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All documents and other materials will be updated accordingly. In the meantime the remaining content of this Isis Innovation document is still valid.

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Phases Of Growth In University Technology Transfer

By Tom Hockaday

Introduction

This paper describes phases that university technology transfer activities have passed through up to the present day, and suggests possible future developments. One of the conclusions is that some technology transfer offices may close, but only in universities that do not appreciate the non-commercial benefits that come from pursuing the commercial route for transferring technologies from a university.

The Phases Identified Can Be Labelled As Followed:		
Phase 1	The 'old days'	Up to late 1980s
Phase 2	The 'heydays'	Mid 1990s to late 2000s
Phase 3	The 'winds of change'	Early 2010s
Phase 4	Economic pressures	Nowadays
Phase 5	Impacts of Impact	Looking ahead

The paper and the phases most closely follow the development of activities and chronology in the UK, although also draw on experience and observations over many years from many universities in many countries. The phases are described in sequence, with reference to accompanying slides, and followed by a discussion of some of the possible consequences.

Phase 1—The 'Old Days'

The university is shown with a porous, flexible boundary. Universities are constantly changing size and shape, how they position themselves in the world and how the world perceives them. The line is porous as there is constant interaction in and out of universities between students, staff and people from industry, government, financiers, philanthropists, press, all walks of life. This paper is

primarily related to interactions between university researchers and people in industry.

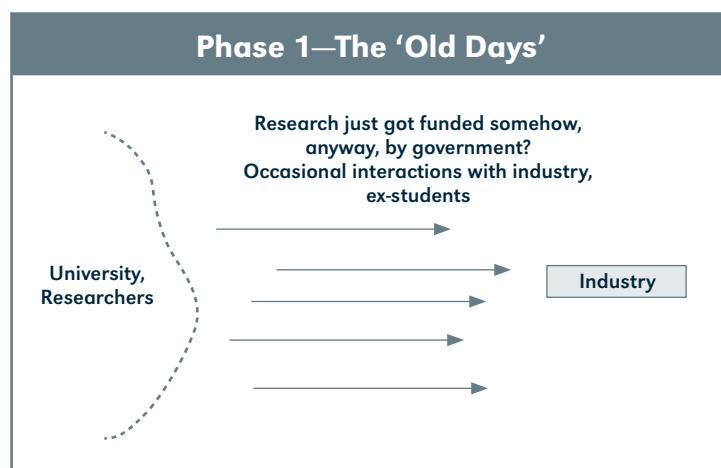
In this phase there were a small number of small scale interactions between researchers and industry. These were often based on contacts between university researchers and their past-students now working in industry.

In addition, there were a small number of large scale connections where industry was funding a substantial programme of research in a university department. The research funding environment was far more straightforward than it is today. Research was funded one way or another, by various units of government, research and grants councils.

University technology transfer offices (TTO's) did not exist. Universities were developing industrial liaison offices of one sort or another, often staffed by university researchers who were interested in engaging with industry. These 'ILO's' were involved in supporting a vast array of university industry interactions: industry research funding arrangements, academic consulting, intellectual property licensing.

Phase 2—The 'Heydays'

As university researchers interacted more with industry they began to realise the value of the intellectual property arising from their research activities. The growing interest shown by industry in the ideas, technologies and expertise in universities helped universities recognise the value of what they had.



In the UK, this was coupled with the high profile example of UK universities and industry failing to capture substantial value from monoclonal antibody technology first developed in Cambridge in the early 1980s. This in turn rekindled memory of the wealth generated outside of Britain from the Oxford-developed penicillin.

Universities began to set up their own technology transfer offices, and government encouraged this. Oxford University set up Isis Innovation Ltd as its wholly owned technology transfer company in 1988. This was relatively early; by the early 2000s most UK universities had started a technology transfer office of one sort or another.

UK experience lagged U.S. experience by a few years. The U.S. equivalent of the 1985 UK legislation that allowed university driven technology transfer, was the 1980 Bayh-Dole legislation.

The TTO's played a role in managing an increasing number, but never all, of a university's interactions with industry. TTO's that tried to dominate and police interactions with industry usually struggled against the understandable resistance from researchers

who did not need looking after in the way the TTO envisaged. The wise TTO's realised that the key to success was 'to help researchers who wanted help commercialising the results of their research' (an Isis motto since the late 1990s).

