How to Set Up a Technology Transfer Office: Experiences from Europe

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ABSTRACT

Technology transfer has an important role to play in the today's world, where access to know-how and knowledge are valuable economic commodities. A technology transfer office (TTO) can be set up in many different ways. The TTO should be tightly aligned with its supporting institution's missions and goals. Available external resources will affect the TTO's strategy and its operational structures, so it is important to consider the TTO's external environment. Income generation is typically one of the main objectives for the TTO, but technology transfer is valuable also because of its capacity to facilitate innovation and broker the exchange of knowledge for society's benefit. This chapter discusses the key elements involved in building a TTO—from structure and staffing to external engagement—and how to lay the foundations for success. A number of European models and trends are described to provide greater context.

1. INTRODUCTION

There is no "right" way to set up a technology transfer office (TTO), but success does require considering some key issues. This chapter discusses how to establish and run a TTO, and, drawing on experiences from a number of such offices, the chapter provides case studies to illuminate these issues. Emerging trends in funding TTOs are also discussed.

2. FOUNDATIONS

Any technology transfer office should be aligned with and supported by the institution it serves. The TTO's mission should be consistent with the institutional mission, and the TTO's approach and activities should support and add value to the institution. The TTO and the institution should agree upon what adds value, because financial returns alone are an insufficient measure of value for universities viewing their commercial activities strategically and contextually. Long-term returns, such as sustained partnerships, cultural change, job creation, and societal well-being should be part of the value provided by TTOs. These long-term returns supplement shorter-term, more tangible returns such as income, access to resources and expertise, and program delivery. This point has been emphasized by the U.S. technology transfer association, the Association of University Technology Managers (AUTM) and the U.K. association for technology transfer (UNICO[1]), which have disseminated data and case studies of how technology and knowledge transfer can benefit society.[2]

Deciding whether the TTO should undertake pure commercialization or broader knowledge transfer is important for developing an operational strategy. In a knowledge-based economy, access to know-how and use of knowledge (outside of the environment in which the knowledge was gained) is a valuable commodity.[3] The U.K. Research Councils define such knowledge transfer as:

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[T]he two-way flow of people and ideas between the research environment and wider economy, [which] thereby contribute[s] to national prosperity, the quality of life of U.K. citizens, and cultural enrichment of our society. Knowledge Transfer encompasses the systems and processes by which knowledge, expertise and skilled people transfer between the research environment (universities, centers and institutes) and its user communities in industry, commerce, public and service sectors.[4]

While the public good is always a part of a TTO's agenda, some have made income generation the prime objective. Others base their agenda on public benefit or economic development. Deciding upon the TTO's objectives will determine how the office should be configured, resourced, and operated. (Examples are presented at the end of this chapter.)

The senior management of the host institution must actively support establishing these foundations. To do so, managers will need to understand the relevance of technology transfer to the institution. Understanding the TTO life cycle is essential for helping the TTO office to encourage academics to participate in technology transfer and will help maintain support when returns seem slow or when a partnering decision appears unappealing on the surface. Such an understanding involves vision from both partners in the transfer and an ongoing dialogue between principals. In particular, it should be clear to all parties that, while technology transfer may be an extra income stream, it should not be relied upon to generate significant revenue for institutional planning. At Isis Innovation (Oxford University), perhaps one of the best-known European examples of technology transfer success, the gross income from technology transfer is about 0.005% of annual turnover. This is based upon annual turnover for the University of UK£530 million, gross income from technology transfer activity of UK£2.7 million, and net income from technology transfer (after the costs of undertaking the business), UK£260,000 (2005–2006 figures).

National and regional policies and objectives also should serve as a framework for shaping the office and directing priorities. When TTOs benefit from funding for local development, for example, they have been able to secure partnerships and fund specific activities of interest to the local region. In the Aachen region of Germany, for example, regional imperatives have engineered local economic development to ensure that an exhausted traditional coal mining region transitions into a high-technology center for innovation. Special initiatives and funding have encouraged the development of new businesses within the region. The scientific institute in Julich (Fachhochschule Aachen[5]) has been central to this redevelopment, having been built up to offer a variety of supporting technology-transfer services, including consultancy, provision of facilities, and the brokering of business advice.

