

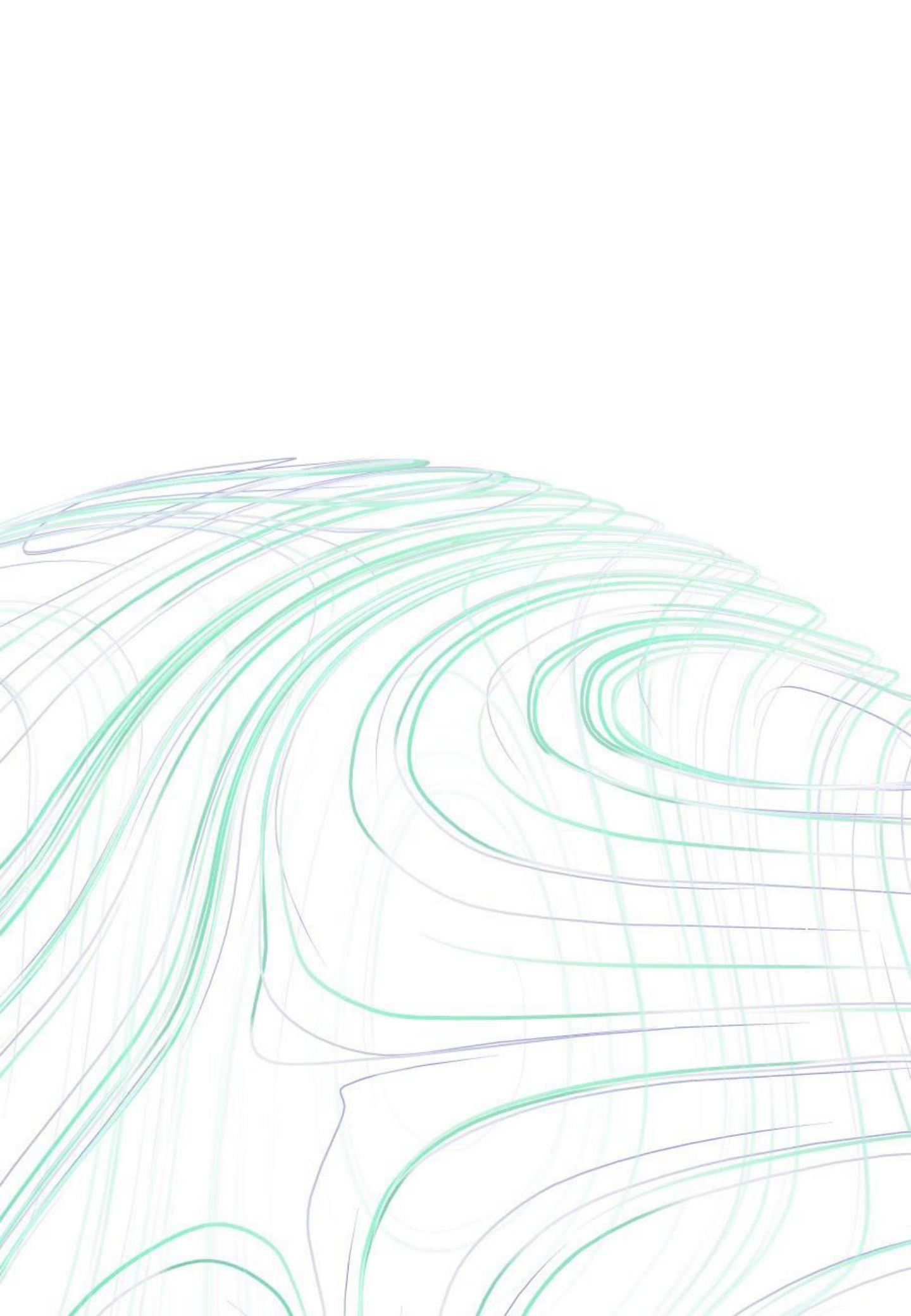


TECHNOLOGY TRANSFER BLUEPRINT

A National Guideline for Technology
Transfer Offices in Saudi Arabia

Developed by Research Development
and Innovation Authority

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Purpose of the Technology Transfer Blueprint

The purpose of this blueprint is to provide guidance on the best practices for technology transfer. It is not intended to be a comprehensive or definitive answer to all questions related to technology transfer activities. Rather, it is a starting point for KSA universities and research centers wishing to establish Technology Transfer Offices (TTOs) and for TTOs looking to improve their knowledge of best practices.

Even though this blueprint is a collection of best practices on how to conduct technology transfer, KSA universities, TTOs, and research centers should use it as a guide, and make sure it is tailored to their specific context, actual challenges, research capabilities and pipeline, and overall aspirations for research and innovation.

The blueprint is divided into three sections:

- The first section defines technology transfer,

TTOs, and IP, and details their importance in the innovation journey. Moreover, this section provides context by giving examples of TTO success stories.

- The second section discusses key considerations for setting up a TTO. It details how TTOs can achieve financial sustainability and forge sustainable long-term partnerships.
- The third section provides key considerations for operating an effective TTO. It provides best practices related to TTOs' operating models, including roles, governance model considerations, organizational structure, policies, processes and procedure, and tools and technologies.

The blueprint is intended for a broad audience, including TTOs, researchers, entrepreneurs, and policymakers. We hope it will be a useful resource for anyone involved in the technology transfer process.

Disclaimer

The information contained in this blueprint is not intended to be legal professional advice. It is important to consult with an attorney and an IP licensing professional before entering into any technology transfer agreement.

01

Introduction to technology transfer

1.1 What is technology transfer (TT) and why is it important?

University technology transfer is the commercialization of university and research centers' outputs. It involves the identification, protection, and promotion of research outputs to businesses, which then commercialize the research by developing products and services based on it. The transfer may be to existing companies or to newly established ones. Granting rights to use a university's intellectual property, such as its patents, is how the transfer is accomplished.

First, it is important to differentiate between business/university research collaborations and technology transfer. Although they complement each other, research collaborations are agreements between businesses and universities to work together on research projects, while technology transfer is the process of protecting and marketing research outputs for commercialization by a company as a new product or service.

Technology transfer is important for several

reasons. It:

- **Improves social welfare** by making new technologies available to improve human prosperity. For example, technology transfer can be used to develop new medical treatments that are more affordable and accessible to people in developing countries.
- **Promotes economic growth and development** by helping businesses to innovate and create new products and services, which can lead to increased employment, higher wages, and a stronger economy.
- **Enables transfer of knowledge and skills between different organizations**, which can improve productivity and innovation. For example, a company might transfer its manufacturing expertise to another organization, which can create jobs and boost the local economy.

