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Higher education and business: beyond mutual incomprehension.

It's a wonderful title for the discussion planned here for today. And it seems to me logical to start off by looking at the last two words in our headline: mutual incomprehension.

There's plenty of scope for total bewilderment in the interface between the campus and the corporate office.

Academics and businesspeople talk a different language, work on different time-scales, get out of bed in the morning for entirely different reasons. Academics, almost by definition, choose a way of life that is much more likely to bring them intellectual than economic rewards: businesspeople have to be focussed on the bottom line. Whereas a business boss is accountable to shareholders, the vice-chancellor of a university has to take into account a much wider of often disparate interests, including those of their fellow academics, their funders, their political masters - not to mention their revolting students.

If a business boss wants to get something done, he calls a meeting and assigns responsibility. If a Dean wants to get something done, the chances are that someone, somewhere, will set up a committee.

Small wonder, then, that mutual incomprehension can sometimes be the default option when the two different groups come together - especially if they want to swap their knowledge and experience. Academics, I've observed, often think that businesspeople are trying to rip off their best ideas without paying a fair price. And business people, for their part, tend to think that academics vastly overvalue their intellectual property, and haven't the faintest idea how much it costs to take a clever idea from the campus laboratory to the marketplace.

And yet for all these obvious disparities, discussions like the one we are having today - aimed at taking higher education and business *beyond* mutual incomprehension - are now taking place all around the world. Just in the past couple of months, I've been in touch with colleagues in France, Germany, Sweden, Australia, New Zealand, the Philippines, Japan, Russia and now in

Belfast- all of whom are seeking to address the same question: how can we do better at exploiting the bright ideas that are being generated in our university system and where appropriate bring them to the marketplace to the benefit of our economy as a whole?

What's going on here? Why have so many people all around the world started at roughly the same time to address the same set of questions about higher education and business?

I'd like to suggest three possible explanations for this world-wide phenomenon.

The first is to do with globalisation.

Manufacturers in the developed world have in the past decade had to come to terms with the fact that commodity type products - textiles, engineering components, electronic equipment, concrete pipes, low price furniture - can be produced in central Europe and Asia at a fraction of the cost that would be involved in the West. But now global competition is moving up the value chain.

For years, those family owned businesses in Northern Italy that had built a world market in products like upmarket textiles or sophisticated machine tools were able to hold out against low cost competition simply because of their manufacturing excellence. But now that excellence is being matched at a much lower cost in India and China, which is one reason why the Italian economy is in such difficulties.

And competition from the developing world is also beginning to bite in the service sector - notably but now exclusively in IT and computer software. With China now turning out 2 million graduates a year and armies more coming from India, this competition can only become more intense.

So it's no wonder that political and business leaders everywhere have become preoccupied with the need to shift their economic activities up the value chain. To identify areas of competitive advantage, where they might have a chance of building up defences against the coming competitive onslaught. To become more innovative, and to encourage investment in science and in research.

Universities form the backbone of publicly funded research in most countries in the developed world. So you can see why it seems to make sense to try and capture that some of that brainpower and bring it to market in order to create new jobs and economic growth.

That's the first reason why this has become such a hot topic.

The second reason is that the nature of innovation is itself changing, in a way that makes universities much more attractive as research partners for business than used to be the case.

All around the world, businesses are finding that it makes solid commercial sense to collaborate with outside partners in order to generate new and more innovative products.

The old model of corporate research, developed originally by the German chemical industry in the nineteenth century and refined after the Second World War by research leaders like IBM, Sony or ICI, was very different. Companies like these, and big public bodies such as those in the telecommunications industry, found it made sense to build big centralised corporate laboratories and to do their development work in secret behind closed doors. Not invented here was a term of abuse: if you could hire the best researchers in the world and give them their head, your competition could never catch up.

But in the past few years, that picture has been changing.

As the complexity of products increases, firms are being forced to conduct research into a wider portfolio of technologies than they can possibly manage or afford on their own, whatever their size. It has become necessary to bring together a whole range of different scientific disciplines in order to make technological breakthroughs: it is no longer enough to be the leader in just one or two sectors.