An early step in setting up the TTO—and an essential ongoing activity—is identifying and fostering relationships with stakeholders. This group will include academics, representatives of the business and user community, and regional and governmental offices. The most important group at the outset is the internal community. Successful and meaningful technology transfer is demand driven, so it is important to understand the external partner's needs. If the internal academic community does not support the technology transfer process, there will be scope for failure at various stages of the process. Although time consuming for the technology transfer manager, he or she should be seen in the academic departments being served. This visibility will accelerate culture change and help integrate the TTO into the fabric of the university. The institutional message must be one of support and encouragement for engaging in technology transfer. TTO staff must work with academics at all levels to educate them in entrepreneurial behaviors at the macro and micro scales. This work could include training in how to engage with business and respond to its needs, how to act as consultants, and how to identify partnership or licensing opportunities. All academics will need to be aware of the intellectual property (IP) rights process, including disclosure, confidentiality, types of protection, and so forth. Such awareness training may be delivered by the TTO itself or in partnership with external providers. For example, IP specialists,

lawyers, and research sponsors are often willing to provide limited training. In the United Kingdom, government funding of universities consortia has established a number of enterprise centers for such training.

Incentive schemes for academic staff need to be carefully considered; policies should be implemented early. Experience has shown that acknowledging an employee's participation in technology transfer and sharing some of the financial reward are clear incentives to encouraging engagement in technology transfer. Siegel and colleagues[6] highlight the importance of faculty reward systems—along with removing cultural barriers and staffing the TTO, the reward system is one of the three key factors for success in technology transfer.

3. STRUCTURING THE TECHNOLOGY TRANSFER OFFICE

3.1 *Personnel*

The core element for successful technology transfer is people. Technology transfer is a "contact sport," so managers must have the ability to engage with people at all levels and across national boundaries. Managers need to understand the potential of their offerings and be highly flexible. Technology transfer managers need to be capable of engaging equally well with academics and business; they must be both inward and outward facing. Business skills are important but hiring an MBA graduate is not essential. The office should be led, however, by an individual who understands the details of running a business. Staff with work experience in the relevant business/user sector who can appreciate its requirements and tailor opportunities accordingly are also very useful. To build up an understanding of the potential for new opportunities, the technology transfer manager needs to win the confidence of academics, which is why it is helpful for the TTO to be embedded in the institution and for the office to be perceived as part of the institution. Staff should be able to spend time with academics to better understand what they can offer to the business and user community—as well as how these opportunities can best be developed for mutual gain by the institution and the community. Similarly, staff must actively engage with businesses to better understand market needs and gain agility in matching proposals with the institution.

An effective TTO is a team with complementary abilities. There is no one rule for the type of background that TTO staff need; much can be learned on the job and through specific training. However, if the office will be brokering opportunities in particular technical areas, then it is wise to recruit technical specialists. They will need to be able to use technical language with academics and customers, understand an opportunity and its applications, research areas of interest to a partner, and translate their ideas into an offering that business professionals will understand. Not all TTOs need to be large. A core viable unit at the outset may have three staff members, two of whom have business and technical skills and have or can develop expertise in IP rights and commercialization. The third staff member would provide administrative support. Often it is hard to resist the seduction of employing specialist staff in preference to administrative staff. However, an office that does not have access to appropriate administrative support will always be inefficient.

Specialist advice can be outsourced (for example patent and legal counsel). A growing number of legal firms have experience with the academic technology transfer sector, and they can provide a service that responds to the needs of this sector—both in terms of the type and level of advice and in the cost of counsel. When options have not been identified, a discussion within technology transfer networks will often reveal a number of suitable choices. While most offices use external legal advisors, a growing number of TTOs now employ in-house advisors, which may be desirable but naturally depends on whether the volume and complexity of work make such an appointment financially sensible.