1.2 What is a technology transfer office (TTO) and why is it important?

Universities, in general, have two primary outputs: highly trained individuals and newly created knowledge. The technology transfer office within a university is responsible for identifying, protecting, and translating that new knowledge into commercial impact. That impact can be measured in terms of societal benefits, enhanced reputation of the university, technological improvement, or even economic impact. It's important to note that economic impact does not only mean income to the

university but can also be the creation of new jobs or sectors in the local or broader economy.

According to WIPO, technology transfer organizations (TTOs) are academic or commercial entities that facilitate intellectual property rights management and technology transfer by bridging the gap between research and practice. They provide support for collaboration and mediate relationships between different innovation stakeholders, such as academia and industry.

TTOs play a pivotal role in enabling university research to be used by companies to create new products and services that can achieve impact. Where a technology is successfully commercialized the university may even receive revenues that can be used to fund future research activities.

The absence of a TTO can significantly impair the university's ability to create impact:

- By not identifying and protecting intellectual property that can then be accessed through partnerships with companies,
- By limiting the output of the research effort to publication only,
- By not being able to track and communicate to stakeholders the value of the research, often funded by government.

Leading international research universities have established TTOs for the express purpose of facilitating corporate access to the research enterprise for the purposes of fostering both collaborations and commercialization within an innovation ecosystem.

TTOs play a central role in the innovation cycle because they enable:

- Collaborating between industry and academia: TTOs can help to collaborate between industry and academia by facilitating collaborative research projects that lead to technology transfer.
- Protecting intellectual property: TTOs add value to research outputs by protecting intellectual property such as patent applications, trademarks, and copyrights. They can also provide strategic guidance to researchers on how to use such intellectual property to commercialize their research.
- Commercializing innovations: TTOs facilitate the commercialization of intellectual property by granting the right to use university owned IP for commercial purposes. This might be done with an existing company or a newly created start-up through licenses. The TTO educates and informs businesses that are

looking to develop new products or services based on how they can accelerate the development process by accessing university innovations.

Intellectual property (IP) refers to inventions, literary and artistic works, designs, symbols, names, and images used in commerce. It is protected by law through, inter alia, patents, copyrights, trademarks, database rights, and trade secrets

The most relevant forms of IP for technology transfer are patents, copyrights, and designs.

- Patents protect inventions, such as new products, processes, or machines. They give the inventor the right to prevent any other person from making, using, selling, or importing the invention in the country where they are granted and for a specific period.
- Copyrights protect any original authored work whether it's the lyrics to a song, a photograph or code written by a developer. Copyright prevents the unauthorized use of that original work for the lifetime of the author plus 50 years in Saudi Arabia, but the period of protection can be even longer in some countries.
- Designs protect the appearance of a product, such as its shape, pattern, or ornamentation. Design rights give the designer the exclusive right to use the design for a specific period.

Research outputs can have multiple forms of IP protection. The publication of the research creates copyright in that work but if the result can be protected by patent, then the research can also yield commercial outcomes beyond the scope of the publication. Society grants creator the exclusive rights to IP in order to foster creativity, innovation and commercial exploitation in the form of new products, tools and services which in turn can create new innovation-based jobs.

However, TTOs should carefully assess the commercial potential of new innovations before filing a patent to avoid having an inventory with little to no commercial value.

Historically, TTOs have assisted multiple notable successes such as:

- **Oxford-AstraZeneca COVID-19 vaccine:** The Oxford University Innovation (TTO) played a major role in the development and commercialization of the Oxford-AstraZeneca vaccine by evaluating the technology, negotiating the licensing agreement with AstraZeneca, and monitoring the clinical trials.
- **MPEG video technology:** Columbia University Technology Ventures (University TTO) worked with Moving Pictures Expert Group (MPEG) to commercialize the IP of MPEG video compression technology. The TTO also

worked with industry leaders such as Sony, Phillips, and Panasonic to develop the technology's DVD format and supported its commercialization.

- **Google search algorithm:** Stanford University Office of Technology Licensing worked with Google to develop the search algorithm that became the foundation for the Google search engine. The TTO supported multiple fronts, most notably by leveraging its network of industry partners and venture capitalists in finding potential funders for Google's IP creators and enabling them to raise \$1 million in seed funding.

1.3 Who are the relevant stakeholders within the technology transfer ecosystem?

TTOs interact with various stakeholders in different ways.

On one hand, TTOs help their customers, private sector companies, by connecting them with universities to address the companies' most pressing needs through collaborative research agreements. They provide these companies with knowledge about the latest inventions and IPs generated by universities and research institutions.

On the other hand, multiple key players contribute to the success of technology transfer and commercialization. Key players include:

- **Government** supports technology transfer by creating a favorable regulatory environment including maintaining and promoting the protection and use of intellectual property) and encouraging the commercialization of early-stage technologies (e.g., through tax or other financial incentives to promote new technology adaptation).
- **University**, as the primary funder of TTOs encourage and incentivize the adoption of research innovations and resources (e.g., funding

cutting edge basic research), supporting TTOs' efforts to commercialize the technology (e.g., providing incentives to inventors), and creating a culture of innovation and entrepreneurship (e.g., providing opportunities for students to start their own companies and encourage entrepreneurship).

- **Industry/Private sector/nonprofit sector** helps the transfer of technology by sponsoring opportunities for researcher and students to collaborate, by investing in technology development projects (e.g., technology hackathons and accelerators).
- **Venture capital and private equity** supports technology transfer by financing the companies that will undertake the commercialization of technologies (e.g., early-stage investment), and provide growing companies the follow-on investment they need to be successful (e.g., later-stage investment in spinouts).

The above parties all play a key role in supporting technology transfer. By working together, these stakeholders can ensure that new technologies are developed, commercialized, and used to benefit society.

02

Key considerations to effectively set up and operate a TTO

Setting up a TTO can be a daunting task which is why a clear plan is important. This guide will provide key considerations when designing a TTO's strategic mandate, business model, and operating model to ensure each serves its purpose.

Before deciding to set up a TTO, KSA universities should carefully consider their situation and resources.

