

TECHNOLOGY TRANSFER IN SOUTH AFRICA: **The road ahead**

The journey of a researcher's good idea to a viable and scalable technology which can be commercialised can be helped along by a strong technology transfer office. *Nazeem Mustapha, Firdous Khan and Gerard Ralphs* reflect on how is South Africa faring when it comes to building this capacity within its publicly-financed research institutions.

Technology transfer is big business in leading university towns around the world. In Cambridge, Massachusetts, where Harvard and MIT are based, and which houses the famous innovation district Kendall Square, between 1999 and 2013, 1,400 start-ups created 40,000 jobs and raised close to \$2 billion (or about R19 billion in 2013) worth of venture capital.

For South Africa, the results of a brand new baseline study of the performance of technology transfer offices (TTOs) at publicly funded research institutions reveal how far

we have come in commercialising inventions. The results also gesture toward what challenges and opportunities lie up ahead.

Institutional capability is growing

The widespread institutionalisation of technology transfer at South African universities is relatively new, and the practice of technology transfer far less established than in the US, for example.

Between 2008 and 2014, just 45 start-up companies were formed from the activities of just five South African universities, the study found; a mere fraction of the output from Cambridge alone.

While there are several South African institutions with a deeper track record of technology transfer activity—for example, the Council for Scientific and Industrial Research (CSIR), which has employed dedicated staff to perform technology transfer since 1955—highly-resourced universities only set up their TTOs from about

1999 onward. Since the inception of the Intellectual Property Rights from Publicly Financed Research and Development Act (IPR Act) in 2008, most other publicly-financed research institutions have followed suit.

What R1bn worth R&D does for technology transfer in SA

South Africa's universities and science councils, which are funded by the Department of Higher Education and the Department of Science and Technology respectively from tax revenues, are tasked with the performance of research and experimental development (R&D). Current policy thinking is that some of this investment in R&D will have return in the form of socio-economic benefits to the country, which is partially why there has been a push from government to set up technology transfer offices.

Quantified, every tax-paying citizen in South Africa would have spent about R100 in 2013 to fund just R1

Fig 1 Number of institutions to first dedicate 0.5 FTE to the TTF (DST, NIPMO, SARIMA, HSRC, 2017)

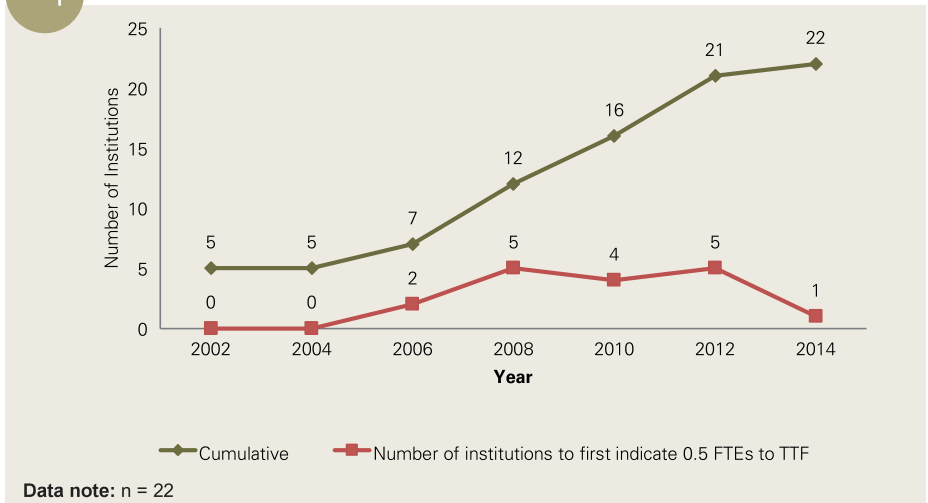
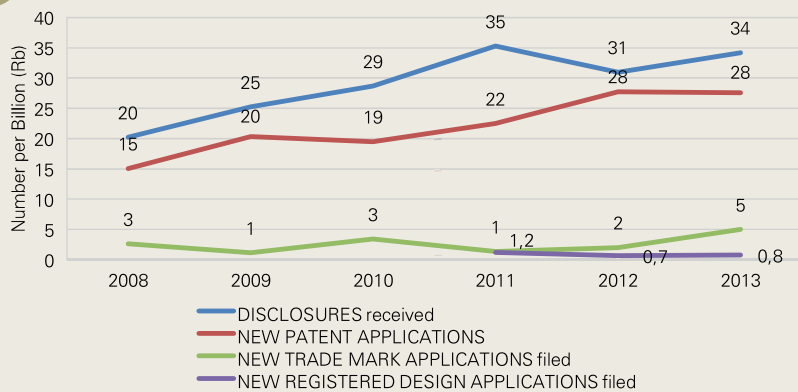


Fig 2

IP related activities per billion Rand of institutional research expenditure in constant 2010 prices (DST, NIPMO, SARIMA, HSRC, 2017)



Data note: n = 21
* Plant Breeders Rights (PBR) data was not included due to insufficient data.

billion worth of R&D. So what does this investment yield?

The answer has a few dimensions. First, R1 billion worth of R&D expenditure invested in public research institutions and higher education institutions was used by TTOs to administer and manage various forms of IP protection arising from disclosures by university-based inventors.

Thus, for every billion Rand that taxpayers invested into R&D in 2013, TTOs received 34 new disclosures and continued to manage 151 technologies.

Second, as a measure of the return on the investment of R1 billion in any one year, the technology transfer process at public research institutions eventually led to five start-up companies that were still operational at the end of 2013.

