

LAMBERT REVIEW OF BUSINESS-UNIVERSITY COLLABORATION

RESPONSE FROM THE UNIVERSITY OF STRATHCLYDE

The topic of Business-University collaboration has stimulated discussion, debate and argument for the last 20 years – and probably for much longer. A major conference in Scotland in 1983 introduced the concept of "Technology Transfer" for the first time and that led to a number of Scottish Universities creating technology transfer offices – Strathclyde University formed its Research and Development Services Office in 1984. A succession of reviews, reports (e.g. Commercialisation Enquiry Report (176 pages), Scottish Enterprise and Royal Society of Edinburgh, 1996), seminars and conferences have examined variations on that theme ever since.

In Scotland, there has been a constructive ongoing dialogue between first the Scottish Development Agency and now Scottish Enterprise and the University sector to help develop relationships between industry and the academic community. One result was that much practical help was given to help academic staff wishing to spin-out their own companies (36 to date from Strathclyde University), and now with SE's "Proof of Concept" funding scheme, the earlier steps towards company formation are being supported. SE is forming 3 Intermediary Technology Institutes which will identify high technology market sectors and, through the Universities develop the technologies which companies in Scotland will require if they are to trade competitively in these markets.

And within the University of Strathclyde itself there is a constant, ongoing dialogue about its own relationships with companies, and the ever-changing culture within the University which evolves to respond to the opportunities which industry, inter alia, brings. The University regularly speaks to universities elsewhere in the world about their experiences – the Americans, Israelis, Japanese, etc. – and knowledge and information on relevant practice are exchanged. Strathclyde receives a constant flow of international visitors wishing to compare notes with it.

It is a topic on which the Universities are well-informed. And in Strathclyde's experience it is a topic which is ill-served unless care is taken to avoid both generalisations about

universities and companies alike, and oversimplifications of what might constitute idealised working relationships between the two.

The following paragraphs serve to illustrate this point..

Strathclyde University has a substantial research base (research income c.£22m pa.) but no medical school.

Its sources of research income form a broadly-based portfolio : industry 14.1%, Research Councils 34.9%, Government contracts 16.5%, charities 7.4%, EU 16.3%, TCS 5.4%, other 5.4%. Industry participates in approximately 50% of all research carried out at Strathclyde. Its most favoured forms of collaboration with industry are through contract research, collaborative research, and licences for the intellectual property resulting from research.

Since 1984, gross royalty income has been £36m. The large majority of our licences have been to small companies, but the large majority of royalty income has been from multi-national companies.

Strathclyde provides training and consultancy services, but its preference is to provide training and consultancy associated with its research base – to transfer new knowledge and skills, ideally at a premium price.

Strathclyde recognises that the major constraint to technology transfer is that the results of research are typically 5 to 10 years from market – which represents a major challenge to any company wishing to invest in new science or technology from this source. However, some areas of fundamental research can produce results which are relatively close to market, such as Photonics, and Strathclyde will form Institutes structured as research-development-commercialisation continua in order to attract both public and private sector finance, and to engage with industry and commerce through fundamental research through to new company formation (spin-outs) and the development of existing companies.

While Strathclyde has had considerable success in these fields it would be a mistake to generalise by citing Strathclyde's aspirations and strategies as best practice models for all others to adopt.

Other universities will have quite different research sponsorship portfolios with emphases ranging from fundamental, to strategic, and to applied research. Some will do little research but will major on providing training and consultancy services which may be more comparable to those available from private sector training and consultancy companies. Some will specialise on working with local companies, others will wish to operate internationally. All will be making important contributions in their chosen roles and markets.

Companies too vary widely in their requirements. Some may wish to collaborate with universities at a research level and may partner them using UK and EU funding schemes. Some are skilful at identifying intellectual property of value to them. Others will use universities to undertake significant consultancy work, while others want problems solved quickly. In some industry sectors, it is common for companies to retain individual academics on an annual basis as advisers. A few will invest in spin-out companies, and joint venture companies. The relationships are many and varied.

