

RESPONSE TO RICHARD LAMBERT

**LAMBERT REVIEW OF BUSINESS-UNIVERSITY
COLLABORATION**

**Memorandum submitted by
The Royal Academy of Engineering**

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Lambert Review of Business-University Collaboration

Summary

Engineering, probably more than any other scientific or technical discipline, has a long tradition of collaboration between academia and industry. This experience has demonstrated that considerable rewards are available to both parties in a successful collaboration, in addition to the benefits generated for the UK economy from technology transfer.

Constructive relationships demand mutual trust and a sound understanding and respect for each partner's motivations and rewards structure. Formalisation of the project aims, conditions and deliverables with expected time-scales must be agreed at the earliest possible opportunity and the construction of a collaboration roadmap can prove valuable. Intellectual Property (IP) is a common stumbling block, with drastically mismatched expectations from academia and industry sometimes producing an impasse. Case studies and model agreements should be useful for informing future negotiations.

University industrial liaison, administration and finance departments are heavily criticised by many industrialists. Academics, meanwhile, lament the short-term approach of some companies and the associated lack of continuity and follow up during a project. Both businesses and universities report that shortage of time restricts their ability to collaborate effectively. The lack of formal recognition of successful collaboration is also a disincentive, particularly in academia.

Government funds and assistance for identifying potential areas and partners for collaboration, providing high quality management and administrative support and advice and promoting the interflow of personnel between academia and industry would certainly make a positive impact on business-university collaboration. Access to support should be simplified and Regional Development Agencies (RDAs) could play a central role in delivering these services, especially since many of the most successful collaborations operate at a local level.

1. Examples of Best Practice in Business-University Collaboration

1.1 The Royal Academy of Engineering offers a range of schemes that promote and support business-university collaboration. The Research Chairs and Senior Research Fellowships are co-sponsored by an industrial partner and have proved extremely successful at stimulating and enhancing business-university collaboration, to the mutual benefit of the researcher, university and sponsor. The Research Chairs serve to establish or enhance an internationally renowned centre of excellence in a specific area of engineering, whilst Senior Research Fellows are relieved of teaching and administrative duties in order to focus on research allied to the requirements of the industrial sponsors, who in turn play an active role in monitoring the programme. Examples of industrial sponsors are provided in Annex 1.

1.2 The Royal Academy of Engineering's Industrial Secondment Scheme enables engineering lecturers to spend between three and six months, on a part-time or full-time basis, in an industrial organisation gaining experience that will benefit their

teaching. Whilst the primary aim of the scheme is to improve the quality of engineering tuition in universities, many secondments have yielded additional benefits such as research and consultancy contracts, donation of equipment and software to the university, acceptance of students for employment, placements and vacation work and visiting lectures by the company staff.

- 1.3 The Academy has also sponsored universities to appoint senior industrialists as Visiting Professors in Principles of Engineering Design and, more recently, Engineering Design for Sustainable Development. This scheme has significantly enhanced the teaching of engineering design through the production of teaching materials based on case studies. Following the end of the five year funding commitment from The Academy, the vast majority of universities have continued to maintain the activities of their Visiting Professors, reflecting their conviction in the merits of this scheme.
- 1.4 In addition, Fellows of The Academy have identified various other examples of successful business-university collaboration. These are summarised in Annex 1, categorised according to the nature of the relationship.

2. Barriers to Business-University Collaboration

Management and Organisational Issues

- 2.1 Management and organisational issues can significantly impact on business-university collaboration and may actually constitute the major barriers to technology transfer. The specific reasons for this are discussed below and possible measures to alleviate these problems are proposed.

Building Relationships

- 2.2 Successful business-university collaboration requires mutual trust between the partners. The most robust basis for collaboration, and a common stimulus for its initiation, may be personal relationships between individuals in academia and industry. In reality, many academics and industrialists, particularly those working in SMEs, do not have the contacts or the time to identify potential partners for collaboration and it could be useful to consider whether there is a role for Regional Development Agencies (RDAs) or other bodies to assist in this process.
- 2.3 Many large-scale collaborative ventures have evolved from an initial small-scale joint project through which trust and confidence have been developed. Indeed, progressive collaboration enables the partners to better understand each other's needs: the missions, motivations and rewards structure for universities and industry are distinct and need to be appreciated for a successful collaboration.
- 2.4 Moreover, the expectations and objectives of the collaborating university and company must be aligned at the earliest possible juncture. This entails reaching agreement on critical issues such as confidentiality and data exchange, as well as IP, which is discussed in detail below. Specification of the project's objectives and time-scales in the form of a collaboration roadmap can be a useful way of ensuring that

there is a clearly agreed direction and commitment for the duration of the project. Establishment of a roadmap may be facilitated by the involvement of independent experts that could, for example, be identified through the RDAs.

