

## THE LAMBERT REVIEW QUESTIONS

### SUBMISSION FROM QINETIQ

#### Question 1: Identifying business-university collaboration best practice

**1a. Provide examples of best practice and excellence in business-university collaboration in the UK and abroad. Types of collaboration of interest include:**

- Industry's use of information contained in academic publications, and academia's use of industry patents and prototypes, and vice-versa.
- JVs between universities and business; e.g., personnel exchange, collaborative research, development projects.
- Informal contacts; e.g., meetings & conferences, science parks, business-university liaison, industry-sponsored university posts or studentships, work experience, business contributions to curriculum development, academic secondments in industry, provision of continuing professional development training by universities for business.
- Formal contracts; e.g., licensing, research contracts, consulting, spin-out companies, product testing, business support.

#### *Response*

Use of information in academic publications does not imply any collaboration (though it is often the best way to find out who to collaborate with). And, incidentally, most academics largely ignore the patent literature.

QinetiQ routinely uses academic groups to supply services in chemical synthesis of new materials, thereby plugging a capability gap locally, and also benefiting from good people in the universities concerned. More generally, the decline of the corporate lab can have two diametrically opposing consequences: it can reduce collaboration because business has fewer staff technically qualified to engage with universities; or it can increase collaboration by business using universities to replace their research laboratories.

Even experienced academic workers, though, tend to be remote from the needs of the commercial world and, in some areas, QinetiQ acts as a bridge. For example, QinetiQ's physics/device background is symbiotic with some academic groups – an example, perhaps, of best (or at least good) practice. But there is a perception that QinetiQ's extensive support has led to the EPSRC feeling that it need not provide funding in the field!

QinetiQ regards the patronage approach to collaboration with universities as bad practice because the universities retain exploitation rights. QinetiQ prefers JVs.

QinetiQ supports ICASE studentships, and has recently entered a collaborative agreement with a local (to QinetiQ Malvern) University. Sandwich courses are especially valuable for establishing relationships with particular universities. The students gain industrial work experience, the company may gain a recruit, and the university gains familiarity with the changing needs of industry.

## *Overview of business-university best practice*

Collaboration works best when both parties (industry researchers and university researchers) are each involved in a common project at the detailed scientific level, making equitable contributions to the research. Ideally this involves an initial joint proposal of research where both parties make significant inputs. Subsequently, the best *modus operandi* is when the 'main' researcher on a given project is either a postdoc or PhD student who is jointly supervised by a senior academic and an industrial researcher, with at least equal supervision from the industry side. In the case of PhD students this has been most productive when the researcher spends his/her first year to 18 months based at the university (to attend postgrad lectures and training), and the remaining time in industry – where the direction of the project can be better controlled. At postdoc level, having the researcher based locally can be a distinct advantage from the point of view of driving the project in the appropriate direction. Extended visits between university and industry at all levels can be fruitful if well planned in advance.

With ever-improving communications, a tightly integrated industry/academic research team has become feasible, with tele-conferencing, web access, and even web-based project meetings becoming straightforward and efficient. The advent of grid-based systems will serve to increase opportunities for integrated industry/academia collaborative teams.

### **1b. How did these relationships come about (e.g., through RDAs, Sector Skills Council)?**

#### *Response*

Almost always through initial common scientific interest in an existing project and casual discussion, e.g. at conferences or when giving invited talks. This then tends to be followed by some exchange of ideas, and maybe even limited collaboration, before considering a more formal arrangement through a joint research proposal.

No relationships have come from RDAs or the Skill Council. Very few have been brokered through national schemes etc. Relationships have been developed through: MoD/RC Joint Grants Scheme; personal relationships (e.g., *alma mater*); QinetiQ staff holding visiting/honorary academic positions; staff associations with RCs; EMR contract placement.

### **1c. What more could be done to facilitate successful partnerships?**

#### *Response*

Partnerships can be difficult, particularly for more market-oriented research. If more and better industry/academic partnerships are to be fostered then there has to be give-and-take to accommodate the different requirements of research of each party. Good-will helps but is not sufficient – there have to be procedures which tend to make a true partnership unavoidable. An agreed joint project with exchange of staff 'built in', and containing significant elements which have clear potential gains for both parties, is the best way to do this.

UK universities are poor at selling their wares (compare websites of leading UK universities with equivalent US universities). More information is needed about what universities have achieved, and what they are in the process of trying to achieve. Universities also need to be better at selling their science into industry, using terms industry can understand. US

universities advertise their achievements through press releases, which also describe why businesses should be interested in their achievements. UK universities need a greater awareness of commercial drivers.

