UK University Technology Transfer: behind the headlines

A note from the UK's leading university technology transfer professionals

Technology Transfer Offices at UK universities play a valuable role in protecting and commercialising intellectual property developed at universities for social and economic benefit around the world. UK universities are almost all charitable bodies, required to comply with charity law. Their charitable objectives are research, teaching and scholarship and the application of new knowledge arising from these activities. Everything that universities do must be directly in line with these objectives. This applies to their business transactions, including the commercial development of their research outputs. Each university in the UK is independent and develops its own strategic goals, emphases, brand and approach to intellectual property management and the commercial development of research outputs.

Universities vary in the way they interact with industry, investors and entrepreneurs: locally, regionally, nationally and internationally; with small, medium and large corporations; in different sectors; in different locations. UK Universities have been interacting with business for more than a century and in a variety of different ways:

- Collaborative and Contract Research
- Academic Consulting
- Testing and Analytical Services
- Providing Biological and other Materials
- Executive Education/CPD/Training
- Student companies – 'Start-ups'
- Licensing of Technology/IP
- Spinning-out Companies

These activities are described in different ways by commentators and policy makers ("engagement, knowledge exchange, knowledge transfer, technology transfer, business engagement") and are grouped and managed in different ways by each university (research support, industry liaison, technology transfer office or company, commercialisation institute, incubators, accelerators).

This note is about the commercialisation of university owned research outputs through licensing of intellectual property rights (patents, copyright, know-how, database & design rights) to existing companies and setting up new, spin-out companies. It is presented as a series of 'Frequently Asked Questions' that arise, in sections on university technology transfer, technology licensing and creating new spin-out companies.

UNIVERSITY TECHNOLOGY TRANSFER

1 . What is a Technology Transfer Office ('TTO')?
The TTO is the part of a university that is responsible for protecting and commercialising intellectual property developed at the university for social and economic benefit around the world.

2. Remit of the TTO
The primary remit is to identify, protect and transfer knowledge created in the university out to business where it can be developed into products and services that benefit society and generate economic benefit for partners, universities, staff and students. TTOs seek a fair and equitable share of the financial benefits of success for the university to reinvest in university research, teaching and future commercialisation activity. Most universities set financial objectives for their TTO over varying timescales; with varying emphases on generating income, making a profit, and promoting research impact.

3. The TTO and Research Office
The Research Office (Research Support Services) of a university will also be involved in intellectual property and negotiating arrangements for research funding involving industry, as well as charities, EU and government. In some universities the Research Office establishes ownership of university intellectual property which is then passed on to the TTO for commercialisation. Each university will develop its own organisational structures for managing research funding, consulting, equipment services, material transfers and sales, and technology commercialisation. TTOs can be part of university administration, a wholly owned subsidiary company or rarely a contracted out service.

4. Who is the TTO representing?
The TTO is representing the interests of all those involved in transferring technology: the central university, department, academic (who may or may not still be at the university), student inventors (many of whom are no longer students) and funders who have contributed to the research. Ultimately the TTO is responsible to the senior governing body of the university it represents; but many of the beneficiaries it is representing are not. This is what makes the activity remarkably complex.

5. What would happen if there was no TTO?
Without a TTO, many of the jobs carried out by a TTO would still need to be done. For example, registering intellectual property, checking freedom to operate, negotiating licence agreements, spin out formation and investment and collecting income and distributing it to beneficiaries. Whilst some academics have the experience to do this themselves, most do not and are often too busy. The TTO provides a central resource of trained and experienced professionals who can provide expert support to their academic partners. Without the TTO the same tasks would be carried out by people within the university for whom this is not their primary expertise or role; this would be less efficient, more expensive and less likely to have a successful outcome. The TTO fulfils obligations taken on by the university from research funding bodies and by the university's own objectives and policies on innovation.