TTOs typically have two options to enable its technology transfer capabilities:

- Set up its own TTO
- Setting up a new TTO involves creating an entity within the university. The TTO is responsible for identifying and commercializing the university's research.
- Partner with an existing TTO to conduct technology transfer

Partnering with an existing TTO to conduct technology transfer involves working with another TTO to commercialize the university's research. The TTO provides the university with access to its existing resources and expertise, such as its network of industry partners, its patent lawyers, and its marketing and sales team.

Several factors can influence this decision, such as:

- The size and scope of the university's research pipeline: universities with a smaller or more limited research pipeline may be better off partnering with an existing TTO for efficiency purposes.
- The university's budget: setting up and running a TTO can be expensive. Universities with limited budgets might consider partnering with an existing TTO.
- The university's culture and priorities: universities with a strong culture of innovation and entrepreneurship may be better off setting up their own TTO. This allows them to control the commercialization process and ensure the TTO's alignment with the university's

goals.

- The availability of an existing TTO: if an existing TTO is a good fit for the university, then partnering with that TTO may be the best option, at least in the beginning. If a TTO with the requisite capacity does not exist, the university must establish a new one.
- The university's strategic goals: university's strategic goals significantly impact this decision. To illustrate, if the university aims to establish spinoff companies, opting for a new TTO might be more advantageous. This approach offers greater autonomy in decision-making regarding these companies, aligning with the university's goal.

If the decision is made to partner with an existing TTO, there are several key considerations to be made, including:

- Experience: the TTO should have a track record of success in licensing technologies, creating spinoff companies, and working with industry partners.
- Network: the TTO should have a network of industry partners.
- Fee structure: the TTO's fee structure should be transparent and fair.
- Competencies: the TTO should have the competencies to commercialize university research. They should have a team of experienced professionals with expertise in patenting, licensing, marketing, and sales.
- Culture: the TTO's culture should be a good fit for the university. The TTO should be aligned with the university's goals and values.

Ultimately, the decision of whether to partner with an existing TTO, at least in the first years, or set up a new TTO is strategic and should be made on a case-by-case basis.

1. Considerations for TTOs' strategic mandate

1. What is a TTO mandate?

A TTO mandate outlines the goals, objectives, and overall purpose of the TTO. It contains themes the TTO wants to emphasize. These themes vary, but recurring ones include:

- Socio-economic impact
- Collaboration
- Innovation

The mandate is typically developed by the university that establishes the TTO and approved by the university's governing body.

The TTO mandate should be clearly defined and communicated to stakeholders. A well-defined mandate should set the direction, purpose, and

boundaries for the TTO's activities, and should align with the parent university's mandate.

When drafting a TTO mandate, it is important to remember that TTOs are not profit centers. Their primary goal should be to impact society, not generate revenue or IP for the university. For example, UKRI defines "impact" as "an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment, or quality of life, beyond academia."

Finally, when defining the mandate, TTOs need to consider their parent university's mandate and the innovation aspirations of the Kingdom.

2.1.2 How do TTOs monitor and track progress and impact?

KPIs, or key performance indicators, are metrics used to measure the performance of a TTO and track its progress. They:

- Set the TTO's direction: defining specific KPIs helps to focus the TTO's efforts and avoid wasting time and resources on activities not aligned with its goals.
- Define the TTO's purpose: the KPIs that a TTO chooses will reflect its priorities and mission. For example, a TTO that is focused on commercializing university research will likely track KPIs such as the number and revenue generated from licensing agreements, and the number of startups and spinoffs created.
- Measure the impact created by the TTO: by tracking its KPIs over time, the TTO can measure impact. This can inform necessary adjustments to the TTO's strategy and ensure its positive impact on the university and on society.
- Communicate the value of the TTO to stakeholders: by tracking and reporting on its KPIs, the TTO can demonstrate its value to stakeholders. This can help build support and secure the

resources needed to be successful.

Without clear and well-defined KPIs, it is difficult for a TTO to know if they are being effective. These KPIs can be divided into three main categories:

- Input KPIs,
- Output KPIs,
- Impact KPIs.

Input metrics often measure the activities undertaken by the TTO and the University to measure the progress of technology transfer while outputs measure the result of the application of TTO expertise to those activities. Finally impact metrics are often derived from the output metrics but are beyond the direct action of the TTO and as such they are more reflective of the innovation ecosystem's overall health and success.

On the other hand, input KPIs primarily measure the TTO's ability to support research and innovation at the university. These KPIs are also essential to the long-term health of the university because they indirectly measure its ability to produce research.

Input KPIs which can include but not limited to:

- Total research expenditures: The level of research funding at the university will drive the capacity for technology transfer and benchmarking against other institutions to gauge success
- Number of active research collaborations: number of research collaboration agreements that have been signed by a TTO between university researchers and industry partners.
- Number of FTE: By knowing the number of people dedicated to the effort in the TTO you can measure efficiency and benchmark success.
- Number of invention disclosures received: Invention disclosures are the lifeblood of technology transfer and reflect the willingness and awareness of the research community to participate in the process. For many new TTOs the main initial measure of success will be an increase in the number of invention disclosures received each year.
- Number of new patent applications filed: This figure will always be a subset of the number of invention disclosures received and reviewed and will also generate a meaningful metric based on the percent of those invention disclosures received that result in a new patent application being filed.
- Number of active technologies marketed: this figure is an indicator of the level of activity per FTE and an indicator of the likelihood of securing agreements related to a technology.
- Total IP management expenses incurred: total amount of money that has been spent on IP management activities, such as patent filing, patent prosecution, and licensing negotiations.
- Total proof-of-concept (PoC) funding given: total amount of money that has been given to university researchers to conduct proof-of-concept studies. PoC studies are small-scale projects that are used to test the feasibility of an invention.

Output KPIs can include but not limited to:

- Number of agreements signed: as a technology is marketed for transfer to a company it will typically see the completion of several agreements including non-disclosure agreements (NDA), option agreements, consulting, equity purchase and eventually commercial licensing agreements all concluded by the TTO.
- Number of startup companies established: number of startup companies that have been created for the express purpose of commercializing university research.
- Number of original patents granted: This figure shows the capacity of the TTO to successfully navigate a patent application through to first issuance. This figure will also yield additional metrics such as pendency (the time to issue) and the claim success rate (what percentage of original claims filed were eventually granted). This metric would not include subsequent patents in the same family such as divisional or continuations in part in order to preserve the integrity of the measure.