One example: Merck, the US pharmaceutical giant, claims to account for about 1 per cent of the biomedical research in the world, but its ambitions are bigger than that. In a recent annual report, Merck said that: "To tap into the remaining 99 per cent, we

must actively reach out to universities, research institutions and companies world-wide.”

Another example: Procter and Gamble - a company which until recently had the well deserved reputation of being one of the most secretive in the world. In a complete change of style, it has set itself the goal of sourcing 50 per cent of its innovative new products from outside the company over a five-year period, up from an estimated 10 per cent in 2002. P & G argues that within its business it employs several thousand scientists working on new ideas. But around the world, there are a further 1.5 million researchers working in the same fields. In an increasingly competitive marketplace, how can it make sense to turn your back on all those brains?

A second reason for abandoning the "not invented here" mentality is that increasing global competition, deregulation and technological change have forced firms to move away from vertical integration and to develop their core strengths. What were the most successful research centres in the world in the post war period? Most answers would include Bell Laboratories, owned by AT and T, and Parc, owned by Xerox. When it had a quasi monopoly of the US telephone business, AT and T could afford to invest huge sums of into basic research which served the public good as much as the company. When it dominated the world's copying industry, Xerox could afford to employ brilliant scientists who came up with a whole stream of commercially successful innovations - almost none of which were exploited by Xerox itself.

But those days are long gone.

Finally, people and capital have both grown more mobile. Researchers are more willing than they used to be to move on to the next exciting opportunity. Venture capitalists have made it possible for research projects that once could only be financed by

big companies to be spun out and developed in new start up companies.

Companies that hardly existed 20 years ago have sprung from nowhere to global prominence, often on the strength of other people's technology: Microsoft is only the best known example. Especially in its earlier years, Cisco acquired its innovative strengths largely by buying up small start up companies with relevant skills. In this way, it was able to overtake Lucent - the company that had inherited the legacy of those astonishing Bell Laboratories.

In this changing environment, universities are very attractive partners for business. Good university researchers operate in international networks: they know where cutting-edge work in their field is going on around the world. Their research effort is supported by public funding. And unlike corporate or public research institutes, they are constantly being refreshed by new brains and new ideas, in the form of graduate and undergraduate students.

That's the second reason why business-university collaboration has become so much more relevant than used to be the case.

My third and final explanation is to do with technology - and it struck me most forcefully just last month, when I was lucky enough to have a tour of Rolls-Royce's military jet engine business near Bristol. This is a facility that I've visited on several occasions in the past few decades - and what's hugely striking is this. The buildings, give or take, are broadly the same as they always were. But what's going on inside them is completely different.

Twenty or thirty years ago, there were hundreds - maybe for all I know thousands, of designers drawing up blueprints. Just about

everything had to be developed in prototype, and laboriously tested before it could reach the production stage.

Today, so far as I could see, there are no draughtsmen at work on blueprints: everything's been done on computer screens. And although there are still big test beds for the completed engines, an increasing amount of testing is being done in the virtual world, saving an enormous amount of time and money in prototype development.

And once development and design can be captured in digital form, it can of course be worked on simultaneously and securely by different people around the world. As it happens, Rolls-Royce is one of the most successful companies that I've come across in developing partnerships with universities. It's developed a series of university technology centres located on campuses around the UK and elsewhere, each of which deals with a specific piece of engine technology. They are models of best practice.

The growth of new, science based industries has also tended to strengthen the links between entrepreneurs and academics around the world. The bio-sciences are the best, but far from the only example. Many of the most successful new businesses in this sector started life as university spin-outs, often led by the academic who came up with the idea in the first place. And many of those that survive into maturity retain close intellectual and social links with their founding location.

Business and academic researchers in, say, the bio-sciences or computer software are, I think, more likely to have shared interests than those in the process industries that used to dominate the economies of the UK and the Irish Republic. And so their laboratories are more likely to be clustered around a university campus.

