SUCCESSFUL UNIVERSITY TECHNOLOGY TRANSFER AND COMMERCIALISATION OFFICES AND THEIR ROLE IN ENTREPRENEURIAL BEHAVIOUR

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ABSTRACT

Australian universities, like their counterparts in other developed economies, are being encouraged to undertake greater efforts to commercialise their research results for a range of reasons including improving the welfare of the community, stimulating economic performance, and creating the so-called third stream of funding. This paper uses data from thirteen university case studies to identify the factors that influence universities’ performance in technology transfer and commercialisation. It concludes that there are three principal factors that are essential for universities to achieve superior commercialisation performance: a university undertaking excellent research with global commercial potential; TTO management that is commercially focused and experienced; and long-term and consistent support for the commercialisation function from the university government and its senior executives.

INTRODUCTION

Universities can exert a powerful influence upon national innovation, and university Technology Transfer Offices (TTOs) can be an important influence in encouraging entrepreneurial behaviour in universities and amongst researchers. To a greater or lesser extent almost every Australian university is engaged in technology transfer and commercialisation (TT&C). The “performance” of TTOs is not a settled issue. A report to the Australian Coordination Committee on Science and Technology (DEST 2005) identifies lists of metrics by which university TTOs may be measured. But there are many metrics that have been used in Australia (DEST 2004; 2007), so that the issue retains some measure of subjectivity. Mere financial performance is rarely the sole determinant of an office’s performance (Productivity Commission 2007). In the absence of better metrics, data collected by official sources such as DEST (2007) and AUTM (2007) is probably the best available, notwithstanding the attendant limitations. At the most elementary level, a TTO is successful if it is able to generate sufficient income to pay for its continued operation. In fact most probably fail to do even this (DEST 2007, AUTM 2007; HES 2006; Riddle 2004). The next level of achievement is to generate a surplus of income in order to invest in nascent discoveries at the point before private capital generally becomes available. The funds to do this are often supplemented by funds from government or not-for-profit foundations. At the superior level of performance TTOs achieve both of these outcomes as well as return cash in the form of dividends for the general purposes of the university. There are few universities in the world at this level, although UniQuest (at the University of Queensland) in Australia has been able to do this consistently for many years.

There appear to be four activities that constitute the components of university commercialisation in Australia: registered IP licensing and assignment (usually involving patents), spin-off companies, contract research, and consulting. These are the four activities identified by UniQuest, Australia’s most successful TTO. In contrast, North American universities would never include consulting, which they deem a private arrangement involving individual faculty members, and often exclude contract (also called sponsored) research in their metrics. Therefore the profile of TTOs in one jurisdiction will not...
necessarily be transferable uncritically to others, but there are some common factors that transcend these differences.

Quotes in the vignettes below come from case study interviews conducted by the author.

AUSTRALIAN ENVIRONMENT

Australia has thirty-nine universities and almost all conduct research to a significant level. Few universities achieve exceptional TT&C results, while most achieve generally modest results. Yet each university TTO in Australia is subject to the same general laws relating to matters such as intellectual property; they all have access to the same federal and State incentive schemes; they all operate under generally similar regimes of university governance and legislation; they all have access to the same generic resources that encourage TT&C; and they all have similar guidance from regulatory and industry groups. That is, they all have the same common infrastructure, a concept discussed by Gans and Stern (2003). There are, however, a number of discernable differences between universities, in particular: the volume and type of research performed; the age of the university and the TTO; the structure of the TTO; the staff of the TTO; the resources provided to stimulate and assist TT&C; the processes and policies used by the university in TT&C; the incentives provided by the universities for researchers to engage in TT&C; the location of the university (whether it is in a metropolitan or regional area); whether a university is research-intensive, has a technical orientation, or some other characteristic; access to early-stage capital; and a university’s entrepreneurship and culture.

