TECHNOLOGY TRANSFER

A policy primer for the commercialization of intellectual property and inventions

CONTENTS

Guide to This Book

Who Is This Book for?

This book is for those involved in any aspect of innovation or Research and Development (R&D). Whether you are viewing Intellectual Property (IP) from a governmental, academic, or industry perspective—as an investor, collaborator, inventor, researcher, incubator, accelerator, facilitator, or service provider—this handbook provides an understanding of what IP is and how it can benefit and serve your interests.

This handbook also introduces government officials to a range of options for developing and improving IP systems and Technology Transfer mechanisms, building on lessons learned from implementation in various countries. Additionally, policymakers and regulators from emerging economies can benefit from this handbook, including those across the Eurasian region, who are considering or actively pursuing the development of a robust IP legal framework with a particular focus on Technology Transfer.

What Is the Scope of This Book?

This handbook provides information needed to implement effective policies that establish and support Technology Transfer and enable an IP-related legal framework. This handbook is not intended to advocate for a particular suite of IP policies, funding mechanisms, or Technology Transfer structures, but provides an overview of options.

Who Wrote This Book?

The authors are a diverse team of intellectual property and Technology Transfer practitioners, including government officials, scientists, public policy experts, IP owners, lawyers, and academics. This handbook seeks to capture their collective

practical experience and current knowledge. It does not, however, represent the policy positions of the organizations, institutions, countries, and/or companies with which the individual authors are or have been affiliated. For such views, please refer to the publications and websites of the respective organizations, institutions, countries, and/or companies. The authors hope this handbook will advance the global development and implementation of intellectual property and Technology Transfer policies and laws.

How Was This Book Developed?

The handbook was produced using the Book Sprints (www.booksprints.net) method, which allows for the drafting, editing, and publishing of a complete product in just five days. The authors sincerely thank our Book Sprint facilitator, Alysa Khouri, for her patient guidance and unwavering leadership throughout the nearly 75-hour drafting process. The authors also thank Lennart Wolfert for turning our rushed scribbles into beautiful and meaningful illustrations, and Agathe Baëz for designing the book. We would also like to recognize the tireless work of Book Sprints copy editors, Raewyn Whyte and Christine Davis.

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How May I Use This Book?

This handbook is designed to capture the vibrant nature of the Book Sprints process and serve as a reference and starting point for further discussion and scholarly work. It may be read sequentially, particularly for those with limited background information about intellectual property and Technology Transfer. More experienced readers may consider skimming Chapters 1 and 2 briefly and diving immediately into Chapter 3, or their topic of interest.

Sincerely,
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Executive Summary

Technology Transfer is a mechanism for emerging and advanced economies to drive the engine of innovation and economic growth. With the speed of information exchanges and global commerce, valuable inventions can come from anywhere. They diversify economies, increase revenue, and generate positive social impacts. The ecosystem of Technology Transfer encompasses universities, governments, private research institutions, investors, industry, facilitators, and service professionals who collaborate to identify valuable inventions, protect their intellectual property, and bring them to market. The Technology Transfer ecosystem is a dynamic economic engine that, when properly established, can drive economic growth for institutions, communities, and countries. This handbook explains the reasons why intellectual property and Technology Transfer are necessary, describes the components of the Technology Transfer ecosystem, and provides practical tools to enable Technology Transfer professionals to maximize the benefits of the ecosystem.

Chapter 1 explains the benefits of intellectual property and Technology Transfer for policy makers, research and academic institution professionals, and innovators. Strengthening intellectual property protection and enforcement incentivizes innovation, expands access to global markets, and attracts investment.

Chapter 2 describes the fundamentals of Technology Transfer, including the basic entities involved and their interactions. To foster innovation, effective Technology Transfer requires collaboration among stakeholders, strategic intellectual property management and commercialization, as well as societal customization.

Chapter 3 highlights the innovation ecosystem and its potential to optimize Technology Transfer results. Governments, research and academic institutions, investors, and industries working together are integral to the development of a thriving innovation ecosystem.

Chapter 4 explains the design and operation of a central stakeholder in the Technology Transfer ecosystem: the Technology Transfer Office (TTO). TTOs lead the invention and intellectual property management process, which supports research, facilitates start-up formation, resolves conflicts, and conducts outreach and education regarding Technology Transfer.

Chapter 5 provides a guide for ways to manage and market innovations to maximize success in Technology Transfer. Balancing metrics, managing start-up pathways and intellectual property, and incentivizing inventors are all important for the innovation ecosystem.

Chapter 6 outlines the elements and structure of a licensing agreement in Technology Transfer. Effective licensing agreements require clarity in the transfer of rights, as well as in financial and performance obligations, intellectual property management, and confidentiality.

Chapter 7 provides principles and practices for start-ups, which are becoming one of the most valuable tools for developing and commercializing intellectual property arising from TTOs. Start-ups play a crucial role in bringing research innovations to market, and TTOs serve as a valuable resource for guiding the formation of start-ups.

Chapter 8 is a look forward into the current emerging trends in Technology Transfer, such as the role of artificial intelligence and digital platforms. These new trends are enhancing efficiency and collaboration in Technology Transfer, but can create ethical concerns for Technology Transfer professionals.

Appendix 1 outlines the basic framework of standard contracts in Technology Transfer, and the Additional Resources Section lists links to organizations, government entities, and associations with helpful information for Technology Transfer professionals.

Chapter 1: Benefits of Intellectual Property

Key Takeaways

- Strengthening Intellectual Property (IP) protection policies can boost Research and Development (R&D) incentives, retain top talent, and access new markets.
- Improving IP enforcement expands access to global markets, creates certainty for a welcoming climate for foreign investment, and curbs counterfeiting.
- Robust IP systems deliver far-reaching benefits to various stakeholders, such as governments, industry, research and academic institutions, innovators, and the general public.

1.1 Introduction

Chapter 1 outlines the differences between tangible and intangible assets, provides an overview of robust intellectual property systems, and uses a Case Study from Hecla Mining Company to illustrate the relationship between innovation and productivity.

1.2 Assets

Tangible Assets

Assets can be generally categorized into tangible and intangible. While it is easy to imagine and protect tangible assets, such as laboratory equipment, buildings, and machinery, protecting intangible assets, such as IP and brand recognition, is more challenging. So why should a government, a company, an investor, a scientist, or a public citizen care about intangible assets?