Free business advice—which can be useful—is abundantly available to TTOs. Peer advice, including participation in technology transfer networks, can be invaluable. Other sources include funders of research (for example, Wellcome Trust, the Centre for the Management of Intellectual Property in Health Research and Development

(MIHR), and the Bill and Melinda Gates Foundation) and government and regional bodies. Business itself is an eager ally of the academic institution and the TTO. Often, experienced people will give their time to advise on specific issues or to become part of an advisory group. Many are delighted to be asked, and few refuse to help.

3.2 *Building skill sets*

As technology transfer has become a recognized profession within many countries, an inventory of best practices has accrued. There are many opportunities to build core skills in the team through networking, training, and literature. Some ways to improve the skills of the office will be free, through personal networks and mentors, for example. Secondments, where a member of one organization spends time in another, and internships with business and other TTOs are an attractive way to bolster skills, gain understanding, and share best practices. Such arrangements always work two ways, and both parties in the arrangement will normally be keen to participate. For the most part, however, specific training is needed for a team to acquire core skills and—as business needs and the landscape evolve—attain new ones. In Europe, the most prominent networking forum is the Association of European Science and Technology Transfer Professionals (ASTP)[7], a professional membership organization for technology transfer managers that hosts conferences across Europe. For technology transfer training, Praxis (a not-for-profit organization) offers a full range of courses that are delivered by practitioners.[8] Emphasizing experiential learning and networking, Praxis offers training both for new entrants and for more experienced professionals. Its courses are open to international delegates. In the United Kingdom, UNICO has published a series titled *UNICO Practical Guides* in a handy, readable format that provides in-depth advice on the range of technology transfer activities, from student IP rights to legal agreements and company formation.[9] There are also numerous guides available both for purchase and free of charge. The *MIHR Handbook of Best Practices for Management of Intellectual Property in Health*[10] is a good example of the latter.

3.3 *Managing information*

When setting up an office, adequate attention must be paid to information management. It is crucial to establish business processes at the outset. Technology transfer is naturally a long-term prospect, and key information on IP rights and legal agreements must be captured, organized, and maintained for a long time. The life of a patent, for example, may last for up to 20 years. Naturally, so will the license obligations. Moreover, most litigation requiring access to initial documents comes after a successful product is on the market, often several years after patent filing and licensing. Without adequate access to records, patent positions may not be sustainable and income may be lost. To develop business, project and contact information must be captured and shared across the organization, so a CRM (customer relationship management) style of database is desirable. It can be purchased off the shelf or developed internally. Each approach has its own strengths and weaknesses. A number of producers and many TTOs who have tried different systems are happy to share their expertise.

3.4 *Budget*

An office without an appropriate budget will struggle. As described above, technology transfer requires a complex combination of activities and skills. All technology transfer outcomes involve a transaction based on hard or soft IP rights (that is, patent or know-how). Invariably, the transaction will be by way of a legal agreement, which requires legal drafting (or use of template agreements) and negotiation skills. The transaction will have a financial component that must be clearly understood, and it will be based upon IP rights and/or access to resources that will need to be valued and protected. This means that someone must understand what elements can and need to be protected. The drafting and filing of a patent application are best done in conjunction with a patent agent, and there is a requirement for ongoing patent prosecution. All of these activities require funding; however, some costs may be recovered through a business deal or by passing them onto a partner.

3.5 *Business model*

Offices tend to be departments within institutions or subsidiary companies. As a department, the TTO is embedded in the institution and has its interests clearly aligned with institutional objectives. TTO staff will be on par with academic colleagues. Running technology transfer through a subsidiary company, however, may encourage a positive perception of technology transfer and demonstrate the seriousness with which it is viewed by the institution. A subsidiary company gives more operational flexibility and the ability to structure staff remuneration packages. Debates over TTO staff pay and incentives are frequent, and it is increasingly common to award performance-related pay and bonuses for meeting targets. This works well when the targets can be easily defined and measured and when reward is against outcomes rather than activities. However, this reward system skews behavior in favor of reaching those targets, so care needs to be taken to ensure that reward systems are properly cast to promote core business objectives. This is another reason why the TTO should have clear objectives that can be easily communicated to its staff—regardless of whether they are employed by the company or by the university. As a final twist on the internal/external TTO, staff do not necessarily need to be employed by the company; they may be employed by the university (and subjected to the university pay and pension scheme structure) and then seconded to the company.