Most of these factors do not prove, however, germane to the differential performance in TT&C amongst universities. It is demonstrated in this paper that the most important factors in determining university performance in TT&C relate to, first, the management of the function at institutional level, which flows through into TTO-level performance and, second, a sufficient level of high-quality research of global importance. Once a national environment is relatively conducive to universities engaging in TT&C the difference in performance resulting from the quality of the management of the function amongst individual universities becomes quite stark. There appears to be a hierarchy of conditions conducive to university TT&C. The first is a base level of conditions common to all TTOs which, when met, satisfy the essential conditions for them to prosper. These are established by legislative, government and institutional arrangements that are largely outside the direct control of individual universities. While the Australian environment for TT&C may benefit from some changes (Rider et al. 2006), evidence suggests that it is fundamentally sound, a conclusion borne out by the fact that some Australian university TTOs exhibit superior performance. Whether a particular university TTO does, in fact, prosper depends on certain other conditions within the control of the university itself.

To demonstrate this theoretically before considering the empirical data, it is instructive to construct a mind experiment along the following lines. When an investor, such as a venture capitalist, is making a decision whether or not to invest in a particular new venture within an industry segment amongst many prospects arising from universities, there are a number of factors that influence the decision. If all the prospects are within one jurisdiction, say Australia, and all the prospects are within the one industry, say pharmaceuticals, then conditions outside the control of the university: such as regulatory approvals; taxation rates; government financial support; the cost and availability of money; the available market – the common infrastructure – is essentially the same among the several prospects. What factor or factors will be the keys that inspire a venture capitalist to invest in one candidate prospect over another? There are two key factors: first, the candidate technology has to possess sufficient market potential to make money, which means it should generally have global potential and, second, the quality of the management of the company into which the venture capitalist is invited to invest must be competent and trustworthy. This is the first rule of investment. The capitalist has to be confident that the management understands the technology, has a good grasp of business, is ethical and honest, and is prepared to work hard to make the technology and the business succeed. Without being satisfied on these conditions, the likelihood that a rational venture capitalist would invest is remote.

Similarly, before any business will deal with a university or its TTO, it has to be satisfied that both the university and the TTO meet the essential conditions for an external business to invest its time and money into the university’s inventions, discoveries and ideas. An individual business, acting rationally, will look at a technological opportunity emanating from a university in much the same way as a venture capitalist will look at an individual investment prospect: do they offer superior technology that
can be made to work, is there a market, and can I trust and rely on the institution and the individuals with whom I will work? If the answer is yes to all points, negotiations can proceed; if the answer is no to any, a business relationship is likely to be fraught with risk. Thus, a university that develops the environment and reputation of being helpful and supportive in its dealings with business has the elements of success, otherwise it will struggle.

It should be made clear that there are three component parts in creating successful TT&C in universities. It starts with a genuine commitment on the part of the university Council or Regents and senior management to make TT&C work. It proceeds through to competent and energetic management and staff of the TTO. And it requires a sufficient number of university researchers producing world-class results who are prepared to work with industry to see the fruits of their work placed into the community.

In the absence of either of the first two elements (the support of Council and senior management, and competent and energetic TTO management and staff), academic faculty will continue to participate in TT&C activities that do not need any substantial institutional support such as consulting, and contract (or sponsored) research. They may do so on a lesser scale than they would with institutional support, but they will continue because of the personal benefits that accrue: income for individual and research use, as well as experience and enhanced academic reputation. However, the presence of the first two elements can create a different dynamic within a university that stimulates academic faculty into a different mind-set – that working with industry can produce a set of benefits that make participation in TT&C worthwhile personally and professionally. The existence of this dynamic supporting TT&C has been measured through, for example, metrics such as the number and quality of licenses and new ventures formed as a result of university research or, as noted above, the financial consequences to the university of involvement in TT&C.

This paper finds that the environment created by the Council and senior executives of a university, the management of the TTO of that university, and the quality of the research undertaken at the university are the key determinants of individual university success in technology transfer and commercialisation.

**METHODOLOGY**

This research uses a cross-case analysis of thirteen university case studies in Australia, the US, Canada and New Zealand. Case studies on eight Australian universities were developed, with universities selected from a range of affiliations as shown in Table 1: two members from the Group of 8 research-intensive universities; two Australian Technology Network universities; three smaller and/or regional universities; and one from the Innovative Research Universities group. The Australian universities were then compared with benchmark universities from other jurisdictions: United States (2), Canada (2) and New Zealand (1). Each case study was developed from interviews with the university TTO Director (and in some cases other) staff, supplemented by information available on the public record.