Intangible Assets

For publicly traded companies, more than 90% of their valuation can be attributed to their intangible assets, particularly IP. The formula for Coca-Cola, a trade secret, or the Nike swoosh logo, a trademark, have significant value. IP assets protect novel solutions to unmet needs, open access to new markets, and help preserve or expand market share.

1.3 Intellectual Property Systems

For governments, a robust IP system and trained judiciary for resolving disputes related to the system can encourage and reward innovation, contribute to increasing a country's economic growth, drive foreign direct investment, and thereby enhance global competitiveness, retain intellectual capital, improve accountability, halt the brain drain, and retain top talent, bolstering the national security and defense sectors. Concerning foreign investment, the Office of the U.S. Trade Representative (USTR) has developed a Special 301 Report (the Report) to identify countries with insufficient protection of IP. Global businesses rely on this Report to evaluate the investment climate before entering or continuing to operate in a country. In 2025, USTR reviewed more than 100 trading partners with the U.S. and placed 26 of them on either the Priority Watch List or Watch List for having insufficient IP protection. In recent years, several countries, including Turkmenistan and Uzbekistan, were removed from the Watch List due to improvements in IP protection and/or enforcement practices.

Access to global markets has led to increased competition, lower profit margins, shorter product cycles, and higher price erosion. As a result, achieving a return on R&D investment becomes more

difficult. Increasingly, more companies recognize that the IP generated is an asset that can create significant value for a business, as shown in Figure 1.1 below.

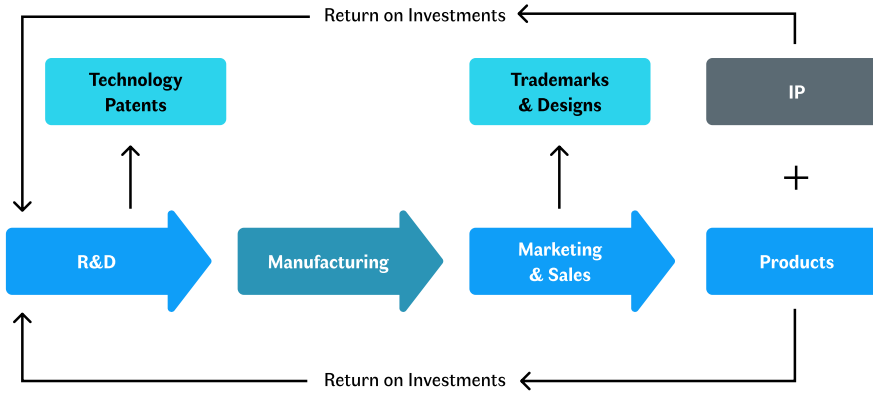


Figure 1.1: A description of the importance and interplay of IP throughout a product development lifecycle

Many companies in advanced countries invest in large IP portfolios worldwide. These IP portfolios can be leveraged to extract value in several ways, including utilizing the IP to generate additional revenue by licensing it to other companies. Additionally, the IP can be traded to gain advantages for businesses (for example, through access to new technology, partnerships) and used as an asset. IP has also been used as a means to create an exclusive position for unique products in the marketplace. The following Case Study illustrates the importance of IP in the mining industry.

Case Study: Innovation in the mining sector, Hecla Mining Company

Mining operations have historically focused on innovation to extract valuable minerals more efficiently, reduce costs, and increase production, thereby enhancing profitability. Cost efficiency was crucial during periods of low commodity prices. However, the modern mining industry recognizes that innovation is vital not only to its economic success but also to obtaining and maintaining its Social License to Operate. This involves securing the agreement of affected communities and stakeholders, including shareholders, governments, local communities, financiers, and civil society, to permit mining operations to proceed.

Innovation is relevant at all stages of the mining life cycle, from exploration, design, development, construction, and operations, to remediation and closure at the end of the mine's life. Employing modern technologies enables mining companies to discover new deposits of valuable minerals and extract them with a significantly smaller ecological footprint, thereby minimizing the impact on natural resources and reclaiming the land for productive post-mining use. Technology also enables the mining of previously abandoned mine sites and tailings deposits to extract valuable minerals from lower-grade deposits and historic operations.

Mining is an expensive and dangerous business. Innovation plays a critical role in enhancing worker safety. Automation and remotely controlled equipment enable access to valuable minerals under hazardous conditions by keeping people above ground. Wearable safety devices significantly reduce the risk of accidents during operations, and virtual reality facilitates safer and more efficient training for miners. A good example of innovation that has dramatically enhanced miner safety while also increasing production is Hecla Mining Company's Underhand Closed Bench patented mining method. The method employs blasting techniques that destress underground mining zones, releasing seismic energy while miners are out of the mine, and increasing productivity.

Strong IP protection provides immense benefits throughout society. Just as IP is critical for businesses, as illustrated in the Case Study above, a culture of implementing IP protection can help elevate the standing and worldwide recognition of RAIs. This ranking can help the institute generate revenue for the further development of other initiatives, attract a pipeline of talent, provide an outlet for creativity in venture creation, and enable collaboration through public-private partnerships.

Likewise, investors evaluate the risk and viability of their return on capital by assessing an entity's IP portfolio. Investors commonly ask entrepreneurs seeking funding about the scope and breadth of intangible assets that the company has secured in advance, to help ensure the certainty and predictability of their investment.

For innovators, their innovations must be protected. In turn, the protected IP makes it possible for the invention to go beyond the lab, so it can be commercialized and generate revenue that will flow back to the innovators and their research programs.

For the general public, a robust IP environment helps raise standards of living through access to a variety of products and services that address unmet needs.

As described, intangible assets yield positive benefits for a variety of stakeholders. It is essential to consider how to balance these benefits with potential unintended consequences. For example, a patent holder could misuse its patent to create unfair trade practices.

Nevertheless, obstacles arise from the lack of a robust IP ecosystem, thereby hindering innovation, economic growth, and local development. Without explicit IP protections, inventors and institutions are less inclined to invest in research due to the uncertain legal landscape, which contributes to low patent activity and causes a brain drain toward countries with stronger IP systems. Weak IP enforcement deters foreign investment,

fosters counterfeiting and piracy, and restricts access to global markets. On a local level, the absence of supportive frameworks impedes the commercialization of research and undervalues cultural assets that could benefit from geographic indications. These challenges are compounded by limited public awareness and institutional capacity, making effective enforcement and strategic growth difficult to achieve.

