. Researchers who are not subject to the day to day commercial pressures of running the business can be highly skilled in helping to identify and overcome endemic problems. Also universities may be working with a number of businesses in the same industry, so can diffuse learning between them. University researchers may be operating in a much broader geographic sphere than SMEs and therefore can bring global experience and expertise to help address local issues.

Challenges One of the most significant challenges to the success of mobility programmes, particularly for senior academic staff (who are probably the most valuable to industry) is that career progression routes in universities, especially the most research intensive ones, can act as a discouragement to mobility. Career minded staff are better off staying within the university and helping it to achieve its academic outputs if they want to progress within the institution as this is often valued more highly than engagement activities.

Where there is a lack of alignment between the research and teaching specialisms of the university and the sectoral specialisms in the local/regional economy, mobility

programme will be less likely to succeed. Businesses will see students and staff as being of little relevance to their operations, and people within the university will not be motivated to move out if there is no link with their research field.

Universities, especially those with worldwide reputations for research excellence in a particular industry or technology will be in demand by the leading businesses regardless of their location. It is therefore a dilemma of less favoured regions that their universities may be supporting business in more favoured regions, which have the capacity to demand and work with their researchers, to the detriment of business and economies in their own region. huge challenge is how to increase the absorptive capacity within SMEs in less favoured regions for university research.

2.5.4 Continuing Education and Lifelong Learning

Description

Lifelong learning can be described as ongoing, voluntary and self-motivated learning. It can be driven by personal as well as professional motivations and therefore can cover a huge array of subjects and varied delivery methods (e.g. online, distance learning, seminars, formal training programmes etc.) Timescales can vary from a few hours to several years, and programmes may or may not be formally accredited.

Continuing education (which incorporate continuous professional development) tends to refer to more focused, vocational or professional training which may be a requirement a person's job or important for advancement and promotion. In the 21st Century where the pace of change both in terms of practice and technology in many jobs is increasingly speeding up, few people will be able to build and maintain a career without participation some form of further training or education.

With the 'job for life' in most sectors now a thing of the past, and labour market skills demands changing in response to new societal and technological development, employees and employers need to find effective and efficient ways to stay ahead of these changes and keep themselves competitive.

Potential impacts

The most obvious and direct impact is on the skills level in the population, which can lead to significant economic benefits as citizens become more employable and more productive in the workplace, pushing wages and business efficiency upwards. There can be positive social impacts as well, as learners from communities and groups who may have been previously excluded from, or found it difficult to access 'traditional'

higher education can more easily take part due to the more flexible nature of the programmes.

For the university there can be benefits in appealing to a wider market for learning, both in terms of recruitment (some learners may progress to more structured full or part time programmes, distance learning allows people geographically distant to take part) and 'widening participation', by servicing the needs of new groups of students such as older people, people without formal qualifications, full time workers etc.

For businesses, having a relationship with a university that can act flexibly and responsively to their needs gives them and their employees access to quality teaching and learning opportunities which can be built around their specific commercial needs.

Offering Lifelong Learning and Continues Education allows the public, employers and civic society to connect and engage with the university in new ways – it can 'open the door' into the university and break down perceived and real barriers that may lead on to deeper collaborations in the future. Indeed many universities have invested in purpose built, often campus based centres where these activities can take place.

Challenges A key issue is who should pay for programme development and delivery – the individual learners themselves, employers, the public purse or even the university itself? All can potentially benefit either directly or indirectly from the delivery of Lifelong Learning programmes. The reality is that this will often be determined by the prevailing economic and policy environment. In places with high unemployment/low skills there may be public funding available, although this source is under severe pressure in times of austerity.

For the universities, choosing which programmes to offer can be a difficult process. Should they be responsive to the specific needs and demands in the local/regional market? What if these do not match well with expertise and specialisms in the university? From a commercial perspective universities also need to guard against cannibalising their existing markets. If a prospective student can get the same learning outcomes in a more flexible and much cheaper way they may chose to forgo a full time place at the university. There may also be concerns that offering courses with low barriers to entry may 'cheapen' the reputation of the university as a place of higher learning.

The emergence of 'MOOCs' (massive open online courses) over the past 5 years, especially in the US, is another possible threat (although it could be an opportunity as well). Learners can now access courses from some of the world's top universities (e.g. MIT, Harvard, Stanford etc.) on a wide range of topics, anywhere in the world and for free. This may dampen demand for programmes in other universities, although some may see it as an opportunity to build a new 'offer' for people seeking Lifelong Learning.

Measuring success and impact of Continuing Education and Lifelong Learning programmes is difficult as these will often be indirect and long term (e.g. improved employment prospects), and it is difficult to track individual learners who may not have a formal transactional relationship with the university.

2.5.5 Entrepreneurship and Entrepreneurial Education

Description   There are generally three main thematic areas deployed by universities to support entrepreneurship among students and recent graduates;

- training in the skills of 'being enterprising'
- providing business experience through placements in local SMEs
- supporting them in the creation of new ventures and the exploration of new business opportunities. This support can include things like
    o Assistance with compiling a business plan
    o Free office space and equipment
    o Free access to meeting and administration areas
    o Specialist industry advice from business mentors
    o Grants and financial assistance

Potential impacts   Universities that are actively promoting and supporting entrepreneurship amongst students and graduates are supporting their local and regional economies two key ways; firstly by adding to the pool of businesses in the economy; and secondly, by retaining high skilled individuals in the region.

Businesses benefit from employing graduates who are more entrepreneurial and have a better understanding of the 'real world'

Placements and other programmes that bring students and businesses together can provide a low risk way for businesses

to recruit or 'test out' potential new employees.

Challenges   It is important to ensure a close cooperation between the universities, the private sector to ensure there is coordination in terms of the nature and content of entrepreneurial development programmes. Otherwise there can be resentment and tensions if graduate businesses are seen to displace or distort existing businesses and markets.

There may be a benefit in creating a common thread between graduate enterprise and broader sector development activities. For example a region which is aiming to become a global leader in ICT might want to encourage graduates to consider starting businesses in this industry rather than another less strategic one.

There also needs to be strong links between support for graduate enterprise development and the 'mainstream' support to businesses in the local area, otherwise new graduate businesses may find themselves isolated once they move on from university incubation support.

3 Methods for assessing and measuring the outcomes and impacts of university-business collaboration

As university-business collaboration is being transformed from decentralized, informal ad-hoc activities to larger-scale initiatives, universities, businesses and the policy-makers who often subsidize such programmes, recognize that there is a need for more systematic evaluation and measurement both to assess initiatives a posteriori, but even more importantly to monitor on-going initiatives to enable adjustment and improvement. This motivational and action-oriented role of measurement is firmly established in the performance management literature (Brown, 2007).

Much of the available literature focuses on cooperation and collaboration in the fields of research and research-led innovation. Whilst this is not directly transferable to the theme of this study, it does offer the most developed approach to measuring the outcomes of university-business cooperation activities. It therefore has some value as a reference case, although the material must be considered in context. We briefly summarise the available literature on research cooperation, identifying relevant insights, before turning to the limited literature that considers the assessment and measurement of the outcome of cooperation activities in the field of education.

3.1 Review of literature on R&D cooperation

The existing literature on the evaluation and measurement of university-industry cooperation is primarily focused on R&D collaboration and commercialization. Three streams of work can be distinguished.

First, a series of previous contributions consider how technology and knowledge transfer should be assessed at the level of universities. For instance, a report compiled for the European Commission (European Commission, 2009) proposes seven core performance indicators, that include items such as research agreements, invention disclosures and patent applications.

A more detailed report authored by SPRU, entitled "Measuring third stream activities", was published on behalf of the Russell Group in 2002 (Molas-Gallart, Salter, Patel, Scott, & Duran, 2002). This report proposes a series of measures for various types of 'third stream' activities and capabilities, including R&D and non-R&D activities, and discusses their strengths and weaknesses from the viewpoint of universities. Molas-Gallart et al (2002) develop a framework encapsulating the mechanisms through which universities benefit society. Having such a framework is important for the development of a measurement system because it facilitates the selection of those indicators that are relevant and why. As Molas-Gallart outline, many effects of universities are indirect and non-linear, and hence measures are required that capture these types of effects. Their simple framework postulates that universities generate benefits via (a) knowledge

capabilities and (b) physical facilities and that they are transmitted via (a) research, (b) teaching, and (c) communication. In their report, Molas-Gallart list a large number of measures for different types of university-industry cooperation, and discuss their relative advantages and disadvantages. For each measure, they propose one or several ways in which data could be collected, and attempt to provide an estimate of the cost of data collection.

Further works focusing on metrics of third-stream activities by universities include works by Jensen et al. (2009) and Holi et al. (2008). Apart from primarily focusing on R&D and commercialization related processes, all of the above measurement frameworks have in common that the unit of measurement is represented by the university, rather than a single instance of cooperation. This means, for instance, that they propose to capture the number of R&D agreements over a certain period of time, rather than the drivers of success for each single project established under these agreements.

By contrast, a second stream of the literature considers the success factors underpinning R&D-related university-business collaboration on the project level. Many of these works do however not explicitly discuss performance management issues nor do they propose specific performance management tools. For instance, according to a Spanish study of 800 alliances between firms and research institutions, trust, pre-defined objectives and quality of communication informed project success (Mora-Valentin, Montoro-Sanchez, & Guerras-Martin, 2004). Similarly, the existence of trust, commitment and 'championship' determined the satisfaction of Australian academics with their industry relationships (Plewa & Quester, 2006). Whilst valuable in their own right, the value of these studies for performance management purposes is relatively limited as the factors considered are rather generic and not easily operationalizable.

A third set of previous contributions consider specifically how university-industry cooperation should be evaluated. Grimaldi and von Tunzelmann (2002) assessed the UK government's LINK programme aimed at promoting pre-competitive collaboration between firms and universities. They argued that the measurement of alliances should be based on outcomes that are broader than easily measurable, yet narrow metrics such as publications or patents. They call for, but do not develop, a measurement framework that allows participants to judge project success a priori, and not just a posteriori. Other evaluation exercises, such as the one conducted for the UK Teaching Company Scheme, have centred on rather indirect and long-term outcomes, for instance, the increase in sales of companies participating in this type of university-industry partnership (SQW, 2002). The problem with these types of measures is that the causal attribution of effects is weak since there are many factors that influence sales performance, for example.

These studies provide valuable insights into the success factors underpinning university-business collaboration but they do not provide instructions on how specific performance metrics could be designed. Cukor's (1992) early work explicitly addresses this aspect, based on a single case study.

Building on these approaches, Perkmann et al. (2011) propose a performance management framework for measuring success in university-business alliances. The framework builds on the existing literature and previous studies carried out by the authors (Perkmann, King, & Pavelin, 2011; Perkmann & Walsh, 2009; D'Este & Perkmann, 2011; Perkmann & Walsh, 2008, 2007; D'Este, Salter, Bruneel, & Neely, 2008) to build a 'success map' that represents the precise process as well as the ingredients by which positive outcomes are achieved within university-business alliances. The success map (see Figure 3.1) allows one to differentiate between input factor and output factors, hence providing a guide for designing both leading and lagging indicators for the performance management framework. This in turn is a crucial device for going beyond mere post-hoc performance measurement that allows evaluation when it is already too late to intervene. Having leading indicators allows users to accompany live initiatives and hence intervene when things go wrong.

Figure 3.1 Success map with metrics
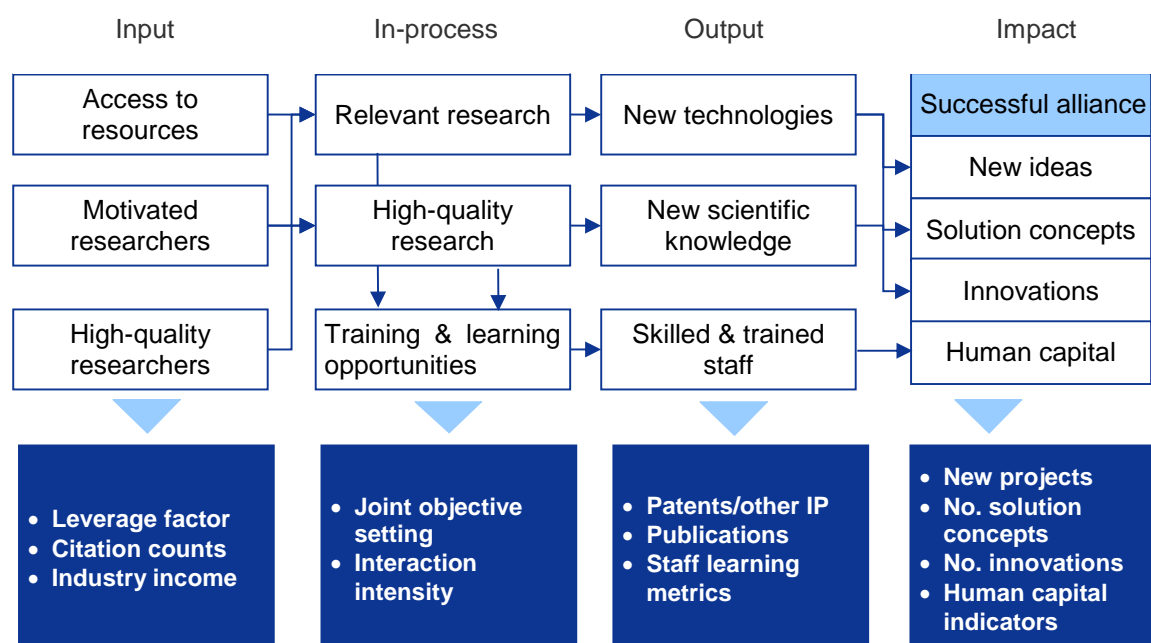
Source: Perkmann et al. 2011.

3.2 Review of literature on cooperation in the field of education

In a novel development, Spaapen and van Drooge (2011) develop a concept of 'productive interactions' as an ex-ante indicator for the potential impact of university-industry interactions. Productive interactions indicate ways in which researchers communicate with their environment, and may include direct (personal) interactions, indirect interactions and financial interactions. The basic idea underpinning this concept is that before any social impact of research is achieved, there will have to be interactions between the researchers and their stakeholders. Accounting for these interactions will therefore provide a leading indicator for the potential impact a project or programme may develop in the future. This approach help addresses the attribution problem, e.g. the fact that in

most cases is will be difficult to assess the impact of a specific research project or publication on social outcomes. The approach is also oriented towards learning and improving, rather than post-hoc judging and accounting. However, whilst strong on identifying the potential value of cooperation and collaboration, it is more challenging to link this to measurable outcomes.