There are many relevant practices which work well when one group of universities with certain common characteristics seek to work with a subset of industry having relevant interests. There is no single "best practice". Many of the most successful relationships are distinctly one-off.

It is our experience that while traditional market research and marketing will pay dividends to a University, many of the relationships between academic staff and their industrial counterparts are of an exceptional or serendipitous nature which are difficult to arrange through "good practice" but are often most valuable when they occur. Such relationships are primarily driven, of course, by the personal interest and motivation of the academic rather than the wish of his/her employer, or even the Government.

And just because an academic has a worthwhile relationship such as this it does not follow that others will wish to follow suit, or for the said academic to form additional, similar relationships – especially if in doing so, the time available for what the academic considers to be a more important pursuit, would be constrained.

Another unhelpful generalisation is to assume that HEFCE's "Reachout" scheme, and English Business Link offices extend into Scotland. Scotland's Proof of Concept Scheme, and SHEFC's Knowledge Transfer Grant have different emphases, designed to suit local needs.

A further unhelpful generalisation, or simplism, is that knowledge transfer, licensing, and relationships with industry generally, follow a simple linear model. Linear models are deceptively easy to describe and with which to plan, but unfortunately rarely bear any relationship to practice.

For example, the linear model for the IPR licensing process will show research leading directly to commercialisation. But the licensing of IPR into a company of means will normally result initially in a substantial investment in further research at the licensor university by the licensee. In fact a good research programme will evidence all manner of feedback loops and diversions, with just a small minority yielding commercial outcomes.

Another example: the Proof of Concept Scheme introduced by SE very usefully provides funding for projects which are showing commercial promise but are no longer eligible for conventional research funding. SE's linear argument is that such funding will result in new companies being formed promptly on completion of the P of C funding. In reality, both technology and the market can intervene to impose other often highly indirect routes towards commercialisation. Also, of course, the academic staff concerned may change their minds as work proceeds.

In response to the Questions for Consultation posed by the Lambert Review

Q 1

- The University's "Commercialisation" website receives 120 visitors per day of which 62% are from .com addresses.

The University's most famous transfer of technology was the assignment of its Atracurium (muscle relaxant) patent to Burroughs Wellcome and the Wellcome Foundation (now GSK); this has earned over £26m for the University.

At the other end of the spectrum, three licences to (originally) SME companies have for years been producing income of:

Artificial elbow joints	£45k p.a.
Goniometers	£15k p.a.
Monoclonal antibodies/toxin detection	£15k p.a.

and these modest business deals have been of importance both to the companies and to the academics concerned.

- A joint venture start-up company created by Strathclyde and Qinetiq plc (The Crystal Consortium Ltd.) is trading profitably, but in the present economic climate cannot raise private sector capital to finance growth.

The Institute of Photonics concentrates on applied research and is a joint venture between the University of Strathclyde, Scottish Enterprise, and a number of companies.

The Compound Semiconductor Technology facility was formed by Strathclyde University, Glasgow University and Scottish Enterprise as a limited liability company to provide the high cost infrastructure to support the Universities' research into the growth of optical processing materials, and the commercialisation of such technologies. The facility subsequently obtained a \$5m private sector VC investment, and 3 of its spin-out companies have raised c.\$40m of investment.

- Strathclyde is a founder member and part-owner of the West of Scotland Science Park which has high levels of occupation by high technology companies – most of which were not University spin-outs as such.

Strathclyde also formed a company incubator on campus (Strathclyde University Incubator Ltd.). This was formed as a company limited by shares and was financed by a Venture Capital Company, a Bank, Scottish Enterprise, and the University. It houses c.25 to 30 companies at any one time, has been operating for 15 years and

regularly produces a profit. 70% of the companies in the Incubator are sourced from outside the University.

- The University has been licensing its ipr for over 20 years. It has earned over £36m of royalties (gross), and last year earned £2.7m (gross). It has a portfolio of 76 patents and is signing licences with companies at the rate of c. 8 per annum.

New research contracts with industry over the last 2 years have averaged £3.6m p.a. (i.e. 14.1% of the total research income).

