



Submission by AIRTO to the Lambert Review of Business-University Collaboration

Introduction

AIRTO is a community of knowledge-transfer companies in the private sector. The members employ some 20,000 scientists and engineers with an annual turnover around £2 billion. This makes AIRTO one of the largest organisations in Europe dealing with knowledge-transfer between academia and business.

AIRTO is at the centre of business-university collaboration. Many senior executives in AIRTO are Visiting Professors in universities and are well-informed about business and university collaboration. Some AIRTO executives are engaged in the policy to encourage spin-out or licensing from academia which provides them with experience in the contribution of academia to the growth of innovation intensity in UK industry.

AIRTO views on the purpose of a university

The primary purpose of a university is education. Through this function the university makes a unique contribution to culture and business attitudes. At its best the university provides well-trained individuals who enter, and constantly revitalise, industry and commerce. This is the greatest and most important contribution of academia to innovation in business. Compared to this purpose – the production of well-educated graduates – business to university collaboration is secondary. However, the influence of business on universities (and their programmes) is vital but often not fulfilled by business leaders.

Academic research and its justification

The academic community receive in excess of £1.5 billion of taxpayer's money each year through allocation from Research Councils. In addition, infrastructure funding to support research is provided from the Funding Council and other public sources. This gifting of public funds has two justifications, which are:

- a unique means to extend the frontiers of knowledge (fundamental research)
- inputs to the teaching knowledge-store to ensure high quality and 'cutting edge' teaching content for undergraduates and post-graduates

Extending the frontiers of knowledge cannot be 'time-bounded'. There are examples of research undertaken many years ago but which is only drawn upon recently by industry eg. fundamental work leading to desktop ink jet printing.



It is necessary to question the quality of academic research and to seek to direct it into the most likely areas of relevance for societal good and wealth creation. The Quinquennial Review of the Research Councils supported this viewpoint.

Research Councils should interpret their role as critical purchasers of research taking account of industry views likely to influence positively the social fabric and wealth creation of the UK economy. To achieve this objective a better balance is needed in the structure of Research Councils undertaking the selection of research most appropriate to the needs of the UK economy, and a similar balance in the peer review process.

Failure to reflect business requirements may be illustrated from the results of a study undertaken recently through the supervision of the Institute of Grocery Distribution (IGD) with support from AIRTO. Among its conclusions this study found that UK government puts more money into higher education research than the top five members of the European community. The UK figure was 20% into Higher Education versus a range from 15% to 18% in other European countries. Also reported was the fact that government R & D expenditures are falling everywhere but the UK leads in this fall.

The distortion in research due to lack of business influence was best illustrated in this study when it found that UK food and drink manufacturing contributes twice the GDP of farming but enjoys only 12% of the agrifood R & D spend. Currently the Research Councils spend on agrifood and agricultural R & D in the year 2002 was £115 million. This compared in the same year to R & D in food from the Research Councils of only £17 million. This research shows clearly the lack of direction which may occur unconsciously through Research Council and peer review allocations influenced by academics but which fail to reflect industrial needs and potential value-added wealth creation (Porter).

The Research Assessment Exercise (RAE) places value on publication in so-called 'reputable journals'. This and citations are used as justification for research and appointments in the academic community. This is in danger of being an incestuous process. Readership of learned journals is tested rarely but when undertaken often shows a low readership with a bias to the academic community rather than business. Reviewers selecting research projects to be supported by Research Councils are generally academics often employed by learned journals. Citations may be academics citing other academics. This all suggests the use of inappropriate metrics to evaluate academic research with failure to reflect the needs and views of business.

Professor Michael E Porter's work on UK competitiveness states clearly that UK business schools and universities compare well with their counterparts in other competitive countries. At the same time Porter draws attention to the low productivity per capita in the UK. This suggests either that higher education is irrelevant to business or that it lacks connectivity with wealth creating business and commerce. Evidence of this gap between the UK academic community and business leadership has been illustrated by the CIM study published through The Times Small Business Network reporting that business has little awareness of academic research in such practical spheres as marketing.

The above observations should not be interpreted as negative in relation to the UK academic community. The intention is to demonstrate the lack of connectivity between the UK academic community and the UK business community. It suggests the need for a vigorous intermediate sector concerned with the translation of knowledge from the academic community to business and vice-versa but it must be acknowledged this reciprocity is difficult to achieve.

The output from the academic community will be 'raw research'. This will not translate readily into industrial practice except in a minority of sectors that are science-based, such as pharmaceuticals. In all other sectors there will be need to define industrial problems and then re-define those problems as challenges for intellectual solution generated by the academic community. Synergising these two communities is central to the stimulation of wealth creation in the UK. This leads to discussion of how an intermediate sector may be stimulated to play a leading role in solution of this problem.

