

# Aligning the Activities of a Technology Transfer Office with the Social Mission of a Life Sciences Research Institute in Portugal: Opportunities and Challenges for a New Office

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## Introduction

This paper outlines the opportunities, concerns, and strategies associated with setting up a technology transfer office (TTO) in Portugal, at a publicly funded life sciences research institute, the Instituto Gulbenkian de Ciência (IGC). First, it discusses the lessons learned from North American models of TTO formation and how best to accomplish the translation of science into valuable assets for the benefit of society. Next, it gives an overview of the history and current landscape of technology transfer in Portugal. Finally, the paper explores the opportunities and challenges in setting up a TTO at the IGC.

## The Role of the Technology Transfer Office

The primary role of the technology transfer office (TTO) is the mobilization of university-based research into practical and societal applications. In this sense, the mission of a TTO

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should mirror the broader societal and academic mission of its host university to mobilize innovative research and knowledge for the benefits of society. One way to accomplish this goal is for TTOs to facilitate and broker the relationships between researchers and external stakeholders, such as other researchers, their institutions, industry, venture capital, and local or regional economic development interests. Such activities are particularly important in the life sciences sector where there are close and complex relationships between research centers and other stakeholders, especially the biotechnology industry. Indeed, many biotechnology companies spawned from research institutions as spin-off companies, and many prominent biotechnology clusters are located near universities (Boston University, Stanford University, and Duke University).

The history of the TTO and the rise of the modern biotechnology industry are closely linked and often associated with the passing of the *Bayh-Dole Act* in the United States (1980) that enabled universities to hold intellectual property rights in publicly funded research products and processes.<sup>1</sup> The *Stevenson-Wydler Act* was the equivalent for government departments.<sup>2</sup> These acts were closely followed by a United States Supreme Court ruling that a genetically modified bacterium constitutes patentable subject matter. This landmark decision in *Diamond v. Chakrabarty* allowed the patenting of products such as gene sequences or life forms, a necessary condition for the life sciences industry to prosper.<sup>3</sup> Most countries in the industrialized world have since followed the U.S. model of enabling publicly funded research institutions, researchers, or some combination of the two to hold intellectual property rights in the products and processes of publicly funded research.

Presently, most research institutions in the United States have a TTO or its equivalent, and technology transfer professionals have formed a close network through organizations such as the U.S.-based Association of University Technology Managers (AUTM).<sup>4</sup> In its most recent survey on the state of technology transfer in the United States, well over a hundred universities plus colleges reported statistics to AUTM.<sup>5</sup> AUTM provides reported data to its members and compiles aggregate reports for public dissemination. However, the AUTM metrics and their equivalents have been criticized as being overly focused on input/output measures such as number of disclosures of inventions from researchers in an institution to the TTO, number of patents filed, number of patents granted, license reve-

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nue generated for the institution, and number of spin-off companies created (regardless of profitability and longevity).<sup>6</sup> Unfortunately, such metrics have come to dominate science policy at a broader level, since they are easily synthesized and understood by institutional and governmental policymakers, even if they do not capture the broader societal benefits of publicly funded research institutions.

This issue of how to measure the success and societal contributions of specific technology transfer strategies has recently received more attention. TTOs such as the University Industry Liaison Office (UILO) at the University of British Columbia have undertaken more comprehensive reviews of their activities considering broad-based societal, academic, economic, financial, and political impacts.<sup>7</sup> In addition, the UILO has taken a global view in determining its social value. It has instituted a global access policy<sup>8</sup> not only for neglected diseases research and global health as advocated by AUTM<sup>9,10</sup> and illustrated through the Better World Project,<sup>11</sup> but for all university innovation. Such policies, among other things, call for differential pricing structures and access principles for developing and developed countries.

Such innovative metrics and activities illustrate the real utility of TTOs, especially considering the small return on investment for most TTO activities based on traditional metrics, especially in smaller research institutes or less economically developed regions. For example, no Canadian technology transfer office is self-sustaining over the long term based on licensing royalties, with the exception of specific years where long-term licensing revenue is elevated due to one big hit. It is naïve, therefore, to believe that the primary role of a TTO is to generate revenue for its host institution, or, in many instances, that a TTO can even generate enough revenue to be financially self-sustaining.