- 2.5 In addition, it could be envisaged that RDAs might provide some funding for the university to carry out a 'loss leader', with the aim of catalysing the development of collaborations. This would involve small scale financing of the university to enable them to undertake some preliminary consulting for the relevant business for a nominal sum, in order to demonstrate the tangible benefits that the business can expect to receive through collaboration. The loss leader would also provide an opportunity for the potential partners to forge trust and understanding. Provision of services such as those suggested above by RDAs could synergise to strongly augment the establishment of productive collaborative relationships.
- 2.6 There is also a need for increased interflow of personnel between academia and industry. This should enhance mutual awareness and understanding in industry and academia and promote the chances of profitable collaborations, as well as providing supplementary benefits such as improvements in teaching quality, as demonstrated by The Academy's Industrial Secondment Scheme. The likely rewards of extending such schemes are considerable and there is a persuasive case for more Government grants to be made available to support the secondment of academics to industry and industrialists to universities.

Barriers and Disincentives

- 2.7 A major disincentive for academics to undertake business-university collaboration has, thus far, been the lack of recognition given to such activities in grant applications and the Research Assessment Exercise (RAE). It is hoped that in the future the RAE, as well as grant proposals themselves, will reward and give credit for good collaboration.
- 2.8 An extension to this point concerns the fact that the pressure to publish regularly may inhibit academics from entering into collaborations with industry, for example if the collaborative research is unlikely to yield significant publishable data. Again, this barrier could be surmounted through adequate professional recognition of the value of business-university collaboration for academics.
- 2.9 Consideration must also be given to the means of evaluating the success of business-university collaboration, particularly if this is to be used as a factor in the assessment of research groups and researchers. The programmed deliverables and metrics used for assessment need to be qualitative as well as quantitative. In other words, simply counting the numbers of patents or licences issued as a result of collaboration, or the value of grants won, is a wholly inadequate measure of success.
- 2.10 Not surprisingly, lack of time is cited by academics and industrialists as a significant potential barrier to collaboration, even once a project of interest has been identified. In this case, high quality administrative and project management support could prove invaluable and the Government should give serious consideration to how this can best be achieved. There are already some services available to SMEs but it is doubtful that these are sufficient to resolve this issue.

- 2.11 Furthermore, there is a serious question as to whether it is appropriate for senior academics to be expected to manage and coordinate collaborations, possibly at the expense of the research itself. In addition to the fact that this responsibility imposes a heavy burden on the academic in terms of time, in many cases the academic will not have the suitable skills or experience to fulfil this position optimally. Again, this implies that there is a potential role for skilled managers, who are not necessarily academics, to support and oversee the university side of the collaboration.
- 2.12 A major complaint from industrial partners in business-university collaboration is the ‘unbusiness-like approach’ of many universities. It would appear that universities sometimes have difficulty in meeting the timeline agreed and can be extremely slow to process contracts etc. A further problem arises if an industrial collaborator wishes to interact with different departments within the university. Improvements in the university administrative and finance arrangements are called for to encourage and enhance the coordination of cross-departmental industrial collaborations.
- 2.13 Indeed, there seems to be a general dissatisfaction on the part of industrialists with the university administration and, in particular, the university industrial liaison departments. It is suggested that the liaison departments lack essential business skills and tend to be inexperienced. Some have been found to be inefficient, uncooperative and unreasonably demanding, such that an agreement readily arrived at by the academics and industrial partner has either taken several months to formalise, or additional costs and conditions have been added by the liaison department which have not been agreed by, and are unacceptable to, the industrial partner. This is clearly a cause for concern and has been responsible for potential collaborations failing to materialise, despite the industrialist and academic wishing to work together.
- 2.14 It should be noted that some universities have largely overcome these problems and there may be an opportunity for universities to share best practice in this area. A few universities have also created a directorate of research and commercial development or appointed a pro-vice chancellor with overall responsibility for research strategy, including industrial collaboration. This recognises the mounting importance of collaborative and commercial research activities in universities and is likely to result in a higher standard of professionalism in all university arrangements pertaining to collaboration.
- 2.15 From the university perspective, there is a desire for the industrial collaborator to explain their internal approval process. At least a proportion of companies already follow clear guidelines in their selection of university partners for collaboration. It would be helpful for the university if, where appropriate, these criteria were made available by the company in the interests of transparency.
- 2.16 A second problem encountered by universities concerns the ‘short-termism’ of their industrial partners. This can manifest itself in a lack of follow up once a project has been embarked upon, often due to staff turnover. In extreme cases, businesses have failed to implement or develop the products of the research due to the removal of key staff or a shift in objectives. It is vital that wherever possible both businesses and universities ensure that there is a single point of contact throughout the duration

of the collaboration. This encourages a sense of trust and facilitates the communication between the partners.