While the above considerations predominantly apply to R&D-related university-business collaboration, there is a distinctive lack of corresponding work on university-business collaboration in the area of education and professional development. Recent work has illustrated how important non-R&D-related activities are amongst the different ways in which universities engage in 'third-stream' activities (Stephan, 2001; Thune, 2009). For instance, recent surveys of UK academics conducted by Imperial College London and the University of Cambridge have documented a considerable variance of activities, including the co-design of curricula with business, enterprise education and employee training (including entrepreneurship education), building of social networks across sectors, student placements, sponsoring of post-graduate students by firms including doctoral students, and attendance of advisory boards, informal networking with businesses and involvement in standard-setting forums (D'Este & Perkmann, 2011; Abreu, Grinevich, Hughes, & Kitson, 2009). Government figures also suggest that UK universities' income from continuing professional development and continuing education amounted to £606m in 2010/11 (HEFCE, 2012) even though the majority of this income will be generated from conventional market offerings rather than genuine cooperation projects.

Despite the relevance of non-R&D related cooperation, there is little published work on measuring the impact of these types of cooperation between universities and industry. Some previous work has developed evaluation and performance metrics for national or regional levels of policy making (Polt, 2001). These contributions propose metrics for multiple types of university-industry interaction, including education-related cooperation, that policy-makers may use to design policies and assess the efficacy of previous policies. Because these works primarily focus on territories, and their higher education institutions, as unit of measurement, we do not consider them in detail in this report.

There is furthermore a small set of previous contributions that propose measures for the whole spectrum of university-industry cooperation but include metrics specifically relating to education-oriented cooperation, from the viewpoint of higher education institutions (Molas-Gallart et al., 2002; Holi et al., 2008; Jensen et al., 2009). For several types of such collaboration, including conventional teaching and learning, professional development and continuing education, and learning-oriented flow of personnel between universities and third organizations, these contribution outline measures that universities may use to determine their success in engaging in these activities. In Table 3.1, we provide a sample list of such measures drawn from some key previous works (Molas-Gallart et al., 2002; Jensen et al., 2009) that are in part themselves drawn from other extant reports.

Table 3.1 Metrics for education-related outreach activities compiled from the literature

Teaching and learning	
Number of students in sandwich courses and attending internships offered by the university'.	Molas-Gallart et al. 2002
Number of credit bearing courses established through a direct request from non-academic organizations	Molas-Gallart et al. 2002
Rate at which students get hired in industry	Jensen et al 2009
Percentage of total recent graduates not looking for work 18 months after graduation.	Molas-Gallart et al. 2002
Percentage of total recent graduates and employees highly satisfied with the knowledge and sets of skills acquired through the course.	Molas-Gallart et al. 2002
No. of postgraduate students directly sponsored by industry	Molas-Gallart et al. 2002
Course design- industry input and endorsement (Number of students in courses with industry endorsement or design input)	Jensen et al 2009
Student satisfaction (after subsequent employment)	Jensen et al 2009
Employer satisfaction with students	Jensen et al 2009
Students working as trainees	Jensen et al 2009
Professional development and executive education	
Income received from non-credit bearing teaching and associated activities (courses, collaborative learning...) undertaken.	Molas-Gallart et al. 2002
No. of different institutions that have attended or have taught in non-credit bearing teaching and associated activities.	Molas-Gallart et al. 2002
Face to face communications with user communities, with clinical and charity professionals, with peer groups, with administrators, and with commercial companies.	Spaapen & van Drooge 2011
Number of presentations to lay audiences	Spaapen & van Drooge 2011
Flow of academic staff, scientist and technicians	
Number of faculty members taking a temporary position in non-academic organizations'	Molas-Gallart et al. 2002
Number of employees from non-academic organizations taking temporary teaching and research positions in universities'	Molas-Gallart et al. 2002
Number of jointly supervised PhD and MA students	Jensen et al 2009
Financing of PhD projects	Jensen et al 2009
Number of lectures at university by firm staff	Jensen et al 2009
Postgraduate Research Experience Questionnaire	Jensen et al 2009
Research Postgraduate income	Jensen et al 2009
Research Postgraduate start-ups and spin-outs	Jensen et al 2009
Research student placements in industry	Jensen et al 2009
Industry funded postgraduate places	Jensen et al 2009
Research postgraduates employed in spin-outs	Jensen et al 2009

Researchers holding dual posts	Spaapen & van Drooge 2011
Number of memberships of advisory committees	Spaapen & van Drooge 2011

We conclude with a final evaluation of previous work on university-level measurement in the area of education. Previous work has in common that it focuses on the synthetic measurement of the *overall* success of a higher education institution in engaging in cooperation activities. As such, the proposed measures provide high potential use value to the management of universities. However, the proposed measures tend to be too coarse for being deployed as metrics for single cooperation initiatives, and evaluate success on an initiative-by-initiative basis. In other words, they focus on the organization level as a whole, rather than providing a tool for the project level of activities. Moreover, primarily as a result of the above, previous approaches do not provide a success map of cooperation initiatives that would furnish an analytical backbone for deciding which metrics are important and how they related to others. In the following section we turn to a series of initiatives to explore the purpose, activities, outcomes and measurement approaches of each case in practice.

4. Examples of university-business cooperation in the field of education

The study has drawn on the experience of 10 cases of university-business cooperation to build an understanding of the purposes underlying cooperation initiatives; the participants involved; inputs made; activities undertaken; the outcomes achieved or desired, and how these are typically being measured or monitored. Whilst this is not a definitive survey of university-business cooperation in the field of education it does provide important insights into existing practices, which can be used to inform the development of an assessment framework. The following section summarises the results of this work. The selection of the cases was set out in Section 1, and short summaries of each of the individual cases can be found at Annex A.

4.1 Participants in cooperation activities

University-business cooperation activities typically involve three key parties: a University, business and students. However, this understates the variety of participants involved. In only one of the ten cases examined for this study did the cooperation involve a single business working with a single university. Nine of the cases involved universities working in cooperation with multiple firms. In four of these cases there was also more than one education institution involved in delivering the cooperation activity. However, three of these were participating in European initiatives that require multiple partnerships to be formed, suggesting that Universities may be less likely to work in collaboration with other education providers than these figures suggest[9], especially across very different national HE systems.

Other participants in the cooperation activity include the individual staff of the universities and firms who deliver, or are exposed to, the cooperation activity. The degree of engagement varies strongly, as we explore in section 4.3 below, which will influence the extent to which staff of the collaborating organisations participate in practice.

The final, and often overlooked, participants in University-Business collaborations are those organisations that may support and stimulate such activity through funding programmes. In five of our cases public bodies are, or have been, key agents in instigating and ensuring the implementation of the cooperation activity. The role of these partners generally seems to extend to providing the finance to enable the activity to be undertaken, and so to shaping the activities undertaken through any conditions attached to the funding. They rarely participate more directly in the cooperation activity itself.

4.2 Objectives underlying the cooperation activities

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[9] European funded cooperation arrangements are over-represented in our sample of cases.

As might be expected, different participants have different interests in supporting the cooperation activity. For students, the main objectives appear to relate around their future economic welfare. Participating in education activities which are based on university-business collaboration is felt to provide a better quality education; to enhance their future employability, or to provide the basis for future business start-ups.

Academic staff, and the universities, also highlighted enhancing the student experience as a key collaboration objective, alongside increasing the students' likelihood of future employability. In part this was driven by a desire to enhance their ability to attract more, or better, students to courses. Other, less frequently expressed, objectives include raising the profile of the University; upskilling staff; bringing in external ideas and stimulating knowledge exchange; broadening the contact base of academics, and stimulating future opportunities for research and innovation collaborations.

For firms, the dominant objective seems to be focused on securing a more appropriately qualified supply of labour, either in terms of technical knowledge or the development of 'softer' skills, and to gain access to potential employees. For some firms, the collaboration offered an opportunity to benefit from the ideas developed by students as part of their course-related activities. In some cases, such as AppCampus, product development is central to the educational approach, in others it is a – no less valuable- byproduct. Firms also recognized the value of collaboration activities for raising their profile, either as a potential employer (or sector of employment) with students or more widely, as exemplified in the SubSea case from the UK. Finally, firms also recognized the value of cooperation activities for widening their contact networks, bringing in external knowledge and helping to upskill their existing staff – either through their involvement in the educational activity itself or through spillovers from contact with the students.

And what of those public and other external bodies that can be involved in stimulating university-business collaboration activities in the field of education? Here there appear to be two principal objectives, firstly in terms of strengthening the local labour market through securing appropriately skilled individuals or greater levels of entrepreneurship and, secondly, to encourage the development of new, innovative, educational offers. Other, less prevalent, objectives include building the profile, or brand, of an area in a particular field and to promote higher levels of innovation in firms.

Whilst motivations and objectives may vary, some common themes do emerge. Summarising, there appear to be nine distinct purposes underlying the decisions of businesses and universities to cooperate, and for public bodies (or other third parties) to support such activities. We illustrate these in Figure 4.1.
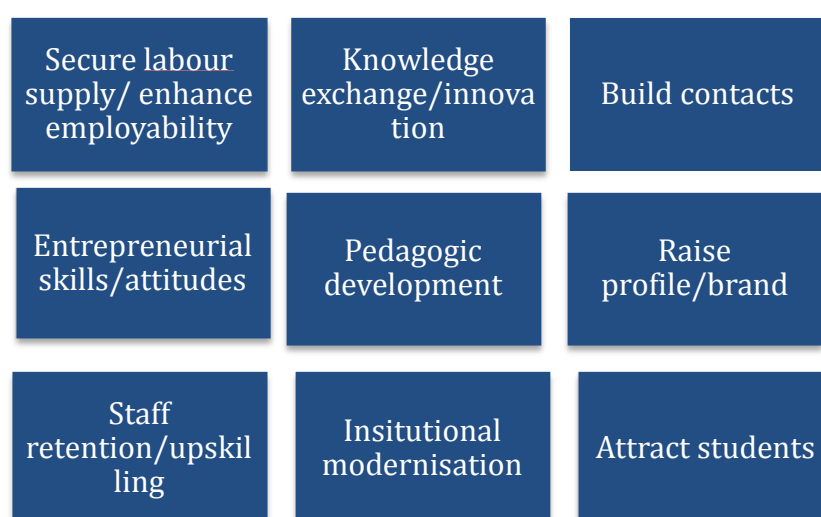
4.3 Inputs into collaboration activities

Our cases of collaboration point to the variety of inputs provided by different parties to make the educational offer possible. These vary from simply providing the funds to enable a collaborative project to go forward, as perhaps typified by

business inputs to AppCampus or the EC's inputs to Knowledge Alliance projects, to more collaborative inputs such as providing staff time or access to equipment or facilities.

When considering the inputs into university-business collaborations in the field of education, attention often falls on the contribution made by businesses. This will often include financial contributions, either to the cost of the educational activity, such as in the case of the chemical sector meeting the costs of professorial posts at the University of Merseburg, or to meeting the costs of some students on the course. Other common contributions include providing staff time, to assist in course development or course delivery for example, and providing access to equipment and the workplace. In a less tangible form, businesses also contribute their knowledge and expertise as part of a cooperation arrangement and will often provide additional credibility to an educational offer. Finally, firms can provide administrative support, particularly in supporting the promotion of an educational offer.

Figure 4.1 Purposes underlying cooperation activities

Secure labour supply/ enhance employability	Knowledge exchange/innovation	Build contacts
Entrepreneurial skills/attitudes	Pedagogic development	Raise profile/brand
Staff retention/upskilling	Insitutional modernisation	Attract students

It no less important to consider what a university brings as inputs to the collaboration. Most commonly this takes the form of staff time; access to equipment or teaching spaces and specialist knowledge, both technical and of pedagogy. One further input, that is often assumed, is the important role Universities play in their ability to offer accreditation for an educational offer and so provide a formal qualification. In turn this provides the cooperation offer with an educational credibility that might otherwise be lacking if a business, for example, sought to develop its own independent approach.

Important inputs are also made by the students themselves. Not only may they provide finance, in the form of fees, to maintain the course, but they also commit their own time and knowledge to the venture. It is crucial that the contribution made by the student body should be fully recognized in the development of assessment frameworks.

Finally, when examining the inputs made by third party agents, such as regional authorities or the European Commission, the most significant contribution is the funding made available to support cooperation activities. However, at a less tangible level, the involvement of third parties can provide a high level of profile to the cooperation activity, and may also provide a degree of additional credibility. Much less common, but potentially valuable, is the advice and expertise that such parties might bring to a cooperation activity, based on previous experience of supporting similar projects in other circumstances.

4.4 Cooperation activities

The cases explored in this study provide an insight into the richness of cooperation activities that are being undertaken in the field of education and demonstrate the myriad ways in which businesses and universities work together. In an effort to summarise these we identify six areas where cooperation appears to typically occur. We include experiential learning and entrepreneurial education in our notion of what constitutes curricula activity, although this may traditionally be regarded as outside of traditional educational approaches.

One of the core areas is in the **co-design of course curricula**. Here businesses and universities work together to design courses which strengthen the knowledge and expertise valued by firms, often drawing on the professional knowledge of the firms involved. We can see examples of this in the Subsea engineering course developed with the University of Newcastle, the Banking Finance course developed with the University of Valencia, the commercial communications course developed with the University of Economics, Prague and the Infomatics course developed with the University of Sofia.

Businesses and Universities will also work strongly together in the **co-delivery of curricula**. It is here that we see the widest range of different activities being undertaken. These range from the provision of lectures and teaching material by staff employed by business through to firms hosting site visits, placements and working with students on live projects[10] (both as individuals and in groups). Examples can be seen throughout our cases. Firms may also provide access to equipment and facilities that are not available in universities, or to intensive Summer Schools. For universities, of course, the delivery of curricula is central to their activities.

A third area where businesses can cooperate with Universities is in the **assessment** of student education. This may involve students making presentations to management or staff within the business(es) involved, or business staff making assessment of written course materials. We have seen fewer examples of this in our cases, but, arguably, collaboration is stronger where joint assessment is prevalent.

An area where collaboration is also less visible is in the **accreditation** of the educational offer. This tends to be primarily undertaken by the university

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[10] Live projects refer to real world projects being worked on within companies, as opposed to purely theoretical exercises undertaken solely for instruction within a university setting.

involved. However, in some cases examples of complementary accreditation formats can be identified. As one example, students on the commercial communications course in Prague have been successful in competing for external awards and contests, AppCampus students produce electronic apps for the Windows platform which have to be accepted for the platform and downloaded by the public. Some courses can also offer complementary professional accreditations – such as Microsoft certification in the field of IT.