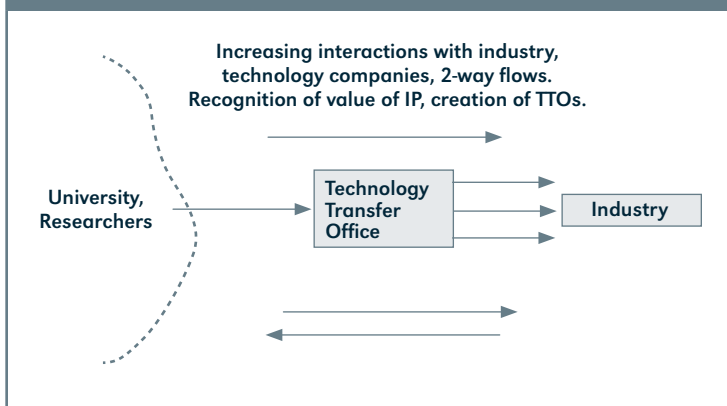
University TTO's grew in size, learning what to count and how to present it as evidence of good things happening, in their universities and in local and national economies. Governments liked what they saw, in their minds converting numbers of patent filings and new companies into direct evidence of sustainable economic growth. Governments provided grants and TTO's grew further.

Phase 3—The 'Winds of Change'

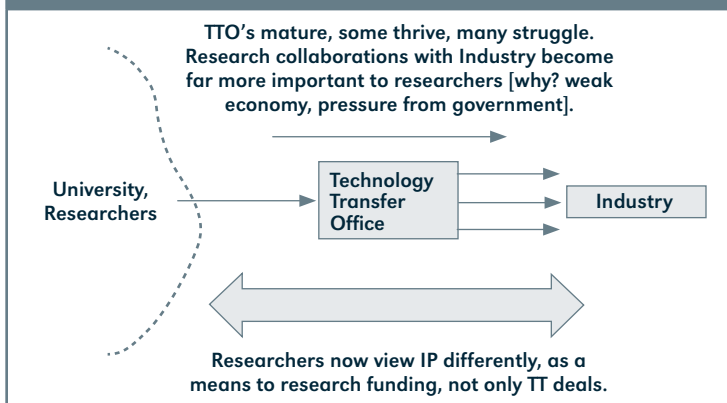
University TTO's matured, developing more organised and professional project management processes and staff learning and development programmes.

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Phase 2—The 'Heydays'



Phase 3—The 'Winds Of Change'



Understanding and satisfying the objectives of TTO's is a complicated subject. Some see TTO's as a quick route to financial riches. If University A is making a hundred million dollars a year in technology transfer patent royalties (almost inevitably from a life sciences blockbuster), and the senior administrators at University B think they are better, then they expect substantial financial success through royalties as well.

Others understand the reality that: it takes a very long time to establish a successful technology transfer programme in a university; success is as much about connecting university technologies with industry as making money. The activity is called technology transfer; it is all about transferring technology; TTO's are not called 'get rich quick' offices.

The debate settled into an understanding of TTO's having two main objectives: primarily to transfer technologies to industry so the technologies receive the investment required to deliver better products and services to people in society; and secondarily to generate financial returns for the host university and its researchers.

Nevertheless, many TTO's struggled to break even after a number of years, and

their universities questioned the best approach. Some universities in the UK passed the challenge over to the private sector, contracting or partnering with suppliers of technology transfer services. However, this does not change the fact that it is a rare blend of the right science, the right business management competencies, and the right marketplace that leads to success taking a new technology to market.

You can only measure the measurable. TTO's continued to measure and count disclosures, patents, spin-outs, income. In many ways the availability of things to count held back an understanding of what technology transfer is really about for universities and society. TTO's need to count these things for internal management purposes; and people paying the bills want evidence that things are happening. But it took a while for the real story to become about the stories that affect everybody's daily lives—better medicines, diagnostics, cleaner technologies, safer materials, better mobile phones, even computer games—and demonstrating one aspect of how important universities are to society and how universities can add to sustainable economic growth to satisfy government interests.

There was another big change taking place as well. Research collaborations with industry were becoming far more important to researchers than in the past. The 'global financial crisis' of 2008 and onwards cut research funding from public sector sources and from not-for-profits dependent upon public donation and endowment investment returns. Researchers were encouraged by need, and government, to develop research funding partnerships involving industry. The existing and potential IP was seen as an important carrot to attract industry research money. This had the direct effect that researchers were less interested in retaining their IP freedoms to explore the commercial routes through the TTO; which in turn has the outcome, in theory at least, there is less IP to transfer out through the TTO. However, managing the IP is not separable from managing the research funding; TTO's have the expertise to help researchers use their IP to win research funding.