6. What are the advantages of working with TTOs?
Our respective TTOs have amassed a great deal of expertise, contacts and knowledge on the process of commercialising technologies from universities. Our staff are well qualified, trained and willing to engage in the process. Working with a TTO adds value and speeds up the commercialisation process. We see many pitfalls and can guide our academic researchers accordingly. In some cases it is clear that an academic entrepreneur is perfectly capable of undertaking the functions of a TTO. In most of our universities there are mechanisms to allow that to occur such that once the necessary revenue sharing agreements are in place the researcher can proceed independently of the TTO. University technology transfer is often described as a "contact sport" and it is important for university academics to have support from experienced people in 'their' university that are close, they know and trust.

7. Are UK universities any good at technology transfer?
Yes. The UK has a higher level of engagement with industry through licensing than US universities, when adjusted for research income. Many global companies and investors cite the UK as one of the best places in the world to form and scale-up new start-ups. UK universities set up twice as many new companies as the US and receive about twice the equity income from them.

LICENSING TO INDUSTRY

1. Why are TTOs often criticised for overvaluing university IP?
Valuation of IP assets can be challenging due to uncertainty with the potential addressable market opportunity for an early stage university technology, timescales to market, investment needs and routes to achieving a commercially viable outcome. In any negotiation between a 'buyer' and a 'seller', the early stages of discussions can involve a degree of asymmetry between the parties' expectations. Companies may assert that universities do not appreciate how much investment they will put in to take the technology to market. The hundreds of licensing deals and spin-out investment rounds completed each year by TTOs shows how often reasonable parties reach agreement.

2. Why do negotiations with TTOs take so long? Why can't TTOs all use the same standardised contracts and systems & processes?
The length of negotiations is affected by the experience of the principals involved in the deal, and their professional advisers. Sometimes lawyers, in-house or external, have too much in their 'in-tray'; and for principals and lawyers inexperienced in university-business transactions it can feel like a slow learning-curve. In many instances TTOs are obliged to refer back to external research funders (e.g. Wellcome Trust, other charities, NHS funders). TTOs have worked with PraxisUnico to publish Practical Guides (www.praxisunico.org.uk) and template agreements which can assist in progressing discussions.

CREATING NEW SPIN-OUT COMPANIES WITH INVESTORS

Creating a successful new business is challenging in any circumstances; balancing the various interests of academic founders, the university, investors, and managers makes this especially so with university spin-outs. Criticism, rumours, myths and prejudice continue to surround the process of spinning out and investing in university technology; the FAQs below explore some of the issues.

1. It can take a long time to form a new spin-out company out of a university. Why is this?
Setting up a new spin-out company is the start of a journey for university academics, involving investors and management, requiring detailed background checks and forward planning. Establishing the source, ownership, and consents for the background IP takes time, involving research funding bodies and research collaborators. Inventions often involve multiple inventors and multiple funding bodies, sometime stretching back over many years. Where investors seek to put in place 'future looking' agreements around research funding and IP improvements ('pipeline agreements') additional permissions are required; these may not always be granted leading to frustrations all round. Addressing these issues early helps.

The single largest 'gating factor' in the formation of a new spin-out appears to be the negotiation of the equity and licence agreement and corporate agreements covering matters such as fair and reasonable warranties and restrictive covenants with the spin-out's management and investors.

2. Why do University TTOs take 'so much' equity in start-ups? Why don't all Universities just agree one common starting equity position and let the academics take the majority of the shares?
TTOs represent different institutions with different motivations, drivers and funding models just as different spin-out companies vary hugely in their routes to market, the amount of investment required and the market opportunity to address. It is unrealistic to expect university TTOs to harmonise to a single equity position in spin-outs, just as it is difficult to expect spin-outs and their investors to agree to one set of harmonised commercial licensing terms.

Universities and investors have different philosophies on spin-outs. Universities generally consider spin-outs as entities created by universities around IP (along with the academic founders as partners), before investors are involved. Setting an appropriate equity split between the founders and the institution is a matter of internal policy. Some universities choose to pre-set this amount to minimise the level of internal negotiation between TTOs and founders, whilst others prefer to leave it flexible to account for differing start-up situations.