Increasing global competition. A new approach to business innovation. The opportunities thrown up by new technologies. These are some of the more obvious reasons for attempting to move beyond the phase of "mutual incomprehension".

What are the benefits that success in this effort can bring to business, to universities and to the general public good? I've already touched on the potential benefits for business.

They include:

- Access to new ideas of all kinds. The best academic researchers are truly international in their scope and range of knowledge. At a more local level, universities will have expertise and established networks in a range of different departments that can be of real value to business.
- The ability to achieve excellence across a wider range of disciplines and through a much larger intellectual gene pool than an individual business could hope to create on its own. I've mentioned the examples of Merck and P and G - there are many others.
- The ability to leverage the research dollar. The fact that Rolls Royce's University Technology Centres have access to public research funding means among other things that the company can do much more than it could afford if it was working on its own.
- A chance to spot and recruit the brightest young talent. Massachusetts Institute of Technology, which is as good as they get in this area, believes that one of the main motives of those corporations which invest in its industry liaison programme is the knowledge that this gives them about the best students who are passing through the university.
- The ability to expand pre-competitive research. By working with universities and with other companies, business can spread the risk and widen the range of their research horizons.

- Access to specialised consultancy, and to post graduates who can come into their businesses on a temporary basis through such schemes as the Knowledge Transfer Partnerships, which at a modest cost to the Government have brought measurable benefits to a good number of small and medium sized enterprises across the UK.

What about the potential benefits for universities?

Again, there's quite a wide range. They include:

- Reputational gains, which are not just confined to the research-intensive universities like Oxbridge or Imperial. A number of UK universities, like Warwick and Loughborough, have built a well deserved reputation for their successful business partnerships - something which has helped them to attract funding and talent. Some of the former polytechnics, like Greenwich, Oxford Brookes or Liverpool John Moores have also succeeded in capitalising on their research strengths in an impressive fashion.
- The chance to play a fuller role in the regional and national economies. The expansion of higher education, and the decline of manufacturing employment means that universities are much bigger and more visible players in their cities and regions than was the case 20 or 30 years. This brings with it responsibilities, and opportunities.
- For individual academics, collaboration with business can bring the intellectual pleasure of seeing an idea which they have developed from first principles being taken all the way through to the marketplace. It can sometimes also bring access to better and more sophisticated research tools than the university can afford on its own. Occasionally, if they are lucky enough to get everything right, business collaboration can make them rich. A number of academic entrepreneurs have made sizeable fortunes

in the past few years, usually by way of a spin-out company. The occasional Porsche on the campus certainly seems to have an impact on the culture of the place.

- You may have noticed that I've left the vulgar subject of money until last. This is because it is not, in my view, as important a motive for collaboration as you might think - and technology transfer is very seldom a way for universities to solve their perennial funding problems. Contracts with business can help research departments to cover their overheads. And the experience of US universities suggests that technology transfer is not usually a large revenue generator. A number of American universities started with this aim, but found it impossible to make large sums of money and so changed their objectives. MIT, Stanford and Yale all now state the their main reason for engaging in technology transfer is to improve the public good - that is, to create the greatest possible economic and social benefits from their research -whether those benefits accrue to the university or not.

Finally, let's consider the public benefits that can flow from successful collaboration between universities and businesses. The one I've just mentioned - the wish to maximise the public benefits from publicly supported research - is extremely important, but there are others.

- It's becoming clear that the overall performance of cities depends at least as much on intangible qualities such as social, cultural and intellectual strengths as it does on hard economic assets. In a recent study, policymakers in 20 world cities were asked the importance of different knowledge sources to their overall competitiveness. Way out at the top of the list came the university infrastructure, ahead of other categories like commerce, banking and insurance, or industrial and production know-how. This means that a country like Ireland, which has been so successful in attracting substantial quantities of foreign

direct investment, have a growing interest in strengthening their higher education system in order to attract more inward investment for the future.