2.17 It is also equally important that both the industry and university partners are sufficiently flexible. University regulations and corporate priorities and procedure can have a restrictive influence on collaborations. The key individuals need to have the freedom to take the necessary risks and bold decisions that the collaboration may require. In this respect, it is essential to have appropriately-skilled individuals in charge of the collaboration, who are invested with the necessary level of authority. These individuals need not be drawn from the most senior positions in the collaborating company – indeed some academics report that it can be more useful for middle-level industrialists to oversee the partnership, on the grounds that they have more realistic expectations and a current understanding of the relevant issues.

Intellectual Property

2.18 IP is a highly contentious subject and has the potential to seriously impede business-university collaboration. Some academics believe that universities have been too modest in the past in their demands over patenting and licensing agreements and that industry regards universities as repositories of cheap knowledge and information. These individuals also opine that universities need to be given more resources, in terms of both financing and skilled personnel, for the prospecting of IP that can then be exploited by the university.

2.19 By contrast, others hold the view that the primary function of universities is education, rather than wealth creation (although the former should beget the latter) and that the focus on exploitation of IP by universities is inappropriate. It is also suggested that the university rules governing patent royalties unfairly disadvantage the academic inventors and benefit the universities disproportionately. There are some people who even propose that universities should be discouraged from acquiring IP Rights (IPR) altogether and that IP resulting from academic research should either remain in the public domain or be owned by the industrial sponsor, depending on the level of financing.

2.20 Many businesses are expressing disquiet about what they perceive to be the unreasonable attitude of some universities regarding IP. Formerly, it was relatively common in business-university collaborations for the company to largely fund the research and own the IP whilst the academics were free to publish their data. Increasingly, however, universities are looking to knowledge and technology transfer as a source of income and as a result are not prepared to relinquish their IP and licensing rights without what they adjudge to be equitable financial compensation.

2.21 Interestingly, some dispute that technology transfer is a viable revenue strand for universities, particularly in the short and medium term. The accuracy of this assertion needs to be evaluated and taken into consideration. Regardless of whether technology transfer is deemed to be a generator of income for universities, academics will still demand what they believe to be suitable recompense for their efforts. Resolution of the debate regarding IP as a source of income for universities is not, therefore, likely to overcome the clash of expectations on the part of business and universities over IPR.

2.22 Overall, neither industry nor business seems convinced that IP arrangements are satisfactory or well understood. There is a pressing need to develop model agreements for IP and licensing, for example using case studies, and to disseminate this information widely within both industry and academia. There may even be a case for a simple standardised approach to IPR, with the flexibility to adapt to exceptional circumstances. At the very least, the identification of best practice and the construction of a series of model contracts by a group of experts may go some way towards reconciling the disparate views of industry and academia on this topic and expediting negotiations in future collaborations.

2.23 A further possibility would be to employ professional, impartial facilitators in IPR negotiations, perhaps provided by the Department of Trade and Industry or the RDAs. It would be important not to introduce an extra layer of bureaucracy into the process; on the contrary, the aim is to accelerate the formalisation of collaborations.

3. The Supply of Skilled Graduates to Business

3.1 There is a fundamental problem concerning the stigmatisation of science and engineering as unattractive and materially unrewarding careers. The status of the industrial technical specialist in the UK is perceived as being lower than in countries such as Japan or Germany, deterring ambitious, high-quality graduates from aspiring to these positions. Furthermore, the poor career progression and salary prospects for those scientists and engineers who remain in academia provides another disincentive to those making career choices.

3.2 A first step towards rectifying this situation could be through increased recognition, including financial, of the importance of technical specialists in UK companies and of scientists and engineers in general. This would, of course, require a change of culture and attitude as much as an improved remuneration package. Increased mobility of researchers between academia and industry could also be beneficial in this respect, eliminating the need for scientists or engineers to make early choices that subsequently restrict the opportunities available to them.