Impact KPIs can include but not limited to:

- Number of new products introduced: Where a licensed technology is developed and introduced into the market.
- Number of new jobs created by startups: Jobs created by a licensee expressly for the purposes of developing, manufacturing, and selling a product derived from licensed IP
- Licensing income from IP: Those revenues that the TTO earns from the commercial agreements it concludes. (this is also a proxy for the market value of the technology and the underlying research of the inventors)
- Follow on investment in startups: Where a startup can demonstrate a sufficiently investible proposition based on the commercialization of the licensed IP there is validation for the research result transferred and the efforts of the TTO in getting it put to use.

2. Considerations for TTOs' business model

The business model section focuses on financial sustainability and partnerships.

Financial sustainability refers to the ability of a TTO to generate enough revenue to cover its operating expenses, while partnerships refer to the mutually beneficial relationships that the TTO seeks to build with success-enabling stakeholders.

1. How can TTOs ensure financial sustainability?

A TTO is financially sustainable when it can demonstrate continued viability through the continued contributions of the University. In order to demonstrate viability, the TTO will have to show that it has the capacity to generate impacts and income from its outputs to offset the investment made by the University. It is a crucial element that enables universities to create impact and benefit for society by supporting the TTO. Without a strong value proposition accepted by the university the TTOs would not be able to support the commercialization of research, build relationships with industry, or promote technology transfer over the long term.

Financially sustainable TTOs are better positioned to attract and retain top talent, respond to challenges, and create positive societal impact.

Achieving financial sustainability can be a long and difficult process due to:

- The time needed to commercialize research: it can take many years to commercialize research, and TTOs need a steady stream of income to cover their operating costs during this time.
- The uncertainty of the commercialization process: there is no guarantee that any research commercialization will be successful, and TTOs need to be prepared for the possibility of losing money on some projects.
- The lack of awareness of technology transfer: many researchers and industry partners are not aware of the benefits of technology transfer, and TTOs need to educate these stakeholders about the process to build relationships and generate revenue.

Government funding is typically directed to the university in the form of research funding. The university then allocates a specific amount at its own

discretion to technology transfer activities, leaving the TTO heavily dependent on the university and making funding unpredictable.

Universities must be educated on the importance of technology transfer and the crucial role they play in it.

To achieve financial sustainability, TTOs need to understand their two main potential sources of income: university funding, and revenue generated from technology transfer activities.

Universities receive research funding from the government. They allocate a portion of this funding to their TTOs. While this is the main source of funding for TTOs, it is also one of their biggest challenges since it makes them dependent on the university research budget.

Additionally, TTOs leverage their own capabilities to generate extra revenue. This revenue can come from different activities, such as

- Licensing: revenue is generated when TTOs license their intellectual property to industry partners. The amount of revenue that a TTO receives from a licensing agreement depends on its terms. Common types of licensing agreements include revenue-sharing agreements, dividends from equity ownership, and the sale of spinout shares. Licensing agreements can also include material transfer agreements (MTA). TTOs receive revenue from patented material or software rights transferred to industry partners.
- Consulting services: revenue can be generated by providing a variety of services, such as identifying potential markets for a technology, developing business plans, providing IP advice, and negotiating licensing agreements. Consulting services can be a good way for TTOs to generate revenue and build relationships with industry partners.

- Research collaboration agreements with industry involve conducting joint research on specific topics. This can involve investing financial resources to develop and commercialize a new technology after concluding the research.

TTOs can achieve financial sustainability by balancing their total revenues with their operational costs. While this is easier said than done, some levers that TTOs can use are:

- Licensing and commercialization activities: these are the most common way for TTOs to generate revenue and include royalties (licensing and dividends) and sale of equity. The more commercial activities TTOs engage in, the more revenue they will generate.
- Charging fees for services: TTOs can charge fees for consulting. This can be a good way to generate additional revenue, for TTOs that cannot generate enough revenue from licensing agreements.
- Carefully managing expenses: TTOs need to stay within their budget by avoiding paying

patent maintenance fees for technologies that aren't being developed or are becoming obsolete.

While TTOs can influence the university funding they receive, their impact is limited. It is usually at the university's discretion to assess the amount of government research funding to be allocated to technology transfer activities.

It is important to note that newly formed TTOs will be highly dependent on university funding. Experience shows that certain leading international TTOs needed five to ten years to reach a maturity stage where revenues from technology licensing agreements were sufficient to cover operational costs.

Finally, TTOs need to better understand the existing government funding schemes and incentives available for their parent universities, such as tax benefits on technology transfer activities, foreign employment visa incentives, and other relevant government-provided funding.

2.2.2 How can TTOs establish and sustain an ecosystem of partnerships?

Partnerships are fundamental for the success of TTOs, allowing them to flourish within a robust innovation ecosystem and effectively realize their objectives. By nurturing these partnerships, TTOs help bridge the gap between academia and industry, fostering an environment of innovation and knowledge transfer.

Leading international TTOs ensure a well-rounded collaborative environment with all technology transfer stakeholders. For example, The University of California, Berkeley, has a TTO that has partnered with companies such as Genentech and Novartis to commercialize biotechnology research. These partnerships have resulted in the development of new drugs and treatments that have saved lives and improved the quality of life for millions of people.

Types of partnerships TTOs can establish include:

- Public sector: governments and governmental entities can provide TTOs with funding, incentives,

and regulations.

- Private sector: private sector players can include investors, small- and medium-sized enterprises (SMEs), large corporations, and startups. They can provide TTOs with funding, commercialization opportunities, and access to markets.
- Technology transfer associations can provide TTOs with funding, training, and technical assistance. They can also foster relationships with other stakeholders in the innovation ecosystem.
- Academia: universities/research centers and TTOs have a mutually beneficial relationship. Universities and research centers offer TTOs access to research topics, pipeline, talent, and expertise. TTOs share best practices and trends in technology transfer enabling a dynamic exchange that fuels innovation and strengthens both entities' capabilities.

TTOs that can forge strong partnerships with these stakeholders will be well-positioned to achieve their goals.

How TTOs can effectively establish and maintain sustainable partnerships?

To effectively establish partnerships and optimize the value generated from each partnership, TTOs should ensure:

- **Strategic Planning:**

- Develop a clear strategic plan that outlines the TTO's goals, objectives, and priorities for partnership development.
- Identify key industries and sectors where technology transfer is a priority and align partnership efforts accordingly.