Chain of command and accountability must be clear. A departmental TTO should report to a senior university staff member. A company will be responsible to a board, which may be chaired by a university senior staff member. In either case, the TTO will be accountable to the university governing body and will be expected to produce at least annual reports of activity. For both types of organizational structure, it will be helpful to have a group of advisors inside and outside of the institution. The advisors can bring new experience to the organization and act as internal and external champions. Advice on the most tax-efficient structures for establishing and running the TTO, for example, may help to determine whether it should be treated as a department or as a separate business. Governance should be considered where a company is formed and may be accomplished by forming a board with nonexecutive directors and/or an advisory board.

A final option is to outsource technology transfer to an independent third party. Outsourcing minimizes investments and the risks for the institution but also reduces the returns to the institution since the partner will take the lion's share of them. Such models are usually predicated upon income, and so the partner will likely pursue activities directed towards high-value, income-generating opportunities rather than technology transfer for the broader public good.

4. TRENDS IN TECHNOLOGY TRANSFER OFFICES

The landscape of technology transfer activity is changing. As Campbell[11] discusses, the United Kingdom is particularly progressive. Universities are creating innovative partnerships and developing expertise in technology transfer to secure financial investment and build future returns. Research funders are looking for initiatives to fill gaps in the technology transfer process.

Sheffield University is an interesting model. It lacked the funding needed to fulfill its technology transfer ambitions, so the director of the TTO set about developing a relationship with external experts, an initiative that led to establishing a separate company: BioFusion PLC (Sheffield, U.K.).[12] With a ten-year exclusive agreement with Sheffield University to commercialize all University-owned medical IP rights, BioFusion is run independently of the University and its TTO. In 2005, BioFusion listed on the Alternative Investment Market (AIM) of the London Stock Exchange, raising UK£8.23 million. The University is one of the shareholders. This funding allows the company to manage and fund both existing and new portfolio companies within the life sciences area. BioFusion has made clear its intention to develop similar relationships within the sector. With the increasing interest in technology transfer as an area for external investment, academic technology transfer companies have been able to secure funding when there is a clear income-generation

model. The most prominent example is Imperial Innovations of Imperial College, London. With a solid track record in commercialization and a robust pipeline of spinout companies, Innovations (and in turn Imperial College) has benefited from private institutional investment and intends to become a publicly listed company. Of course, this model of external funding does not work for all TTOs because it applies only to those organizations with potentially high investment returns. This will not be the case for most technology or knowledge transfer activities because most offices are brokering partnership deals to bring cash to a university for specific research rather than to generate unencumbered income. At Imperial, knowledge transfer and research partnership development has remained within the institution; Innovations concentrates on the cash-generating activities of licensing and spinouts.