Stimulation of the intermediate sector through fiscal policy

To enhance university and business collaboration will mean focusing on the task to stimulate the intermediate (knowledge-transfer) sector so that academic researchers may continue to do what they are best at – fundamental research; while at the same time industry continues what it is best at – wealth creation. The need is for the two to intermingle. By stimulating the intermediate sector, innovation intensity will be increased which leads to wealth creation which in turn leads to a higher tax yield for the UK economy which provides the means to stimulate further fundamental research. Government involvement with universities distorts the market place, a 'level playing field' is needed if real infrastructure for knowledge-trading is to prosper.

The intermediate sector consists of companies with different constitutions. Some are non-profit distributing, some share profits with employees and others are profit distributing to shareholders. Fiscal policy should not be concerned primarily with these different categories. The critical issue is nurturing downstream leverage. The downstream leverage multiplier from intermediate companies to manufacturing industry is anything from 10 to 50 times the investment made in the intermediate company activity (evidence from TWI). Thus if university to business collaboration is to be optimised, it will be achieved only by stimulating a vigorous intermediate knowledge-transfer sector.

Fiscal policy (tax relief) can be a powerful motivating tool in this context. Other infrastructural mechanisms can be also valuable, such as Faraday Partnerships. This type of initiative will succeed only if it is managed by an organisation which understands industry problem solving – that will not normally be an academic institution. Infrastructures such as Faraday Partnerships must be aligned with a mission to develop specific sectors likely to generate wealth in the UK economy. Present processes of selection are and subject to questionable peer review. We propose a change in the process and policy to develop these valuable partnerships. There is a tendency to use mechanisms such as Faraday Partnerships and RDAs to increase investment in the academic community (supply-side) instead of increasing investment in the intermediate knowledge-transfer community and the demand-side. In the long term that is not beneficial either to the academic community or to the wealth creation processes of UK industry.

What follows in this paper are answers to the specific questions posed at the outset of the Lambert review of business/university collaboration.

1.1

What is industry's use of the information contained in academic publications and academia's use of industry patents and prototypes or vice versa?

The use of academic publications by industry is very limited. This is evidenced by the CIM report and citations which, in majority, reflect academia citing academia. Evidence of this gap is that provided by Porter. If the academic community is of high quality yet the UK lacks competitive productivity, it means either that academic research is irrelevant or lacks connectivity with industry application. There is little evidence of academia's use of industry patents and prototypes in determining research strategy. A bridge is needed between academic fundamental research and application in industry. Most countries recognise this need – USA, Germany, Finland etc. Academic research will reflect guidelines provided by the Research Councils. In turn, the Research Councils are dominated by the same academic community. Although most Research Councils will have user communities, these communities have relatively little influence on the topics chosen for research. The use by industry of universities patents or prototypes is limited. This may be due to the complexity of the knowledge-transfer process or simply that the state of industry knowledge is ahead of that in UK academia. Industry uses patents as a strategic tool, academia tends to use patents for stand-alone developments which will have most appeal to venture capitalists or other investors.

1.2

Are there effective joint ventures between universities and business, for example, personnel exchange or collaborative research and development projects?

Where an industry is science-based (eg. pharmaceuticals) there will be joint ventures between universities and business. However, where industry is not science-based (the majority of manufacturing industry) little collaboration occurs. Personnel exchange between academia and university is rare except at the lower level through programmes such as TCS. The exchange at a higher level (research director in industry or chair-holder in academia) is rare. Joint ventures between business and industry in collaborative research, is not, in general, of significance in the economy. Initiatives such as the LINK Programme attempt to stimulate such collaboration. However, these initiatives are often led by proposals from academia which industry does not find appropriate to their timetable. The financial incentive to industry is limited. The process of project approval is often too slow to achieve relevance. Government policy tends also to drive universities to seek to benefit financially from collaborative research and development projects (third leg). Where there is a match in knowledge and need between the industry sector and the university department, this may be successful because the private sector company will usually be able to buy information cheaper through a university than through its own resources. The output from university research is the extension of knowledge at a fundamental level. For application in industry a process of translation is needed. The infrastructure in the UK is lacking for this purpose and has been for the last hundred years. Faraday Partnerships provide an effective framework for interaction between academia and business in a fresh context and should be encouraged.

1.3

Are there informal contacts, for example, meetings and conferences, use of science parks, business-university liaison, industry sponsored university post or studentships, work experience for students, business contributions to curriculum development, academic secondments in industry and provision of continuing professional development training by universities for business?