- What applies to Cities also applies to regions and nations. Britain has more regional inequality than any other country in the European Union, and in a number of its regions universities have become effectively the only knowledge intensive players in the economy. For example, the eight research-active universities in Yorkshire and Humber spend something over a quarter of billion pounds a year on research and development, one of the higher levels in the UK.
- But the death of the coal, steel and heavy engineering industry in the region means that there's very little business investment in R&D in the area, which is also one of the lowest recipients of government funded R&D outside the university sector. Small wonder that the region is absolutely determined to bolster its university science and to improve the connections with its industrial base. Without the university labs, there would be just about no science going on in the region. Universities are an obvious - and in some cases, the only - vehicle for developing new knowledge and new ideas in significant parts of the UK and Ireland.

For all these reasons, it's not too surprising that governments have become more anxious to ensure that more of the economic benefits of taxpayer-funded research should accrue to those same taxpayers.

In the words of a document published by the UK Treasury last year, "The productivity and responsiveness of the UK science base is primarily delivered by the strength of research talent and management within the UK's universities and public research institutes." And the Treasury wants to capitalise on those strengths.

So if they can move beyond mutual incomprehension, there are real benefits to be gained by businesses, universities, and the

country at large. But it's not a simple process, and there are bear traps along the way. Above all, it's important to be clear what universities are for - and what they are not for.

Everyone will have their own take on this theme. My own view, for what it is worth, is that universities exist to generate and disseminate knowledge, as widely as possible. They don't exist to provide cheap research facilities for industries, or to help fix a problem next year's new model vacuum cleaner.

Academics very properly attach great importance to their freedom to publish the outcome of their research, in whatever direction it leads them. In the US, there have been a number of scandals where businesses have attempted to suppress the results of work which they have sponsored and which has been unfavourable to their interests. And in the UK, both the Royal Society and the Science and Technology Policy Research Unit have both raised the concern - again, very properly in my view - that greater emphasis on developing intellectual property in universities may divert research towards short term business needs.

This is one of the reasons why increasing business-university collaboration requires that more attention be paid to the way universities govern themselves, something I will come back to in a moment.

For the moment, though, it is worth noting that those US universities that are best at technology transfer also have enormously strong reputations for the quality of their long term research. When the interests of the university and an individual company are properly aligned, benefits can flow to everyone.

So what are the general principles that apply when business and universities work together? I'd like to mention a few, in no particular order, that have occurred to me along the way:

- The best form of knowledge transfer comes when a talented researcher moves out of the university and into business, and vice versa. The implication is that quality teaching and quality research go hand in hand, and it would be a mistake to try to separate the two.
- The most exciting collaborations come as a result of like minded people getting together - sometimes by chance - to address a problem. Encouraging academics and business people to spend more time together should be a high priority - the more networks, formal and informal, the better.
- Innovation processes are complex and non-linear. It's not simply a question of researchers coming up with clever ideas which are passed down a production line to commercial engineers and marketing experts who turn them into finished products. Great ideas emerge out of all kinds of feedback loops, development activities and sheer chance. This is another reason why it is so important to build dynamic networks.
- Diversity is good. The type of business collaboration that would make sense for one kind of university might be either impossible or irrelevant for another. A less research intensive university can play an invaluable role in working with local business in a way that might make no sense to one of the big research institutions.
- Proximity matters when it comes to business collaboration, especially for small and medium sized enterprises. Informal networks cannot easily be sustained over long distances, and even large companies find it more efficient to work with research departments within a few hours drive of their base. This issue, it seems to me, is especially important for businesses in the island of Ireland, and may be something we will want to debate later.
- Business-university collaboration needs careful and consistent management by both sides. I've come across too many examples

where the chief executive and the vice chancellor have had a nice lunch, signed a contract - and left things to collapse. Universities talk about the problems that can result from frequent changes in company strategy, or in the boardroom. And businesses repeat the complaints that I made in my opening remarks. Tender loving care is required, at all times.