Chapter 2 describes the fundamentals of IP, Technology Transfer, and the innovation process.

Chapter 2:
The Fundamentals

Key Takeaways

- Technology Transfer is a multi-stakeholder endeavor, requiring effective collaboration between governments, research institutions, start-ups, and industries.
- Successful Technology Transfer relies on effectively managing Intellectual Property (IP) rights, commercializing these rights, and tailoring strategies to local contexts and development goals.
- Harnessing external expertise and strategic partnerships can lower costs, accelerate development, and enhance the odds of success.
- The effectiveness of Technology Transfer depends on customizing strategies to match each country's unique conditions, resources, and priorities.
- Enduring success in Technology Transfer depends on steady commitment and the creation of self-sustaining innovation ecosystems.

Technology Transfer is the systematic process by which technology, knowledge, creative work, material, data, and methodologies are transferred from one organization to another, or from the Research and Development (R&D) phase to practical application. This process enables the transformation of innovations and scientific discoveries into products, services, and processes that benefit society and drive economic development.

2.1 Introduction

Building on the foundation laid in Chapter 1, which emphasized the critical role of IP in fostering and capturing innovation within a nation, Chapter 2 explores a key mechanism for unlocking early-stage ideas: Technology Transfer. More than a conduit for invention, Technology Transfer serves as a strategic engine for economic development—empowering governments, research institutions, start-ups, and private industry to transform

research into real-world impact. In the pages ahead, we unpack essential concepts, terminology, and frameworks that enable nations to convert innovation into sustainable growth.

Technology Transfer provides a pathway for accessing cutting-edge technologies, building local capacity, and fostering innovation ecosystems that can compete globally. However, successful Technology Transfer requires understanding the complex interplay between IP rights, innovation processes, and the various stakeholders involved in the ecosystem (see Figure 2.1 below). As described in Chapter 1, a robust IP ecosystem is critical for all stakeholders involved.

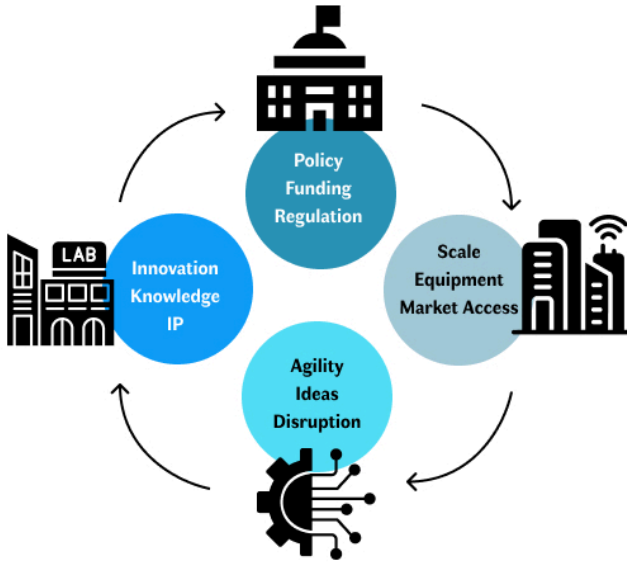


Figure 2.1: An illustration of the interplay between the Technology Transfer stakeholders

2.2 What is Technology Transfer?

Technology Transfer is the systematic process of moving knowledge, discoveries, and innovations from one organization to another for further development and commercialization. It is the bridge that connects innovation, scientific discovery, or creative work with practical impact, transforming promising research into products, services, and solutions that improve lives and strengthen economies.

This chapter examines the fundamental concepts, stakeholders, and mechanisms that facilitate successful Technology Transfer, with a particular focus on the unique opportunities and challenges encountered by emerging economies. This chapter examines how governments, Research and Academic Institutions (RAIs), start-ups, and industries each contribute to vibrant innovation ecosystems, and how they can work together more effectively.

2.3 The Foundation: Understanding Intellectual Property

Before diving into the mechanics of Technology Transfer, it is essential to understand its legal foundation: IP. As the currency of innovation, IP provides the legal framework that enables creators to protect and benefit from their intellectual creations, ultimately advancing those innovations to the broader public good.

IP encompasses all creations of the mind: inventions, artistic works, designs, symbols, names, and commercial imagery. The IP system grants exclusive rights for limited periods, creating incentives to innovate while ensuring that knowledge eventually

becomes publicly available. The primary forms of IP include patents, trade secrets, copyrights, and trademarks, as illustrated in Figure 2.2 below.

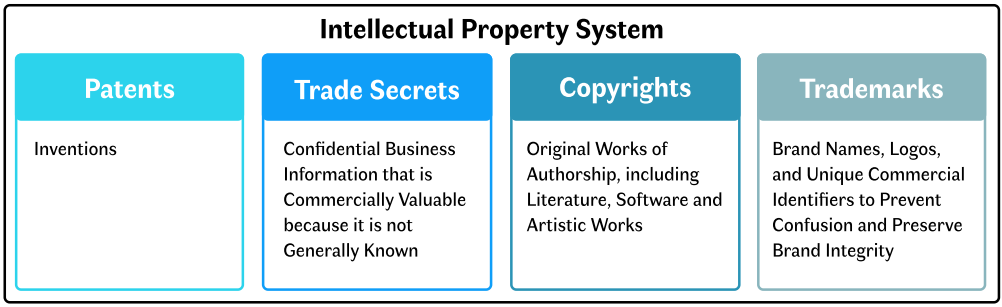


Figure 2.2: A chart outlining the various forms of IP rights

A robust IP system strikes a delicate balance—it must provide strong protection to encourage innovation and investment by providing certainty, while ensuring that knowledge flows freely to enable follow-on innovation and public benefit.

Below is a Case Study demonstrating the benefits of solutions obtained from social innovation discoveries, ultimately benefiting the public.

Case Study: Novel water purification technology

Consider this example: a research institution develops a new water purification material (technology); when industry figures out how to manufacture this material cost-effectively and deploy it in rural communities lacking access to clean water, that becomes innovation.

