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Strategies for Promoting Patenting among Academics and Researchers

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Academics are a curious bunch. They range from the head in the clouds, eccentric clichés to the business savvy company executives, and yet, they have one thing in common: the public trusts them to tell the truth. According to a 2019 survey,¹ over 80% of the UK public bestowed such trust on scientists and professors—not far behind doctors and teachers, and ahead of judges. We express this trust by supporting academic institutions through our taxes and granting research institutions and scientists the right to own their inventions by passing laws such as the Bayh-Dole act. In return, academia has contributed extensively to the wealth and wellbeing of the public. For example, from 1996–2017, academics in the US alone, have contributed to \$1.7 trillion gross industrial output, disclosed 420,000 inventions, formed 13,000 start-up companies, and developed over 200 drugs and vaccines.² The course of knowledge transfer from academia to industry has not, however, always run smooth, and technology transfer offices (TTOs) are often tasked with being the ‘translators’ between academia and industry. Given that not all academics speak the same metaphoric (and sometimes literal) language, however, the question arises about how TTOs can best work with researchers in order to optimize this knowledge transfer. We conclude that a bottom-up approach to the management of technology transfer, where faculty are intrinsically motivated to disclose their inventions, yields the best results. The conclusions may also be instructive when working with researchers in non-academic settings such as companies.

To Industry and Beyond

According to a recent report published in *Nature*,³ the share of industrial research in corporate R&D has dropped by 8% from 1985 to 2015, with more

industries relying on universities to do the research work. This, combined with the societal drive to make universities a more integral part of the economy by adding the dimension of ‘knowledge transfer’ to the traditional education and research dimensions, is giving universities unprecedented challenges and opportunities. Part of this challenge arises from an ‘information asymmetry’ that exists between universities and companies: on the one hand, there is a question of research quality—of which professors are best informed—and, on the other, the capacity for exploiting these research—of which companies are best informed.⁴

University technology transfer offices are often the main interfaces between universities and companies and are thus tasked with navigating this knowledge asymmetry and matchmaking between academic research and commerce. They have been also been at the forefront of harnessing the opportunities, which has involved promoting the engagement of universities in the commercialization of their research. These opportunities yielded a doubling of the number of university-spawned start-ups and the number of patents filed by US universities between the periods 2001 to 2013, and 1996 to 2014, respectively.⁵

However, being at the interface between the corporate world and the world of academia has its own unique challenges for TTOs. For one, universities are rarely monolithic entities with most encompassing a large range of scientific and technological research, which is increasingly interdisciplinary in nature. It is therefore impossible (and very costly) for a TTO to employ experts in every field of research. On the other hand, it is difficult for TTOs to be aware of the commercial importance of every idea and invention. In fact, a recent survey⁶ of academic inventors shows that 42% have bypassed their TTO at least once because they perceived too many barriers and disadvantages to involving the TTO. On the other hand, according to a survey of US universities’ TTO managers believe that faculty may prefer not to disclose their inventions at all and that less than half patentable inventions with commercial potential are ever disclosed.

There, therefore, seems to be a dichotomy between industry demand for new research output from universities and the universities' ability to capture the relevant inventions and to successfully license them. This gives rise to questions about best practices that universities in general, and TTOs in particular, can adopt in order to minimize the gulf between town and gown. That is, how can universities ensure that research outcomes are disclosed, that the valuable disclosures are identified and patented, that patents are filed in jurisdictions that are most likely to generate licensing revenues, and that the inventions are matched to the right industries to generate maximum licensing royalties. In a sense, TTOs are not only having to act as translators between academia and industry, they need to ensure that the university environment and culture is conducive to disclosure of research outcomes.

It's All About the Environment

The increasingly important role of TTOs comes to the fore when we compare the number of patents filed by universities with the universities' licensing revenues. A Bloomberg report⁷ in 2014 indicates that universities with highest revenues from patents are not necessarily those with the most patents. For example, University of California's 453 patented inventions generated \$109million in licence revenue while Northwestern University's 84 patents earned it some \$361million. The disparity between the patenting successes of universities was highlighted in a study⁸ carried out by researchers at Stanford University in the early 2000s, which compared the patenting activities of a large state university with a smaller private university in the US. Among other things, this research showed that despite the similarities between the universities in terms of the number of active researchers, total R&D expenditure, and publications in science and engineering, faculty members at the private university disclosed three times more than their counterparts in the state university and the private university filed eight times more patent applications than its state counterpart. Perhaps more importantly, while the inventors at the private university were issued five times the number of patents compared to their colleagues at the state university, the private institution received a whopping 128 times more in royalty income.