3.3 Modernisation of university degree courses through the incorporation of subjects such as business and communication skills into the syllabus could broaden the appeal of science and engineering, as well as producing more rounded graduates. From the perspective of industry, it is highly desirable for students to be equipped with business skills. This is most commonly achieved through industrial placements, however there are other initiatives, such as the Scottish Enterprise/RSE Fellowships that enable Scottish PhD students to commercialise their inventions. These schemes not only produce more employable graduates and postgraduates but also render science and engineering careers more attractive.

3.4 Many businesses have responded to the uncertainties regarding the supply of technically-skilled graduates by taking a more active role in universities, sponsoring or contributing to the design of relevant undergraduate and postgraduate courses, offering work placements for students or even entering into major partnerships with particular universities.

- 3.5 Those companies who have developed strong ties with particular universities invariably find this to be a worthwhile investment. By influencing the course content, the company can ensure that students are equipped with skills that meet the requirements of the company. Furthermore, the positive presence of the company within the university, coupled with direct links made with students, enhances the company's ability to recruit high calibre graduates. This is especially true when the company connects up with a local higher education institute and then maintains contact with students who, for example, have undergone work placements there. The Teaching Companies Scheme has also achieved great success in this area.
- 3.6 There are additional ways that industry could contribute to propagating the supply of skilled science and engineering graduates. For example, they could take a more direct approach to articulating the benefits and opportunities available to science and engineering graduates. It is noticeable that even the largest employers of engineering graduates for technical positions do not have a noticeable presence at some major UK universities during the recruitment rounds.
- 3.7 Furthermore, businesses wishing to employ technical staff must consider improving the range and depth of training opportunities that they offer. It is commonly remarked that many capable science and engineering graduates and postgraduates embark on careers in the City rather than continuing in research. One reason for this, besides the salary differential, is the far superior training and personal and career development programmes universally provided by City firms.
- 3.8 Finally, it is crucial that the openings that are available for scientists and engineers, as well as the improvements that are currently taking place, are communicated to school children prior and during the time that they begin to make career choices. The Royal Academy of Engineering runs a highly successful group of engineering education initiatives, collectively known as *Best*, that aim to interest and develop engineering students, undergraduates and graduates between the ages of thirteen and thirty four. However, more funding and creative approaches need to be enlisted in order to redress the dwindling flow of technically-skilled graduates.

4. Financial Considerations in Business-University Collaborations

- 4.1 Financial considerations exert a powerful influence over business-university collaborations. However, there can be fundamentally mismatched expectations on both sides in business-university collaborations. In general, industry is inclined to believe that universities can do the research more cheaply than they say and universities think that industry has far more money than it admits.
- 4.2 Universities tend to believe that they have previously been short-changed and industry has often undervalued the IP and services in academia. Some academics purport that industry is not prepared to support the true cost of their work.
- 4.3 Industry, meanwhile, regards the increasing emphasis placed on the exploitation of IP by universities as a hindrance to business-university collaboration, especially in cases where industry is expected to fund the research whilst being denied any rights over

the IP. They believe that universities can be unreasonably demanding over the price of their research and fail to appreciate the true cost and risks associated with taking an innovative research concept for a product or service to market.

- 4.4 A second problem encountered by industry is the great variation in the financial systems between universities and even within an individual university depending, for example, on the financial status of a particular cost-centre. University financial arrangements must be rendered transparent and need to be simplified to accelerate the processing of collaborations. Industry has also expressed the view that it would be preferable if a higher proportion of the overhead funding was fed back to the point of delivery of the collaboration rather than being absorbed into an unidentifiable crevice of the university administration.
- 4.5 The proliferation of different Government schemes to encourage business-university collaboration needs to be addressed. The variation in regulations between schemes and the limited funding available for each restricts their utility – replacement of these initiatives by a single, adequately financed scheme with clear regulations should be considered. It is also worth exploring the possibility of providing a fast track funding stream for those partnerships that are seen to be delivering convincing product or technology enhancement.
- 4.6 Irrespective of the forms of scheme selected, provision needs to be made for collaborations with small, medium and large industry, all of which have different requirements. SMEs tend to have shorter timescales and smaller budgets for R&D and may be less familiar with IP related issues. In line with the Government’s vision of less research intensive universities playing a central role in technology and knowledge transfer, support must be given to SMEs wishing to connect up with appropriate universities and vice versa. RDAs could also play a role coordinating small businesses with overlapping research interests, in order to generate the critical mass needed for a university to be willing to engage in a collaboration. Funding in these areas, in conjunction with proper administrative and management support, could significantly reduce the reluctance of UK universities to enter into short term, smaller scale collaborations with SMEs. An awareness of the specific needs of medium-sized enterprises could also facilitate fruitful collaborations.
- 4.7 On the other hand, it is often assumed that large enterprises do not require special support for establishing and maintaining collaborations. There is, however, an argument for Government funds to be devoted to collaborations between universities and large industry, particularly in times of financial uncertainty and adversity. Collaborations involving large enterprise often produce ancillary opportunities for SMEs to join forces with the university and major partnerships between universities and key local players in industry can have extensive positive effects on the regional economy.
- 4.8 It may also be judicious to make funds available to bridge the gap in technology transfer that can arise when a promising technology developed by the university is not sufficiently mature to be readily utilised by industry. The Research Councils are generally unwilling to commit funds to ‘near-market’ research, yet without additional funding, this university research will not attract interest from industry. Funds for IP