There are informal contacts between industry and academia. This may take the form of Visiting Professorships or participation in conferences, a good example of which are those presented by Cranfield University. University science parks have been successful in attracting clients and producing income to the university. One of the best examples is the park owned by UniS. However, in most cases the link between research in the university and application by companies on the science parks is low. Universities often seek connections with the business community to guide them.

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Business is usually so short of resource it is difficult for the best persons to be allocated to academic liaison. Conferences frequently attract academics talking to academics. It is difficult to get business people to attend. This is a problem of time pressure and the level at which many academics present themselves to impress other academics with the complexity and advanced nature of their work, rather than advertising the simplicity of solutions sought by business. Universities contribute to continuing professional development but have limited resources available to allocate to such activity. The influence of academia on industry through this mechanism is limited in the national context.

1.4

Are there formal contracts, for example, the use of licensing, research contracts, consulting projects, establishment of spin-out companies, product testing or business support?

The emphasis by government on spin-out companies from universities has not yet been successful in producing leading enterprises or change in the manufacturing and service environment. The spin-out concept, the cost of which is usually born primarily by the university, has been financially beneficial to individual senior academic staff. Where the spin-out has led to a trade purchase or public offering it is likely that individuals in academia will have benefited significantly in their financial rewards. In general academic personnel are not well suited to leading business enterprises. Evidence from the Cambridge Entrepreneurial Centre (CEC) has suggested that the model in the UK is incorrect in terms of spin-out initiatives. CEC argues that the academic community should seek partnership with organisations able to create and develop new enterprises based on the models used in MIT. The use of licensing by universities is likely to be a more efficient means of implementing knowledge. Unfortunately many universities lack the legal and commercial understanding of the licensing process to optimise this arrangement and to activate it rapidly. In general, universities do not have a good reputation for contract research or consultancy. They are frequently said to be poor on delivery and time-keeping and at staying focused on the priorities of business. This is hardly surprising as it is not the primary function of a university to conduct external contract research or consultancy.

2.1

What are the main barriers to strengthening relationships with universities, are they, management and organisational issues; mechanisms for priority setting, decision-making and funding in the university sector? What changes might encourage collaboration?

There is a fundamental misunderstanding in government concerning the relationship between universities and business.

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The error is that government appears to believe that universities produce a continuous flow of knowledge which is capable of being converted into value-added activity by business. That is not the way that transfer of fundamental research in a university operates. Businesses seek new products, new services or solutions to problems. These are critically time-bounded. By contrast, university research is not time-bounded. It is not solutions orientated. The purpose of university research is to 'think the unthinkable'. It is the unique resource to extend the frontiers of knowledge. That does not mean that academic research should ignore areas defined by industry. The greatest contribution which business can make to academic research is to define clearly the probable future areas of interest which they consider relevant to their organisation. The MIT 'hit-list' is a good example. However, this will not solve the university to business relationship. Academic research produces 'raw' results. The first demand on this material should be to integrate it with the teaching activities of the university. This will contribute to business by producing graduates that are inducted to the latest knowledge in a subject area. Their employment will therefore stimulate that business activity. This is a vital contribution to innovations which can be made only by the university community.

For 'raw' academic research to be applied in industry requires a particular skill of diagnosis and understanding of the fundamental knowledge emerging from academic sources. Many countries recognise this function and accept it requires stimulation either by tax relief or by financial contract support. The UK has an infrastructure of intermediate companies engaged in this process but the agencies of government have failed to recognise the need to utilise and support such infrastructure. Thus encouraging universities to enter into partnerships with knowledge-transfer organisations and motivating those organisations to change the behaviour of UK manufacturing and service industry would provide solution to the problem of knowledge transfer that has evaded the UK economy for the past hundred years.

2.2

What are the barriers to technology transfer and how can it be made more effective?

Technology transfer occurs in many different forms. Much technology transfer in manufacturing industry is through the supply chain. Another source of technology transfer is where concepts cross sectoral boundaries. Yet another source will arise from innovative thinking by individuals in companies. The problem with this source is that the company is usually ill-equipped to encourage such innovative thinking in terms of investment and disruption to existing patterns of production. Finally, technology transfer will arise from the academic community of a Member State but more importantly from the academic global community. Thus it must be noted there are many sources of technology for transfer.

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Technology transfer between academia and UK manufacturing industry will be stimulated by two means. The first is to make simple the licensing arrangements between universities and a value-adding company. This process of licensing should have as high a priority as spin-out companies. The second element needed is a publicly funded scheme which encourages partnership between an academic centre, a knowledge-transfer business and a recipient company. Technology transfer is not a one-to-one process. It requires diagnostic skills to define the need in a company coupled with linkage to more than one academic centre. Thus the need is more complex than can be satisfied by the stimulation of a single university. There is urgent need for government to study in more detail the complex nature of technology transfer and the incentives required to motivate all partners to collaborate in this process. Other barriers include: differences in terminology and language, differences in the perceived importance of technology transfer, shortages of 'soft' and commercial skills, attitudes to and risk in management.