The variety of Australian universities was selected to identify, if they exist, any differences between different types of university. It was found that the same key factors influence TT&C performance irrespective of the type of university.

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*Table 1 – Characteristics of the Australian Case Study Universities* Source: Author
The first step in the analysis was to identify the characteristics which distinguish universities when it comes to TT&C. These were selected by reviewing relevant literature and identifying the factors that arose most commonly as likely to distinguish TT&C results achieved. They were derived as part of a larger research project and are unlikely to excite objection from most researchers in this field. While more factors can always be included for comparison, those used here are sufficient to allow a good first-pass assessment. The next step was to use the evidence from the Australian university case studies to analyse the importance of each individual characteristic to determine, as far as possible, which among all the characteristics had a significant effect on the success of Australian universities in TT&C. Each of the thirteen case study universities was then subject to a cross-case analysis to identify recurrent themes, providing a robust result capable of being understood and reproduced by other researchers.

SELECTING THE COMPARATIVE CHARACTERISTICS

There are eleven factors used here to compare the case study universities:

- the volume and type of research performed by the university;
- the age of the university and the TTO;
- the structure of the TTO;
- the staff of the TTO;
- the provision of certain resources to stimulate and assist TT&C;
- the processes and policies used by the university in TT&C;
- the incentives provided by the university for researchers to engage in TT&C;
- the location of the university;
- whether the university is research-intensive, has a technical orientation, or some other characteristic;
- access to early-stage capital; and
- the entrepreneurship and culture of the university.

One of the most important criteria in developing a sound relationship with industry involves the linkages formed between a university and industry, but this criterion is not assessed here because it is asserted that the linkages themselves are closely related to the quality of the university and TTO management – so closely bound, in fact, that they appear to exist or fall together.

One unexpected factor that was common among all the superior-performing universities was that the several TTOs were not bound by the university management to meet specific performance benchmarks such as number of patents, number of disclosures, or even financial performance. Successful universities appear to be content to install good quality staff in the TTO and then impose no greater specific obligation than meeting their costs (after an appropriate period of establishment) – with anything beyond that a bonus. This approach reflects, in part, the difficulty of using metrics in this environment, as well as the relative immaturity of the TT&C business which is still working to define clear objectives.

THE EFFECTS OF EACH CHARACTERISTIC

Volume and Type of Research Performed

Proposition: research-intensive universities produce better TT&C results because a large volume of research is needed from which some results can be commercialised. The evidence from the case studies shows that the key determinant for research to be commercialised is that it is world class. Universities see themselves as operating in a global market, and it is the quality and global application of their research results that determined their TT&C performance, not the volume of research. Naturally, a larger volume of high-quality globally-applicable research should, ceteris paribus, produce more TT&C results \( ^{\text{vii}} \), but smaller and regional universities are equally as capable of producing outstanding TT&C results from smaller budgets as long as their research meets the quality benchmark.
Age of the University and TTO
Proposition: the longer that universities and TTOs have been established, the better the TT&C results. Many Australian universities are quite young as a result of being created during the university expansion of the 1960s and 1970s, or as a result of their creation from former institutes of technology and colleges of advanced education during the 1980s. There is strong evidence that successful TTOs need to have been in existence for at least ten years before they begin to become self-sustaining, particularly in the case of TTOs at larger universities, but merely having a long-established TTO is not conclusive of having a successful TTO. Some Australian TTOs have been in existence for many years (Allen 2003, p. 38) but still do not produce superior results. Some recently-formed TTOs, such as that at the New Zealand case study university viii, established in 2002, have produced outstanding results.

Structure of the TTO
Proposition: There is a difference in results achieved by a TTO depending on whether it is a university unit or a separate company. There are essentially two structures that are used to establish a TTO: as a unit of the university (most commonly within the purview of the Deputy Vice-Chancellor Research), or as a company, usually wholly-owned by the university. There are other options such as outsourcing some or all TT&C functions but these have yet to be embraced to any significant extent in Australia.