A fifth area of potential cooperation is around the **promotion** of interest in an educational offer or particular sector. We see examples of this in the work of HP with the University of Sofia, and the University of Newcastle working in the subsea engineering sector. In the latter case, the University forms an important link into local schools, acting to further strengthen the profile of this sector as a potential for future employment. Third parties will often be engaged in promoting particular forms of activity as way of encouraging new forms of working, such as the cases being supported by the EU's Knowledge Alliances.

Both businesses and Universities also collaborate in **extracurricula activities**. This might include firms providing students with advice on future employment opportunities, or university staff proving technical seminars to business employees. Again, this tends to be less significant than the co-design and co-delivery of courses.

4.5 The (expected) outcomes of collaboration activities

Earlier assessments of the potential benefits of collaboration activities in the field of education noted that these could vary by beneficiary and take different forms (Figure 4.2). Whilst different participants might place a different value on particular outcomes, the strength of the collaboration comes in the combing of interests rather than a simple duplication of interests.

Figure 4.2 Four forms of outcomes
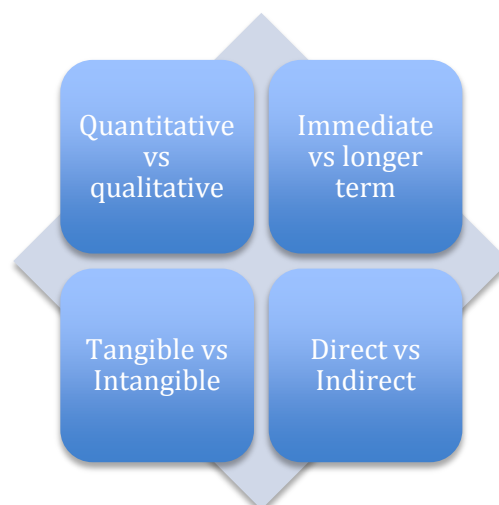
In previous work, SBMRC identified that the higher the level of perceived benefits the greater the level of cooperation, arguing that those benefits which are most direct, measurable and with immediate returns are the most likely to be subject to cooperation activity (2011).   The report goes on to argue that academics regard the highest returns from cooperation activities as accruing to students and then to firms, with only limited benefits perceived for themselves or their institution. In practice, our cases both illustrate the focus on immediate, highly-visible returns but also emphasise the significance of less tangible and more indirect returns to participants, with different participants placing differential values on particular outcomes.

For students, the reason they wished to participate in these collaborative offers in the field of education was primarily related to the fact they felt it would provide them with greater skills than a more conventional course, that they were more likely to find subsequent employment or that it would provide them with enhanced entrepreneurial opportunities.

For universities and academics there was a similar emphasis on the enhanced skills acquired by students, the greater employability of these students and the stronger entrepreneurial outcomes anticipated. These outcomes were expected to feed through into an increase in either the quality or the quantity of student applications, with improvements in student perceptions of course quality also anticipated. Additional outcomes which were cited in some instances included the opportunity provided for increasing contacts in the business world, the updating of skills through exposure to contemporary businesses practices and the building of trust-based relationships for future collaborative research. Whilst these latter outcomes were very subsidiary to the focus on student attraction and student employability there was no doubt that they were occurring.

For businesses, the primary outcome reported was in terms of an enhanced pipeline of suitably skilled potential employees, together with improvements to the wider labour force. There were also particular outcomes peculiar to individual cooperation arrangements, such as the development of successful apps for the Windows platform in the case of AppCampus. Businesses also reported that the cooperation arrangements provided benefits in the form of raising their profile (Educckate) but also helped to build trust and wider contact networks with academics for future collaborative research. Firms also reported that involvement in live projects did provide the opportunity for product and process innovations, adding economic value to the company, and that the bringing together of students and existing employees served to raise the knowledge levels of employees as well as students.

For other parties, such as regional authorities, the anticipated (and realised) outcomes largely revolved around economic benefits, such as an enhanced labour supply, increased levels of graduate employment, higher levels of new business-starts or (rarely) higher levels of innovation.

In the three cases supported by the Knowledge Alliance project we can also see wider outcomes being sought. This includes the development of new monitoring systems (EUEN) and innovations in educational pedagogy (KnowFact).

4.6 Measuring the outcomes of university-business collaboration

Each of the cases of university-business collaboration explored for this study involves some degree of monitoring and assessment of the outcomes being achieved.

As a base level this involves monitoring and reporting on the number of applications for the course, the number of successful graduates and, often, the outcomes achieved by the students involved. This might include numbers entering employment, students starting a business or apps developed. Many of the cases also report the use of qualitative surveys to monitor the quality of the educational experience. This is information that is typically collected by a university on any of its courses and most monitoring systems are part of wider university procedures.

External parties, such as the EU or regional authorities also often attach target achievements to their funding. These appear to mimic the indicators which have previously been mentioned, together with any inputs promised by the project applicants, or the achievement of a given output (such as the development of a new course).

Businesses are less likely to report the use of a formal monitoring system with indicators and associated targets. This does not mean that progress is not being monitored, rather that it is being undertaken in a less formal manner. Businesses typically reported that they relied on 'gut-instinct' or 'gut-feeling' to determine whether the cooperation was meeting their objectives or not. They would hold regular review meetings with the academic partners to discuss progress and their view of the success of the cooperation could be seen in their choice as to whether to continue to work with the university, or not. However, it should be stressed that the discontinuation of a collaboration arrangement did not mean that it was necessarily unsuccessful, it could simply be that the arrangement had achieved its goal. The one business sector where formal monitoring was more prevalent was amongst larger multinationals, where corporate resource investments needed to be justified.

The evidence available from the cases explored in this work suggests that monitoring activities are undertaken at two levels in the field of university-business collaboration in the field of education:

- Firstly, through the use of standard student-orientated metrics
- Secondly, through informal metrics based around joint-perceptions of success

The cases also suggest that there are a range of outcomes of university-business collaboration activities in the field of education that are not currently being captured by existing monitoring and measurement arrangements. However, in no case was this felt to weaken the cooperation arrangements underway. Indeed, to the contrary, the suggestion was that widening the formal

measurement and monitoring process to include more indicators would incur an additional burden for limited gains.

However, the risk of not acknowledging the wider benefits realised through university-business cooperation is that "those types of UBC[11] offering more direct, measurable and promotable benefits" will remain the most developed (SBMRC, 2011 p.10).

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[11] University-Business Cooperation

5. Towards an Assessment Framework: a scorecard approach for educational university-industry collaboration

## 5.1 The scorecard approach

The central idea of the balanced scorecard is that several metrics can be used to evaluate a process in question. One dimension where the metrics differ is in terms of timing. Financial outcomes, for instance, are a useful measure of performance but they appear only post-hoc when one cannot intervene in the process anymore. Therefore it is important to identify leading (ex-ante) measures that with some degree of confidence will lead to desired outcomes. The choice of the measures need to be led by a causal map, i.e. a causal framework that outlines how the leading measures are linked to the lagging measure (outcomes). One of the fundamental tensions inherent in any measurement exercise is that lagging measures are easy to measure yet by definition become only available post-hoc. In turn, leading measures are available from the start or throughout a collaboration yet their link to eventual outcome is uncertain. Therefore, a comprehensive measurement framework including both leading and lagging measures is needed to gain overall traction on measurement.

A causal map for educational university-industry collaboration initiatives is given in the diagram below. From the qualitative appreciation of our case studies, we identified four areas of measurement that form the essential components of a scorecard for university-industry collaboration. Starting with the benefits, the expected outcomes of a collaboration will revolve around increasing levels of education, improvement of skills and improved employment opportunities and employment levels. In turn, those benefits will be generated via those activities that are pursued during the collaboration.

These activities may be shaped by specific processes used, and the organizational structures that are put in place. Even before the activities are being designed and implemented, their success is closely linked to two types of ex-ante input for each collaboration: people and resources. The skill and qualification of the personnel involved, or the quality and volume of funding made available, for instance, will be crucial ex-ante ingredients of a successful collaboration. These four elements of our stylized causal map provide the starting point for the development of our scorecard approach.

Figure 5.1 Stylised causal map for university-industry collaboration
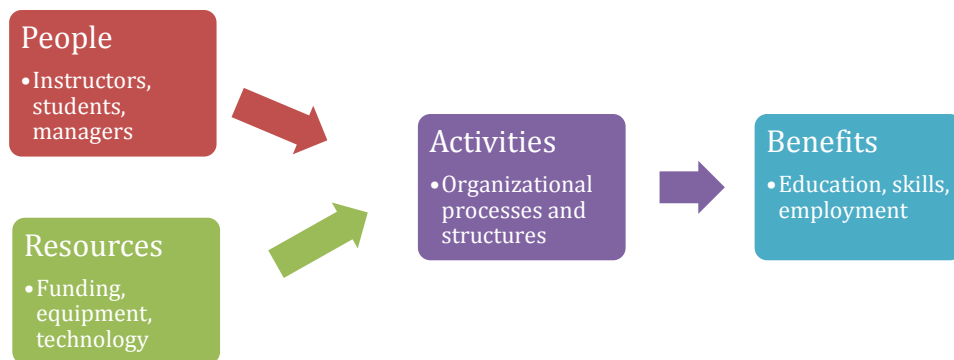
The four elements identified above form the basis of our scorecard as represented in the diagram below (Figure 5.2). We first consider the benefits of a collaboration in quadrant (1). Benefits represent the overall outcomes of a collaboration that may materialize either immediately or more likely in the medium and long term. Benefits include both financial measures of success, and measure of stakeholder perception and satisfaction. By nature, these benefits will be generated post-hoc, and hence this will be a lagging indicator of success.

Figure 5.2 Scorecard: general structure

A second important area of assessment is the bundle of activities that are pursued during the collaboration. These include the processes that are used and the organizational structures through which the collaboration is pursued. The better the quality of the activities, the more likely one may assume that beneficial outcomes are generated.

A third area of assessment is represented by the 'inputs' that are initially brought to the collaboration whereby both the amount of resources as well as their quality play a role. We distinguish between resources in quadrant (3), and people in quadrant (4). Resources may include for instance the total amount of funding that is made available for an initiative, as well as the quality of the existing infrastructures on which it can build. By contrast, the people aspect refers to the qualification, fit and motivation of the persons that are involved in the collaboration. For instance, if a collaboration is able to attract high quality, highly-motived students, it is more likely that the final benefits of the collaboration will be enhanced. Similarly, if the students are thought by instructors who are well trained and well qualified to provide the requested instructional activity, overall success in terms of benefits is more likely.

5.2 Designing Collaboration-specific scorecards

The scorecard approach represents a general tool that can be adapted for different types of educational university-industry collaboration. Consider, for instance, a scorecard for a collaboration aiming at developing and delivering a joint university course. In terms of the people, the likelihood of a positive outcome will be enhanced by factors, such as the ability of the collaborating university to attract good students, the qualification of the university team to create a high-quality curriculum in the specific area in question, the contribution by industry personnel to the design of the curriculum, or the contribution of high-impact industry personnel as instructors.

In terms of resources, positive outcomes will be made more likely if during the course students are given to appropriate industry (and/or university) equipment, whether sufficient funding is available for ancillary activities and so on.

In terms of activities, the likelihood of beneficial outcomes will be enhanced, for instance, by the existence of a bilateral steering committee that involves both university and industry personnel, or the appointment of a dedicated programme manager who is accountable to deliver the joint course. Of additional relevance may be the presence of a process whereby activities are assessed, and adjusted if needed, on an ongoing basis.

Figure 5.3 Example of scorecard for joint course development and delivery

People
- Quality of students attracted
- Quality of indsutry instructors
- Experience of curriculum designers

Benefits
- Speed of student employment
- Quality of organizations employing students
- Salaries offered to students

Resources
- Access to firms' equipment
- Learning technology infrastruture
- Match-funding provided by industry (not only public subsidies)

Activities
- Dedicated programme manager in place
- Bilateral steering committee

Finally, in terms of overall benefits, the partners may choose to evaluate the outcomes of the collaboration by using measures such as the speed by which the students find employment, or indeed the nature and quality of the organizations who recruit the graduating students or the salaries that the students are offered.

5.3 Designing stakeholder-centric scorecards

Apart from providing an assessment and monitoring guide for different types of collaboration, the scorecard approach can be further adapted to provide a view onto the specific requirements for each of the stakeholders involved in a collaboration. On this basis, stakeholder-centric scorecards can be created. Each of these stakeholders is likely to have their own objectives, and hence they will be interested in specific outcome measures that may be different from other partners'.

Consider, for instance, the case of a policy-maker such as the European Commission providing subsidies for collaboration projects. In terms of outcomes, the European Commission may for instance not be as interested in the later salaries that students command but more in their employability at SMEs. It may also see a collaboration as a vehicle whereby students from less favored regions are educated and after graduation find employment in those regions. The type and quality of processes and structures in place required to generate the above

outcomes may partially overlap with the measures as discussed but they may also contain more outcome-specific items. For instance, the close involvement of a well networked local intermediary, such as a chamber of commerce, in a placement programme during the course may mean that many students are placed at local companies and may later receive employment from them. In terms of resources, for a collaboration aimed at improving the skill profiles of SMEs in a specific region, a contribution by each of the participating SMEs may be required to ensure companies' motivation and avoid lack of commitment. Finally, in terms of people, the percentage of students recruited from a less favoured regions or specific, disadvantaged social groups may be a desirable input measure for a specific stakeholder such as the European Commission.