There needs to be a mechanism for a two-way flow of information between academia and business which meets the needs of both sides for IPR protection and information confidentiality.

## **Question 2: Barriers to, and strengthening of, business-university partnerships**

### **2a. What are the main barriers to creating, or strengthening partnerships (e.g., management/organisational issues)?**

#### *Response*

Probably entrenched positions are the main barrier. Universities write papers and go to learned conferences whilst industry makes things and (hopefully) makes profit! The most successful university/industry partnerships happen when this dividing line becomes blurred – the leading Japanese and US electronics research labs are good examples of this.

IP is also a major barrier: universities are perceived to be increasingly determined to retain IPR, yet they often have insufficient, and ill-qualified staff, to negotiate on a commercial basis.

A broader view is that UK universities do not seem to be “UK business driven”. The focus is on position in league tables, RAE assessments, and academic papers. Another issue is that few university groups really have the culture to respond to requests on a timescale compatible with commercial targets. On the other hand, if universities were business driven, even in a UK context, scientific excellence would likely suffer, and “blue skies” research, which rightly belongs in universities, would diminish. Universities should be encouraged to do what they do best, and business likewise. The need is for a bridge.

### **2b. How can businesses & universities best organise themselves to benefit from each other’s resources?**

#### *Response*

Through joint projects and proposals, and networking for a common goal. Integration of resources, staff exchanges (where possible/feasible), and increasing use of the web/grid, are all crucial to organisation.

Where QinetiQ has no capability at all (e.g. in clinical medical sciences) we are now building specific new relationships between QinetiQ teams and hospital specialists. Instinctive recognition of complementary expertise is soon welcomed.

RDAs can play an important role, but they tend to support SMEs, while looking to larger companies for financial support. Also, EU rules on competitive state aid can be a handicap to companies establishing relationships with RDAs. Information is the key to universities and businesses benefiting from each other’s resources. What is urgently needed are searchable databases providing information on capabilities, interests, research areas, facilities etc across

all S&T. RCUK and/or UUK should be well placed to provide this information for universities, whilst DTI might provide it for companies, large and small. RCs could also be a route to accessing information on foreign universities.

Universities should adopt a more professional approach to:

- Knowledge transfer (see response to question 2e)
- IPR
- Knowledge management and dissemination
- Inter-university networking

**2c. Do present mechanisms for priority setting, decision making, and funding in the university sector help or hinder business-university collaboration?**

*Response*

University policy and decisions are primarily driven by excellence in both education and research. The industry view is often that these activities are largely irrelevant to their needs (except in general terms) and research is often too academic. Small shifts in priority setting and funding which both encourage excellence and increase the potential for spin-off and wealth creation, could significantly improve this situation. An evolutionary approach is more likely to be successful than radical changes in policy.

Priority setting might be easier, and more rational, if Government had a clear policy on science and innovation. National priorities could be identified through Foresight, and these could receive preferential funding. QinetiQ experience of opportunities provided by local universities to advise on priority setting is mixed: from real enthusiasm to take account of the business perspective, to paying “lip-service” to the commercial viewpoint.

From an industry perspective, there seems to be a very fragmented approach to establishing capabilities in UK universities. Individual UK universities are encouraged to compete with each other, rather than co-operate. It would be easier for outsiders to interact with concentrated centres of capability where, for example, major items of equipment were grouped together, supported by substantial teams of experts and students. At present, funding seems to be very *ad hoc*: one item of equipment is purchased, but without the necessary supporting infrastructure. It sometimes seems that facilities and equipment are replicated in different institutions just to demonstrate that each has the capability, while the necessary supporting teams and infrastructure are neglected. It needs to be recognised the important competition is with the rest of the world, not with ourselves, and if the UK wants to become, and remain competitive on the world stage, then there must be a single UK strategy, much greater unity, and more co-operation.

**2d. What changes might encourage collaboration?**

*Response*

Trust is key, based on mutually beneficial (technical and financial) partnerships. Also, when working with businesses, universities need to absorb the commercial ethos; e.g., honour milestones; deliver only what is asked for; manage projects professionally.

Universities must preserve a critical mass within research teams. Expertise can be built up in PhD students/post docs, who too often leave before contract completion. Furthermore, senior university staff (department heads, internationally-regarded researchers) too often take no active role in supporting research contracts (too busy attending conferences, writing research proposals etc). Overall, the transient nature of university teams is a major weakness. Probably more security of tenure, and less emphasis on short-term contracts, would help.