These start-up companies stem from the activities of just five institutions, mostly those institutions that had dedicated staff for technology transfer prior to 2001, which suggests the lifecycle from an idea at a public research institution into a functioning company is one that can take several years, sometimes even decades.

Why the outputs are so low

It is in the nature of national technology transfer systems worldwide that only a handful of universities in a country have the resources to function at a level where they are producing viable start-ups.

Despite the hard work that TTOs are putting into the system, and the creative and entrepreneurial capacity of university inventors, the current state of technology transfer is simply not yet operating at that level of dynamism that is seen in technology-focused areas in the US.

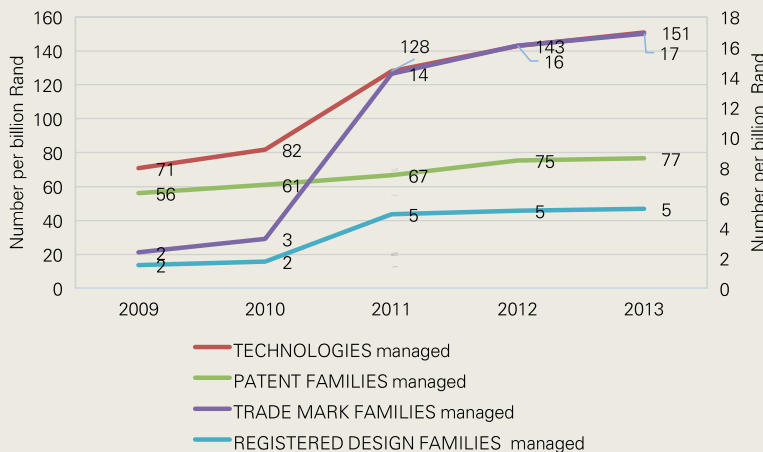
There are probably many reasons to explain this state of development, but we highlight what we believe are three key reasons policy makers within and outside of these institutions should consider.

First, the TTOs we studied identified the current level of funding as being insufficient to their operations, which is an obvious impediment to performance. The Kendall Square example is powerful because it illustrates that venture capital is attracted to excellent ideas with strong potential for scalability. They are also attracted to the track records of the universities, their graduates and researchers, and their research infrastructures. In South Africa there is not much venture capital activity around technology transfer offices (indeed, the level of venture capital investment in South African businesses is low, generally speaking). However, this does beg a set of questions as to why venture capitalists are not more in tune with what is coming out of universities in South Africa, or whether they are aware, and not yet interested enough to commit their bottom line to new ideas.

A second area that was identified as inhibiting future growth in

Fig 3

IP related activities managed per billion Rand of institutional research expenditure in constant 2010 prices (DST, NIPMO, SARIMA, HSRC, 2017)

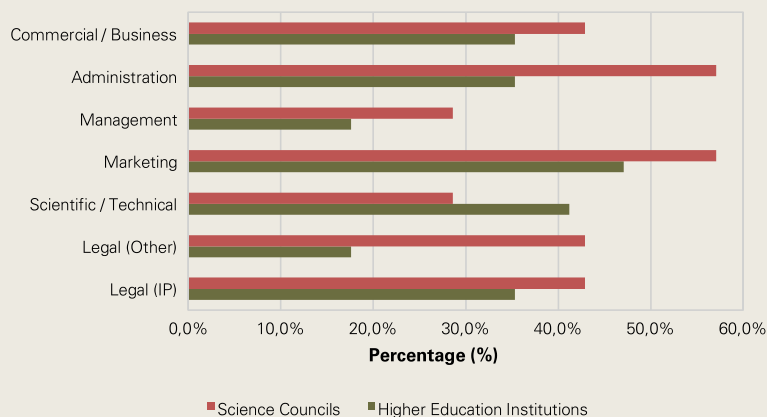




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Fig 4

Percentage of institutions that indicated which specific skills were “much” or “critically” needed, as at 2014 (DST, NIPMO, SARIMA, HSRC, 2017)



Data note: HEI n = 17
SC n = 7
These percentages were computed based on the number of responses per skill, divided by the total number of respondents by institution type.

technology transfer was the skills profile of TTOs. Survey results indicated that staff within the TTOs are made up primarily of individuals with undergraduate qualifications in the natural sciences, most of them with a Master's degree. Because technology transfer requires knowledge of legal stratagems and processes, it is not surprising that general legal skills, as well as specific legal skills in IP protection, are perceived as a skills shortage in the TTOs. Critical, too, were TTOs that highlighted a key need for individuals with marketing skills

Third, the territory on which IP protection battles are being fought is changing rapidly, as firms jockey for position in the context of the so-called Fourth Industrial Revolution. It may be that the very nature of TTOs—as organisational forms—need rethinking to cope with the demands of the emergent global business environment.

The road ahead

Technology transfer capacity is essential for South Africa if we aspire to economic development

principles such as export-led growth.

Equally, we must be realistic about what a technology transfer office within our universities or science councils can achieve over the short- and medium-term, and develop compelling visions for what they might achieve over the long-run.

The study was conducted by the Human Sciences Research Council in collaboration with the Southern African Research and Innovation Management Association (SARIMA), the National Intellectual Property Management Office (NIPMO), and the Department of Science and Technology (DST), and is available for download from the HSRC's website <http://www.hsrc.ac.za/en/departments/CeStii/reports-cestii>. To watch the live launch of the study, visit YouTube https://youtu.be/J0gp_ejfpXs.

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