When innovation reaches rural areas, its impact can be transformative. Access to clean water through advanced purification technologies not only improves public health but also empowers communities economically and socially. Children can attend school instead of spending hours collecting water, local clinics can operate more safely, and agricultural productivity can rise with reliable water resources. Innovation bridges the gap between possibility and progress, turning remote regions into thriving ecosystems of opportunity, resilience, and hope.

2.4 The Science Spectrum: From Curiosity to Application

The innovation journey typically begins with scientific research, which can be understood along a spectrum:

Basic Science (fundamental research) expands our understanding of natural phenomena and materials without immediate commercial applications. It is driven by curiosity and

the desire to understand how the world works. A physicist studying quantum mechanics or a biologist investigating cellular processes is engaged in basic science.

Applied Science takes insights from basic research and deliberately develops them to solve specific problems. Applied researchers use established scientific principles to create new technologies, improve existing processes, or address unmet needs.

Both basic science and applied science are essential and interdependent. Basic science generates the fundamental knowledge that makes future innovations possible, while the unmet needs of applied research often drive new fundamental investigations. Technology Transfer typically bridges this gap, moving discoveries from basic research through applied development toward commercial implementation.

2.5 The Innovation Process: From Ideas to Impact

Innovation is the engine that transforms scientific potential into societal benefit. The following Figure 2.3 illustrates the four categories of this engine.

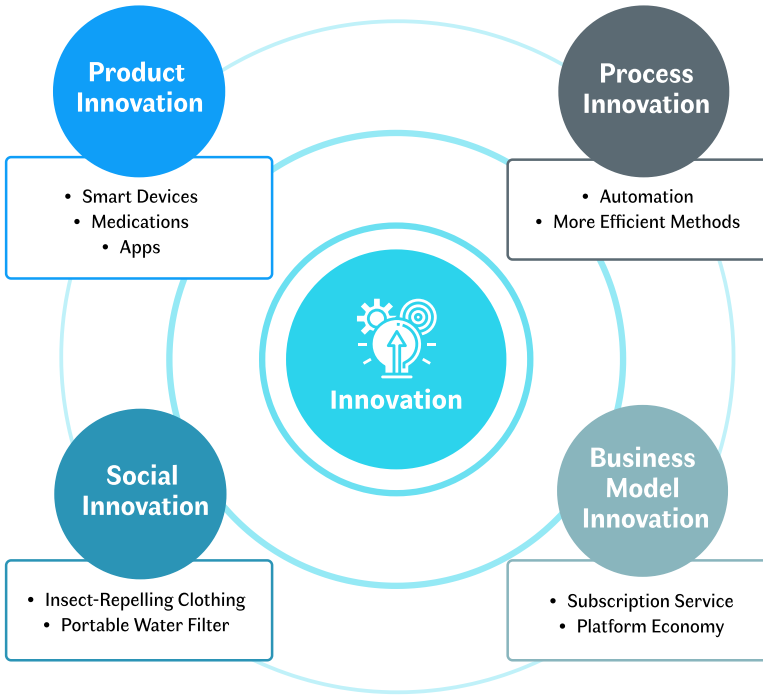


Figure 2.3: A model describing the four categories of the innovation engine

Product innovation focuses on creating new or substantially improved goods and services. Process innovation focuses on developing better methods of production, delivery, or organization. Social innovation addresses societal challenges through novel approaches. Lastly, business model innovation looks for new ways to create, deliver, and capture value.

Invention vs. Innovation: The Critical Distinction

An invention is any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof. Innovation happens after invention—taking that invention and developing it into something that creates practical value for users. Innovation is an invention with a potential commercial application.

This distinction is crucial because many inventions never become innovations. It is worth noting that not all innovations are brand-new inventions. Sometimes innovation involves combining existing technologies in novel ways or applying established technologies to new markets or use cases.

2.6 Government: The Ecosystem Architect

Governments play a unique and vital role in Technology Transfer, serving as both direct stakeholders and architects of the innovation ecosystem. Their influence extends far beyond funding research—they shape the legal, policy, and institutional environment that determines whether innovations successfully transition from laboratory to marketplace.

Government's Technology Transfer Mission

For governments, Technology Transfer entails creating conditions that enable the translation of publicly funded research and local innovations into products and services that benefit the economy and society. This involves both direct Technology Transfer (through RAIs sharing findings with industry or communities) and indirect facilitation (creating policies and mechanisms that enable Technology Transfer between other actors).

In many countries, government priorities often include:

- ➔ Establishing clear legal frameworks for IP ownership and licensing
- ➔ Building institutional capacity for technology commercialization
- ➔ Facilitating connections between research institutions and industry
- ➔ Creating incentives for private sector engagement in innovation
- ➔ Ensuring that Technology Transfer serves broader development objectives

Building the Innovation Infrastructure

Technology Transfer Offices (TTOs) represent one of the most important institutional innovations in Technology Transfer. These offices, typically housed within RAIs, serve as the professional interface between research discoveries and commercial applications.

Figure 2.4 below illustrates the critical functions performed by TTOs.

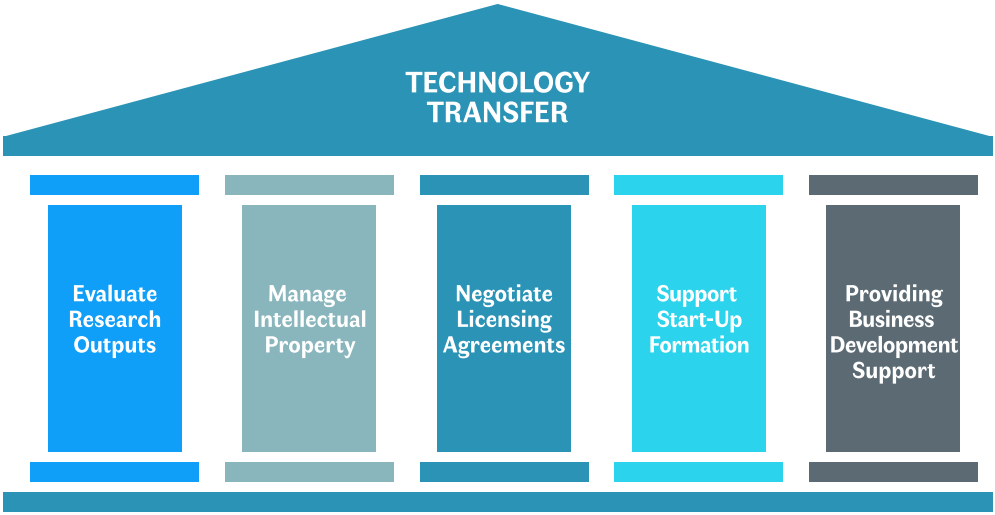


Figure 2.4: The critical functions of a TTO

Government support is essential and can take various forms. Figure 2.5 shows some of the sources of government support.