A recent UK review suggested that these stakes range from 20-67% in the UK and 5-100% in the US. Investors see things differently. Investors correctly view academic founders as a vital component of the business in its early stages, but do not tend to recognise the role of the university and TTO as 'value adding'.

Keen to incentivise academic founders, but not the university, and mindful of future dilution, investors prefer the academic stake to be significantly larger than the institutional stake. Compromise is required to reach agreement and sophisticated TTOs understand this and can find common ground.

3. Should TTOs be trying different and new approaches to equity and anti-dilution such as the 'golden share' model advocated by some investors?
From time to time the idea of introducing anti-dilution provisions for only the university's shareholding into university spin-out company investment agreements attracts attention. TTOs are increasingly willing to explore and engage with different models of equity in new spin-out companies, but do not see the 'golden share' as realistic. TTOs are naturally circumspect about the chances that the anti-dilution protection provided by a 'golden share' will survive all the

way through to an exit event, because later stage investors may insist on its removal as a pre-condition of funding. Not all investors are in favour either: the perpetual anti-dilution protection provided by the golden share does not mesh well with issuing different classes of shares to later investors or liquidation preference stacks. If one shareholder has special shares why wouldn't others want them as well?

4. Investors and TTOs can disagree over licensing or assigning IP to the spin-out. In addition, the reversionary rights over IP (i.e. upon termination or insolvency) requested by TTOs can be perceived as problematic for investors. Why is this?
TTOs generally license IP into the newly formed spin-out company and do not transfer ownership through assignment, largely because spin-out companies are high-risk, young start-up ventures. There are three technical reasons that TTOs prefer to license IP into spin-outs rather than assign it.

1. Enforceable performance obligations, to ensure that the spin-out uses a reasonable level of effort to progress development and commercialisation of the IP.

2. Reversionary rights to ensure the IP generated by the university can be returned to the university if the licensee can no longer progress its development (sometimes a requirement of research funders).

3. To ensure that obligations to pay royalties are not decoupled from the IP. With assignment, the obligation to pay royalties may not be binding on the subsequent assignee as it was not a party to the original royalty agreement.

Investors object to the reversionary IP rights requested by the TTO because returning the IP to the originating TTO upon insolvency may act to de-value the spin-out and may reduce investor returns on liquidation.

5. Investors achieve their return through equity only, whereas TTOs often ask for a combination of equity and royalties thus resulting in perceived misalignment of returns and so called 'double dipping'. Why is this?
Universities seek a royalty return from the underlying IP to recognise a fair return from the commercial development of the IP to inventors, contributors and the university. Universities seek a shareholding in return for providing the core assets and promoting the spin-out. Royalties provide a mechanism to reward researchers who may not have been granted founding equity. Some universities allow founders who do hold equity to retain a 'fall-back' mechanism of return should the value of their equity stake be diluted to very low levels or becomes unsaleable in an 'un-exitable' company.

6. TTOs sometimes request cash sums from spin-outs during the start-up phase. Why is this and wouldn't such cash be better spent on technology development?
This is a rare event these days. TTOs have listened to the objections and changed approach. In our experience TTOs rarely request upfront cash or technology access fees from spin-outs. TTOs may request other forms of deferred remuneration such as: recovery of past patent costs; annual fees to supplement the performance obligations; milestone payments to recognise the value of the IP in the business, when the company has the resources to pay them.

7. In some cases the academic founders seem ill equipped to handle the spin-out journey ahead of them (e.g. the level of involvement and influence they will have, equity dilution they will experience and the time commitment required). Could TTOs do a better job of equipping the founders for this journey?
The current model is to form spin-outs in partnership with the academic founders and hence TTOs feel an obligation to prepare founders for the spin-out journey and its likely financial and time commitment implications. However, there is always room for improvement with large amounts of variation in the levels of coaching and assistance being provided across different universities. New initiatives are beginning to emerge (e.g. the creation of dedicated spin-out support groups within TTOs and universities that are tasked with formation, funding and incubation as well as coaching the academic and student founders about the journey on which they are embarking).