The study found that faculty decisions to disclose were largely shaped by their perceptions of the 'benefits' of patent protection and the perceived 'cost' of

interacting with TTOs. Perhaps more importantly, faculty perceptions of these costs and benefits were found to be colored by the institutional environment, which could be supportive or oppositional to the pursuit of commercial endeavors. Another study⁹ of researchers at a German research center revealed that the perception of barriers to patenting vary significantly between patenting researchers and non-patenting researchers. The study found that non-patenting researchers rated the monetary and time barriers to patenting significantly higher than their patenting counterparts. Interestingly, whereas the patenting researchers ranked 'reputation' as a higher motive for patenting than licensing income, non-patenting researchers rated licensing income as the main motivation for filing a patent. This indicates a misconception of barriers to patenting and the potential income generated from possible licensing royalties.

Solve a Puzzle, File a Patent

In line with the findings of the study of German researchers, other studies¹⁰ have also shown that besides having the public's trust, academics have something else in common, which may, in fact, explain the trust: what drives and motivates them is not money but something more intrinsic. It turns out that what academics ultimately like to do is to solve "puzzles". This puzzle-solving brings about intrinsic satisfaction, which money—read patent royalties—cannot match. The study shows that faculty members who engage in commercial activity do so because of the intrinsic satisfaction that they derive from such engagements.

Another research¹¹ at MIT has confirmed that the two elements of tying peer recognition to priority in research discovery, and the intrinsic satisfaction derived from problem-solving are the tenets of the reward system in science, which drive scientists to publish and disclose inventions, regardless of their tenure. This, and other studies^{10,12,13} have shown that inventors rank the enhancement of one's academic reputation more highly than potential monetary gains. That is, researchers' main incentives for disclosing their invention are highly intrinsic. This is, of course, a broad generalization, and there are significant variations in the motivations across scientists according to their value orientations, but it does give an insight into why the promises of patent royalties go largely unnoticed. True, royalties take years to materialize, if ever, by which time the inventor may have moved on. But it is instructive to note that monetary incentives may be less effective than other

measures when it comes to encouraging invention disclosures.

Top-down or Bottom-up

There have been suggestions¹⁴ that taking into account patenting and commercialization activities of faculty alongside publication and teaching when assessing tenure and career advancement is an effective incentive for invention disclosure. Although this form of top-down management, where policies are dictated from above in the hope of making changes lower down, can have its merits, it does not seem to fit in with the intrinsic nature of faculty's motivations to disclose their inventions. Furthermore, it seems that a surge of scientific productivity, not steady research performance—which is often highly regarded in tenure considerations—is most likely to be associated with patenting. In a study¹⁵ of over 3500 academics in life sciences, it was found that at individual level, the uncovering of new and productive areas of scientific enquiry was an important precursor to patenting.

Furthermore, numerous studies^{11,16,17,18} have shown that, perhaps contrary to expectations, there is a positive correlation between publication and patenting activity. That is, those academics who are involved in patenting are already likely to have a high number of publications and that good research is likely to result in patents, as well as publications, with or without patenting incentives. Interestingly, the positive correlation between patenting and publication seems to be geography and discipline agnostic. A research by Agrawal and Henderson¹¹ that was carried out over 15 years, and which involved over 260 faculty members and two MIT departments, showed that patenting did not have a negative effect on publishing rates. Subsequent studies^{17,18} have found that patenting has a positive impact on the rate of publication.

Similar studies in Italy have shown that not only is there not a trade-off between publishing and patenting, there is a positive relationship between patenting and publishing, even in natural sciences. This positive correlation is also confirmed by a study of Norwegian universities.¹³

Conclusions

Given that faculty decisions to disclose are largely shaped by their perceptions of the benefits of patent protection, the intrinsic nature of faculty motivations for disclosing their inventions, and faculty misconceptions about barriers to patenting, it seems imperative that universities establish a culture and environment that fosters technology transfer by educating its faculty about the actual benefits and barriers to patenting. Most TTOs do not have the resources to search a wide range of scientific activity for commercially viable inventions and it is thus up to the faculty to decide to disclose their inventions. To this end, it seems that a bottom-up approach to IP management at universities, where the institutional environment catalyzes academic patenting by lowering the actual and perceived barriers to invention disclosure and capture, and educates faculty about patents, is likely to be the most effective approach. In one such environment, academics learn that not only does patenting not inhibit publication, in fact, the two activities go hand in hand. They are also motivated to disclose their inventions because the collegiate environment ties patenting with academic reputation and prestige, thus propelling more peers forward to disclose their inventions. Increased patent output from universities not only confirms their rightful place as the research cogs that turn the wheels of industry, it also provides an independent trusted cog that the public can turn to time and again.

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