2.1

Are the present arrangements understood and appropriate to deal with intellectual property?

In general, IPR issues are not well managed by the academic community – there are notable exceptions. Academic institutions need to clarify the relationship between their employees (particularly senior academics) and the ownership of IPR. IPR arising in academia should be owned by a university irrespective of the origin of such intellectual property. Thereafter there are two issues to consider. The first is the protection of the IPR through processes such as patenting. The second route is to recognise that patenting is too expensive and too slow by comparison to taking the idea rapidly to market. This latter route may produce more benefit to a university. However, moving rapidly to market requires sophisticated legal understanding of contracting and the protection of ideas in the process of taking to market. This will require partnership.

In general the exploitation of IPR by a university via its senior staff and the launch of a spin-out business, produces more benefit to the individual than it does the academic centre. There is little evidence that IPR through spin-outs has made a significant contribution to the UK economy. The management of IPR in universities would benefit by contracting out the process of IPR management to organisations dealing regularly with such issues. This is not the case at present. Most universities retain internal legal advisors or make use of local legal houses which often lack sufficient technical background wide experience in IPR management and exploitation.

3.1

Is the quality of graduate recruits satisfactory? Are there any obvious gaps in terms of skills and disciplines?

Industry seeks from graduates a community of persons appropriately motivated and with a trained mind. In some cases industry will also seek vocational skills particularly in engineering and the sciences. Universities vary widely in their record of post-graduate employment uptake. There is a cultural problem rather than a specific skills problems related to the suitability of graduates for employment in industry. Two cultural issues in particular give rise to problems. The first is a disinclination by graduates to find excitement from employment in manufacturing industry. The second is the concept that to be a graduate means to enter an industrial hierarchy at a relative senior level. Both these cultural issues need to be addressed by the academic community which is failing in the cultural attributes it should be providing to graduates.

3.2

How do businesses communicate specific needs for relevant courses in universities?

Apart from some science-based companies, this is a failing of industry. It is a catch 22 issue. If industry knew what it wanted and had the time to articulate this need, the problem would be solved. That is not the case. The result is that leadership in the academic community must engage the manufacturing world to better define its needs to enable universities to equip graduates with appropriate attributes. Partnership between universities and intermediate companies would be beneficial in this respect but collaboration must be championed by government. Other means of communication include advisory panels but these are problems in conveying composite industry needs to the discipline based structure of university schools.

3.3

How could more attractive career paths for science and technology graduates and post-graduates be developed?

The simple answer is: enhanced status and enhanced financial rewards. This requires a cultural and economic revolution in manufacturing companies. Other countries have solved this problem (noticeably Germany) and are worthy of imitation. The solution will take many years and must be embedded in the whole educational experience. Industry should discourage some 'role model' people in universities taking pride in 'not being technical'.

3.4

What plans does business have to attract the best talent in the future? Are universities aware of them?

This is another catch 22 issue. There is much talk (in government) of the knowledge economy. Management in only a few companies have any real understanding of what this means. Disruptive technology has received a severe set back through the dot.com failure. Alternative leadership and connectivity are required. It could be provided by a combination of top management from progressive companies, intermediate companies familiar with the management of change, the Research Councils and Vice Chancellors. Government (the DTI and HM Treasury) need to take up a champion role and establish the incentives and metrics to bring about such change.

4.1

Are there ways in which the present financing arrangements could be made more effective?

The issue must focus on the demand side for technology transfer rather than the supply side. Evidence has been supplied by AIRTO to HM Treasury and the DTI to demonstrate the benefits of giving tax relief to those companies engaged in technology transfer. Stimulation to the demand side for knowledge transfer combined with appropriate tax relief and emphasis on optimising the licensing arrangements by academic centres would enhance the situation significantly.

4.2

Has the introduction of R & D tax credits influenced business demand for research and skills, and if so, how? Are there other means to the same end?

Tax credits will enhance slowly R & D but the process needs to be developed as described in the AIRTO paper submitted to HM Treasury (a copy of which is attached). Another mechanism which would enhance R & D and knowledge-transfer would be to nurture and develop the Faraday Partnership concept. At present this concept is too low on the agenda of government and the Research Councils. Progress is being made but requires increased leadership and financing of the framework. Faraday Partnerships should be selected independent of government and Research Councils and operate in topic areas critical to the UK economy and the growth of wealth creation. The AIRTO network should be used as a third party contactor to develop Faraday Partnerships, as new technology transfer organisations, as was the original intention.