8. Technology transfer offices sometimes expect board seats in spin-outs despite the fact that they seem to add little value to the business as it progresses. Is this true?
TTOs form spin-outs in which they often hold significant initial equity stakes. It is perfectly reasonable and normal practice for a shareholder to expect a board seat whilst their equity stake remains substantial (Investors expect the same). The TTO appointed director can be a particularly valuable addition to the business during the early formative stages, offering important advice on matters such as university engagement, access to grants and service providers, document completion and good knowledge of the initial IP.

There will come a time when the university's stake is diluted to a level where the justification for a board seat no longer becomes tenable and most universities accept the nominated director comes off the board or becomes a non-voting observer at this point.

9. Investors are sometimes frustrated by being invited to invest into spin-outs with existing groups of microinvestors or 'business angels' whose goals and exit time frames may be different from theirs. Why do TTOs permit these types of investor to participate?
Some university spin-outs are suitable for Venture Capital (VC) or institutional investment from the very beginning. Others will never be suitable for VC investors for various reasons (e.g. smaller market opportunity, fast to revenue model requiring little capital, service based business model etc.) and these companies are more suitable for angel investors or tax-efficient investment funds (e.g. EIS and SEIS funds). Occasionally some spin-outs may transition between the two types: after a period of de-risking the spin-out is ready to 'step-up' to a full investment from VC sources. It is in this scenario that a mismatch between the existing shareholder base and the new syndicate may emerge.

It is important to remember the circumstances in which such a scenario may arise. The TTO and founders are looking to get the company funded, but VCs are not yet ready to fund it due to its risk profile and/or a shortage of capital in the sector. As such, the TTO and founders may feel that the angel or crowd fund options offer the best (and possibly only) mechanism to move the technology forward. It is incumbent on the founders (including the TTO) to keep the new investment structure as simple as possible to avoid putting off potential future VC investors and the TTO will normally advise the spin-out on this.

Section C - Summary
The above FAQs are intended to highlight differences in views and opinions where investor returns and motivations may not always wholly align with those of the TTO, their respective University and founders. Consequently it is not surprising that reaching agreement to create a spin-out, agree a licence or secure an investment agreement can be difficult, especially where investors and TTOs are unfamiliar with each other (in person) or unfamiliar with each other's respective motivations and drivers. Deals may flounder when any one party adopts inflexible practices or naïve blanket policies (e.g. "spin-outs must always have IP assignment", or "TTOs must always have milestone payments" etc.). Understanding each side's respective drivers and working flexibly to agree an acceptable compromise remains fundamental.

CASE STUDIES

Simulect
In excess of half a million people have been treated with a monoclonal antibody developed at UCL and marketed by Novartis as Simulect - an immunosuppresant agent used to prevent transplant rejection in people who are receiving kidney transplants.

Detecting sub-sea hydro-carbons: MTEM Ltd
In 2001 researchers in University of Edinburgh's School of GeoSciences developed a new electromagnetic method to detect sub-sea and underground hydrocarbons. In November 2004 MTEM Ltd was launched from the University of Edinburgh with £7.4 million of funding from three equal investors: HitecVision, Energy Ventures, and Scottish Equity Partners. After completing the first commercial marine survey in the North Sea, Petroleum Geo-Services (PGS) bought MTEM Ltd. for $275m. PGS then established a Strategic Alliance with the University leading to £1.1m in research funding.

Assessing and sustaining organs to improve transplant outcomes: Organox
There are around 30,000 patients on liver transplant waiting lists in Europe and the US and only 12,000 liver transplants take place per year in these countries. Oxford's OrganOx device was developed to address this shortage of donor livers. The device sustains organs outside the body by enabling an organ to self-regulate its blood flow and blood pressure, causing minimal harm to the organ.