Thus our starting premise for establishing a new TTO at a life sciences institute, the Instituto Gulbenkian de Ciência, in Portugal is that the activities and mission of the office should align with the broad social mandate of the institute. The following discusses the opportunities and challenges in setting up such an office.

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## Technology Transfer in Portugal

Portugal's exports have been steadily moving from low technology products to medium- and high-technology goods.<sup>12</sup> Moreover, in 2008, corporate research and development (R&D) expenditures (0.61 percent GDP) exceeded state R&D expenditures for the first time.<sup>13</sup> The growth in business sector expenses for R&D indicates an effort from the private sector to increase Portugal's scientific development and technology capabilities. Currently, Portugal offers a highly competitive system of fiscal incentives for R&D, offering tax deductions of up to 82.5 percent of the investment in R&D.<sup>14</sup>

This significant progress was driven by several initiatives that tackled the country's shortcomings with regard to technological development.

One important area where these initiatives have been active is knowledge transfer between industry and the academic sector. As in most developed countries, science and technology policy in Portugal has moved toward facilitating exchanges between government, publicly funded research institutions, and industry, including the enhancement and modernization of intellectual property rights and of the national intellectual property system.

Historically, one of the engines behind Portugal's recent progress in technology transfer has been the National Institute for Industrial Property (INPI, Instituto Nacional da Propriedade Industrial). INPI is the national institution responsible for management, policy, and education on intellectual property. Since 1999, INPI has been actively implementing an original initiative aimed at establishing a network between itself, entrepreneurs, patent agents, and other stakeholders within the innovation system. INPI has focused on developing strategic partnerships with business associations, universities, technological centers, and incubators.

The tangible outcome of this initiative was the establishment of offices to support intellectual property rights known as GAPI (Gabinetes de Apoio a Propriedade Industrial). From 2001 to 2002, fifteen GAPI units were established serving diverse organizations and institutions such as business associations and universities.<sup>15</sup> Five more GAPIs were established between 2003-2005. It is important to understand that, prior to this initiative, most

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*Ana Margarida Prado, PhD, David Cristina, PhD, and Tania Bubela, PhD*

institutions in Portugal did not have any intellectual property (IP) management or knowledge transfer departments, so these GAPIs were an important springboard for Portuguese technology transfer. The GAPIs became the precursors to many of the TTOs currently active in Portugal.

GAPI funding came from both European programs and INPI. Besides providing professional and logistic support for each GAPI, these funds also promoted capacity building in the best practices for management of intellectual property rights and technology transfer as well as global networking through the participation of GAPI professionals in international workshops. A new GAPI initiative is in progress and will encompass companies, startups, as well as universities and other R&D institutions.<sup>16</sup>

As a major upside, this initiative successfully brought together two formerly disassociated communities in Portugal: intellectual property lawyers and managers and the research and development community. However, on the downside, many of the problems in Portuguese technology transfer can be traced to how the GAPI initiative was initially implemented. The GAPI units were autonomous from INPI and their organization and institutional policies were defined by their host institution, meaning there was no standardized format or guidelines for these offices. As a consequence, Portugal, a very small country, now has twenty TTOs.

These TTOs have completely different models of operation and compete with each other. Clearly, for a country with limited resources, it would be highly beneficial to avoid organizational redundancies across different TTOs and centralize technology transfer, thus reducing institutional costs. However, due to the GAPI legacy of highly fragmented TTOs with very different operational models, a centralized TTO is extremely difficult to implement.

Some of these problems are currently being tackled by UTEN (University Technology Enterprise Network), a joint five-year effort between the University of Texas and Portugal that started in 2007. This follows an initiative of the Portuguese government to establish several international partnerships, not only with the University of Texas at Austin, as well as, with the Massachusetts Institute of Technology, Carnegie Mellon-University, Harvard

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*Ana Margarida Prado, PhD, David Cristina, PhD, and Tania Bubela, PhD*