The scale of university–industry interactions not involving the TTO grew in importance. What is the TTO to do?

Phase 4—Economic pressures

This brings us to the present day. In the face of these changes, TTO's need to adopt

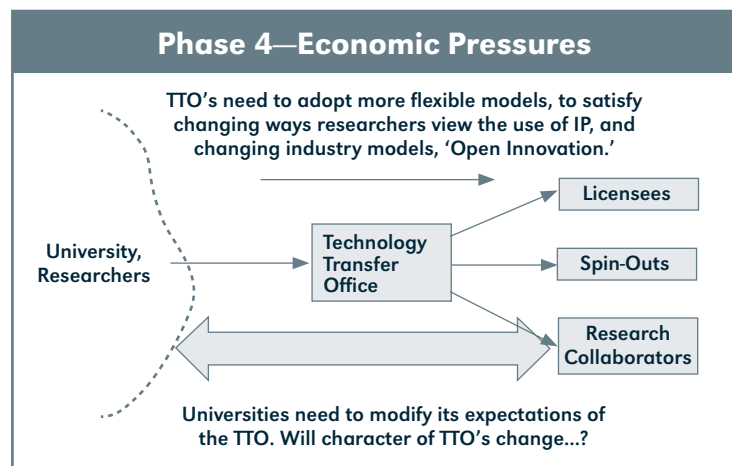
more flexible models and approaches to satisfy the changing ways researchers view the use of IP.

In industry, a number of companies in various industry sectors were changing their models of business, not least in terms of opening up to open innovation [see Henry Chesbrough—*Open Innovation, 2003 and Onwards*]. Companies reviewed their models of interacting with universities, a number wanting to establish long-term collaborative partnerships with selected universities; with the plans for commercialising the IP being tied down in research funding agreements at the start, not technology licences after the research is done. Other companies have moved in an opposite direction, becoming less innovative, relying on technologies at higher 'technology readiness levels', expanding the gap between university research and industry.

There is a general shift from viewing all companies in the broad category of industry, and that being something the TTO dealt with; towards recognition amongst researchers that companies should be viewed in different ways. Is the opportunity for 'research funding now' rather than 'licence and wait'?

Researchers continue to want help from the experts in the TTO but in new ways. TTO's are asked to spend more time supporting research funding applications, either because they involve IP negotiations in research funding discussions with industry, or because government/not-for-profit research funders want more evidence of how their money will see ideas reach through to the end-use (consumer or patient).

Successful TTO's are run as businesses, staffed by business-minded people. They will leave if the business elements of the job disappear. The university is then not well-placed to provide a professional technology transfer function when the need arises.



Phase 5—Impacts of Impact

Universities in the UK are preparing to submit data to the Research Excellence Framework (the latest version of the government exercise every few years to assess the quality of research in every department in every university). Other countries are watching with interest; some are already planning to adopt a similar approach.

For the first time, this exercise involves points being awarded for 'Impact'. The government defines Impact in some detail; it can broadly be summarised as benefits to society. The Impact case studies are important: 20 percent of the points awarded relate to the strength of impact that a department can demonstrate. And points mean prizes—billions of pounds of government funding will be allocated over many years based on REF scores.

The impact issue started with demands from government for evidence of economic return as a direct 'return on investment' from government funding of universities. Universities were quick to object that there is far more to it than economic impact; to which UK government responded that when they say economic impact what they actually mean is economic social and policy impact; peace restored, well not really, why don't we just call it impact then, and here we are today.

Many researchers embrace this, many will fight it well into their pensions. One outcome already has been that universities are becoming far better at telling the stories of how their activities touch and benefit people's lives around the world. Universities really are a good thing.

The challenge for the TTO is that it is now a smaller part of a bigger picture. Researchers are motivated to see their research transferred out from the university

to society (as always for some, an entirely alien concept for others); and are learning how to describe the success of this arising from the traditional activities of academic publication, public lecturing, policy advice, consulting, and not only through the commercial route of the TTO. So what are the implications?

Implications

There are potentially serious implications for a number of people and organisations in this area.

For Technology Transfer Offices

TTO's may disappear in universities where the university sees no economic value in the IP arising from its research activities and does not understand the non-commercial benefits of the commercial route; this is a bad thing for everyone involved. As the TTO becomes a smaller part of a bigger picture, decisions may be made to subsume its activities into other university administrative functions, for its resources to be dispersed across the university, and for its activities to become re-directed towards other university activities, for example helping researchers prepare research funding proposals. This is bad because universities (and society) will lose the non-commercial benefits of the commercial route.