- **Market Analysis:**

- Conduct regular market analysis to identify industry trends, market needs, and potential partners.
- Stay updated on emerging technologies and their commercialization potential.

- **Metrics and Performance Evaluation:**

- Develop key performance indicators (KPIs) to measure the effectiveness of partnership efforts.
- Regularly evaluate and report on the TTO's impact on technology transfer and economic development.

By implementing these strategies, technology transfer offices can enhance their readiness to establish partnerships and contribute to the successful commercialization of innovations and technologies.

In addition, it is crucial that TTOs follow a

strategic and proactive approach to networking. TTOs can leverage multiple strategies to nurture long-lasting partnerships:

- **Membership in Technology Transfer Associations:** join international (and national) TT Associations such as AUTM and PraxisAuril to network with professionals and connect with potential partners on a global scale.
- **Event organization:** plan and host focused workshops, seminars, or training sessions that unite researchers, industry experts, and entrepreneurs. These gatherings provide a platform to showcase existing technologies and explore collaborative prospects that can drive innovation.
- **Industry outreach and networking events:** participate in industry-specific conferences, seminars, and workshops. These events provide opportunities to connect with potential partners, showcase technologies, and discuss collaboration possibilities.
- **Collaborative projects and consortia:** participate in collaborative projects or consortia involving multiple research institutions, industry partners, and government agencies. These initiatives can enhance TTOs' capabilities and exposure.

Building and nurturing partnerships is a slow and gradual process, requiring not only their initial establishment but also the cultivation of these relationships over time.

To ensure success, TTOs should establish collaboration mechanisms, such as regular meetings and committees, and continually engage with industry partners. This helps maintain a strong and mutually beneficial partnership.

3. Considerations for a TTO's operating model

This section describes key considerations when developing an optimal operating model, including primary and secondary roles, governance model, organization structure, policies, required capabilities, procedures, and technology and tools.

1. What are the relevant functions and roles of a TTO?

TTO staff, whether they be one person or multiple teams, play a variety of roles to enable the commercialization of university research output. The primary roles, observed in most international TTOs, include:

- **Policy and Practice Development:** managing the process of developing guidance for the university and its constituent elements on how to establish, improve, and accelerate knowledge transfer activities.
- **Engagement and Education:** engaging actively in the realm of technology transfer, where TTO staff frequently participate in lab meetings, visit professors' offices, and attend classrooms across campus. These engagements involve discussing the advantages of contemplating the initiation of a company, forming partnerships with industries, or simply aiding a professor in realizing their role as an inventor.
- **Invention Disclosure Assessment:** representing the expansive opening of the innovation funnel, this phase demands adept professionals who possess expertise in both science and business. Their task is to ascertain which disclosures have the potential for protection and, more significantly, which ones necessitate protection.
- **Intellectual Property (IP) Management:** making the decision to file, where to file, when to file, reviewing the filing to date and managing the costs associated with the outcomes are all aspects of creating something that can be marketed to businesses or form the basis of a startup.
- **Marketing:** promoting the technologies, expertise, and resources of the university to potential industry partners, investors, and startups. This includes developing marketing strategies, creating marketing materials, and organizing networking events. The TTO must also market its own success internally and externally to achieve sustainability.
- **Licensing:** pricing, negotiating, and concluding commercial right agreements with industry partners and startups.
- **Compliance:** monitoring compliance with financial and non-financial aspects of licenses once they are concluded to ensure that the university recovers that which it is entitled to receive whether it be royalties or information on the development of new jobs and products.
- **Spinouts:** supporting and encouraging the establishment of startup companies created specifically to license university IP (often called a spinoff) and to participate in the management and growth of those companies through incubation, investment and often the provision of space.
- **Consulting:** establishing a first form of engagement that a company will have with a university before engaging in more substantial collaborative research projects. The TTO can support researcher who are willing and able to develop future opportunities for their research through consulting activities.

2.3.2 What are the governance model options for a TTO?

What are the governance model options followed by TTOs?

TTOs can adopt various governance models depending on several factors such as their maturity level and resource availability. Governance model options include:

- Remain embedded within the university.
- Exist as an independent wholly owned subsidiary.
- Form a nonprofit company owned by a consortium of universities.

A. Embedded within the university

TTOs following this model are considered a department within the university. This model offers several advantages such as:

- Providing access to university resources.
- Fostering a culture of innovation and knowledge transfer within the institution.
- Ensuring close proximity to ongoing research and emerging technologies and enhancing the ability to identify promising innovations.
- Being a part of the university community, positioning the TTO as an innovation vehicle.

This model might also present some challenges, such as:

- Slower decision-making processes due to reliance on numerous stakeholders, potentially impeding the technology transfer timeline.
- Potential conflicts of interest between the TTO and research departments because the former emphasizes commercialization while the latter prioritizes research outputs.
- Remuneration on a university scale rather than an industry one.

B. Independent wholly owned subsidiary

TTOs following this model operate outside the university but remain under its ownership. These TTOs have dedicated people across all their functions. This model offers several advantages such as:

- Fostering stronger business-to-business relationships with private companies, as an independent entity solely focused on bridging academia and industry.

- Enabling quicker and more agile responses to business needs, more effectively meeting industry demands.
- Providing legal protection to the university through a "legal firewall" by signing separate agreements and shielding the institution from potential liabilities.
- Facilitating successful commercialization due to attraction and appropriate remuneration of top technology transfer talent and capabilities.
- Clearly segregating responsibilities between research and commercialization.

The governance model also offers some challenges such as:

- Potential misalignment between the TTO and other parts of the university.
- Challenges communicating and coordinating with other university departments.

C. Nonprofit company owned by a consortium of universities

TTOs following this model are nonprofit organizations operating under the ownership of several universities. Representatives from these universities usually sit on the board of these TTOs. This model offers several advantages such as:

- Ensuring faster capability building due to collaboration among partner universities,
- Increasing exposure to new research since each university may have unique focus areas.
- Realizing better cost efficiencies due to shared functions.
- Having a greater breadth of resources than an individual university could justify.

However, the model is less prevalent than the first two options due to certain challenges, such as:

- Higher risk of conflicts between partner universities, requiring careful management of differing interests and priorities.
- Slower decision-making processes due to cultural differences between collaborating institutions.
- Weak attachment perception to the university.

Governance models one and two are the most common. The choice of model depends on the maturity of the TTO, its size, and the volume of the university research pipeline. Model three is less common due to the potential for conflict between partner universities.