Figure 5.4 Stakeholder-centric scorecard: Example of European Commission
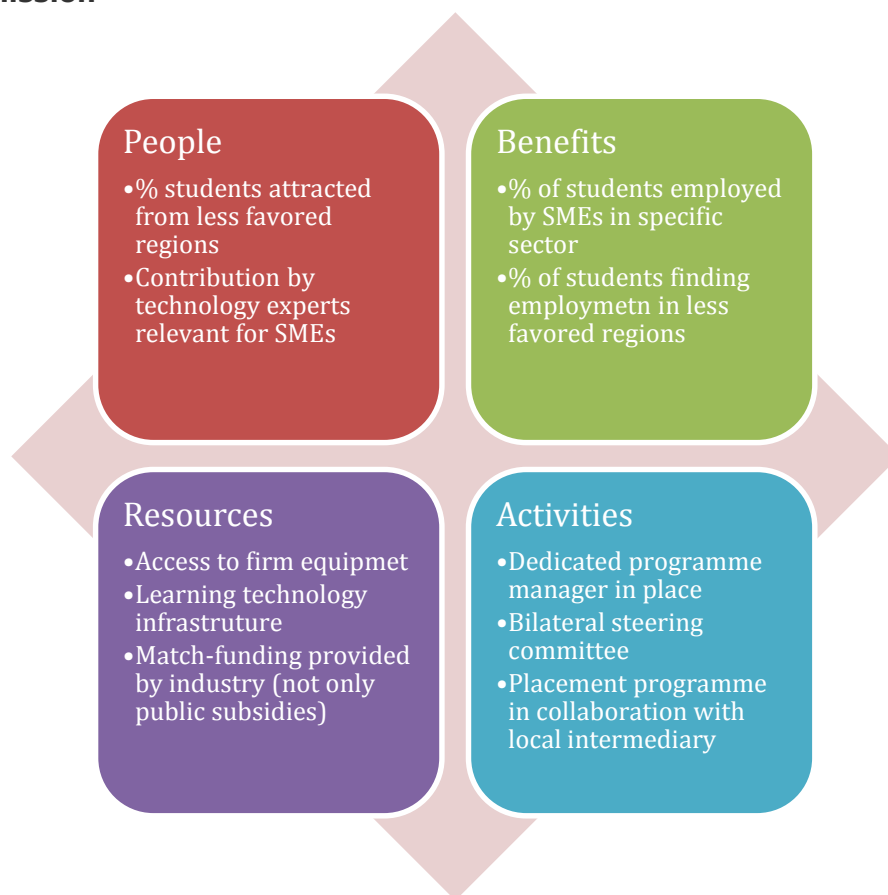
5.4 Relationship between scorecards

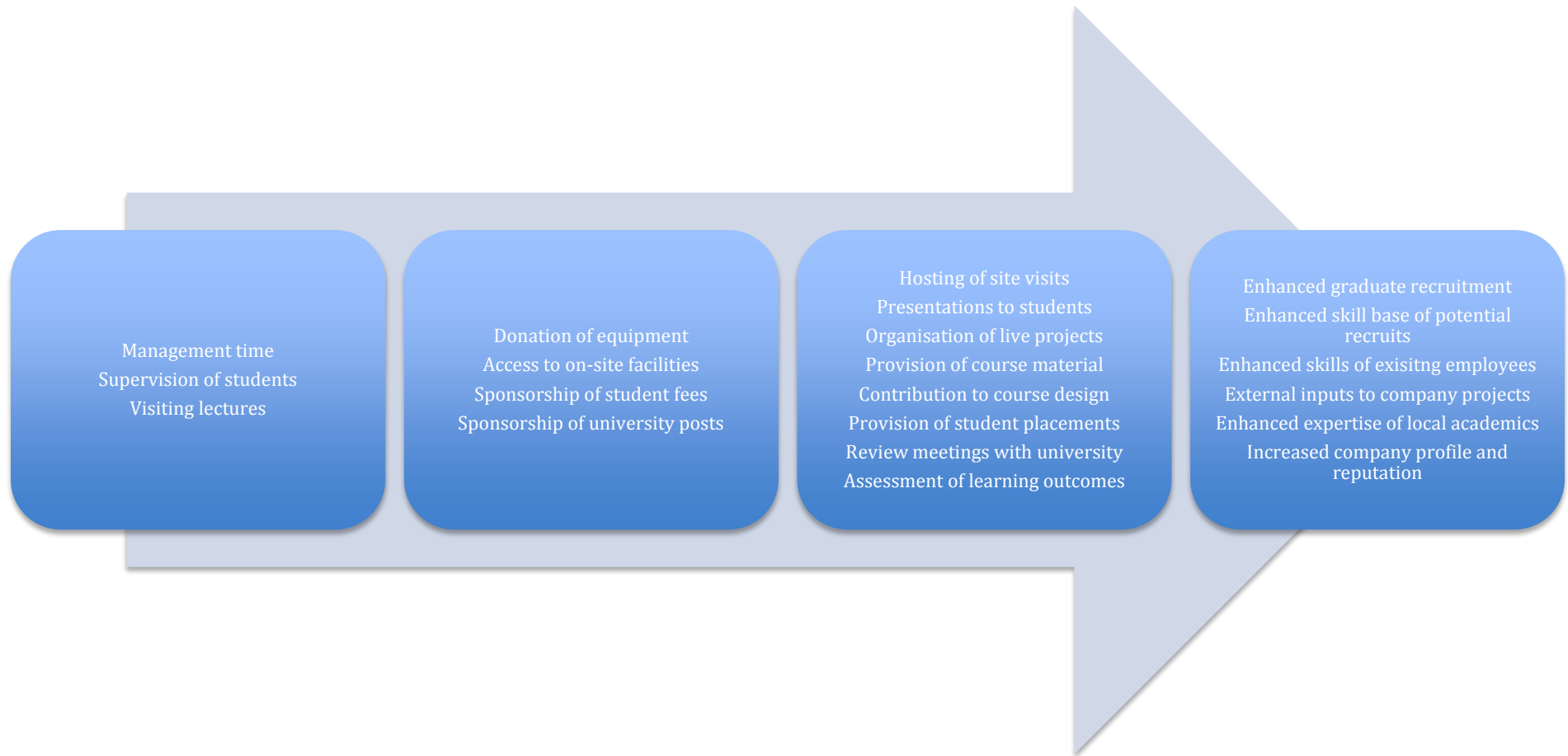The collaboration-specific scorecard, and the stakeholder-specific scorecard serve different purposes. The collaboration-specific scorecard should capture those metrics that are central to those who lead and manage the collaboration. This scorecard should present a moving snapshot of the people and resources input, the activities pursued, and the outcomes as projected or already achieved. There

can only be one such scorecard because competing scorecards would put a strain on the collaboration. This means that in particularly the desired outcomes need to be agreed upfront by the collaborating parties, together with those metrics that are seen as those inputs suitable for generating the resulting outputs.

By contrast, the stakeholder-centric scorecard can be used for assessing potential or planned collaboration initiatives. It provides an implicit causal map that expresses a relationship between the desired benefits of a collaboration, and the inputs and activities required to generate those benefits. Each stakeholder can ex-ante create a stakeholder-centric scorecard that captures those elements that are most salient to them. For a given stakeholder, this is especially useful when evaluating proposals for potential future initiatives. The stakeholder-centric scorecard provides a map that allows for the evaluation of each specific element of a proposal, and its likely contribution to an overall outcome that is desirable to the stakeholder. The following worked example illustrates the type of content that might be envisaged in a typical scorecard approach. Three linked scorecards are presented for a hypothetical project in the field of engineering: one for the company concerned, one for the university department concerned and a composite scorecard for the project as a whole. It is assumed that there is no additional funding provided by other parties for this project.

Example 1: Company scorecard for cooperation in the field of engineering

Management time
Supervision of students
Visiting lectures

Donation of equipment
Access to on-site facilities
Sponsorship of student fees
Sponsorship of university posts

Hosting of site visits
Presentations to students
Organisation of live projects
Provision of course material
Contribution to course design
Provision of student placements
Review meetings with university
Assessment of learning outcomes

Enhanced graduate recruitment
Enhanced skill base of potential recruits
Enhanced skills of exisitng employees
External inputs to company projects
Enhanced expertise of local academics
Increased company profile and reputation

Example 2: University scorecard for cooperation in the field of engineering

Lectures and teaching	Provision of facilities:	Course design	Enhanced staff expertise
Supervision of students	laboratory space and	Teaching and learning	Enhanced graduate employment
Course administration	teaching space	Design of course material	Enhanced reputation and profile
		Assessment of learning outcomes	Enhanced recruitment of students
		Accreditation of course	Improved student skills and expertise
		Review meetings with company staff	Improved position in ranking measures

Example 3: Combined project scorecard in the field of engineering

Management time
Visiting lectures
Lectures and teaching
Course administration
Supervision of students
- company staff
- academic staff

Donation of equipment
Access to on-site facilities
Sponsorship of student fees
Sponsorship of university posts
Provision of facilities:
- laboratory
space and
- teaching space

Course design
Review meetings
Hosting of site visits
Teaching and learning
Accreditation of course
Design of course material
Presentations to students
Organisation of live projects
Provision of course material
Provision of student placements
Joint assessment of learning outcomes

Enhanced expertise of academic staff
Enhanced graduate employment
Enhanced student applications
Improved student skills and expertise
Enhanced graduate recruitment
Enhanced skill base of course graduates
Enhanced skills of exisitng employees
External inputs to company projects
Enhanced expertise of local academics
Increased company profile and reputation
Enhanced university reputation and profile
Improved university department position in
ranking measures

6. Developing an assessment methodology

The scorecard approach presented in the preceding section provides a valuable mechanism for identifying the components of potential university-business collaboration activities in the field of education.   In this section we draw on our research to consider some further dimensions to developing a useful, and usable, assessment methodology for collaboration projects in the field of education. In developing the methodology there are three elements to consider.

Firstly, what are we measuring? Our terms of reference suggest that this should be the outcomes and impacts of cooperation activity. This means that we would not consider inputs, activities or (necessarily) outputs. Thus, our work could not be considered to be a complete assessment framework. We have chosen to interpret our brief more widely and set out a more general approach.

Secondly, over what timescale should the assessment be based?   Some cooperation relationships will get stronger and deepen over time as trust, confidence and shared knowledge builds. Others might weaken as partners consider that the original objective has been achieved, or as circumstances change. A weakening relationship does not necessarily constitute failure. As the relevant timescales will vary depending upon the activity, we merely highlight this as a key consideration.

Thirdly, and perhaps most significantly, who should measure what? Monitoring involves costs in terms of time, resources and goodwill. These costs need to be seen to be proportionate to the benefits realized by the parties involved. Where an agent may gain a strong benefit then they may be willing to invest resources in developing monitoring systems to track the benefits of the cooperation activity, where the benefits are less apparent then a monitoring system may need to be intuitive and resource-light.

6.1 Indicators of collaboration

Returning to the purposes identified for collaboration (Figure 4.1), we find that there are, broadly, four common types of indicator:

- Those that relate to teaching and learning, aimed at strengthening the labour supply and employment
- Those that relate to stimulating entrepreneurship through teaching and learning
- Those that relate to knowledge exchange, aimed at promoting product/process innovation or new pedagogy
- Those that relate to raising the profile of an organization

We are able to divide these between those focused on measuring inputs to the collaboration project, or activity; those which measure the activities being

undertaken (or-in-process); those focused on the outputs achieved and those measuring overall outcomes.

The indicators identified in Section 3 and through our case studies largely relate to the first of these, with a few addressing entrepreneurship, one or two in the field of knowledge exchange and very few considering the question of profile. This, understandably, reflects the focus on the educational element of collaboration activities in the field of education. However, it does mean that wider benefits of educational cooperation may be overlooked. Equally, the indicators identified through the literature tend to focus on the inputs to collaboration activities and then to student outputs and outcomes.

Table 6.1 illustrates indicators typically linked to these various stages, although the potential range of indicators is clearly much wider and should reflect the objectives associated with individual projects (or programmes) and the activities undertaken.

Table 6.1 Indicators typically used in educational collaboration
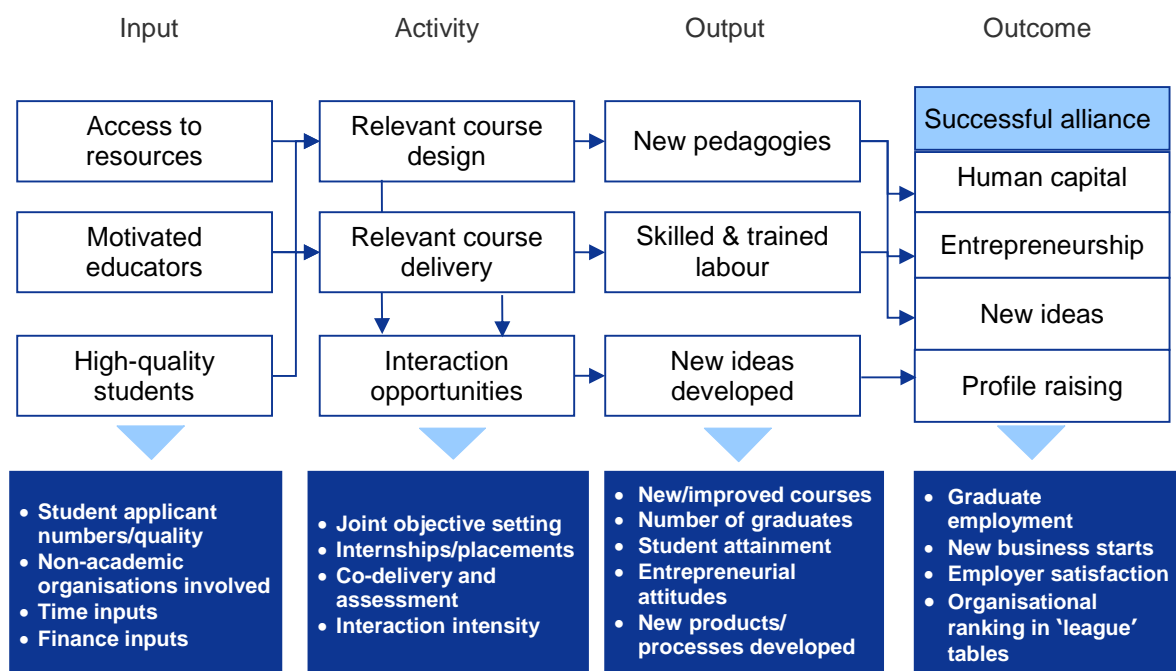
Input	Activity	Output	Outcome
- Number of student applications - Number of students on courses - Quality of students accepted - Number of sponsored students - Income raised - Number of organisations involved in delivery - Non-university staff involved in course delivery - Academic staff involved in course delivery	- Number of joint assessment exercises - Number of internships - Number of placements - Number of collaborative projects undertaken - Number of site visits	- Number of courses developed - Number of graduates - Level of student attainment - Number of students expressing interest in entrepreneurship	- Graduate employment levels - Levels of student satisfaction - Level of employer satisfaction - Business satisfaction with collaboration - Membership of advisory committees

Our case studies also demonstrated how different parties could value different indicators, as illustrated in our stakeholder-centric and project-centric scorecards. Table 6.2 provides a synthesis of the indicators identified from various sources based on a stakeholder perspective. Table 6.3 then provides a template that can form the basis of an assessment framework. For any given purpose, objectives can be identified, the proposed inputs setout, planned activities agreed and the

desired outputs established. This provides a framework for both the pre-assessment (and negotiation) of proposed collaboration projects, as well as subsequent monitoring.

From the material available it is not a strong leap to consider developing success maps of university-business collaboration in the field of education, similar to those developed in the field of research and innovation. We provide an example of such a map in Figure 6.1 below.