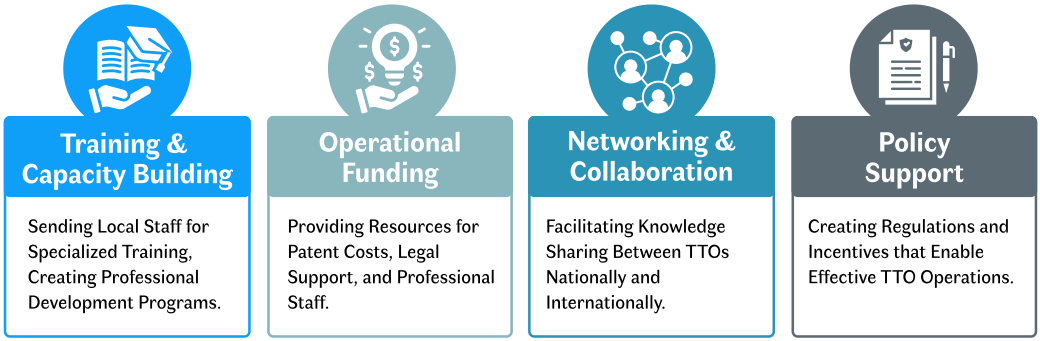


Figure 2.5: Examples of governmental support

Case Study: Dedicated Resources to Increase Research Commercialization

The U.S. Creating Helpful Incentives to Produce Semi-Conductors for America Act of 2022 provides an instructive example—it authorized USD 3.1 billion specifically to help research institutions strengthen their Technology Transfer capabilities. As this Act demonstrates, dedicated resources for the nuts and bolts of Technology Transfer can dramatically increase research commercialization.

Beyond individual TTOs, governments can invest in broader innovation infrastructure:

- Incubators and accelerators: Provide intensive support for early-stage technology ventures.
- Science and technology parks: Create physical spaces where researchers, entrepreneurs, and industry can collaborate.
- Innovation hubs: Foster ecosystems of interconnected innovation activities.
- Funding mechanisms: Provide financial support for different stages of technology development.

2.7 The Triple Helix Model

The most successful innovation ecosystems are characterized by strong, frequent interactions among three key spheres: academia, industry, and government—referred to as the Triple Helix model, proposed by Henry Etzkowitz and Loet Leydesdorff (see Figure 2.6 below). In these systems:

- The government provides funding and policy support to foster this ecosystem, while also facilitating connections.

- ➔ RAIs conduct research while also actively engaging with industry needs.
- ➔ Industry invests in R&D while also collaborating with RAIs.

Figure 2.6: A depiction of Etzkowitz-Leydesdorff's triple helix model

Many countries currently operate with more siloed systems, where these three spheres have limited interaction: RAIs may focus purely on academic output, industries may not trust local research capabilities, and government efforts may not be well-aligned with either academic/scientific priorities or commercial objectives. Recognizing this challenge, many governments are implementing policies to encourage greater interaction, such as funding joint university-industry research projects, creating physical spaces (like science parks) where different actors can interact, providing incentives for researchers to engage with industry, and supporting industry investment in local R&D capabilities.

2.8 RAIs: Where Knowledge Meets Opportunity

RAIs are the primary generators of new knowledge and technology. For these institutions, Technology Transfer represents both an opportunity to increase their societal impact and a source of revenue to support further research.

RAI's Perspective on Technology Transfer

For RAIs, Technology Transfer is the systematic process of identifying, incentivizing, protecting, developing, and commercializing research outputs to maximize their societal and economic impact. This involves managing a complex portfolio of activities; for example: recognizing when research outputs have commercial potential, protecting IP through patents and other mechanisms, finding appropriate commercial partners, negotiating licensing agreements or supporting start-up formation, and maintaining relationships with industry partners.

Critical Concepts for RAIs

The starting point for most Technology Transfer activities is the invention disclosure—a detailed document that researchers submit to their TTO describing a potentially patentable discovery. Appendix 1 provides a checklist for the Invention Disclosure form.

One of the most important concepts to understand is public disclosure—any non-confidential sharing of invention details with any third party. This includes publishing papers, presenting at conferences, posting information online, or even informal discussions without confidentiality agreements. Public disclosure is critical because patent law requires that inventions be unique. Some countries provide a grace period. For example, the United States offers a one-year grace period following the first public

disclosure, during which applicants can file for their first patent protection. Many other countries (including most countries in Europe) lack a grace period after the first public disclosure.

Intellectual Property in RAIs

RAIs must navigate several types of IP. Patents remain the primary mechanism for protecting scientific inventions. In most countries, patents typically have a 20-year term from the filing date of the first application filed, during which the patent owner can prevent others from making, using, or selling the claimed invention. In return, the inventor must publicly disclose the method of making and using the invention, thereby contributing to the broader public knowledge base.

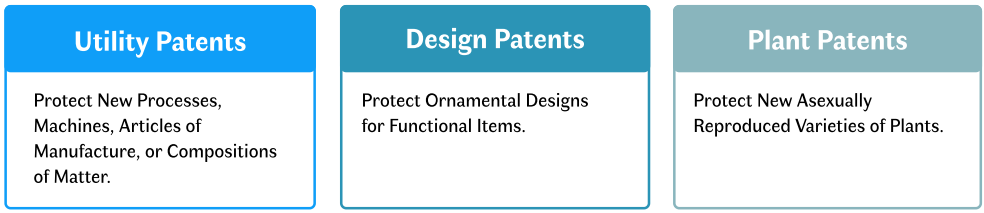


Figure 2.7: A chart of the types of patents permitted in the United States

Trade secrets protect confidential information that provides a competitive advantage—such as manufacturing processes, customer lists, or research methodologies. Unlike patents, trade secrets can potentially last forever but offer no protection if the information is independently discovered or reverse-engineered. Data, such as raw unprocessed information to organized compilations and databases, is an example of information that can be considered a trade secret.