TTO's therefore need to continue, constantly, to explain to the university the non-commercial benefits of the commercial route through the TTO. In this way the university will support and appreciate its TTO for the twin reasons of the commercial and non-commercial benefits it brings.

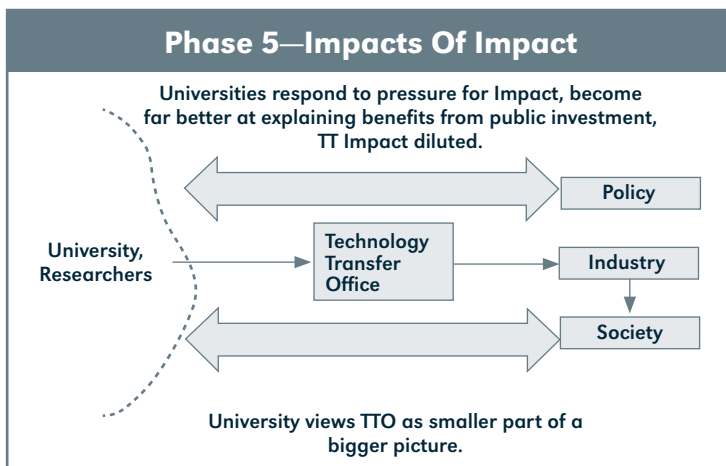
For Universities

If a university reduces the scale of its TTO activities, then it risks losing the non-commercial benefits of the commercial route. These non-commercial benefits are: demonstrating the university as part of the local community in which it resides; generating stories to

show the application of its research to society; promoting entrepreneurship amongst staff and students; attracting new staff who are keen on commercial technology transfer.

The university will then later complain, and be the subject of criticism and complaints, if it misses out on the commercial benefits of a blockbuster because it had insufficient and unskilled TT resource.

Universities may wish to consider the funding models they have put in place for their TTO's. As the environment changes, are the funding mechanisms (often for example retention of a share of royalties)



recognising and motivating what the university thinks it wants from the TTO?

For Government

Governments need to beware of the ‘commercialisation effect’ by which pushing hard for the commercial, economic returns has the opposite effect of reducing them. This is because those being pushed often react against the desired activity. This point is well described in *What Money Can't Buy*, M. Sandel, 2012 and *Social Limits to Growth*, F. Hirsch, 1978.

If governments wish to push universities to create more economic impact, they are advised to put substantial effort into helping universities understand why the commercial route is good for them, for the non-commercial reasons; rather than relying on the ‘stick’ of financial penalties. In this way universities will continue to promote and support their TTO’s, transferring technologies from universities to business, where business delivers better products and sustainable economic development.

For Industry

The implications for industry, if universities reduce the effectiveness of their TTO’s, are perhaps the most complex. On the one hand, companies may gain access to more unprotected ideas and technologies which they can use in open competition with their competitors (in this scenario technology is normalised, and business success is down to ‘brand and smarts’). On the other hand, if the IP is not protected, companies may miss out on accessing protected technologies which give the company the comfort to justify the investment to take the early stage research outputs through to market for the benefit of customers, clients, and patients.

‘The World is Getting More Global’

Former U.S. President George Bush coined this phrase and it did not take long for former UK Prime Minister Tony Blair to copy it. The serious point be-

ing that universities and governments in emerging economies are now actively exploring how best to develop their own technology transfer models. This paper references mainly western, developed nation approaches to university technology transfer. Universities and governments in recently emerged and emerging economies have looked at the old ‘heydays’ models and recognised the shortcomings and lack of relevance to their own circumstances. Whilst technology transfer and IP activities are considered as significant indicators in university and national worldwide league tables, universities occupy different places in society around the world. The opportunities for promoting local entrepreneurship may be far more relevant than international patent applications. The new model of combining technology transfer with student entrepreneurship, and with local business interactions is most appealing in many places.

Conclusion

Everything changes, nothing stays the same. University technology transfer offices have evolved and grown over the last 30 years, as have the universities they serve and the expectations placed on universities. Current pressures on university researchers to secure research funding and promote the benefits derived from the research outputs in the short term, may distract researchers from considering the longer term value (in commercial and non-commercial terms) of protecting and marketing their research outputs with their university’s TTO.

The smart university will continue to invest in its technology transfer office to protect its long term interests in realising the potential and returns from its research-based intellectual property. ■

Author’s Note

I am grateful to a number of Isis colleagues for their comments and suggestions on this paper.