A significant research contract with industry is exemplified by the long term funding by Rolls Royce plc of a University Technology Centre (UTC) through which Rolls Royce and the University maintain close contact and a high degree of collaboration.

The purpose of the UTC is to allow the Centre for Electrical Power Engineering at the University of Strathclyde to undertake long-term research programmes under the direction of Rolls Royce personnel in order to meet Rolls-Royce's future market requirements. The UTC was established in 1996 and is ongoing and has a highly influential steering committee drawn from several of Rolls Royce's research and engineering divisions and from the senior academic staff of CEPE.

The University has worked effectively with its local government agency, Scottish Enterprise Glasgow (SEG). SEG has invested in research and commercialisation institutes, supports the formation and growth of spin-out companies through grants, advice, and access to mentors and experts, has supported linkages with industry through part-funding commercialisation managers who work with relevant academic teams, and by actively involving itself with the running of the Science Park and the University's company incubator.

Q 2)

- The University has had to constrain its resources while addressing tasks which increase in number and complexity year-on-year. The most effective way of increasing the mutual benefits which can be obtained from business/university

relationships is the simplest – spend more time in sustained dialogue with industry and its representatives. The time available for this is in short supply.

Where the University has been able to make the investment and provides this time in a focused way, there has been a useful dividend. There are two examples:

- i) The Strathclyde Institute for Drug Research represents six academic departments involved in drug discovery, development, formulation, delivery and synthesis, and through a director markets that capability to industry to obtain research and development contracts at a full market price. It is successful.
- ii) PharmaLinks is the trading name given to a joint Strathclyde University/Glasgow University initiative to market their combined biomedical and bioscience research capabilities to industry. The Universities have invested in the provision of a joint marketing team which travels internationally to meet companies and to negotiate contracts. This is a young initiative already producing major contracts.

The University does not address its management of "external relationships" with a view to business development in the broadest sense, in an integrated manner. This is the norm in most universities, but is due for change. It would be fair to say that the management of external relationships therefore has a lower priority than the management of internal academic activities. This is not surprising since the latter is the core business of universities which are funded accordingly. If it is to be necessary to increase the priority of "external relationships" as an activity, then the level of priority needs to be identified, management structures modified, and funding adjusted.

Anything else is "playing at the margin". Without an increased resource, there is a limit to the extent that universities can "deliver" their academic staff members to provide reliable services to industry – which fall out with what academics will regard as their core academic tasks.

- The main barrier to technology transfer is the inescapable fact that most research results are several years distant from market and this gap represents too great an investment risk for most companies.

There are some important exceptions. The large pharmaceutical companies routinely trawl the universities for early stage drug opportunities – they are accustomed to a 15/16 year research-to-market gap.

Some technologies, such as photonics or bio-engineering, can have research results which are close to market on a regular basis, and relationships with companies in terms of technology transfer are consequently easier.

Many small to medium sized companies are not at all familiar with the process of licensing. In contrast, all research-based universities have become very experienced in processing licence deals – often handling them every week of the year. It is Strathclyde's experience that some inexperienced companies heartily dislike dealing with an experienced university – even if the university is, as usual, aiming for a fair and normal outcome. The complexity of a standard licence agreement and the manner of conducting a negotiation can be off-putting to the inexperienced. And some have been known to complain loudly and publicly about "their treatment".

From the University's point of view, a very practical constraint has always been a relative lack of market research and marketing staff. All technology transfer deals should be informed by market data.

- The University of Strathclyde believes the present arrangements for intellectual property rights operate well. The vast bulk of the University's IP rights results from research grants and sponsored research and there has not been a single occurrence in 20 years of a potential sponsor refusing to sign a research grant or contract because the University and the sponsor could not reach agreement over the ownership of foreground ipr, the rights to use foreground ipr, the ownership of background ipr, and the rights to use background ipr.

The present arrangements are well understood by the research-based universities but it is acknowledged that some universities which have small research portfolios are less experienced in handling and dealing with intellectual property.

It is noted that an increasing number of countries which in the past had laws which gave ipr ownership to the academic inventor, have changed or are changing their laws to align themselves with the position to be found in the UK. Within the UK, Cambridge University has altered its practice with regard to ipr created by its employees to conform with all other universities in the UK.