Copyright is a type of IP that protects original works of authorship as soon as an author fixes the work in a tangible form of

expression. This would include software code, written materials, and artistic works. In research contexts, this often applies to software, databases, and educational materials.

Plant Variety Protection (PVP) or Plant Breeders Rights (PBRs) protect new sexually and asexually reproduced plant varieties.

The Licensing Process

Licensing is the primary mechanism through which RAIs commercialize their innovations. It involves granting another party the right to use, manufacture, or sell a patented invention in exchange for a specified amount of compensation. Chapter 6 provides a more detailed discussion of License Agreements. Generally, license agreements vary. Figure 2.8 provides some types of license structures.

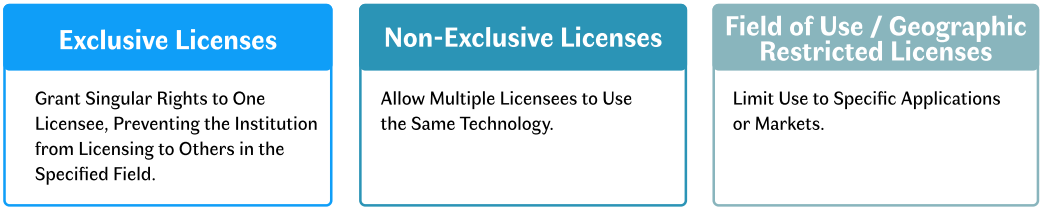


Figure 2.8: A chart of some types of license structures.

License agreements comprise financial terms, such as:

- ➔ Upfront fees: Initial payments required upon signing.
- ➔ Milestone payments: Payments triggered by development or commercial achievements.
- ➔ Royalty payments: Ongoing fees based on sales revenue.
- ➔ Equity stakes: Ownership in start-up companies formed to commercialize the technology.

Diligence requirements ensure that licensees make reasonable efforts to develop and commercialize the licensed technology within specified timeframes.

2.9 Start-ups

Start-ups represent one of the most dynamic pathways for Technology Transfer, transforming research discoveries into new companies and commercial products. Start-ups are newly formed companies, typically developed by entrepreneurs who identify market opportunities and assemble resources to pursue them. While start-ups may license technology from RAIs, they are generally independent ventures owned by their founders. Start-ups also may be companies created directly from RAIs and typically involve the transfer of IP, sometimes personnel, and usually equity ownership. Chapter 7 provides a more detailed discussion of start-ups.

The Role of Investors

Entrepreneurs are individuals who start and operate businesses, accepting financial risks in pursuit of profit and impact. They often serve as the driving force behind the commercialization of technology, bridging the gap between research and market application. Angel investors are high-net-worth individuals who invest funds in early-stage companies. They typically invest smaller amounts (USD 10,000-500,000 in the US) and often provide valuable mentoring and networking support in addition to funding. Venture capitalists are professional investors who manage funds dedicated to investing in high-growth potential companies. They typically invest larger amounts (USD 1-50 million or more in the US) and often take active roles in company governance and strategic direction.

Government Programs provide various forms of support, including grants, loans, tax incentives, and technical assistance. Programs similar to Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) in the United States and the EXIST program in Germany provide structured pathways for research-based start-ups to access government funding.

Common Challenges

Start-ups face numerous technical, business, and funding challenges in commercializing research-based technologies. These include:

- ➔ Technical challenges: Scaling laboratory discoveries to commercial production, ensuring quality and consistency, meeting regulatory requirements, and continuing product development.
- ➔ Regulatory challenges: Preparing for and executing on testing —for example, early stage pharmaceutical or other medical innovations to make sure they are effective for human use.
- ➔ Business challenges: Validating market demand, acquiring customers, building effective teams, managing finances, and executing business strategies.
- ➔ Funding challenges: Navigating what is known as the "Valley of Death," where government research funding ends but commercial revenue has not yet begun, attracting and managing investors, and balancing growth with financial sustainability.

2.10 Industry: The Commercialization Engine

Industry plays a dual role in Technology Transfer—they are both consumers of external innovations and producers of technologies that may be transferred to others.

Sponsored Research Agreements

Sponsored Research Agreements (SRAs) serve as a mechanism for facilitating collaboration between industry and university. These agreements typically involve companies funding specific research projects at universities in exchange for access to results and often preferential licensing rights.

Figure 2.9 illustrates the types of SRAs, including Basic Sponsored Research, Collaborative Research, Contract Research, and Consortium Agreements.

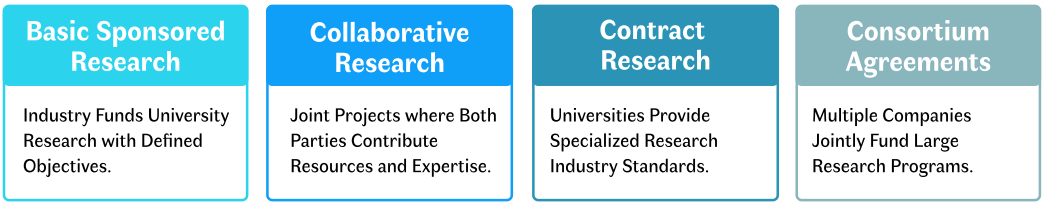


Figure 2.9: An illustration of types of SRAs

Key considerations in SRAs include IP ownership, publication rights, confidentiality requirements, and access to research results.

By understanding these concepts and implementing supportive policies and institutions described in this chapter, countries can harness the power of Technology Transfer to drive economic

development, build local capabilities, and address pressing societal challenges. The journey from research discovery to real-world impact may be complex, but it represents one of the most potent pathways available for sustainable development and improved quality of life.

Global collaboration continues to grow, yet substantial differences remain between developed and emerging regions in their paths to economic prosperity. As key drivers of innovation, RAIs should understand and navigate these disparities, drawing on local strengths, addressing specific challenges, and crafting creative and adaptable models that protect their competitive advantage and fuel future research.

Chapter 3 outlines the infrastructure for a productive IP and TTO ecosystem.