Vignette #1
Seven of the eight Australian case study universities mention the fact that they are operating in a global market. Examples from three universities:

“…we are in a global industry, we are looking at global markets – you’ve got to find the best partner in the world, not in Australia, and that’s what we are doing…”

“… In a lot of cases we can [call on venture capital], and when we do create [a new company], we create them with the intention, right from the start, of going after global markets. And their charter is to hit the global market as fast and as hard as they can”

Vignette #2
On how long it takes for a TTO to become self-funding, a US State university said:-

“If one were just to be starting up a new office at a university that didn’t have one, or had a very weak one, I think you would have to expect at least five years, and maybe ten years before you could have an expectation that the office would be generating an income equal to its expenses…”.

While a private US university TTO said:-

“...your office needs to have been around for at least…fifteen years for institutions to make money from commercialisation”.

The evidence suggests that there may be a difference between large and small universities in how long it takes for their TTOs to become self-sustaining. Smaller universities, with the right environment, may be able to achieve TT&C success within a few years. Larger universities, on the other hand, are likely to take longer, typically not less than a decade from the time of establishment.
Having a university-owned company acting as TTO should be distinguished from other companies, such as patent holding companies or spin-off companies, that the university may own.

In each case study in North America the TTO was a unit of the university while, in New Zealand, the TTO was a university-owned company. Of the Australian case studies, TTO companies were used by both Group of 8 universities and one of the ATN universities but, in all other cases, the TTO was a unit of the university. Several universities, both in Australia and elsewhere, have transitioned between the two structures, and neither could be held out as representing the ideal. The company structure in Australia has at least two advantages over being a unit of the university: it can claim funding under some government programs that require a corporate structure in order to participate; and it is able to offer greater salaries and incentives to recruit and retain TTO staff, while university units appear obliged to offer benefits within the usual limits of university staff classifications.

The downside reported by universities in having a company structure is principally that some have operated independently and without sufficient oversight by the university resulting in substantial financial losses. This is really a matter of proper corporate governance, and there are examples of university TTO companies that are well-run, profitable and responsive to university needs.

### Vignette #3

On using a company structure for the TTO, the Director at a Group of 8 university said:-

“The ability to pay market salaries is part of the motivation for having a company separate from the university. [Our university] believes that it is important to have people working for the university who are as capable as those working for industry on the other side of negotiations, so market-linked salaries are essential”.

### Staff of the TTO

Proposition: A successful TTO needs to have high quality staff. The truth of this proposition is virtually self-evident, as poor staff are unlikely to achieve good results. But the issue relates more to the particular qualities that are needed amongst the professional staff. This is considered at two levels: the director; and the other professional staff.

While the most usual qualification held by TTO professional staff is a PhD, among the better-performing TTOs the Director typically does not hold a PhD, but a first degree and, sometimes, a MBA. What the Director needs is flair, imagination and a degree of entrepreneurship ahead of expertise in any particular technical domain.

### Vignette #4

What makes a good CEO for a TTO? The Director of a successful TTO said:-

“I’ve been a lot more aggressive than your average university employee would be… I’ve come from my own businesses where cash is king – you’ve got to get cash in the door – you’ve got to do the deals, and when you’re doing the deals you’re thinking about next year and the year after’s profit and loss statement” and

“I’ve come in, having created a series of companies and I’m applying all of those disciplines you learn [in business], and all those fears and trepidations you get from watching your bank balance every day: I’ve applied all that to it, and just the hunger for making a buck. At the end of the day I come to work every day because I want to make a dollar…” and

“I don’t think most people [in university commercialisation offices are bold]. I think most universities are deal-takers, whereas we are deal-makers”
The next important appointment was often a good contract manager, usually a lawyer, and then domain specialists in the university’s fields of research strength. Universities successful at TT&C typically employ staff with impressive qualifications – for example, in 2006, all UniQuest business managers (the TT&C technical experts located with the researchers,) possessed a relevant technical degree, while 65% had a PhD, 31% had a MBA or business qualification, 52% had experience at CEO level, and 72% had international experience.