Figure 6.1 Success map for educational collaboration

Input	Activity	Output	Outcome
Access to resources	Relevant course design	New pedagogies	**Successful alliance**
Motivated educators	Relevant course delivery	Skilled & trained labour	Human capital
			Entrepreneurship
High-quality students	Interaction opportunities	New ideas developed	New ideas
			Profile raising

• **Student applicant numbers/quality** • **Non-academic organisations involved** • **Time inputs** • **Finance inputs**	• **Joint objective setting** • **Internships/placements** • **Co-delivery and assessment** • **Interaction intensity**	• **New/improved courses** • **Number of graduates** • **Student attainment** • **Entrepreneurial attitudes** • **New products/ processes developed**	• **Graduate employment** • **New business starts** • **Employer satisfaction** • **Organisational ranking in 'league' tables**

Table 6.2 Assessment matrix from literature and cases

Agent	Objective	Input	Cooperation activities	Cooperation outputs	Expected benefits	Monitoring
Student	Better quality education Greater employability Business start-up	Fees Time Knowledge/ideas			Enhanced entrepreneurial opportunities Enhanced skills Greater employability	
Firm	**Improved labour supply** **Employee pipeline** Reputation/profile building External ideas/knowledge exchange Product/process innovation Upskill (retain) staff Widen contacts	Money (fees, salary costs etc) Equipment/space Staff time Knowledge Promotional support Active projects Credibility	Joint assessment Internships/placements Site visits Awards/contexts Live projects Summer Schools Course delivery Course development	**Enhanced pipeline of employees** New products/processes Enhanced knowledge of existing staff Further collaboration ideas Trust	Enhance trust/contacts Greater levels of collaboration Enhanced value generation Enhanced labour supply Staff learning and retention Improved reputation amongst graduates	Informal 'gut-feeling' review meetings (pacing)

University	**Increase student employability** **Enhance student recruitment (more/better)** Improve student experience Reputation/profile building Upskill staff External ideas/knowledge exchange Product/process innovation Widen contacts	Staff time Equipment/space Credibility Knowledge Accreditation	Course development Course delivery Joint assessment Training camps Technical seminars Accreditation Links to schools	*Number of mentors* *Number of apps* **Number of graduates** **Number of course applications** Number of start-ups **Improved course quality** Quality of graduates Trust	Course quality improvements Increase student numbers Increased skills/staff knowledge Increased contacts Greater levels of collaboration Innovative course design Employment outcomes Improved reputation Enhanced entrepreneurial attitudes (staff and students)	Quantitative records Qualitative surveys on student outcomes, student experience, course quality (web feedback) Student attainment records
Academic staff	External ideas/knowledge exchange Develop own skills Build contacts **Improve student experience**	Time Knowledge (know what, how, who) **Personal contacts**				

Firm staff	External ideas/knowledge exchange Develop own skills Build contacts	**Time** Knowledge (know what, how, who) **Personal contacts**				
Third party (eg DG EAC or regional authority)	**Encourage innovation in the educational offer** Encourage firm-led innovation **Strengthen the labour market** Build profile/reputation	**Money** **Profile** Credibility Experience	Stimulus actions (such as calls for proposals, pilot actions etc).	*Improved monitoring systems* *New pedagogic approaches* Enhanced labour supply Number of business start-ups Level of graduate employment	Increased levels of employment Diffusion of innovative pedagogy Increased levels of innovation Enhanced business base	

B = objectives/inputs/outputs most commonly identified

i = examples of outputs specific to particular objectives/projects/activities

Table 6.3 Draft Assessment Framework

Purpose (may be multiple)		Objectives (of different agents)	Expected Benefits (of cooperation actions)	Inputs (by different agents)		Activities (jointly or by individual agents)		Outputs		Monitoring (indicators and approach)
Labour supply										
Entrepreneurial skills/attitudes										
Staff development										
Profile building										
Innovation										
Student attraction										

6.2 Tools and Techniques

There is a strong existing literature on potential tools, techniques and considerations for monitoring the progress and outcomes of projects. These can equally be applied to university-business cooperation project in the field of education. It is beyond the scope of this report to set these all out in detail. However, it is useful to provide some pointers that emerge from this research.

Current assessment practice amongst the projects we have examined is relatively limited. There is a strong emphasis on the measurement of student-centred indicators, particularly those related to learning outcomes. This tends to be undertaken through standard quantitative and qualitative approaches. Thus, universities will collect data on the number of student applications, the resulting number of graduates and the grades achieved. Student surveys are often utilised, either to identify levels of satisfaction with the quality of the course, or to gain information on post-graduation outcomes. Most often, the tools and techniques used are those that apply across the University concerned and are not specific to collaboration with business.

Companies are less likely to engage in formal monitoring. Instead they report that they are more likely to rely on qualitative assessment, based on a 'gut-feel', as to whether a cooperation project is delivering the returns that they were hoping for. Review meetings between firms and universities are an important dimension to this process. This prioritises the overall outcomes of the cooperation activities rather than seeking to measure individual elements. The exception to this is large corporate cooperation programmes, where the separation of the organisers from the delivery divisions leads to a greater emphasis on formal measurement returns.

Where projects are funded by external parties, such as the European Commission, monitoring and measurement tends to focus on the targets and indicators agreed at the outset of the project. There was very little evidence of projects developing more comprehensive indicator sets or measurement approaches from the material available to this study.

Whilst our work argues for expanding the set of outcomes and results being considered in any assessment of university-business collaboration activities in the field of education we find that the available tools are largely appropriate to the task in hand, though are not always fully utilised. This will include routine quantitative data collection, regular qualitative surveys, review meetings and other measurement techniques. However, our work has also identified some considerations which should inform the assessment approaches adopted.

The first of these is to identify leading and lagging indicators. What measures can provide an early indication of a proposed result (leading indicators)? For example, creating more opportunities for interaction may be expected to lead to higher levels of innovation in the future. Thus one measures the level or intensity of interaction owing to its value as an indicator of future outcomes. A lagging indicator is one that trails

the trends that it is measuring. An example in this case might be the change in profile of an organisation as measured by its ranking in a league table. Another example could be business starts, or student employment outcomes, which might lag the cooperation activity itself by one or more years.

A second consideration is the ownership of the metrics and the data used in the assessment process, and the resources expended in data collection. Assessment methods that maximise the use of data which is routinely collected should be favoured over those which impose additional requirements. However, ensuring access to data that is collected for other purposes may not be straightforward, or may be subject to comparability issues. Equally, where additional data does need to be collected then recognition must be given to the costs that this imposes on partners. The costs should be proportional to the benefits obtained from the cooperation activity and the indicators related to the involvement of each partner. Thus it is probable that Universities will be best placed to collate materials on student involvement and student outcomes, whilst firms will be able to provide information on the outcomes of cooperation within their own company. Assessment methods should be avoided where they impose strong costs on parties through requiring the adoption of new cost-accounting techniques, unless this is justified by the returns received.

A third consideration for the partnership is the purpose of the assessment process. Fewer indicators should be favoured, where possible, over greater numbers. A more parsimonious approach is likely to lead to greater levels of engagement. The practice of identifying key performance indicators is worthwhile here, where they are thought-through and particular to individual projects, or programmes. It is advantageous for key performance indicators to be agreed by all parties (and might consist of a qualitative assessment rather than a quantified indicator). Developing project or programme-level indicators is particularly challenging owing to the risks of imposing indicators on partners that are ill-equipped to deliver on these. Where this is the case consideration might be given to alternative means of collecting similar data.

The balance between qualitative and quantitative assessment is a fourth consideration. Whilst there is a strong tendency to favour the use of quantitative data in project assessment, the practices in cooperation activities considered by this study illustrate the value of qualitative data. This is due to the significance of indirect and intangible outcomes, such as trust and knowledge exchange amongst staff members raising expertise, skills and capabilities. Capturing the value of such outcomes is not easy, but can be done through a variety of approaches, some of which are being developed by Knowledge Alliance projects themselves. Box 6.1 provides an example of a qualitative review approach. Embedding such approaches in a more results-orientated, outcomes-based measurement framework would be highly advantageous to assessing the real value of university-business cooperation activities in the field of education.

Cooperation projects might also be encouraged to adapt and develop web-based self-assessment techniques, available to be completed by firms, students and university personnel. These could provide real value in the ongoing monitoring of cooperation activities and enable more informed management decisions, alongside more traditional

analysis of the realised inputs and outputs. One example of a self-assessment technique that could be adapted to cooperation activities in the field of education is that developed by DG EAC regarding Innovative Universities. There are other examples available.

Box 6.1 "Pacing" as a monitoring mechanism in university-industry alliances

Given the considerable resources invested in university-industry alliances by both industrial sponsors and public funders, these actors have a legitimate interest in ensuring that outlined objectives are met. However, since most activities in an alliance are carried out at the university and are hence somewhat removed from these sponsors' day-to-day control, the question is how this can be achieved.

One way in which indirect oversight may be maintained without exerting day-to-day control over the actual work may via a *pacing* approach. The central idea behind pacing is that a sponsor or funder may be able to exert macro-control over collaborative activities by motivating the university partners to maintain the velocity of a collaboration. For instance, sponsors may require quarterly management reports, possibly combined with meetings where the alliance participants report on progress and communicate results. In addition, individual representatives of the sponsor organizations may request regular meetings with individuals involved in the actual activities in which details on progress are requested.

Such an approach acknowledges that micro-management of outputs is hard to achieve. However, via the agreed reporting requirements and meeting schedule, influence can be exerted by ensuring that for each phase of an alliance certain sub-goals are defined and agreed. More importantly, the regularity of interaction functions as a motivational device, as it forces participants to work towards deadlines. This approach to performance management allows sponsors to assess progress and manage risk while allowing the university the latitude they require to accomplish their work.

Finally, amongst the examples of university-business cooperation considered by this study are examples from the EU's Knowledge Alliances programme. These highlight one additional dimension of cooperation which might need to be included in an assessment framework, that of transnational cooperation. Identifying and assessing the additional value of the transnational dimension to a cooperation project may require a particular approach with additional metrics, although the core considerations are likely to remain the same. As with all assessment methodologies the key is to identify the expected benefits from the transnational cooperation activity (i.e why is the transnational dimension important) and to select indicators and collection techniques which are appropriate to this.

6.3 Potential benefits of the assessment approach

This study has proposed a flexible approach to measuring the impact of university-business cooperation activities, using a balanced scorecard approach allied with a success-map for cooperation activities. This recognizes the multiple purposes that

underlie cooperation activities and acknowledges that a one-size-fits-all approach is unlikely to prove fit for purpose. What are the benefits and implications of the approach proposed to policy-makers and to the collaboration partners themselves?

For policy-makers the tool can be used in a variety of manners.

- In the first instance it forms a framework for the ex-ante development of the proposed programme. By identifying the resources that are available to the programme, or might be available, and the desired objectives programme officials can identify the types of activity that might lead to the desired results. Through a process of iteration the scorecard can be refined further. This can then provide a baseline for a call for applications.
- The scorecard approach might then be used for the assessment, or appraisal, of applications. Assessors can check the applications against the programme scorecard to identify the extent to which each applicant contributes to the desired approach and objectives. In a dynamic approach the programme scorecard can be updated through the inclusion of novel and innovative approaches proposed by applicants, which were not foreseen during the development of the programme. A blank scorecard template might also be completed by assessors as a means of summarising the information contained in applications in a common format. The approach could highlight missed opportunities for collaborative activities, or resource/people inputs, which can form the basis of negotiation with programme applicants.
- Following a successful application, a project scorecard can then form the basis for the review of project progress. This can examine the activities undertaken, resources expended and people involved against what was initially planned, together with the benefits realized, compared to those that were expected. The review meeting can then explore the reasons for any differences examining cases where inputs are greater than anticipated, perhaps owing to the cooperation going better than planned, or where results or inputs are less than originally proposed and whether remedial action needs to be taken.

The scorecard approach can also deliver significant benefits to the collaboration partners themselves.

- As a starting point it can form the basis for robust project design. The scorecard can be used as a mechanism for each partner to set out what they wish to achieve from the cooperation activity and what they are able to contribute. Each partner can then identify what they expect of the other partners. Using the scorecard approach can also assist in identifying where potential opportunities might have been overlooked in the original project design and where small changes might reap large rewards. This can then form the basis of the collaboration agreement between parties.
- Project partners can then use their own stakeholder scorecard as a means for internal review and monitoring of the collaboration activity. This provides a useful mechanism for identifying whether desired outcomes are being achieved and the extent to which anticipated inputs and activities are occurring. As a

dynamic process, the scorecard can be updated as activities are added or amended or other inputs change.

- The partnership as a whole can also use the scorecard as the basis for ongoing project reviews. This can consider whether the original assumptions remain valid and whether some activities are more appropriate than others in achieving the desired objectives. Crucial to the review process is to ensure that all partners are realizing the benefits that they sought initially and, if not, how this might be rectified. The scorecard approach provides a means of structuring this review process.

In order to promote the use of the scorecard approach the Commission may wish to provide a guide to its use in the context of university-business cooperation activities. This would offer the opportunity to develop worked examples tailored to different cooperation purposes. Such a guide could also incorporate advice on practical techniques for measuring the outcomes of cooperation activities. In the first instance, this could form part of a toolkit available to assist those parties interested in applying for Knowledge Alliance projects.

7. Conclusions

Despite a long history, cooperation activities between businesses and universities in the field of education have a relatively low profile. However, there are signs that there is now a recognition of the value to be gained from such collaborations. Whilst there is no single driver for this, businesses, universities and students all value the benefits that this brings to the experience gained by students and their stronger employability in the labour market. The rise in significance attached to entrepreneurship and the role of education in stimulating this is a further foundation for the strengthening interest in cooperation between universities and businesses.

Our work has also identified a number of other drivers underpinning cooperation initiatives. Some of these are similarly linked to skills development, particularly of existing staff within the businesses involved and university staff. This might be through their involvement with the delivery of courses, or through spillover benefits accrued through contact with students, or the knowledge imparted in the development and delivery of courses. Others relate to the value generated through student projects, or the contacts made between academic and business staff, which can lead to future innovation-led projects. Whilst this may be a secondary considerations for many cooperation activities, there are signs that in some circumstances this is an important element in the decision to cooperate. A fourth area, and one which is taking on increasing significance, is in terms of the way in which cooperation activities can enhance the profile (and brand reputation) of the parties involved.

There are many ways in which cooperation activities take place, ranging from cooperation in the design and delivery of courses, through the mobility of staff and students (for varying durations) to providing resources and facilities. In practice, most cooperation activities involve more than one form of cooperation. The level of cooperation may also change over time as activities mature, evolve, or reach the end of their lifespan.