- Governance, as I've already suggested, really matters. As universities become more involved in commercial activities of one kind or another, they will have to develop clearer ideas of their mission, and firmer rules for dealing with potential conflicts of interest. How much time can academics spend consulting as opposed to teaching, or working on their spin-out's research project as opposed to their core research activities? What form of constraint, if any, is it reasonable for companies to place on the publication of jointly funded research? How far should the university go to protect its intellectual property? These and similar questions become critically important in this new environment.
- The management and control of intellectual property is important, and can be a stumbling block in the path of collaboration. Most UK universities have adopted a similar and sensible approach to IP ownership in the past decade or so: I'm afraid to say I don't know how consistent higher education institutions in the Irish Republic is in this respect.
- If I may be allowed to put in a personal plug: over the past year, I've chaired a group of UK universities, businesses and business organisations, and technology transfer people which was determined to simplify the transfer of intellectual property: to reduce the complexity, and cut down on the lawyers' fees. What we've come up with is a kind of Dummy's Guide: a discussion of the main issues, a decision tree aimed at pointing you in the right direction; and five model contracts which are aimed at covering just about any interaction between business and universities. It's freely available on the DTI website if you are

interested, under what my mother and I agree is a brilliant title: the Lambert Toolkit.

To conclude, I'd like to consider the implications of all this for the island of Ireland. I do this with extreme trepidation, conscious of my ignorance of how things work in the Republic and of potential sensitivities in cross border relationships. But it would seem rather feeble not to give it a go.

The first point I'd like to emphasise is the benefits that the UK has derived from relatively modest sums of public funding to support technology transfer. This so-called third stream funding has encouraged what I believe is a real culture change on our campuses in recent years. Universities have been able to pay for academic ambassadors to reach out into the business community, and to build a front door through which business people can find their way into the unfamiliar surroundings of academe. It's supported technology transfer offices, and the employment of legal and business expertise. I think there is a lot to be learnt from the success of third stream funding in the UK.

I was most impressed to read in the latest review from the Centre for Cross Border Studies that a study is being undertaken to examine the feasibility of an all-island technology transfer and intellectual property service.

One of the conclusions from my review was that there appears to be a minimum efficient size for running commercialisation activities within universities. Those which only do a modest volume of knowledge transfer activities cannot justify the cost of employing industrial and legal experts, and building bridges between their academics and the market place.

I concluded that there was a strong case for many universities to develop shared services in technology transfer with other

universities in the region rather than trying to do everything themselves. And my guess is that the same would apply on this side of the water.

There may be legal and funding questions about developing such services on a cross border basis. If so, it would be worth trying to tackle them.

But there are also at least two arguments for considering wider collaboration between universities on either side of the border. For the first, I go back to my point that proximity matters when it comes to building bridges between business and the campus. If collaboration means you have to spend the night away from home, it's unlikely to become a way of life. Universities in the North must have much to offer businesses in the South, and vice versa. It would make sense for them to map out and publish their areas of relative strength, and share ideas about their future development.

In the UK, universities are increasingly working with each other on a regional and national basis: I think immediately of the White Rose consortium, or the universities in the North East which are building new relationships with business in the region. I don't know how much this is going on here: I look forward to you telling me.

A second argument for working together is this. Science Foundation Ireland, I read, has mapped out the areas of comparative research strength in the Republic, and decided which ones it makes sense to support in the future. That's a very appropriate way of deciding on the allocation of public funding. I don't know whether this mapping exercise took into account the strengths and weaknesses of research departments in the two Northern universities. But if one goal is to attract more foreign direct investment to the island of Ireland, then it would make sense to extend the mapping exercise to both sides of the border.

One of the great things about academe, I've learnt, is that it knows no borders. Scholars look for insights wherever they are to be found, and are mobile in their search for fresh knowledge. The same applies, for rather different reasons, to business people, who don't see borders as a barrier to their activities. If that is right, this area of business-university collaboration must be one that merits serious attention from the Centre for Cross Border Studies, and I congratulate them for initiating today's debate.