Medical School, and the Fraunhofer-Gesellschaft. The UTEN network in particular aims to bolster Portuguese R&D institutions and establish thematic networks in Portugal, the transfer of technology to commercial ventures, and the introduction of Portuguese companies to the U.S. market. UTEN aids in establishing Portuguese small-medium enterprises (SMEs) and startups in the U.S. market by building contacts with venture capitalists and synergies with U.S. companies, good examples of such interactions are Bioalvo, Fluidinova, and YDreams Portuguese SME that UTEN has helped to establish a presence in the United States in 2007.<sup>17</sup>

UTEN has, so far, managed to identify technology-based business opportunities, offer training to technology transfer officers, and create a fluid network between all Portuguese TTOs. Therefore, although the idea of a centralized TTO for Portugal may still be distant, there has been significant progress in aligning most Portuguese TTOs' goals and practices.

So far we have focused on government and universities. In Portugal, however, industry also poses some interesting challenges. Since R&D has thus far played a small role in Portuguese industry, it is not surprising that the private sector has a certain lack of interest in engaging in interactions with academic institutions. This, in turn, makes the TTO's job more challenging in that it has to educate both researchers and industry partners about the value of technology transfer. Furthermore, this lack of sophistication in the private sector can make attracting venture capital for startups very difficult since high-technology companies are viewed as risky endeavors by investors. Nevertheless, funding for high-technology startups is becoming more available, namely through private/public funds programs.

If we take all these factors together, then we can safely say that, although much progress has been made in Portugal, there is still significant room for improvement.

## **The Challenges and Opportunities in Setting up a TTO in Portugal**

Keeping in mind the initial discussion on the role of a technology transfer office in a publicly funded life sciences research institution and the Portuguese policy goal of facilitating technology transfer for the benefit of Portuguese industry and broader society, we now discuss the specific case of establishing a technology transfer office at the Instituto

**Aligning the Activities of a Technology Transfer Office with the Social Mission of a Life Sciences Research Institute in Portugal: Opportunities and Challenges for a New Office**

*Ana Margarida Prado, PhD, David Cristina, PhD, and Tania Bubela, PhD*

Gulbenkian de Ciência (IGC). The policies and practices of such a TTO should, ideally, align with the mission of the IGC.<sup>18</sup> The mission of the IGC includes promoting science and serving the Portuguese research community, pursuing modern biomedical research in both content and technological basis, as well as producing internationally competitive science.<sup>19</sup> It has strong postgraduate education programs and is a leading life sciences research institute in Portugal. It is a highly academic institute with a history of scientific excellence.

This mission is based on the broader mission of Fundação Calouste Gulbenkian (FCG), a private foundation, which established and supports the IGC. The FCG has a very clear mission of improving Portuguese and global society. Consistent with this, it is involved in and fosters co-operative projects based on the United Nations millennium goals<sup>20</sup> (end of poverty, universal education, gender equality, child health, maternal health, combat HIV/AIDS, environmental sustainability, global partnerships) with Portuguese-speaking African countries and East Timor.

Hence, due to its mother institution, the IGC carries a very strong social mission. This has led to an internal culture of Mode 1 research and of little interest in generating revenues through IP licensing. However, recently the IGC has started to show interest in high social-impact technology transfer initiatives as it is becoming clear that technologies that do not leave the lab have smaller social contributions.

So, for a TTO to be aligned with the IGC's goals it needs to take into account the institute's concern with excellence in scientific research and the societal mission of the institute.

What kind of TTO, then, can be developed that incorporates both these elements? The policies will need to be carefully crafted to encourage high-quality applied scientific innovation in the life sciences. Thus, part of the mission of a TTO must address the possibility of facilitating or directly generating, through licensing revenues, additional resources for research.

Having a TTO within a research institution serves an important educational function for research faculty and students by (1) providing training on identification of research with

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*Ana Margarida Prado, PhD, David Cristina, PhD, and Tania Bubela, PhD*

translational potential; (2) providing training on IP protection, entrepreneurship, and business development; and (3) allowing access to networks that include entrepreneurs, investors, and industry. These initiatives, in turn, stimulate scientific innovation within the institute by increasing the perceived impact of research findings. Currently we are pursuing this in two ways: we are addressing the doctoral students directly, through courses on technology transfer and its importance, and we are meeting with the principal investigators directly on a one-on-one basis in order to educate and build long-term, trust-based relationships.