Through this study, numerous benefits of university-business cooperation in the field of education have been identified. These effects range from the tangible to the intangible, the direct to the indirect, the quantitative to the qualitative. The benefits are also not symmetrical, as some parties gain from some effects, and others from others. Often, though, they are mutually reinforcing. For example, a student benefits from a more-rounded education gaining valuable softer skills and a more relevant industry-related qualification. The local labour market is strengthened and firms benefit (directly or indirectly) from access to more highly skilled employees. The better employment outcomes and higher levels of student satisfaction provides an improved profile for the university (and higher levels of applicants), whilst academic staff also gain knowledge of current industry practices. By carrying out joint educational projects the firm (and its staff) gains access to new ideas from students and their tutors. Through closer working the academic and business staff also develop a deeper relationship, making future innovation-led activity more likely.

The benefits of collaboration can be broadly described as falling into four categories, namely:

- Those that are aimed at strengthening levels of human capital, with labour supply and employment implications
- Those that relate to stimulating entrepreneurship through teaching and learning
- Those that relate to knowledge exchange, aimed at promoting or stimulating product/process innovation or new pedagogy
- Those that relate to raising the profile of an organization

However, the actual benefits (or effects) will depend very strongly on the nature of the collaboration and its intended objectives. It could be the case that a collaboration was targeted firmly on just one of these, or met all four. For example, a student competition aimed at solving real-world problems could serve to improve the skills of the students (and respective staff), stimulate entrepreneurial attitudes, facilitate the development of innovative products and processes and raise the profile of the organisations involved. We see examples of this in some of the cases studied for this work.

Assessing the outcomes of this in a simplistic or prescriptive manner is undoubtedly complex. As we have seen, there is a very limited literature on the cooperation in the field of education at the university level. Most attention has been given to monitoring and measuring cooperation activity in the research arena. Whilst this offers some useful pointers in terms of approach, there are few examples that are directly transferable.

Similarly, the evidence from the case studies demonstrates a very narrow approach to formal monitoring and measurement. This revolves around student numbers, attainment and outcome. There is very little consideration of potential wider outcomes. Exceptions to this do exist in terms of larger multinational initiatives (such as by Deutsche Telekom), but these are the exception rather than the rule.

This does not mean that businesses (and Universities) do not monitor their cooperation activities. Rather it takes place on an informal, or semi-formal, basis. Monitoring tends to be on the basis of a sense of the success or otherwise of the cooperation (often referred to as 'gut-feeling'), often (but not always) backed up by regular review meetings, with little formal measurement or reporting undertaken. Businesses were generally reluctant to engage in any processes that involved anything more intrusive (or resource-intensive) than this.

Established methodologies for measuring, or assessing, the outcomes and impact of business-university cooperation in the field of education are quite limited. However, our research provides a good basis for developing new approaches in this area.

A starting point is to acknowledge that co-operation involves different parties, often with diverse (but complementary) objectives. Each brings different inputs to the cooperation activity, which enhances the value of the cooperation over unitary action.

Recognising the different perspectives of agents, and their various inputs is a starting point for any assessment methodology.

The next step is then to consider how this might inform the development of an assessment methodology and relevant quantitative and qualitative indicators to measure the outcomes and impacts of university-business cooperation in the field of education. In doing so we take notice that different agents will have different interests. This leads us to consider a Balanced Scorecard approach as a means of assessment of cooperation projects.

Finally, we suggest that partners will want to develop a more comprehensive framework to ensure that all pertinent aspects are considered. We present a template for this. Such a template, together with a consideration of techniques and indicators that might be used in any assessment of cooperation activities, provides the basis for a methodology for assessing the outcomes of university-business cooperation in the field of education. We do not specifically include a transnational dimension to this work as we feel that this should be integral to any project where such transnational cooperation is a fundamental objective.

This report has presented two, linked, approaches that can be used to assess university-business collaboration in the field of education. Both the scorecard and the assessment framework can be used for project planning and the assessment of investment proposals; both can be used for assessing the progress of projects, from different perspectives, and both can be used for assessing the success of collaboration projects. In neither case though has this report prescribed the criteria on which that assessment should be based, as this is so often highly-dependent on the situation pertaining in individual projects.

Annex A

**Examples of University-Business Cooperation
in the field of Education**

AppCampus

Aalto University

Background

AppCampus is 3-year project collaboration between Aalto University in Finland, Nokia and Microsoft. Launched to the public in May 2012, AppCampus offers grants and training to developers of applications (apps) for the Windows Phone platform in exchange for an exclusivity agreement requiring that the app not be released on competing smartphone platforms for at least six months after its Windows Phone launch.[12]

For Aalto University, the collaboration is an opportunity to have a significant social impact by facilitating the creation of new businesses and new employment in the local area, and to further develop their reputation for mentoring and acceleration of new businesses. For Microsoft and Nokia, the objective of this collaboration is to bring through a number of high-quality, innovative applications first launched on the Windows Phone platform, which could act as a decisive factor in customer handset choice.

It is funded by €9 million each from Microsoft and Nokia, and managed by Aalto University in Finland, who cover operating costs of around €3 million. Nokia and Microsoft provide funding, connections for AppCampus to their other developer-focused initiatives, and merchandising support for applications funded by AppCampus once they are released. All day-to-day operations are carried out by AppCampus staff, who are employed by Aalto University.

It is aiming to attract software application developers to the Windows Phone platform. The available grants range in size from €20,000 to €70,000, and submissions go through a stringent selection process with an emphasis on app novelty and quality. In particular, applications submitted to AppCampus should not have previously been released on a competing platform, and they should support key features of Windows Phone software and hardware.

All teams whose apps are selected for investment receive support from AppCampus screening, quality assurance, and technical staff, who all assist the developer teams with different aspects of their application and nascent business more broadly over e-mail. Selected teams also have the opportunity to attend a month-long AppCademy training camp in Finland, at AppCampus' expense.

Outcomes

AppCampus' key impact in terms of skill development has been on the developer teams funded by the programme, both in terms of technical skills but also business-skills. For Aalto University, AppCampus has been successful in raising the university's

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[12] The required exclusivity period was reduced to 90 days at the end of March 2013.

profile, with the investment from Microsoft and Nokia acting as a signal of the quality of the business environment around the university and in Finland in general. This increase in the value of the university's brand may have already begun to play a role in the decisions of large information and communication technology corporations regarding where to locate their research and development centres. Another outcome of this collaboration to date is the increasingly large network of organizations and accelerator programmes that AppCampus is partnering with outside of Finland. Benefits to the local economy are also identified, particularly the multiplier effect of the additional expenditure from the funded students.

For Microsoft and Nokia, it is still too early to make a judgment on the programme's overall outcomes as only a handful of AppCampus-funded applications have been released to date. However, the collaboration has succeeded in drawing developers to Windows Phone, as evidenced by the number of submissions that AppCampus has received, while the performance of some of the first batch of applications is highly encouraging. These results have led to an increase in attention to and support for the collaboration from the business partners.

Monitoring

A steering board consisting of four AppCampus staff, two staff from each business partner, an independent member, and a member of Aalto University staff meets on a monthly basis to evaluate the collaboration's performance to date and to discuss whether any changes to the collaboration are required.

Key Performance Indicators are monitored, primarily relating to the number of applications for places on AppCampus; the number of developer teams that successfully complete AppCampus; the number of apps developed and their success in the market place.

Subsea MSc and Foundation Degree

North East England

Background

The subsea project was a collaboration was between Newcastle University, Newcastle College and Subsea North East, a cluster of businesses operating within the Subsea Sector to develop an MSc in Subsea Engineering and Management at Newcastle University and a Foundation degree in Subsea Engineering at Newcastle College.

The project emerged from a successful bid, led by Newcastle University, to the Regional Development Agency's Higher Level Skills Capacity Fund[13] to develop a range of subsea specific skills provision in the region. The collaboration took place over the period 2009-2010 and was based around established relations between the organisations involved.

A cluster of Subsea sector firms already existed in the North East of England and there was the beginning of a solid relationship with Newcastle University. The subsea sector identified a key priority for them as higher level skills and the difficulty in being able to recruit technical staff, they also wanted their engineers to be provided with appropriate continuous professional development. The Industrialists also wanted to raise the profile of Subsea, helping to engage with young children through schools. They saw both the short term skills needs and the longer term problems if these issues were not addressed.

The project secured funding of £0.582 million from One North East towards a project worth £1.8 million, with the remaining amount being funded by contributions from Newcastle University, Newcastle College and firms in the region's subsea industry. The project brought together industry and academia to develop new content appropriate to the subsea industry; financed the development of a bespoke control room, for practical instruction; developed a series of technical seminars to showcase cutting edge developments; involved students in collaborative projects with subsea firms, and worked in partnership with other organisations to raise awareness amongst children and young people of the opportunities that were available in Subsea Engineering. The course involves substantial industry engagement with guest lectures from world renowned industry experts, industrial projects, and site visits.
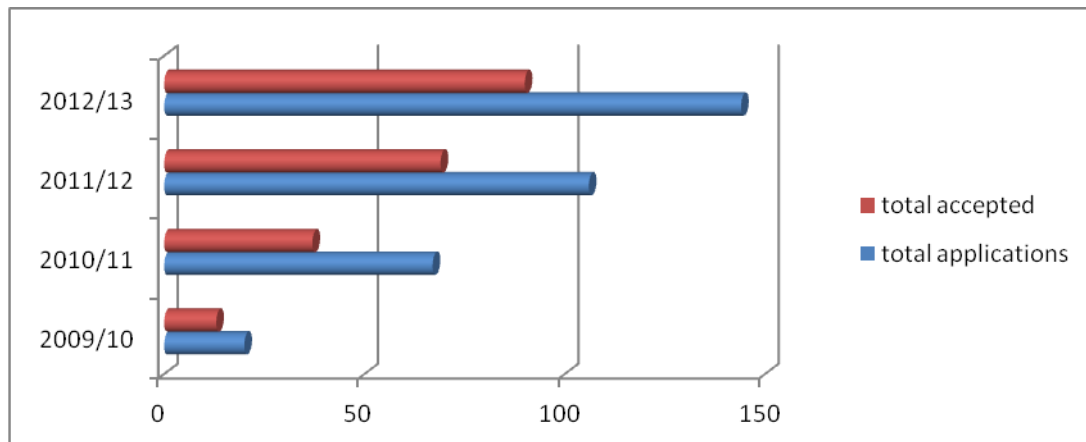
Outcomes

The key outcomes were the development of an MSc in Subsea Engineering and Management at Newcastle University, a Foundation degree in Subsea Engineering at Newcastle College, the purchase of subsea equipment to support students in both these courses and awareness raising activity about careers and opportunities within

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[13] The Regional Development Agency was called One North East. It was established in 1999 and wound up (along with all RDAs in England) in 2010.

the Subsea sector. The MSc continues to develop in popularity, as demonstrated by the number of applications and students (illustrated below).

Source: Quarterly monitoring form for the Higher Level Skills Capacity Fund

The project also had a number of formal targets to achieve. The situation at the formal end of the project is set out below, although as the collaboration continues after the closure of the initial funding, many outputs continue to be realized, as demonstrated by the ongoing student recruitment numbers.

Key Outputs for the project	Forecast	Actual
Businesses Supported	40	40
Knowledge based business collaborations	20	22
Total amount levered	£1,103 286	£1,327,574
Skills	262	99

Additional outcomes have also been achieved. In March 2013 the Neptune National Centre for Subsea and Offshore Engineering was announced by the UK Government. The Centre was hailed as the first of its kind bringing together industry and academia to create a world-class engineering research facility. The existence of a flourishing collaboration between Higher Education and the Subsea businesses played a role in enabling the Neptune Centre to be located in the North East.

Monitoring

A series of target outputs and milestones was established for the project. Each output had a formal definition within the National Tasking Framework (NTF), for example an individual had to receive at least 6 hours of instruction to be included in the return. The University as the lead applicant was expected to produce a quarterly report, for One North East, on progress against both the outputs and the milestones.

Following completion of the project and the ending of additional funds, the MSc course and the Foundation degree are being monitored for student numbers and quality of the course, the student destinations will also be monitored but there are no other

monitoring systems in place. The mechanisms used are the standard monitoring procedures applied for all courses at the College and the University.

Chemical industry relations

Central Germany

Background

The present case study focuses on recent projects that involve the Merseburg University of Applied Sciences (Merseburg UAS), located in Saxony-Anhalt in Central Germany and the surrounding firms in the Chemical Industry.

Local industry became concerned at the ending of courses in plastics engineering at the Martin Luther University, Halle (MLU). They were worried that this would limit the supply of suitably qualified labour and also threaten the availability of related research capabilities. To counter this, local firms and Merseburg UAS implemented a course in plastics engineering, with firms financing two chairs (professorships) to teach the new subjects associated with the study course. The equipment of the MLU for plastics engineering research was already located at the Merseburg UAS. The UAS thus appeared to be a natural choice when searching for ways to preserve the plastics expertise. In addition, affiliated institutes of MLU and the Merseburg UAS were founded where professors were able to offer their services to firms.

The chemical industry in the region consists of a number of firms; several of them are located in one out of six chemical parks. Further partners are the North-East Chemical Association and the isw (Gesellschaft für wissenschaftliche Beratung und Dienstleistung, organization for scientific consulting and services). Several firms and organizations have organized themselves in associations, such as CeChemNet (Central European Chemical Network). The goal of CeChemNet is to facilitate communication between different actors, taking on the role of a cluster manager.

In 1992, the Merseburg UAS was founded, although the campus had existed since 1954 and was previously a technical college. Sponsoring a chair as done in the study course of plastics engineering ensures business that knowledge regarded as important it taught at the Merseburg UAS. Additionally, this knowledge can be accessed in form of contract research, for instance through affiliated research institutes such as Polymer Competence Centre Halle-Merseburg and the Polymer Service GmbH Merseburg. Professors from the Merseburg UAS are also part of these research institutes that are used conduct contract research. Other cooperation formats are seminars taught by professors at firms.

Outcomes

The main result achieved is that the expertise in plastics engineering has stayed at a research and education facility in the region. From this follows, that the chemical industry in the region has maintained regional access to essential resources that are needed in a competitive environment. As the course was only recently initiated the first students are still to graduate. A variety of other outcomes are also expected, as a consequence of retaining the course in Saxony-Anhalt, as illustrated below:

Overview of results by beneficiaries

Beneficiaries	Students	University	Business
Results *(the color indicates the partner in this collaboration)*	Internships	Students	Hires
	Research projects	Finances	Expertise of sponsored chairs
	Theses	Equipment	Knowledge of employees
	Jobs	Research projects	
		Reputation	Reputation

Merseburg UAS observes that, as a result of the collaboration, students join the study course in plastics engineering. The business sector profits from the collaboration by being able to access the expertise of the sponsored chairs and other professors that are active in the study course. Further advantages arise from a better understanding of the business world by professors and students. It can further be observed that the knowledge of employees is broadened when students do internships and work on a research project or theses. By interacting with students during their stays at the firm, employees learn from them as well, showing that the exchange of knowledge is here a two-way-street. In addition, professors of the Merseburg UAS who hold seminars at firms teach the employees important aspects.