auditors and marketing staff could also assist in connecting up the potential users and suppliers of a particular technology.

4.9 There is also an apparent need for more adventurous seed-corn funding to launch the formation of spin-out companies from universities. For the most part, universities have been successful in attracting Venture Capital investment for start-ups, but a modest level of additional support is necessary to initiate the process.

4.10 With regards to R&D tax credits, the consensus is that whilst their introduction is a positive innovation, there is limited evidence to date that they have made any impression. The expectation is that they will impact on future budgeting decisions, but it is considered premature to attempt to analyse their effect at this stage.

ANNEX 1

Examples of Successful Business-University Collaborations Identified by Fellows of The Royal Academy of Engineering

1. Industrial training of university students through placements in companies

Smiths Group Plc

Numerous others

2. Industry input into the design of university course content and industry sponsored undergraduate, postgraduate and foundation degrees

Rolls-Royce, Corus, ARM, CIMA, HSBC, Barclays and Waitrose –

Loughborough University

Jaguar Cars Ltd – Coventry University

3. Teaching Companies Scheme

Vosper Thornycroft – University College London

4. Continuing professional development courses run by university for industry

Ford – Loughborough University

Jaguar Cars Ltd – Coventry University

5. Secondments of academics to industry and vice-versa

The Royal Academy of Engineering Industrial Secondment Scheme

The Royal Academy of Engineering Visiting Professorships

6. Industry sponsored research projects, PhD students, postdoctoral researchers and research chairs

The Royal Academy of Engineering Research Chairs and Senior Research

Fellows co-sponsored by companies such as Advantica, BNFL, BP, Kodak,

Perkins, Schlumberger and ScottishPower

Aston Martin/Ford - Nottingham University

Smiths Group Plc – University of Nottingham, University of Bristol and Imperial College, London

Nortel International Academic partnership - Edinburgh University

Mobile VCE – Universities of Bristol, Edinburgh, Strathclyde, Southampton,

Surrey and King's College and Royal Holloway College, University of London

IBM – Edinburgh University

SUN – Edinburgh University

BAE SYSTEMS – Edinburgh University and Heriot Watt University

Naval industry through contact between the Ministry of Defence and University College London

7. Major partnerships between universities and large companies

Rolls-Royce University Technology Centres and University Technology Partnerships
BAE SYSTEMS University Partnerships
Land Rover – Warwick Manufacturing Group (Warwick University)
Ford College on the Loughborough University Campus
Ford Faculty in the Business School of Excellence (Loughborough University, supported by the London Development Agency)
JCB - Staffordshire University

8. Major joint ventures, including regional centres and institutes

European Process Industry Competitiveness Centre - University of Teeside and the major process industry companies on Teeside (works closely with Cogent, the sector skills agency for the chemical manufacturing sector).

The Regional Centre for Innovation in Design – Newcastle University

CAPCIS Ltd – UMIST (emerged from Corrosion and Protection Centre)

Centre for Advanced Structural Materials – University of Strathclyde (initially supported by the European Regional Development Fund)

9. Intermediate Institutes

Fraunhofer Institutes (Germany, e.g. Berlin)

ITIA-CNR (Italy)

GINTIC-IMT (Singapore)

10. Others

Incubation Centre at Loughborough University (funding from East Midlands Development Agency)

West Midlands ‘Contacts’ initiative (makes funding available to provide consultancy services to SMEs)

Staffordshire University and the Mercia Institute of Enterprise (educational initiatives and business support)

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