Chapter 3: Infrastructure for the Productive Ecosystem

Key Takeaways

The innovation ecosystem comprises the following stakeholders, each playing a distinct yet crucial role:

- ➔ Government establishes legal frameworks to enable Research and Academic Institutions (RAIs) to own, manage, and license Intellectual Property (IP), thereby attracting investment.
- ➔ RAIs function as the central hubs of invention and scientific discovery within the ecosystem.
- ➔ Industry plays a vital role in translating academic breakthroughs into commercial opportunities.
- ➔ Investors supply the capital necessary to launch start-ups.

3.1 Introduction

While Chapter 2 explores the foundational principles of IP and the role of Technology Transfer Offices (TTOs) in enabling innovation, Chapter 3 focuses on the infrastructure that fuels a thriving innovation ecosystem. From supportive policies to collaborative networks, we examine the essential elements that transform scattered ideas into sustained, scalable impact.

3.2 The Innovation Ecosystem

The innovation ecosystem is an umbrella term that encompasses a diverse range of stakeholders, each playing a distinct role in the overall process of transforming inventions into new products, services, ventures, and jobs. This ecosystem creates measurable economic benefits by capturing the value of creative, intellectual assets through IP mechanisms, entrepreneurship, and constructive investing.

TTOs are a vital component of this ecosystem, serving as one of the primary sources of innovation and driving economic growth by bridging the gap between research and real-world applications. Other stakeholders include: government, industry, investors, research parks, incubators/accelerators, facilitators, and the community of service providers.

To enable a thriving and sustainable ecosystem, deliberate and strategic government action is needed, including

- ➔ The establishment of robust IP laws and complementary policies.
- ➔ The training of the judiciary in adjudicating disputes related to these IP laws.
- ➔ A mandate given to the country's patent office to actively inform RAIs on the practical application of robust IP laws.

Such government action includes enacting legislation covering the creation, ownership, protection, and enforcement of IP. The absence of such laws or the presence of disabling legislation can severely hinder progress. For example, if RAIs are legally prohibited from owning IP, they cannot license discoveries to attract industry partnerships, hindering the incentives for creation. Weak enforcement of IP rights or ambiguous contract laws can deter investment and lead to costly disputes. By establishing a coherent legal framework and ensuring its effective implementation, governments dramatically increase the likelihood of successfully capitalizing on the innovation.

Sections within this chapter discuss the enabling factors and challenges that contribute to the overall effectiveness of the ecosystem, as well as a highlighted Case Study of this interplay between stakeholders.

3.3 Key Stakeholders and Their Roles

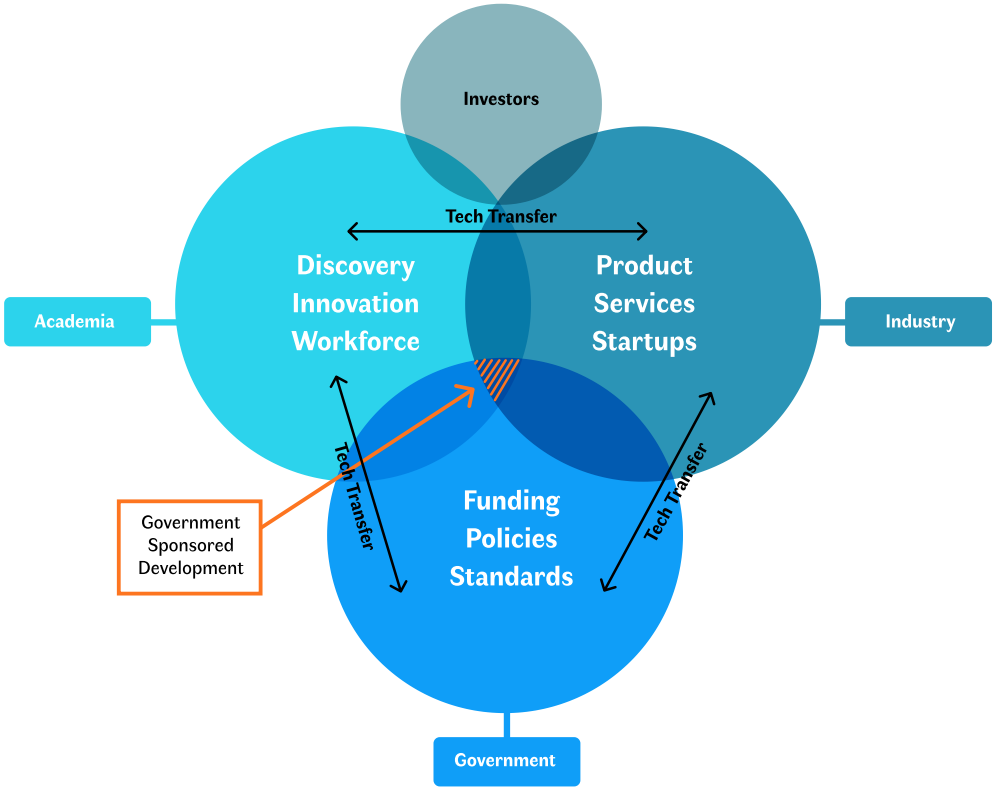


Figure 3.1: Key stakeholders and their interactions in the innovation ecosystem

There are several key stakeholders essential to driving a productive ecosystem. This includes government, industry, RAIs, investors, research parks, regional governments, entrepreneurs, incubators/accelerators, facilitators, and service providers.

Figure 3.1 illustrates the interconnected roles of government, industry, RAIs, and investors in Technology Transfer within a thriving ecosystem. The arrows represent the flow of knowledge, resources, and support among these stakeholders, highlighting their collaborative contribution to economic growth, technology commercialization, and workforce development.

A. Government

Governments play a catalytic role by providing targeted funding to stimulate innovation. Research grants fuel discovery at RAIs, while proof-of-concept funds and small business grants help translate those discoveries into market-ready applications. Incentives such as tax breaks or innovation prizes can further encourage risk-taking and creativity. To ensure transparency and effectiveness, each governmental agency or institute should have specific expertise to evaluate proposals, approve funding, and monitor expenditures. This accountability fosters confidence among RAIs, innovators, and investors alike.

Strong patent and trade secret laws are crucial for protecting early-stage ideas while allowing inventors time to refine them. A patent office with skilled examiners and access to attorneys who can file patent applications ensures that local innovations can compete globally. Copyright laws also safeguard creative outputs, and courts must be equipped to enforce these rights swiftly and fairly. Clear laws governing contract interpretation, licensing agreements, and IP enforcement are critical to building trust among the many stakeholders.