Monitoring

The success of the education activities is mostly evaluated in terms of a "gut feeling". Firms stress that implementing standard indicators or reporting systems would be costly and outweigh the benefits of the activities themselves. Furthermore, the success depends on current demand and capabilities and absolute numbers thus need to be put in context.

Larger firms are, however, more likely to collect certain numbers, as, for instance, the number of hires from the Merseburg UAS, the number of inquiries from students (e.g. for internships), the number of students active in the firm (e.g. in research projects), the number of inquiries by universities, or the number of cooperation contracts. Another indicator is feedback received from students, for instance, in personal interactions at fairs or workshops. Additionally, the reputation of actors in the region can be used to measure the success of the cooperation.

The Merseburg UAS further conducts an alumni survey of all students to keep track of their development. The financial support by firms, for instance, in form of sponsored

chairs, is another helpful indicator as the overall health of the relationship between the University and local industry.

Master in Banking Management, ADEIT,
Valencia, Spain

Background

The Master in Banking Management has 25 years of history. It was created for serving the banking sector, especially at local-regional level. Like most other economic sectors, the banking sector has had major internal organizational changes that affected the needs of human resources training.

The Master in Banking Management is a collaboration between ADEIT and local firms. ADEIT is a Foundation of the University of Valencia (the *Fundación Universidad-Empresa-* ADEIT). It was established in 1989 with the objective of developing relationships with the business sector.

The Master in Banking Management was initiated in 1988 in response to the need for specialist banking personnel expressed by the CEO of one of the leading Spanish banks at that time (*Banco Central*). The University of Valencia took up the challenge, designing a programme specifically for the banking sector. Once a rough version of the Master was prepared, all the regional banks and local branches of national banks were invited to provide their opinions and suggestions. In 1988, thanks to the commitment of bank managers and university teaching staff, the Master of Banking Management (known at that time as the Master in Credit Entities) was established.

The Master in Banking Management aims to complement the knowledge gained in the academic degrees, providing recent graduates (or not so recent) with training for the management of credit institutions, covering both theoretical and practical aspects. The teaching staff is composed of an equal proportion of academics and external professionals, mostly from the banking sector, but also from other financial institutions, public and private. Many of the current teaching complement are alumni of the course. This business-university approach of the master means the Master has to be managed outside of the university core.

There were from the beginning two categories of students: bank staff wishing to improve their knowledge and skills in order to increase their job opportunities in the banking sector and recent graduates seeking to find a job in the sector. At the beginning the first category was dominant but later the situation was more balanced.

Initially, one of the ways of support from the banking sector to the master was to provide professionals with expertise in practical field as teachers of the master for free. In recent times all teachers receive a modest salary for their participation in the master. Companies now provide the (compulsory) paid work placements included in the curriculum, which strengthens the relationships of the master with the banking sector.

Outcomes

The Master in Banking Management constitutes a benchmark for banks in the region. They consider it to be both a source of complementary specialist training for the sector and a source of new recruits with appropriate profiles.

More than 600 students have benefited from this programme. Initially, around 60% came from banks in the region, the rest being recent graduates. In recent years, however, the focus has changed, with more and more recent graduates joining the course. The majority of the students find employment upon completion of the course within the sector, as local institutions place great store by the course.

The University of Valencia has also developed study programmes and research projects financed by the banks themselves. They have been able to establish an informal network of professional and academic experts, which promotes the exchange of knowledge and experiences arising from contact with sector representatives.

Monitoring

ADEIT is not constricted by the more bureaucratic rules of the University of Valencia. They have a more flexible way of monitoring programmes. On the other hand, as ADEIT programmes are self-financed, ADEIT needs to control with detail aspects as the demand or the satisfaction of students. They make every year a follow up of each edition of courses. This include number of applications, number of enrolled students, number of students passing the course, marks of each student, financial results of the course, final evaluation of teachers and the rest of indicators that are necessary to control a study programme.

The results of the surveys to graduate are used for renewing the curriculum in a permanent adaptation to the changing needs of the banking sector. This continuous evolution of the curriculum is probably one of the secrets of the success of this master which has been alive and in high demand for 25 years. In addition to regular follow-up of the course, from time to time ADEIT carry out a survey to former graduates, to identify longer-term outcomes.

KNOW-FACT

Patras, Greece

Background

The KNOW-FACT project is a European-funded project that targets the development and exploitation of the Teaching Factory paradigm in manufacturing education. The goal of the project is to enable academic, research and industrial organizations to benefit, achieving industrial training and education for university students, while transferring research results and providing high-level training to industrial personnel.

The KNOW-FACT project emerged from collaboration of the partners through the MANUFUTURE technological platform, specifically in the Manufacturing Education workgroup. The partners of KNOW-FACT include European academic organizations, specifically the University of Patras (Greece) (project leader), the Technical University of Darmstadt (Germany), Politecnico di Milano (Italy) and industry, specifically TECNALIA (Spain), VOLVO (Sweden), FESTO (Germany) and CASP (Greece).

The project was initiated by the Department of Mechanical Engineering and Aeronautics of the University of Patras, which coordinated the project. VOLVO and FESTO, as the industrial partners, were involved mainly in concept definition and the pilot cases, while the Universities (Politecnico di Milano and Technical University of Darmstadt) and TECNALIA (the research branch of the company) were involved in concept definition, content specification, development and delivery. CASP was involved mostly in the specification and layout of the infrastructure. Industrial partners brought practices from their factories to the classroom, through interactive sessions and enabled student projects based on actual problems. Academic organizations brought new knowledge/results to industry through sessions.

Outcomes

The main goal of the KNOW-FACT project has been the development and dissemination of the Teaching Factory paradigm in both academic and industrial sectors. The efforts of the project included:
- Feasibility study for the implementation of the paradigm
- Three (3) pilot cases for the validation of the concepts and technologies adopted
- An Extended Partnership of academic and industrial organizations

Industrial partners benefited from (i) the provision of new ideas and solutions to existing problems (new people, new solutions), (ii) the interaction with competent students of manufacturing who are interested in participation in real, practical environments, and (ii) the ability to offer training to their employees in an effective way, in their well understood environment on new ideas, concepts and procedures.

Academic partners benefited from (i) the new experience of realistic problems in an operational, practical environment, (ii) the ability to provide hands-on training to students on real problems, (ii) a path for technology transfer of research results to a practical environment.

Monitoring

The project consortium developed an evaluation and assessment methodology, mainly led by TECNALIA, which was used to evaluate the effectiveness of the project's results. The methodology included the use of questionnaires and a set of key indicators that enabled the evaluation of the effectiveness of the concept on all involved "clients", i.e. students and academic staff as well as engineers in industry.

KNOW-FACT did not use any specific methodologies to measure the outcome and impact as University-Business cooperation. Their work and evaluation focused on the effectiveness of the approach developed using the Teaching Factory paradigm. However, the consortium plans future collaboration through activities such as funding proposals for European projects, indicating that all partners consider the KNOW-FACT collaboration promising in several directions.

Importantly, some partners, e.g. TECNALIA, are exploring the possibility of exploiting the results and the concepts of the KNOW-FACT project in other directions, such as the improvement of manufacturing processes at a local level

Informatics and Software Engineering

Sofia, Bulgaria

Background

The business university cooperation between HP and Sofia University is carried out by Hewlett-Packard Global Delivery Centre Bulgaria (HP GDC) and The Faculty of Mathematics and Informatics (FMI SU). HP GDC was set up in 2005. Its sole owner is Hewlett-Packard Central and Eastern Europe Holding. The Bulgarian unit provides IT infrastructure outsourcing services.[14] The purpose of the Centre is to provide clients and partners of the company from the region of Europe, Middle East and Africa (EMEA) with high-value and cost effective IT and business remote services. The cooperation with HP is mainly focused on students of Master's Programs Informatics and Bachelor's Programs Informatics, Computer Science, Software Engineering.

HP university program in Bulgaria started in 2006 after the opening of the Hewlett-Packard Global Delivery Centre - Bulgaria (HP GDC). The first joint course was carried out from September 2006 through March 2007. It was intended to remedy the deficit of qualified IT specialists and the growing competition for labour between the companies operating in the Bulgarian market. For HP, it is also about being seen to be a socially responsible company. The overall attitude towards the education is the strategy of the company which is a way to build a positive image. For the University, the additional resources also enable it to expand its offer and to attract higher quality students looking for a more business-orientated education.

The joint HP/FMI delivery of courses is considered as the most important cooperation activity by the HP managers, the professors and the students having attended those courses.   The main contributions by HP are in the design of course material; supporting of courses through teaching; the donation of equipment, and the provision of placement opportunities. HP has also helped academics to upgrade the content of teaching material and teaching methods. Moreover, young HP specialists are assigned with the task to assist professors in other faculty courses in view of using them later as teachers in their own company.

Outcomes

The principal outcome achieved has been an increase in the number of high-quality students graduating with appropriate skills and experience. All parties agree that the

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[14]http://www.securities.com/Public/company-profile/BG/Hewlett-Packard_Global_Delivery_Center_Bulgaria__%D0%A5%D1%8E%D0%BB%D0%B5%D1%82-%D0%9F%D0%B0%D0%BA%D0%B0%D1%80%D0%B4_%D0%93%D0%BB%D0%BE%D1%83%D0%B1%D1%8A%D0%BB_%D0%94%D0%B5%D0%BB%D0%B8%D0%B2%D1%8A%D1%80%D0%B8_%D0%91%D1%8A%D0%BB%D0%B3%D0%B0%D1%80%D0%B8%D1%8F_%D0%A1%D0%B5%D0%BD%D1%82%D1%8A%D1%80__en_3263591.html

DSMT MSc Program graduates have acquired new technological skills, which has enhanced their employability and career prospects.

For HP, the main benefit is the possibility to select and recruit students during the training, coupled with the opportunity to refresh the skills of HP staff in the same courses. The collaboration also provides HP with valuable publicity and enhances its reputation as a 'good' employer.

For the University, the collaboration provides access to up-to-date appropriate technology, helps to find and retain good teachers/practitioners and enables staff to keep abreast with the new development of the new technology. It also serves to attract high quality students (with at least 4 applications for every place) and generates positive employment outcomes for the students.

Monitoring

There is no written overall monitoring mechanism for the collaboration itself. There is a view that the parties are aware as to the success or otherwise of the cooperation activity, as indicated by their continued (and deepening) involvement. Where there are problems these are discussed.

The process of joint trainings and their results are, however, monitored. Standard assessments **tests** about the training outcome are regularly used. The quality of training provided is measured by 10-point scale quantitative evaluations which the students give to training material, the teachers, and the way of teaching. The knowledge and the skills of the students themselves are assessed by the traditional approach for the Bulgarian education 6-point scale where a score of 2 denotes poor/ unsatisfactory result. Scoring 3, 4, 5 denote the corresponding fair, good, and very good, while 6 denotes excellent result. Attached to the results of the test is the attendance sheet of the trainee pointing out when and which classes the student has attended.

The faculty Internet site also provides possibilities for students' feedback. There they can indicate approval or disapproval (with symbols) of the content of the specialty, the course, the teachers etc., and also give their free - form arguments. Considering that this information is based on those who have responded, the lecturers could use it "to see how the land lies." The feedback indicators included in the questionnaires are defined by the university professors participating in the courses, while the assessment tests are especially prepared by HP GDC.

European University Enterprise Network

Transnational

Background

The EUEN project aims to enable University-Business cooperation to improve the offer of entrepreneurial education in Universities. It is a transnational project, financed by the EU's Knowledge Alliances pilot action. The project has 7 partners and 6 associated partners from across 6 countries. Several of the partners have worked closely together in the past. The project is led by the Institute of Applied Entrepreneurship (IAE) at Coventry University in the UK.

The original aim of the EUEN project was for each University to work with a dedicated 'local' business partner. However, the format of collaboration evolved through the course of the project, following the realization that different levels of HEI entrepreneurship-readiness require different forms of University-Business cooperation.

Overall, the EUEN project aims to enhance partnerships between businesses and higher education through:
- organisational development,
- staff development,
- curricula development
- delivery of "business-university-student" enterprise and entrepreneurship projects.

Alongside the desire to stimulate innovation and entrepreneurship, the EUEN consortium recognizes that Universities are facing increased competition based on the employability of their students; students are facing increased regional and global competition in the labour market and businesses are demanding a greater skills focus with graduates needing to be equipped with a range of 'enterprising skills'.

There are a number of objectives outlined in the project that seek to enhance the structures of universities for business co-operation, create enterprising academics, deliver collaborative based projects and are informed by the learning that comes as a result of the co-operation. These can be summarized as:
- ✓ Course redesign
- ✓ Development of flexible curriculum model
- ✓ Student projects
- ✓ Partnerships/relationships between organisations
- ✓ Dissemination to other countries, institutions, departments
- ✓ Creation of (scalable) businesses
- ✓ Leadership workshops to encourage entrepreneurial thinking in HEIs
- ✓ Staff training in education and entrepreneurship

Different partners are involved across a series of 'mini-projects' organized in a series of Work Packages. This was summarized by one participant as "1 partner, 1

collaboration and 1 pilot project". For example, IAE cooperates with Hewlett-Packard in the UK, and Turku University collaborates with Orion in Finland.

Outcomes

EUEN project Outputs to enable cooperation:
- Portal for engaging academic – industry partners and graduates
- 200 students engaged in university-business collaboration projects
- 50 businesses engaged in pilot activity
- Dissemination to 10 EU member state organisations and 30 European Universities
- European Legacy Network Established

As a pilot project, the EUEN identifies some challenges for University-Business Cooperation. Firstly, that individuals working within companies may not necessarily attribute the same priority level to their work as do the University staff directed with delivering the project, with the cooperation being seen as over-and-above their job role. Conversely, one University partner found internal difficulties as the individual working on the project was also a Pro-Vice Chancellor, "so whilst it was flattering that they attributed such importance to the project it did also mean that time to work on the project was not on their side".

A tangible outcome as a result of the different forms of cooperation that were enabled by EUEN is that an e-book has been produced that forms a 'how-to' guide. It will be available online and contains case studies of the cooperation undertaken by regional partners, detail difficulties faced and how they were overcome, and provide contacts for those who wish to find out more.

Monitoring

The main way in which activities were monitored was on the progress made against achieving the outputs stated in the project proposal. However, this monitoring focuses primarily on the overall objectives of the EUEN project and the University-Business cooperation as a component of achieving this.