TTOs must assess their unique circumstances and requirements to strategically design and implement the most suitable governance model.

Several governance mechanisms support the effective functioning of TTOs. These mechanisms help ensure transparency, accountability, and successful technology transfer. Some relevant governance mechanisms include:

- Advisory board: provides strategic guidance, oversees the TTO's activities, reviews major decisions, aligns technology transfer efforts with the institution's goals, and provides insights into market trends and opportunities.

The advisory board typically comprises TTO leadership, university senior administrators, academic leaders, industry players, legal professionals, and experienced entrepreneurs.

- Audit Committee: responsible for overseeing the financial reporting process, internal controls, and audit functions. This committee ensures accuracy, reliability, and transparency of financial statements.
- Risk Management Committee: identifies, assesses, and manages various risks faced by the TTO, including operational, legal, financial, and reputational.
- Compliance Committee: monitors the TTO's compliance with laws, regulations, and ethical standards. It ensures that the TTO operates within legal and regulatory boundaries.

2.3.3 What are some key organizational design considerations for a TTO?

TTOs commonly adopt a functional organizational structure, which organizes operations around well-defined roles. Employees are grouped together based on their skills and expertise such as finance, marketing, or IP. This structure ensures clear delineation of responsibilities.

These functions are divided into "front-office" functions such as licensing, intellectual property management, marketing, and spinouts, and "back-office" functions such as human resources, finance, and information technology. This helps TTOs manage activities in a well-organized manner, ensuring visibility and accountability.

There are several important elements to consider for the successful TTO, including:

- Size: TTO size (number of employees) depends on several factors such as the volume of patents handled, the research output of the university, and the topics of interest in research. A TTO can be sized by estimating the number of IP patents it

handles annually and assuming that it needs one IP manager for every 40 patents. This number considers all other functions and roles performed by the TTO, such as licensing, marketing, and back-office support.

- Roles and responsibilities: a dedicated team with well-defined roles and responsibilities promotes efficiency, avoids confusion, optimizes resource allocation, expedites decision-making, and enables effective communication. It is essential for TTO employees to clearly understand their roles to ensure efficient navigation of complex technology transfer processes.
- Leadership: strong leadership is essential for TTOs to guide strategy, decision-making, resource allocation, external advocacy, and relationships with the university leadership and administration. TTOs should seek the support of university leadership and ensure a shared understanding of the pivotal role of technology transfer within the university's agenda.

2.3.5 What are the human capabilities required for TTOs?

Possessing the right human capabilities is essential for TTOs and can be a key differentiator. Generally, TTOs need multiple capabilities, including but not limited to:

- IP specialization: proficiency in the patenting process, licensing agreements, and intellectual property protection.
- TT project management: skills to effectively handle multiple technology transfer projects, meet timelines, and allocate resources efficiently.
- Legal and contractual expertise: knowledge of IP laws and policies, contract negotiation, and compliance.
- Commercial background: business acumen to understand what businesses look for and to properly value IP and sell licensing agreements.
- Communications and marketing skills to promote TT activities and manage the TT network and events across groups including researchers, industry partners, and investors.
- Negotiation skills to reach mutually beneficial agreements with stakeholders during deal making, and post-deal relationship management skills for effective collaboration.
- Specific industry talent: depending on the TTO's focus, industry talent related to certain topics such as cybersecurity, artificial intelligence, or any other niche topic.

Recruitment is an important channel for TTOs to acquire talent and build capabilities. They can leverage multiple channels to attract candidates, such as job postings, recruitment agencies, networking in TT conferences, and partnerships with academic institutions and industry

organizations.

TTOs build capabilities using multiple channels aimed at enhancing knowledge, skills, and resources in technology transfer. Key capability building channels can include:

- Training Opportunities: TTOs actively encourage their employees to participate in various training activities, including workshops, webinars and forums. These opportunities encompass a wide range of options, such as online and in-person courses focused on marketing and licensing, webinars discussing specific skill development or broader industry trends, and expert-led workshops.
- Certifications and recognitions: TTOs support employees in obtaining certifications like Registered Technology Transfer Professional (RTTP) and Certified Licensing Professional (CLP) which are internationally recognized certificates obtained from international associations that showcase an individual's ability to conduct technology transfer and licensing according to international standards.
- Online resources on technology transfer: TTOs support employees in taking advantage of available resources in online channels such as education in IP management and negotiation skills. Additionally, online resources can include forums where technology transfer professionals ask questions and share best practices.

These are some of common channels used to build employee capabilities, but TTOs should consider additional options according to their unique context and available resources.

2.3.6 What are the core technology transfer processes and procedures followed by TTOs?

Technology transfer is a long and difficult process with a low chance of success. TTOs need to effectively manage this process to maximize the chances of developing innovative technologies.

TTOs usually follow similar processes and procedures in their technology transfer journey.