Transitive Corporation is a University of Manchester spin-out.
Transitive's "Rosetta" products lie behind the ability of Apple to use Intel chips and can be credited with rapid sales acceleration for Apple's laptops, which almost doubled from 2006 to 2009. Transitive was bought by IBM in 2009 and as a result IBM has a research lab in Manchester.

Technology to control pests and invasive species including mosquitos: Oxitec
Insects spread human and livestock diseases and ravage agricultural crops, contributing to food shortages in the developing world. Oxitec is developing proprietary insect strains, whose offspring die before reproducing, reducing the size of the disease-carrying population. This has the advantage over the 'sterile insect' technique of being more affordable, effective and applicable to a wider range of pests.

Land remediation
Hydrocarbons are the most frequently occurring land contaminants, polluting millions of ex-industrial sites worldwide, with no effective remediation solution. The STAR (Self-sustaining Treatment for Active Remediation) technology developed by Edinburgh University effectively remediates hydrocarbons using smouldering combustion. In 2010, the technology was licensed to Geosyntec Inc and has now been demonstrated in two field trials resulting in 99% remediation. With ex-situ field reactors planned for release at the end of 2015, the technology offers an outstanding opportunity for environmental and societal impact via re-use of previously abandoned ex-industrial sites.

Philips/Volcano Corp
Imperial Scientists developed a technique that can determine the degree of blockage in arteries to assess whether to insert a stent. Imperial Innovations protected, packaged and licensed this IP to Volcano Corp (a division of Philips). The technique is now in routine clinical use in over 1000 catheter labs across three continents, and provides an alternative to methods that require administration of a costly drug that may be unsafe to use in certain patient groups.

Permasense Ltd
An Imperial team, in collaboration with BP, developed a new pipe-wall thickness corrosion monitoring technology to improve safety in the oil and gas industry. Imperial Innovations patented the IP and formed a company, Permasense, to manufacture and market the technology. Permasense products are now used in the refineries of multiple customers around the world, including all BP oil refineries.

Solexa: the $1000 genome
Genetic and genomic data are revolutionising many aspects of our world. Sequencing the first human genome was a $3 billion global project. Today, thanks to Solexa, a University of Cambridge spin-out from the Department of Chemistry, genome sequencing costs as little as $1,000 per genome. Solexa was acquired in 2007 for $600 million by San Diego-based Illumina, which today has approximately 80% of the world market share of gene and genome sequencing technology.

Nanoco is a University of Manchester spin-out.
The company has developed pilot scale-up operations for quantum dots. Full-scale manufacture is carried out by industrial partners such as Dow Chemicals. While Nanoco has global partnerships with companies, the headquarters remains in Manchester where its R&D facilities are located. Nanoco's market value is £250M.

Biovex
In 2011 Biovex, a spin out company originating from UCL was acquired by US Biotechnology giant Amgen Inc in a deal worth $1bn. The company has since completed Phase III studies on its anti-cancer vaccine targeting melanoma and has submitted a Biological License Application to the US FDA awaiting product approval.

ICThinking: Challenging 'Us versus Them'
The on-going financial crisis and the continuing sectarian conflicts across the world all multiply the tensions associated with globalisation. Cambridge Enterprise supported researchers in Cambridge's Department of Psychology to operationalise a programme with the aim of preventing ideological extremism and intergroup conflict. The model has achieved wide success and is being taken up around the world, and there are now plans to meet the growing demand for the work by establishing a not-for profit company: ICThinking (Cambridge) Limited.

FURTHER INFORMATION & NEXT STEPS

We hope that this document goes some way to addressing the understanding of why TTO-investor discussions can be difficult and take time to conclude. By increasing the level of understanding and awareness of the issues we hope to inform all those involved in the process and look forward to working together with all stakeholders to improve the processes and develop more efficient and productive ways of working together.

We are all committed to listening, changing, and exploring ways to make technology transfer between our universities and business more successful, more effective and less painful for everyone involved. We are preparing additional information and FAQ sheets to explore the issues and challenges raised here in more depth.

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