**Resources to Stimulate and Assist TT&C**

Proposition: *The presence of technology incubators and parks stimulate better TT&C performance.* Of the thirteen universities studied, only two had established anything in the nature of an incubator. One was a small regional Australian university which appears to use its associated technology park and incubator to encourage regional economic development more than to promote university commercialisation as such, while one private US university has an incubator, but the approach is tempered by cost realities shown in Vignette 5.

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**Vignette #5**

On the role of incubators a leading private US university said:-

“... universities have very high cost structures. We have a couple of incubators. I think we’re now [of the view] that they’re nice to have for our own spin-outs for a period, but the President said to us: ‘Why...do you bring external companies onto campus? We’re never going to make money from them. The only reason to bring them on-campus is if they’re going to become part of the intellectual climate of the university - [for example], take students and give them internships, talk about their business plans in the School of Management and [such like]’”

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Metropolitan universities, in particular, reported a greater general reluctance to become involved with their own incubators and technology parks because of the high costs associated with their establishment and upkeep. Where they are perceived as being needed, universities would generally prefer that they are provided by the state or private foundations and operated for the general good of the community and regional economy. There was a reported instance of an expensive incubator being built by local government adjacent to a university in New Zealand but the university TTO preferred to have its spin-off enterprises go into more modest premises to reduce costs.

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**Vignette #6**

On the importance of incubators to start-ups, a leading US venture capitalist said:-

“You can’t start a company with a manager. A company’s got to be started by an entrepreneur. An entrepreneur doesn’t really fit into an incubator. So I think all the incubators in the world are a waste of time. And, of course, I’ve spent a lot of time working with development people at the State level and all that stuff. They just want to do the right thing as they see it. They want to take the taxpayers’ money and they want to build these incubators, and what they end up being is poor real estate investments. And the reason is that an entrepreneur doesn’t work that way. I have never seen a successful incubator, whether it’s funded by the State or whether it’s funded by private [funds]. Entrepreneurs don’t want to go into an incubator where there’s a… telephone ... and a Xerox machine down the hall – they just don’t want to do that, they want to be off in their own place. Incubators are just a waste of time and money”
Incentives to Engage in TT&C

Proposition: Research staff are motivated by incentives to undertake TT&C activity. The greatest incentive for researchers to undertake TT&C is usually their wish to bestow a benefit on the community that funds the research. Apart from this, most academic researchers are motivated by rather prosaic benefits as teaching relief, with personal profit generally lower in the spectrum of importance. Nonetheless, all Australian universities provide two particular incentives for academics to engage in commercialisation: they allow up to 20% of paid time for academics to undertake personal commercial activities (fairly much the same is allowed in North America) and, where an idea generates profit, a share in that profit.

Where researchers are employed in private or public enterprise apart from universities the employer will normally own all the right, title and interest in any intellectual property created by an employee and will normally exploit such intellectual property for the benefit of the company alone. Almost all universities claim rights over the intellectual property of employed academic staff but, because of the distinctive nature of the relationship between academic staff and university, will normally allow the academic researcher to share anywhere between one-third and half or more of the profits arising from the exploitation of intellectual property created by the academic. This situation is complicated by the different rules that apply to students and visiting researchers as a result of the application of general intellectual property laws, but the principle of profit-sharing is now well established.

Evidence from the case studies, however, suggests that the incentive value of big dollars from the block-buster discovery is not a great motivator principally for the reason that such events are rare. The freedom for researchers to undertake extensive private commercial activity appears to act as a more potent incentive to commercialise than any set of official parameters, however well intentioned they may be.