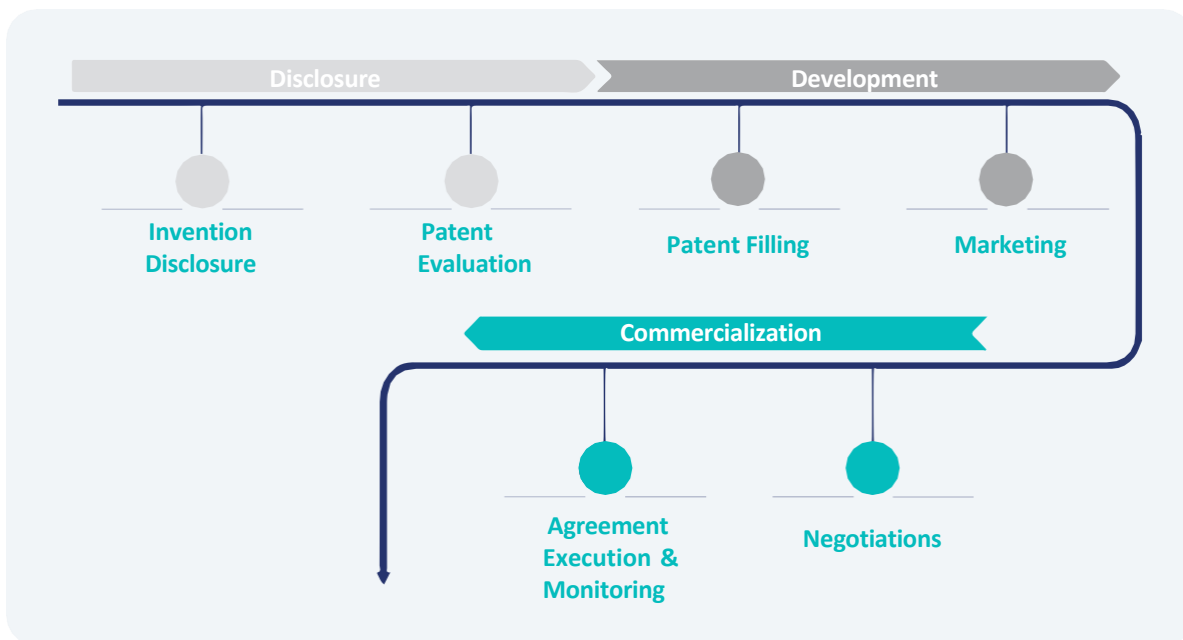


Figure 1: Core technology transfer process

2.3.3 What are some key organizational design considerations for a TTO?

As seen in figure 1, these can include:

- 1) **Invention disclosure:** providing information about an invention to a TTO. The disclosure should include a detailed description of the invention, as well as any relevant information about the invention's potential commercial applications. Its importance lies in:
 - a) **Assessing potential:** disclosure allows the TTO to evaluate the invention's worth and decide on further action.
 - b) **IP protection:** disclosure enables the TTO to file a patent, safeguarding the invention's related intellectual property.
 - c) **New technologies marketing:** disclosure helps the TTO present the invention to potential partners for commercialization.

Inventors should disclose their inventions to a TTO as early as possible. By disclosing, inventors can protect their inventions and increase the chances of commercialization. The disclosure process should be detailed, confidential, and timely.

The process typically begins with the inventor submitting an invention disclosure form to the TTO, which should include the following:

- The name of the inventor(s) and their relative contributions
- The title of the invention
- A detailed description of the invention (including the critical solution it provides)
- Any relevant information about the invention's potential commercial applications
- The inventor's contact information

It is particularly important to make a full disclosure of the invention and to define it in a way that clearly creates borders of protection for the resulting patent. An incomplete disclosure can cause problems in the patent filing activity. Moreover, a disclosure outside of the TTO and university at this stage will, in most countries, invalidate any patent application, so the disclosure should be kept internal to the university and be on a need-to-know basis.

A request for “prior arts” research (“prior arts” refers to previous inventions related to the disclosure) should be made with every invention disclosure to ensure novelty and inventiveness—the two tests of patentability.

The TTO will review the invention disclosure form and decide whether to pursue it. If so, they will file for a patent and market the invention.

2) Patent evaluation: following disclosure, TTOs conduct a patentability and commercial potential evaluation process to assess a patent application's eligibility for protection. It aims to grant exclusive rights only to valid inventions. The four-step process involves the following:

a) Disclosure review: meeting with inventors, revising the disclosure form, and gathering additional information.

b) Prior Arts research: assessment by the legal team of the novelty of the patent after examining existing published articles and other filed patents. The legal team will also assess the patentability of the invention by answering a set of questions such as:

- How strong is the patent position?
- Is there enough experimental data/information to support patent claims?
- Does the invention meet the key criteria for patenting? In other words, is it new and inventive, and applicable to industry?
- Is now the right time to file a patent?
- Should this invention be patented?

c) Market attractiveness and commercial opportunity assessment: due diligence commercial assessment of the opportunity, performed by answering a set of questions such as:

- Is there an unmet market need for the invention?
- What is the size of that market?

- How competitive is that market?
- Who are the key industry players in that space?

d) Go/No-Go decision: Based on the assessment, TTOs decide whether to proceed with patent filing.

During the patentability assessment step, inventors' feedback is essential. Inventors should be contacted to answer pertinent questions about their invention and may be asked to attend some meetings or workshops.

After the assessment, the inventors will be given feedback in the form of an “Opportunity Evaluation Summary.” The process usually takes up to six months.

If the TTO decides to file the patent, the inventor and the TTO usually sign a Confirmatory Patent Assignment Agreement.

3) Patent filing: patent filing is crucial because it provides legal protection, market advantage, and licensing and commercialization opportunities. Patent filing usually follows a four-step process:

a) The TTO collaborates with the inventor(s) and patent counsel to draft the patent application, including drafting the specifications, formulating the claims, preparing the abstract, and creating drawings if necessary.

b) The TTO files the patent application, submitting it with the relevant patent office and paying fees.

c) The TTO prosecutes the patent application by addressing patent office inquiries and making necessary amendments.

d) The TTO obtains the patent by completing administrative steps to secure the patent certificate.

Throughout this entire process, the TTO serves as a liaison between the inventor(s), a patent agent or attorney, and the patent office, managing the legal aspects of the patent application and providing support and guidance to protect and commercialize the invention effectively.

The patent filing process can be lengthy, taking months or years due to factors like invention complexity, TTO experience, and patent office backlog. Tips for a faster process include:

- Start early to expedite patent acquisition.
- Collaborate with an experienced TTO for efficient handling.
- Review and simplify if required the patent application to speed up review.
- Be prepared to respond promptly to patent office inquiries (office actions) to avoid delays.

Once a patent application is filed and granted it has a finite lifetime, typically 20 years. Filing too early and too late can both be detrimental to the patent and its protection. It is therefore important to carefully consider the right time to file, including such factors as:

- Time-to-market in some areas, such as new drug development, which can greatly impact a patent's life cycle if the patent is filed too early.
- Competitiveness of the landscape and the potential risk of another entity filing a similar patent.
- Exemplification of the patented concept and anticipation of possible strategies that can be used to circumvent the protection offered by the patent.

Patents can be filed in multiple countries if commercially viable. Deciding where to file depends on factors like technological capabilities, target markets, goals, and budget. Initial filing can be done through the PCT (Patent Cooperation Treaty) route that defers the decision and cost on international filings.

4) Marketing: is the process of identifying and engaging potential partners to commercialize university-generated IP. Two main steps for marketing a technology include:

a) Conduct market assessment: a market assessment is the process of conducting market research for a particular invention and provides a better understanding of the target market(s), the customers and their needs,

and what competitors are doing, as well as enabling identification of potential target licensees.