Monitoring of the activities between cooperation partners such as IAE-HP and BID-Orion has been undertaken through the form of Case Studies and informal on-going monitoring, such as qualitative assessments by individual students or partners. Other techniques employed include:
- Business feedback: expectations met, skills gaps identified
- Weekly reporting of placement students to tutors
- Stakeholder analysis
- Entrepreneurial readiness scorecard
- Entrepreneurial intention survey
- Monitoring levels of satisfaction

EDUCCKATE

Transnational

Background

The 'Education Cultural & Creative Knowledge Alliance for Tomorrow's Entrepreneurs' (EDUCCKATE) pilot project is the first pan-European entrepreneurship mentoring scheme to target the cultural and creative (CC) sectors. It involves 11 partners in 7 countries and is supported through the EU's Knowledge Alliances initiative.

The EDUCCKATE project concentrates on two dimensions of University-Business Co-operation:

  I. Cooperation between HEIs and businesses (project partners and entrepreneurs) to develop a system that will effectively monitor and guide mentored internships.

 II. Cooperation between the students and entrepreneurs in completing a mentored internship. This cooperation is facilitated by the HEIs and the mentoring framework that will be developed by EDUCCKATE project. Cooperation will occur throughout the partnership countries and will focus on the development of entrepreneurial skills and outlooks. All project partners will contribute to this activity either by identifying entrepreneurs or monitoring internships.

EDUCCKATE aims to bring Universities and businesses together through facilitating the mentoring role of 105 Cultural and Creative industry entrepreneurs. The project will enable 3 month mentored internships for students in the CC sectors, providing access to businesses and the opportunity to develop collaborative business projects. The project will sustains its impact by training academic staff to build this learning in to future taught degree programs.

The project predominantly addresses students and the mentors, who, through a 3-month internship-collaboration will gain expertise in mentoring and new business ideas. Some project partners such as UCL-Advances will particularly gain through learning how to better moderate their internship schemes, whilst others are offering a service that will contribute to the development and management of the project. This said, the project partnership has given extensive consideration as to who the 'target groups' are for varying stages of the project.

The main purpose is to ensure that graduates in Cultural and Creative disciplines leave University with the skills required to be successful in the Cultural and Creative industry: the internships provide opportunities to develop business projects and 'try out' professional paths. Alongside this, and what may possibly translate outside of mentoring in the Creative and Cultural sector, is the development of a framework by which the process can be guided. Moreover, students gain business-relevant skills and experience of micro-enteprise in an industry that is dominated by self-

employment. For the University enhanced student employability and entrepreneurial opportunity is generally seen as beneficial. Businesses welcome the opportunity to expand their contact networks and to test and explore new ideas.

Outcomes

No outcomes have yet been achieved as the project only began in 2013 but EDUCCKATE projects the following results:

- Tool box for mentoring and entrepreneurship in the cultural and creative sectors
- Mentoring training for 105 entrepreneurs as mentors for students leading to 3-month internships
- Entrepreneurship training for 105 students to support development of business ideas
- Mentoring and entrepreneurship training for 21 academic staff
- Mentoring and internship framework
- Project database for innovative business projects
- Online Network connecting universities, entrepreneurs and students
- Mentoring and entrepreneurship competence validation system (LEVEL5).

Monitoring

EDUCCKATE splits its monitoring activities into two strands. The first monitors the progress of the project overall, the second monitors the internships.

The progress of the EDUCCKATE project itself will be assessed through metrics that outline the number of internships achieved, staff and entrepreneurs trained amongst other indicators. This is recorded using a standard project monitoring system approach.

In the case of the internships a qualitative, competence-based assessment package is used to assess non-formal learning outcomes. Managed by one of the project partners the approach has been adapted to assess the competencies valued by entrepreneurs.

Carbon Storage

London, UK

Background

The Qatar Carbonates and Carbon Storage Centre (QCCSRC) was established to investigate key challenges in gas and oil production in Qatar and build local capacity in this area of expertise. The Centre operates at Imperial College London, and is funded by Qatar Petroleum, Royal Dutch Shell plc, and the Qatar Science and Technology Park (QSTP).

The collaboration brings together four main players, namely: Qatar Science & Technology Park (QSTP) - Qatar's national agency charged with executing applied research and delivering commercialized technologies in identified areas, and with a remit to promote economic and human capital development in Qatar; Qatar Petroleum - created in 1974 with the overall objective to maximize the national wealth of the State of Qatar through the exploitation of Qatar's hydrocarbon reserves; Royal Dutch Shell - a major international energy corporation, and a major investor in Qatar, and Imperial College London - a research-based university specializing in natural sciences, engineering, medicine and business.

The $70m, 10-year QCCSRC research centre was established in 2008. The QCCSRC's major objectives are to conduct novel geoscience applied to Qatar's geological specificities, to support new methods of carbon capture, and develop local talent in Qatar in the wider field of geosciences and engineering. The centre involves over 40 academic staff, postdoctoral researchers and PhD students, drawn mostly from two Imperial departments, the department of Earth Science and Engineering, and the department of Chemical Engineering.

The principal objectives of the centre can be divided into two main categories: first, research and second, education and training. As regards education and training the main objective of the centre is to develop local talent in Qatar through higher education and research training in geo-sciences and engineering, and the establishment of an R&D facility in Qatar. The latter objective is linked to a broader objective pursued by QP and Shell, "Qatarization". This refers to the attempt to identify and develop Qatari personnel for assuming permanent positions in Qatar's oil and gas industry, which is the country's principal economic sector. In particular, via the collaboration with Imperial College London, the intention was to select suitable Qatari candidates for being enrolled in a PhdD programme within the context of the research activities pursued by the centre.

Outcomes

The research objectives and education and training objectives of the initiative are closely-linked. The centre pursues a portfolio of parallel projects on specific scientific

or technical aspects of carbon oil or gas reservoirs whereby each project is lead by principal investigator drawn from two departments at Imperial. Each project is co-supervised by an R&D scientist drawn from one of the industrial partners. PhD students may be allocated to any of the projects, and pursue their academic training by accessing the data, materials and expertise generated from them.

In this way, the PhD students contribute to the success of the projects, and simultaneously receive research training in specific subject matter highly relevant to their country. Accordingly, the centre combines the generation of research outputs with the creation of human capital, which in the long-term is hoped to support the up-skilling of the indigenous petroleum industry in Qatar.

A further outcome of the centre activities was seen to consist in the creation of high quality material suitable for being integrated into Imperial College's teaching programmes. In particular, because the work in the centre was connected closely with industrial application, the academic participants were hopeful that the resulting teaching programmes could be rendered more relevant and practice-oriented. This in turn would improve the quality and attractiveness of Imperial's teaching offerings, and hence benefit a core activity of the university.

Monitoring

Centre participants use both quantitative and qualitative methods for monitoring the ongoing collaboration in general and the outcomes produced more specifically. There are differences in emphasis amongst the participants regarding what measures where seen as primary. Whereas Imperial academics valued indicators linked to the quality of research and the quality of PhD graduates, Shell, Qatar Petroleum and QSTP were more focused on measures that may have a deep impact on R&D results and economic performance.

The monitoring and assessment of the centre's performance was performed largely as part of quarterly review meetings where participants appraised what had been achieved in the previous period and took action, where necessary, to remedy undesirable developments. The centre had put in place a reporting structure whereby participants are required to report on their progress with respect to certain milestones on a quarterly basis, in conjunction with more frequent meetings amongst the research teams.

Commercial Communications

Prague, Czech Republic

Background

This case involves the cooperation between the University of Economics in Prague and the Association of Communication Agencies (ACA). The ACA is the trade body for leading agencies in the Czech advertising, media and marketing communications industry which, together, account for around 85% of the Czech market.

ACA participates in carrying out a whole minor field of study or minor specialization called Commercial Communications (CC) in the Department of Retailing and Commercial Communications. CC is designated to students who want to obtain information on how to communicate with consumers in the world mass media and new information technologies. All the courses within CC (5 altogether) are taught by experts in their fields and come from international communication agencies, research organizations, industrial and trade companies, media and the departments of Retailing and Commercial Communications and Law. The minor specialization is formed in accordance with instructions from Edcom (European foundation for teaching commercial communications), that is part of European Association of Communication Agencies. Some of the courses are held in English and taught by foreign representatives from major firms, e.g. McCann-Erickson, OMD, Johnson & Johnson, TESCO.

The cooperation began in 1994 when Association of Advertising Agencies (now the ACA), participated in teaching the optional course *Advertisement* that was held at the university. This then developed into a five-week course called PR Academy which involved one week of theoretical preparation and four weeks of internship in a PR agency. The dept. then created whole minor specialization program Commercial Communications in 2002. The courses are untypical as they come in a specific order and are all taught in an intensive way just in one semester.

University staff set the general framework for the studies and provide quality assurance. Administrative tasks are also carried out by the university staff, including: selecting students to the program, arranging premises, testing, consultation and other necessary administrative tasks. The department has one secretary, but other staff is involved such as IT technicians, students' supervisors and so on. Actual instruction is provided by more than 60 teachers from business, who create syllabus and most importantly handouts and other materials for their students. They teach, share their experience and bring case study problems from their companies for students to work on. Students have the possibility to meet their potential future employers and companies have the possibility to choose and get to know their future employees.

For the companies involved the main objective is to secure well-educated graduates, who are able to work fully right away, together with raising the profile of the firms.

For the University, the objectives are to improve students´ skills in the field of commercial communications; to increase the attraction of students for future employers and to develop their entrepreneurial skills, and to improve the employability of graduates and to widen the offer of courses.

Outcomes

During the period 2002-13 566 students graduated from Commercial Communications minor study in total. Out of those 566 students, 306 wrote successfully diploma theses on CC topic. Out of the 306 students who chose the CC topic, 265 students received an Association of communication agencies (ACA) certificate. Students are awarded this certificate under certain conditions. They have diploma thesis on a CC topic and high scores in tests and exams (all As).

Students are also encouraged to take part in supplemental courses and competitions. Throughout this period 7 students also graduated from the Roger Harchuel Lions Academy in Cannes, a high profile one week course held during the Cannes Lions International Festival of Creativity. Five times in a row (2008-2012) student's team (winner of the national round) has been winning the world finale of L'Oreal competition in Paris. L'Oreal Brandstorm is an international game organized by L'Oreal SA. The aim of the Game is to offer the students a pedagogical and professional experience and the opportunity to take the role of an International Marketing Hub Director within the beauty products industry. Finally, 15 student´s teams took part in international competition AD VENTURE (EDCOM as part of EACA). AD VENTURE proclaims that is the first pan-European competition which gives participants the chance to experience what it is like to work in an advertising agency.

The university representatives confirmed the existence of outcomes that we anticipated and these include a better image of the university, gaining prestige, improvements of the quality of the study program, suitably educated graduates, better equipment, wider choice of courses, ambitious and self-confident students. Businesses reported that the collaboration provides prestige, well prepared job candidates/future employees, a well-structured and adapted pre-selection process, and training adapted to corporate needs. Individual instructors reported personal benefits such as a sense of satisfaction and prestige.   Students not only report improved skills and knowledge, but also the value of meeting the representatives of different companies, getting to know the corporate culture of these companies, practicing presenting in real life conditions (in front of higher management) and the possibility to be offer a job in the future.

Monitoring

Data on student results are routinely collected by the University, although this does not include information on employment outcomes. Courses in the minor study CC are also formally evaluated using the integrated study information system of the University of Economics. Students anonymously evaluate the quality of teaching by means of survey questions related to teachers´ professional skills and helpfulness to students. Another set of questions focuses on the overall quality of the course (of

interest to students, the difficulty of the course, the overall workload for the successful completion of the course). Students have five possible answers – they can agree without hesitation, they agree, they agree with some reservations, they do not agree and they totally disagree. In addition, students can complete their evaluation with some detail on what they liked and disliked about the course and also give recommendations on possible changes. The system automatically evaluates the answers.

Annex B

Topic Guide for Case Studies

Interview schedule for case study interviews

The Interviewer should make themselves familiar with the main characteristics of the collaboration before the interview, using either public information or information passed on by interviewees upfront. The questions below contain factual and more subjective questions. The factual questions do not need to be repeated with each interviewee once 'saturation' is reached, i.e. the interviewer has learned everything about this aspect. Subjective questions are about what each interviewer believes, and hence need to be addressed at each single interviewee.

For each interviewee, note down job role and professional background.

Background and Inputs

1. Could you please briefly tell me why and how this collaboration was created [factual – this is a question for those how have been engaged in collaboration from beginning]

2. What activities does the collaboration involve? [factual]

3. What is the role of each partner in this collaboration?

4. Have these roles changed over time?

5. Ensure the following information is recorded:
   - overall budget / budget per year; inception year and duration
   - partners involved
   - contributions by partners and other funders (approximate figures in €/£/other …)
   - how many members of staff are involved in managing/delivering the collaboration
   - who is audience/ how many beneficiaries (students , etc.); etc.
   - with which units in each partner organizations lies the responsibility for the collaboration

Objectives

6. Why was this cooperation initiated? (and by which party?)

7. What do you see as the most important objective of the collaboration, seen from the viewpoint of your organization? (Explore different perspectives)

8. Was there at some stage any disagreements between the partners about what goals should be pursued?

Outcomes and Benefits

9. What are the main outcomes of this collaboration? (what is actually being 'produced' in this collaboration – as opposed to the benefits of these outcomes which I will ask you about in the next question).

10. What are the benefits of these outcomes for your organization?

11. As far as you can see, what are the most important benefits for the partner organizations?

12. What are the benefits to the students?

13. What do you see as the wider, collective benefits of the collaboration? And who do you feel are the beneficiaries?

Success and evaluation

14. How do you know if and when the collaboration is successful?

15. How are the outcomes and results of the collaboration measured and monitored?
    a. If so, what are the indicators used? Do you feel these capture the full range of benefits, including tangible and intangible outcomes?
    b. What are the monitoring instruments use to assess the outcomes of the cooperation activities (surveys, reporting). Please describe in detail, including time periods of recording and reporting.
    c. What are the strengths and weaknesses of these approaches

Underpinning of success

16. From what you have learned so far, what do believe needs to be in place for making this kind of collaboration successful? In other words: what are the key ingredients of successful collaboration? When answering this question, please try and distinguish two aspects:
    a. What needs to be in place at the start? (e.g. aspects relating to resources, contracts, division of labour, etc.)
    b. What is important throughout the collaboration (e.g. certain practices, approaches, etc.)

17. Is there a sense that the collaboration could have achieved, or could achieve, more than it has actually achieved (or is achieving at the moment)?
    a. If so, what do you think are the obstacles that are holding the collaboration back?

Annex C

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