Vignette #7

On the importance of freedom for academics to pursue their own interests in commercialisation, a leading US venture capitalist said:-

“What is different in the universities? “It’s a matter of freedom. If you take a Princeton or most schools like Princeton, they have a pretty rigid set of rules”. Faculty members have only one day a week to do what [they] want – consulting, forming a company, or whatever. “But MIT? Who knows where anybody is? MIT is totally free in that regard. There are guys on the faculty at MIT who are running companies... It’s more related to how much freedom there is than anything else... The two [most free] places are MIT and Stanford... The whole business of doing start-ups started at Stanford, and it was because of one man, who was the Dean of Engineering, Frank Terman... and it’s why Silicon Valley is there”

At the same time, universities themselves have a fairly limited incentive to start a TTO given the difficulty in finding appropriate staff and the fact that they can take many years to become financially self-sustaining. In the meantime, as Vignette 8 explains, universities have to find the funds from somewhere to maintain them.

Vignette #8

The TTO Director at an Australian technology university observed that:-

“Under present arrangements universities are not funded to undertake commercialisation. They are funded for teaching, and they are partially funded for research, but they receive no funding for commercialisation while, at the same time, there are increasing expectations that they will engage in commercialisation.”
Location of the University
Proposition: *Universities located in metropolitan areas perform better in TT&C than those located in regional areas.* This result, if true, could arise because of access to more resources and venture capital, proximity to receptor businesses or other reasons.

Evidence from the case studies shows that a university situated in a metropolitan location is not a reliable indicator of TT&C performance. The first criterion necessary to achieve superior TT&C performance is undertaking world-class research. Some regional universities specialise in areas specifically as a result of their location (such as agriculture or veterinary science) and manage to achieve good results from this advantage. It is, however, true that universities that undertake a greater volume of good quality research, *ceteris paribus*, produce a greater volume of TT&C results.

Characteristics of the University
Proposition: *Research-intensive universities perform better at TT&C than other universities.* In Australia, this means members of the Group of 8 universities or, in the US, Carnegie Tier 1 universities. Research-intensive universities inevitably receive greater research funding and, as a result, usually have a greater proportion of world-class research being undertaken. This leads them to have more potential to achieve greater TT&C outcomes. However, not all Australian Group of 8 universities achieve superior TT&C results, notwithstanding the quality of their research results. On a like-for-like basis some of the smaller and technical universities produce more TT&C results than Group of 8 universities.

Access to Early-stage Capital
Proposition: *In order to succeed at TT&C universities must have access to early-stage capital to provide funding for proof-of-concept development and to undertake detailed market evaluation.* There is little doubt that early-stage capital is usually important to allow nascent ideas to be developed to a technically acceptable stage before intellectual property can be licensed either to industry or a spin-off company. Universities, where they have the resources, generally provide funds at two levels: for initial proof-of-concept, typically in the range up to $100,000; and to develop the idea to a commercial level where most technical risk is minimised, typically in the range $500,000 to $2 million. Further funds for full development to marketability are supplied, when needed, by venture capital.

As it concerns early-stage funding, the usual issue facing universities is where those funds should come from. There is some strong sentiment in the US that funds at this level should come from the private sector, not-for-profit foundations, or from university funds (most usually comprising retained earnings from earlier commercialisations). Where US universities are near large sources of capital, such as California and Massachusetts this appears not to raise an issue, as sophisticated private investors are available.

Vignette #9
A US venture capitalist says of funding the early stages of commercialisation:-

“I think government should not fill that gap. The way that government should fill that gap is to create incentives for private investment. A bureaucracy cannot manage and work with successful, growing, high-technology companies... The trouble with a bureaucracy is that no one’s in charge”. What government can do is “create incentives for private investment, and that’s something that’s extremely important”.

Many universities in Australia and elsewhere use retained earnings from successful commercialisations to fund the future development of new ideas. In the US, doing so is sometimes forced on a TTO because State universities do not have authorisation to use funds for such purposes, while some are simply run too lean to risk the use of operating funds.

The government is often seen as the lender of last resort for nascent ideas that cannot get funding elsewhere but, because government rarely provides the full funding needed, researchers are usually obliged to obtain matching funding from an industry partner. Australia has an extensive program of
support for early-stage development (DITR 2003) which is available not only to universities, but more generally.