- **Market Research and Analysis:** research conducted to understand the potential demand for the patented technology.
- **Potential Licensee or Partner Identification:** identification of who might be interested in the patented technology.
- **IP Landscape Analysis:** a thorough analysis of the IP landscape, conducted by the commercial team to determine the uniqueness of the patented technology. TTOs should assess whether the technology is novel and non-obvious compared to existing patents, which impacts its market value.
- **Commercialization Feasibility Assessment:** TTOs evaluate the commercialization feasibility of the technology, considering factors such as production costs, scalability, regulatory requirements, and potential barriers to market entry.

b) Identify potential partners:

- **Networking:** TTOs and researchers attend industry events and conferences to network with potential partners. This can be an effective way to learn about companies that are interested in university-generated IP, to build relationships with key decision-makers, and to learn about new, commercially interesting research opportunities.
- **Researching industry publications:** TTOs research industry publications to identify companies that are active in the same field as the university's IP. This can be an effective way to learn about the companies' goals and strategies and identify potential partners.
- **Contacting companies directly:** TTOs contact companies directly to introduce them to the university's IP. This can be a great way to get the attention of key decision-makers and start a conversation about potential partnerships.

- Using online databases: TTOs leverage several online databases (such as Crunchbase) to identify potential industry partners. These databases typically list companies that are active in a particular field, and often include the companies' goals, strategies, and contact information.

Identifying partners is time-consuming. Key tips TTOs can use to conduct successful IP commercialization include:

- Clarifying goals to focus research.
- Being prepared to pitch the IP clearly, highlighting its benefits and market potential.
- Being patient, because finding the right partner can take time due to the significant investment requirement for early-stage inventions.

The inventor plays a crucial role in marketing by leveraging their expertise and industry contacts. They should collaborate closely with the TTO's commercial team.

Finally, in some cases, the licensee or industry partner may not be able to commercialize the technology due to factors such as lack of resources, lack of expertise, or incorrect opportunity assessment.

5) Negotiations: TTOs initiate negotiations after identifying potential partners to agree on transfer terms. This is a critical stage in the process, and success depends on all parties being collaborative, open, flexible, and committed to a meaningful relationship. The process usually involves:

- a) Signing NDAs and exchanging confidential information: confidential information may be exchanged following the execution of a confidentiality agreement with the potential partner.
- b) Visits or meetings: the partner may request a visit and/or set online meetings.

They may be interested in having discussions around the science behind the invention; reviewing available supporting data, development plans, or potential applications; and getting to know the inventor and the TTO team personally.

- Due diligence investigation: the partner may launch a review of the business assumptions that are critical to determining the commercial value and potential of the invention.
- License agreement drafting: if the partner is satisfied with the results of the due diligence investigation, licensing agreement negotiations can start. Many rounds of discussions may be necessary to finalize a license agreement.
- Legal review and licensing approval: the legal teams of both parties perform a final review of the agreement and approve it.

The time frame for negotiations varies based on how quickly the TTO and the partner can agree on the licensing terms, and the partner's prior experience in technology licensing agreements. IP licensing terms can be complex and can include sections on the scope of the license rights, license fees, royalties, sub-license rights, patent reimbursement, performance milestones, contract length, dispute resolution, exclusivity, renewal rules, and improvements. The license will also need to contain important terms for the university such as continued freedom to research and teach the patented material, and the reversion of the patent to the university if the company is not actively developing it. These terms may be unfamiliar to industry negotiators and will need to be properly explained.

6) Agreement execution and monitoring: the last step in technology transfer involves finalizing and overseeing the implementation of the negotiated licensing agreement and ensuring compliance. It usually includes:

a) Implementation oversight: tracking progress, milestones, and compliance with the technology transfer plan.

b) Royalty and payment monitoring: ensuring accurate reporting and addressing payment compliance.

c) Reporting obligations: requiring regular reports from the licensee on technology development and market penetration.

d) Intellectual property management: ensuring proper use and protection of IP rights.

e) Dispute resolution: handling conflicts through specified mechanisms like arbitration.

f) Termination and renewal: overseeing termination or renewal processes as per the agreement.

These procedures are made publicly available on the TTOs' websites, offering transparency and clarity regarding requirements, and ensuring that the parties involved in the process understand the steps required for technology transfer.

2.3.7 What technologies and tools are relevant for TTOs?

TTOs leverage certain technologies and tools to support their technology transfer activities. Selecting software depends on the TTO's needs and the size of their operations. Adequate training should be provided to all relevant members to maximize the benefits. Some useful technologies and tools used by international leading TTOs include:

- **Data management software:** TTOs deal with data related to intellectual property, licensing agreements, and research projects. Implementing a robust data management software facilitates organized and efficient handling of this information. There are

several commercial software offerings to do this, of which the most popular are Inteum and Wellspring.

- **Patent search databases:** TTOs can benefit from accessing patent databases such as USPTO patent search or Patentscope to conduct prior art searches and assess the novelty and patentability of inventions.
- **Knowledge management systems:** TTOs can employ knowledge management systems such as Sharepoint to organize and share internal expertise and best practices related to technology transfer.

Glossary

Confidentiality Agreement: A legally binding document enabling one party to reveal intellectual property (IP) to another party for specified purposes, with strict prohibitions against sharing it with others, returned to the giver upon request.

Copyright: A category of intellectual property rights that pertain to creative works fixed in tangible forms of expression; copyright protection applies to various forms of expression like novels, songs, photographs, and software from the moment they are created.

Disclosure: A statement that describes the nature, structure, operation, and/or application of an invention.

Intellectual Property (IP) Rights: These rights grant creators exclusive control over their creative works for a defined period, preventing others from using or replicating them without the creator's permission.

Intellectual Property (IP): Ownership of an idea or design by its originator, categorized under property law as intangible property resulting from creativity; encompassing trade secrets, trademarks, copyrights, and patents, particularly relevant in university contexts for inventions and original authored works.

License: A contractual agreement allowing the owner of intellectual property to grant specific usage rights to others.

Licensee: The party receiving the rights granted in a license agreement.

Licensor: The party granting the rights in a license agreement.

Non-Disclosure Agreement (NDA): legally binding contract that establishes confidentiality and secrecy obligations between two or more parties.

Patent: A form of intellectual property protection for novel, useful, and non-obvious ideas or concepts; certain creative works can be eligible for both copyright and patent protection.

Royalty: A payment made for the use of intellectual property, typically calculated as a percentage of product sales.

Trademark: A type of intellectual property represented by symbols, words, or phrases legally registered or established through use to identify a company or its products; also referred to as a brand or brand name.