Such a traditional role for a university TTO, however, should not be the only goal, especially within an institution with a strong public-good mission. Any new policy must also recognize that technology transfer to industry via intellectual property rights and licensing is only one of the mechanisms to mobilize institutional research for the public good. A number of TTOs at institutions such as University of California, Berkeley, and the University of British Columbia have established global access policies to facilitate, for example, the transfer of technology to developing countries. In these circumstances, revenue generation should not be the primary concern, but rather take second place to the dissemination of useful products and processes. In this sense, it is very important for the TTO to value the overall social impact of a certain project over its immediate returns for the institute.

The final issue is the pragmatic one of implementation. The answer to this question is intimately related to the size of the institution, or, in other words, to its critical mass and power to engage the discovery and dissemination of new technologies. The constraints imposed result from the costs of seeking patent protection and the ongoing issue of generating successful commercial outcomes. Thus, the management of limited resources must be a priority.

One means for a TTO at a smaller institution such as the IGC to bypass the resource issue is to establish collaboration with an already fully functional TTO from another organization. In such an event, creativity in partnering will be important so that it can answer the expectations of both parties. This type of engagement makes sense if both parties are willing to start a long-term relationship since the outcomes of technology transfer have a lag time of several years from disclosure to being available to society.

**Aligning the Activities of a Technology Transfer Office with the Social Mission of a Life Sciences Research Institute in Portugal: Opportunities and Challenges for a New Office**

*Ana Margarida Prado, PhD, David Cristina, PhD, and Tania Bubela, PhD*

To start a collaboration of this sort, a careful choice of collaborator will be essential. It is important to consider whether the mission of a candidate TTO organization aligns with goals of the FCG/IGC. The desired scenario would be to find a partner such that the IGC would engage in work collaboration as if it were an additional department of that organization. To align with the FCG/IGC's public interest mandate, as much as possible, this partner TTO should favor technology transfer by encouraging nonexclusive licenses and dissemination of innovation in general and, in particular, to developing countries at a lower cost. Willingness to adopt innovative models of IP management, such as supporting initiatives for patent pooling, are also considerations in selecting a partner TTO.

Other important factors to consider are accountability and transparency of the TTO in reporting on and justifying its activities to key stakeholders, including the public. So far, however, finding an appropriate partner has proven difficult, since most large international TTOs are reluctant to make such an effort for an institute with a small output in IP.

An alternative to partnering with a larger, established TTO is to change the focus of the technology transfer away from more traditional models used in larger institutions. Traditional TTOs tend to manage large IP portfolios and generate revenues through licensing agreements. Since the IGC has limited resources for securing and marketing a large volume of patents, an attractive option is to only secure IP for a few select projects that fit well with the institute's mission. These projects would have to be entrepreneur-driven to minimize the load on the IGC's resources and would need to have the potential for high societal impact to fit with the institute's social mission. In summary, spin-offs that may be for profit or nonprofit driven by researcher/entrepreneurs or by external entrepreneurs. The role of the TTO, in this case, would be to work as an in-house entrepreneur while offering support, training, and networking opportunities to the researchers.

We believe this model of an entrepreneurship-driven TTO, in supporting entrepreneurial initiatives with a strong focus in social impact, addresses a need that is present in institutes other than the IGC, and we have initiated talks with another institute in Portugal to offer our services.

**Aligning the Activities of a Technology Transfer Office with the Social Mission of a Life Sciences Research Institute in Portugal: Opportunities and Challenges for a New Office**

Ana Margarida Prado, PhD, David Cristina, PhD, and Tania Bubela, PhD

In conclusion, the North American experience has contributed in the shaping up of technology transfer in Portugal, of which the UTEN network is an embodiment. There are many challenges in setting up a TTO in a developing European country, including resource and cultural challenges. Starting a TTO is a tremendous opportunity to build an institution from the ground up, learn from the experience of other organizations, and truly align the mission of the TTO with the social and scientific goals of its host institution and country.

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**Aligning the Activities of a Technology Transfer Office with the Social Mission of a Life Sciences Research Institute in Portugal: Opportunities and Challenges for a New Office**

Ana Margarida Prado, PhD, David Cristina, PhD, and Tania Bubela, PhD

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