The case studies show that overseas best practice in TT&C involves funding from retained earnings, private investors (where the market is sufficiently mature) and increasingly not-for-profit foundations (most commonly in life sciences and pharmaceuticals). Many Australian and international universities report that there are more ideas worthy of funding than they are able to find early-stage funding to support. While there is a continuing need for more funding in this area, there is no apparent major difference within the Australian case study universities created as a result of the presence or absence of funding – they are all largely in the same circumstances, as Vignette 10 suggests.

**Vignette #10**
A leading Australian venture capitalist, when speaking of Australian Government programs, said:-

“From a funding point of view, actually I think the government’s done really well. They’ve been very generous, and perhaps not been richly rewarded enough. I think AusIndustry is particularly good – as a department they are actually as close as you get to entrepreneurs in government; they do have a lot of empathy for what we do. I think the nature of the agreements that we have with them for our pre-seed program are pretty much sensible - as sensible as they can be given that there’s a lot of government policy surrounding it... And they really have stimulated the industry. They have allowed management teams to form and get experience. A number of new managers have benefited from these programs in the past.”

**Entrepeneurship and Culture**
Proposition: *A culture of entrepreneurship and support is vital if a university is to succeed at TT&C.*

This culture has to extend across the university from its Council, through senior executives, the TTO to researchers.

If a university’s Council and senior executives do not explicitly support TT&C the probability of it succeeding is quite low. Support must be symbolic, but it must also be tangible. It must support investment in the TTO, the employment of good quality staff, it must remunerate and motivate the staff, it must set an environment that encourages and recognises researchers and students and, most importantly, it has to be prepared to do this for several years if necessary so that the commercialisation environment becomes part of the culture of the university and not a mere fashion statement that does little more than comply with government expectations. Things typically done by some of the superior universities include: have the TTO report to the university President or next most senior executive; encouraging engagement with industry through activities such as affiliations and consortia; establishing entrepreneur-in-residence programs; business planning competitions for students; providing and encouraging funding for early-stage development of promising ideas; offering particular recognition to faculty members and students of achievements in commercialisation; and offering flexible remuneration to researchers (in terms of income or equity) to participate in TT&C.

**Vignette #11**
On how a supportive university management is essential to the success of commercialisation, the Director of a successful TTO said:-

*In 2005 “...we got the new Vice-Chancellor we also got a new Deputy Vice-Chancellor and a new head of Corporate Services, which are the next two most [relevant to commercialisation] in the university, so the whole senior management team came in and were all very supportive of commercialisation”*
UNIVERSITY COMMERCIALISATION AS AN EXAMPLE OF ENTREPRENEURIAL BEHAVIOUR

Using this analysis as a guide, universities have at least three levels of potential entrepreneur: university senior management; staff of the TTO; and researchers and students. The evidence from this research is strongly suggestive that a university achieving success in TT&C closely parallels the general requirements for achieving success in business: there has to be a goal which is set and supported by the board and senior management; there has to be qualified and motivated staff capable of executing the plan; and there has to be a product that is sought and desired by the market. For each of the elements required to establish a successful business there is an analogue in the university TT&C environment.

First, the University Council and President have to embrace TT&C and provide it with the moral and tangible support it needs to become established. The evidence shows that, especially in larger universities, support is likely to be needed for at least a decade before the TT&C environment becomes well established and self-supporting. How many Australian universities are in a position and prepared to do this?

The TTO has to be staffed with people qualified and motivated to perform. Probably the most important ingredient in making a TTO successful is the quality of the Director. A successful TTO Director needs a mix of skills that are rare: the ability to meld a team of highly intelligent individuals; the ability and willingness to work within the arcane bureaucracy of a university; the ability to work with a range of technologies that usually have vastly different profiles; and the inspiration to identify real commercial deals and the tenacity to see them through to completion. To this must be added obligations that include training researchers in commercialisation, and growing a complex business in an environment that is immature and changing with amazing rapidity. While the staff of TTOs commonly have professional qualifications – PhDs in relevant domains are usual – the CEO needs different qualities. In many of the most successful TTOs the Director does not hold a PhD, but a first degree or MBA at most. What they possess are the skills mentioned above, and typically come from a private sector background (but not a large corporation) with an emphasis on entrepreneurial behaviour. The archetypal example from the case studies is the TTO at the New Zealand case study university where the Director is a serial entrepreneur. Finally, a principal reason commonly mentioned by case study universities for forming a TTO company was to allow TTO staff to be remunerated according to their skills and performance rather than on a salary alone. In this way superior performers can be recognised and rewarded.