That said, it should be recognised that there are significant numbers of companies, especially SMEs, which are unaware of how the law determines the ownership of inventions and copyright.

There is a great deal of unhelpful mythology about ipr; at the end of the day it is nothing more than a collection of assets whose initial ownership is determined by law, and whose use is determined by a business transaction. As with all business transactions, some are conducted well, others poorly. The latter does not point to a fundamental problem, merely a lack of experience, or training, or of business sense, or some combination of them.

Q 3

- The four questions posed under Question 3 clearly are being put to business, but the University of Strathclyde wishes to set out its approach to working with companies to not only maintain the quality and relevance of its education provided to students, but to attract them to a university education in the first place. The following response is based on the particular activities of our electrical engineers.

The number of school leavers with qualifications relevant to science and engineering has been in decline for 10 years. Indeed, it is noticeable that in school curricula, while reference is made to science, technology, physics, mathematics, the word "engineering" is rarely, if ever, mentioned.

The IEE is experiencing a decline in new members. It has taken a close interest in the undergraduate programmes in university EEE departments, and is working with its membership to promote engineering, as a profession, in schools. But overall it is finding it difficult to reverse the trend.

The EEE Department at Strathclyde has similarly experienced a shortage in the supply of students, and it has elected to address the problem by offering students a well-rounded and meaningful education package. It has introduced an Engineering Scholarship programme in conjunction with 8 blue-chip industrial sponsors willing to take a long-term view.

The scholarship package provides each student with £1000 p.a. throughout their course together with a series of summer placements in industry. The students feel valued, receive financial support, and gain highly relevant education and experience. The companies can influence the educational package, and take a long look at the students. They are also allowed to promote themselves within the University.

The EEE Department at Strathclyde continues an ongoing dialogue with industry through its Industrial Liaison Committee and its Industry Advisory Panel, and this informs the educational programmes available to students.

An important point to make is that the University is able to extract far more value from such discussions if the companies concerned are willing to involve themselves on an ongoing basis. The benefits such companies obtain are only realised in the longer term, and in any event it takes time for a university and a company to fully understand the fundamental differences in each others business – while exploring what is needed to produce and to employ high quality and relevant graduates. By the same token, the University finds it difficult to use constructively those comments on educational standards voiced by some companies which seemingly have little desire to engage properly with what is a complex challenge for society as a whole.

Beyond just providing a high quality engineering degree, the EEE Department at Strathclyde recognises that there is a need to provide graduates with Continuing Professional Development education and training by offering portfolios of short

courses for industry employees. These courses are closely coupled to the Department's research portfolio and are designed with inputs from its formal interfaces with industry, as described above.

Q 4

- In Scotland, finance available from the Knowledge Transfer Grant (SHEFC) has been helpful in enabling universities to strengthen their linkages with business. At Strathclyde the early monies from this source have been used to build up the market research, marketing, and website development to support knowledge transfer activities, and to begin the building of business development teams within the Faculties. These teams work very closely with Faculty research group to increase industry sponsorship of, and collaboration in the University's research base

SHEFC is looking to introduce metrics with which to measure performance in commercialisation and outreach activities and so to inform future funding decisions. One can only support the principle of measuring performance, and yet there is concern lest the measurement process constrains all the universities to behave in a similar manner in order to maximise grant income. One of the strengths of the University sector in Scotland is that each university has developed its own house style and a set of priorities, and operates with industry in its own chosen manner. Bearing in mind that industry and business is equally varied in its behaviour and needs, this diversity is attractive. Each can learn from the others.

There is a danger that too much measurement, linked to the release of grant funding, will destroy diversity, and policy will be overly influenced by those who draw up the metrication forms.

There is sufficient pressure on universities to earn income (by serving industry and commerce) to safely allow universities leeway to use relatively unfettered finance to optimise their performances in their selected markets.

- The introduction of R and D tax credits may have influenced business demand for research and skills, but there is little evidence available to us to allow us to say that this had happened.