**2e. What are the barriers to technology transfer, and how can it be made more effective?**

*Response*

Technology Transfer is most effectively driven from the industry side, where good interfaces between the 'long-term, high-risk' research teams (which are ideally industry/academia partnerships), and the teams working on specific applications, should be established, with both formal and informal interactions. Somehow, both sides have to see that it is to their mutual benefit that technology transfer becomes effective to ensure further (or enhanced) funding for the more fundamental aspects of research, and to ensure competitiveness in new products and systems.

There is a funding gap for taking innovative ideas forward between initial demonstration of feasibility and development of prototype systems (a gap the US DARPA fills for military projects which are both high risk and high pay-off). Universities see technology transfer mainly as a means of cash generation for themselves, not in terms of benefiting industry or UK Ltd. As noted above, they are competing amongst themselves, rather than sharing technology and IP with other universities and companies. Also, university technology transfer offices tend to be small, be regarded as an administrative function, and cover a large range of technology areas; i.e., they are amateurish.

**2f. Are the present arrangements regarding Intellectual Property understood and appropriate?**

*Response*

QinetiQ view is that IPR is a major issue influencing business-university collaboration. As universities are encouraged to generate income through retained IP, through spin-out companies, and to compete amongst themselves, so industry sees them as becoming increasingly commercial, and therefore as potential competitors, not collaborators. This perception is similar to that of DERA held by many R&D companies during the 1990s. And it is not a uniquely UK problem: Fraunhofer (Sweden) and TNO (Netherlands) are examples of university/business hybrids.

### **Question 3: Attracting the technology graduates and skills required.**

#### **3a. Is the quality of graduate recruits satisfactory, and are there any skills or discipline gaps?**

##### *Response*

The balance is wrong: too many in humanities, social sciences, and biosciences; not enough in the hard sciences and engineering (see Sir Gareth Roberts' Review). Basic communication skills (especially writing) are generally poor and declining.

#### **3b. How do businesses, individually or collectively, communicate their needs for specific scientific or technical skills, and for the development of relevant courses in universities?**

##### *Response*

Large companies for which S&T is important often have "Directors of Academic Liaison", senior company representatives who work directly with selected universities, and with the RCs. Some universities provide opportunities for local businesses to discuss courses and curricula.

#### **3c. How could more attractive career paths for S&T graduates be developed?**

##### *Response*

This is addressed in Sir Gareth Roberts' Review. Job security and job challenge/interest are important non-salary factors. However, there is a need to encourage careers in S&T at an early stage of secondary education, before opportunities to pursue scientific subjects are lost. Companies should be supported to send their younger staff into schools to talk to students (but smaller companies shouldn't be expected to fund this type of activity themselves). The quality of life for those pursuing a career in S&T is generally regarded as better than for many other higher paid, but also highly-pressured jobs, and job satisfaction greater. This could be emphasized. But companies themselves fail to encourage children and students to embark upon scientific or engineering careers by providing greater financial rewards to those with business and/or management skills. Too often scientists and engineers are the poor relations, lacking financial incentive and a career path within their areas of expertise.

#### **3d. What plans do businesses have to attract the best talent in the future, and are the universities aware of them (and if not, how can they be made aware)?**

##### *Response*

Branding: making companies attractive to graduates. Also, offering prizes, offering/sponsoring lectures, and working with university careers offices. The opportunity to undertake further degrees – Masters and/or PhD – can also attract good recruits. However these, especially PhDs, require formal supervision within the company. There is also the risk that the project supporting the research being undertaken by the student may be prematurely curtailed.

Post-graduation debt will become an increasing burden, and is likely to be higher for science and engineering students if universities seek to recover full costs. Businesses could attract S&T graduates by offering to pay off some or all the debt.

University career officers could work more closely with companies, possibly through RDAs.

#### **4. Financial issues affecting relationships between businesses and universities**

##### **4a. Could the present financing arrangements be made more effective?**

*Response*

The many schemes offering studentships, fellowships etc by the UK RCs should be rationalised. There should be a “one-stop-shop” for sponsorships. Have a single RC “Portal” which provides all necessary information, would help.

##### **4b. Has the introduction of R&D tax credits influenced business demand for research and skills – and if so, how?**

*Response*

Too early to tell, but reportedly not working well in SMEs.

##### **4c. Are there other means to the same end?**

*Response*

That is for the review to determine! However, to cite an earlier Foresight study:

- Technology transfer within universities must become more professional and UK-oriented; e.g., set up subsidiary company.
- Emphasize creativity and sharing, not short-term financial gain and acquiring IP.
- Recognise technology transfer as a discipline supported by qualified professionals.
- Universities should be encouraged to exchange information, combine IP, and work closely with business to support new initiatives.
- Less emphasis on universities to deliver money, more on knowledge generation and knowledge sharing.
- Offer proper rewards for entrepreneurship.