5. EXAMPLES OF TECHNOLOGY TRANSFER OFFICE MODELS

At King's College London (KCL), technology and knowledge transfer is managed within one organization, KCL Enterprises Ltd., a wholly owned subsidiary of the university. KCL Enterprises is responsible for new opportunities and research support, which bring all the external business facing and research funding activities together. This combining of functions weaves the activities of the organization together and creates an extended, integrated team. Established 12 years ago, the initial team was a small technology transfer unit of staff specializing in the protection and commercialization of college IP rights. Over time, the research grants and contracts office of the university was incorporated into the organization. The company has since grown to 50 people and now encompasses business development, consultancy, work placement, marketing, technology transfer, spinout company incubation, and research support. The mission of the organization is to leverage the intellectual capital of the university to generate income and benefit society. The business development team underpins the activities of the company; specialist functions take on the leads appropriate to them. Eight business development managers specialize in different sectors and are co-located in both Enterprises and their relevant academic departments. Their objectives include developing collaborative research with business and promoting enterprise within King's and externally. The technology transfer team focuses on the identification, management, and exploitation of IP. They are skilled in patent prosecution, due diligence, and drafting and negotiating license agreements, and are supported by a team dedicated to mentoring and incubating new company spinouts from the university. The expansion of the team has been possible through funding from the university and from government, both of which recognize the increasing importance of the knowledge economy and applied research. Particularly active in promoting knowledge transfer, the U.K. government has established a specific stream of funding, the Higher Education Innovation Fund, which is available to universities within England. This has allowed many universities to develop knowledge transfer capabilities and capacity. It also allows them to take some risks in finding mechanisms to encourage and capture new opportunities at the institutional level.

The government has been keen to encourage development of knowledge transfer through the public sector research establishments within the United Kingdom. An early leader in this sector is Medical Research Council Technology (MRCT), a wholly owned subsidiary of the Medical Research Council (MRC). This technology transfer company grew from a team of four MRC staff in 1990 to a company that currently employs more than 60 people and that this year saw a windfall of over UK£140 million in income from royalty sales. MRCT in many ways is a unique example of technology transfer, but in other ways it points the way for others to follow. MRCT became a separate entity by merging with another applied-research activity of the MRC, thus gaining staff and expanding its technology transfer offerings to include applied-development laboratories. Its expansion was enabled through a record of good work and the vision and support of its parent institution. While the amount of income it generates is unusual, the sources of the income are typical: a suite of related technologies and their various,

carefully crafted exploitation. (This case still supports the general notion—discussed by Scherer and Harhoff[13]—that big wins in commercialization come from only a few deals.) Continuing its expansion into applied research, MRCT has developed new activities to add value and speed the uptake of academic IP. One approach has been to create a drug discovery team that identifies academic IP and develops licensing leads in industry. U.K. funders and international initiatives have also tried to expedite the process. For example, Cancer Research Technology (CRT) has a drug development laboratory, and the Wellcome Trust offers Translational Awards for developing early-stage opportunities into more commercially attractive offerings. International approaches include Medicines for Malaria Ventures, which brings public, private, and philanthropic sector partners together to fund and manage the discovery, development, and registration of new medicines to treat and prevent malaria in disease-endemic countries.

A push for technology transfer in the past ten years has created more than 20 technology transfer offices across Switzerland. To build critical mass, the two universities of Bern and Zürich jointly own a subsidiary nonprofit technology transfer company that they established in1999: Unitechtra. With a staff of seven and serving two other research institutes, Unitechtra has a clear mission to contribute to the economy, facilitate research uptake for the public good, develop mutual beneficial close ties with industry, motivate and retain academic staff, and, ultimately to increase income to the institutes. These objectives are pursued through activities that include the commercialization of research results, the negotiation of research agreements, support for the creation of new spinout companies, and training and education for scientists in the field of technology transfer. As a natural next step in the evolution of Swiss technology transfer, in 2003 the Swiss Technology Transfer Association (swiTT[14]) was formed. A network organization, it aims to bring together TTOs and specialists in the field to improve the provision of services and to share information and resources. The Swiss Network for Innovation (SNI) and the Swiss federal government provide funding to swiTT.

6. CONCLUSION

TTOs can be set up in a variety of ways, but in all cases it is helpful to draw on external skill resources where possible. Possessing clarity of purpose and building the right foundations is essential for planning the operations of the TTO. Making money will always be a consideration when setting objectives, but technology transfer adds value in other important ways: as a resource to facilitate innovation for the public good and as a way to broker the exchange of knowledge between the business and public sectors for society's benefit. Transferring knowledge across such disciplines as the humanities, law, and social sciences is as important as transferring knowledge and technology across the applied sciences, and TTOs should be set up to have the flexibility to accomplish this broader knowledge-transfer objective. ■

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