CONCLUSIONS

The case studies turned up a result that was not expected but probably should have been. There are three essential ingredients to establishing a superior commercialisation environment within a university: senior management support; a high-quality TTO; and world-class research. That is, a successful university commercialisation environment is no different to any business. There are no special rules applicable to universities in achieving commercialisation success. There are some peculiar challenges resulting from their particular environment, but they still have to meet the criterion of establishing and maintaining a successful business within the university, for that is what commercialisation essentially is.

TT&C is more than making money, in the same way that business is more than just making money. Universities have an obligation to benefit the society that creates and nurtures them, and they provide many benefits in terms of skilled graduates and new ideas. But, if they are going to engage with industry at a commercial level (which is what commercialisation is), it has to be approached as a business. Anything else will not stimulate the energy and entrepreneurial behaviour needed to maintain a successful TTO. There are many cases of TTOs that have lost their entrepreneurial flair and largely become another component of the university bureaucracy. Successful TTOs should not be captured by the mainstream university culture. They are an agent of change. They represent a different way of operating for the university and require recognition that it must be managed in a distinctive way. Australian university Presidents are not yet uniformly aware of this imperative.
NOTES

i The thirteen case studies of universities have been prepared by the author as part of his PhD research into the topic: Enhancing Australian Universities’ Research Commercialisation Performance

ii The term Technology Transfer & Commercialisation (TT&C) is used for the first time noticed by the author in ARC (1999). It is the term best capable of summarising relevant activities.

iii To say nothing of the extensive work done in other jurisdictions in an attempt to collate effective data, such as AUTM (2007) in the US.

iv The Productivity Commission (2007, p.280) says that, ultimately, “… in terms of community wellbeing, it is the transfer, diffusion and utilisation of knowledge and technology that matters”.

v The issue of trust in commercial dealings arises repeatedly in the case studies and the literature, for example, see Santoro and Gopalakrishnan (2001)

vi For convenience, the senior governance of a university will be called hereafter the Council.

vii This is what Siegel et al. (2003) refer to as a “return to scale”: namely, the greater the volume of research, the greater the volume of commercialisation.

viii This New Zealand university was established in the 1960s.

ix For this purpose the definition used by the Productivity Commission (2003) is used, namely a university with a student population below 20,000 EFTSU (Equivalent Full-time Student Units) is treated as a small university.

x In North America: the Vice-President Research.

xi For example through the medium of intermediaries such as, in the United States: Battelle Memorial Institute; in the UK: Imperial Innovations plc and IP Group plc; in Germany: Fraunhofer Society and Max Planck Institute

xii Although, in some cases, universities used a separate company to hold intellectual property or for the purpose of applying for government funding when a company structure is required.

xiii A detailed survey of incentives among selected Australian universities was conducted by Yencken and Ralston (2005) for the Australian Department of Education, Science and Training. Their conclusions are noticeably different to the ones mentioned by the participants in the case studies here.

xiv The profit shared by university inventors is generally one-third of net profits after costs have been deducted, although this can vary between universities, typically 25% to 50%. In some cases researchers can also participate in equity in spin-out companies.

xv For more about intellectual property rules applying to universities see Collier (2007), forthcoming in Commercialize, The Journal.

xvi This is best illustrated by the fact that most TTOs have a mix of two principal types of technology: life sciences (typically around 50%); and physical sciences and IT (the balance). The profile of these two technology types could not be more different in terms of temperament of the industry, time to market, regulatory constraints and researcher attitudes. To successfully manage a business combining these two disparate elements would be a challenge for most managers.

xvii There is cogent evidence from the case studies and the literature that traditional modes account for over 95% of idea dissemination from universities: (Agrawal and Henderson 2002, p. 45)

REFERENCES