Establishing IP enforcement mechanisms and robust legal frameworks is crucial for fostering certainty and promoting innovation. Strong regulations and enhanced judicial capacity are needed to provide adequate protection for IP rights. Efforts such as updating legislation, providing specialized training for judges, and increasing stakeholder awareness are critical steps in building a secure and vibrant innovation environment.

The Case Study below describes different government approaches for financing the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs in the U.S. and the EXIST program in Germany.

Case Study: Government-sponsored funding programs to drive innovation

Germany's EXIST program exemplifies how targeted government support can catalyze the formation of start-ups. It provides funding for start-ups emerging from RAIs, covering living expenses, equipment, and coaching. This holistic approach not only supports entrepreneurs but also strengthens Germany's innovation pipeline.

The U.S. SBIR and STTR programs offer competitive grants to small businesses engaged in Research and Development (R&D) with commercial potential. These programs have successfully bridged the gap between academic research and market-ready products, serving as a model for public-private collaboration.[1] Under SBIR and STTR, the small business that receives the grant must be conducting R&D in domains considered to be priorities by the agency that provides the grant.

B. Industry

A close cooperation between the public and private sector is the essential linkage that enables Technology Transfer. Industry is a critical partner in bridging the gap between invention and commercialization. By collaborating with RAIs, existing companies, start-ups, and government agencies can accelerate time-to-market and expand societal benefits. Additionally, by investing in

early-stage research through grants, sponsored projects, or collaborative development, companies validate and refine the market relevance of RAI inventions.

Licensing IP and technologies from RAIs enables the industry to reduce its internal R&D investment (thereby reducing its financial risk) while capitalizing on inventions arising from publicly funded research. Additionally, licensing generates a revenue stream for the inventors and institutions. The industry also provides essential services, including product manufacturing, regulatory expertise, and market access. Moreover, industry engagement is vital to scaling technologies beyond the prototype stage, navigating regulatory pathways, and establishing commercial proprietary advantages through branding and implementing worldwide IP strategies.

C. Research and Academic Institutions

RAIs are at the epicenter of invention. They generate new knowledge, train the workforce, and serve as hubs for interdisciplinary collaboration and research. RAIs must also adopt effective policies to preserve and grow their Technology Transfer functions, such as clear IP ownership rules, incentives for researchers to innovate and disclose inventions, streamlined licensing procedures, revenue sharing with inventors, and other incentives for faculty engagement.

D. Investors

Investors, including venture capitalists, angel investors, industry professionals, and crowdfunding platforms, provide the financial resources needed to launch start-ups. Their involvement not only brings capital but also strategic guidance, market insight, and credibility. Beyond individual investments, many investors actively build innovation ecosystems by supporting incubators, accelerators, and collaborative research parks.

Investors identify promising inventions and transform them into viable businesses. They help bridge the gap between research and commercialization phases by funding new ventures at any stage, de-risking bold technological pursuits, and accelerating the journey from lab to market. Through strategic guidance, due diligence, and valuation expertise, investors assist start-ups and TTOs to refine their business models, align innovations with market needs, and keep start-ups accountable for meeting goals and milestones.

Investors' influence extends to shaping IP strategies, licensing structures, technology readiness assessments, and commercialization pathways. By connecting researchers, entrepreneurs, and institutions, investors serve as key ecosystem builders, catalyzing innovation and ensuring that promising technologies reach their full potential.

Crowdfunding has emerged as a dynamic and democratized way to fund start-up companies, allowing entrepreneurs to raise capital directly from the public, often without relying on traditional investors or venture capital. Global platforms such as Kickstarter, Indiegogo, and GoFundMe enable founders to showcase their ideas, validate market interest, and build a loyal customer base before even launching a product. Beyond financial support, crowdfunding creates a powerful community of early adopters and brand advocates who can amplify visibility and accelerate growth. For start-ups with compelling stories and innovative solutions, crowdfunding offers not only funding, but also momentum, while keeping in mind the public disclosure safeguards mentioned earlier in this Handbook to avoid forfeiting the right to later file or protect IP due to public disclosure.

E. Secondary Stakeholders

Beyond the primary stakeholders of government, industry, RAIs, and investors, a network of secondary stakeholders provides

essential infrastructure and specialized services that strengthen and sustain the innovation ecosystem.

i. Research Parks

Research parks and similar collaborative hubs foster convergence and cross-fertilization among RAIs, industry, start-ups, and government. These environments offer cost-effective access to sophisticated resources—such as clean rooms, prototyping labs, and testing facilities—that would be prohibitively expensive for individual entities to acquire. By clustering diverse stakeholders, research parks accelerate innovation and create vibrant micro-economies.

ii. Regional Governments

Regional governments play a crucial role in cultivating vibrant local innovation ecosystems by tailoring strategies to the unique strengths and needs of their communities. They stimulate economic development by attracting new businesses through targeted incentives such as tax breaks, streamlined permitting processes, and infrastructure support. In addition, regional governments play a crucial role as conveners and network enablers, bringing together ecosystem actors for meaningful engagement. Regional authorities can also craft local regulations that reduce barriers to entry for start-ups and make their jurisdictions more attractive to investors. Hosting recruiting events, innovation fairs, and business forums helps connect entrepreneurs with talent, capital, and collaborators, while showcasing the region's commitment to growth and innovation. By acting as agile and responsive partners in the innovation journey, regional governments complement national efforts, ensuring that innovation flourishes beyond major urban centers.

iii. Incubators/Accelerators

Incubators and accelerators provide critical support to start-ups. These platforms often serve as launchpads for high-impact ventures that emerge from university labs or research parks.

Incubators typically support start-ups at the earlier stages by providing access to shared facilities, infrastructure, mentorship, and business development resources. Additionally, they help start-up founders refine their ideas, build sustainable business models, and navigate the initial hurdles of commercialization.

Accelerators, on the other hand, operate on shorter, more intensive timelines and focus on scaling start-ups that already have a minimum viable product (MVP). These programs provide seed funding, expert coaching, and direct access to investor networks, enabling start-ups to validate their market fit and accelerate growth.

Through targeted support, collaborative environments, and strategic connections to key stakeholders, such as investors, industry leaders, and regulatory experts, incubators and accelerators help start-ups overcome entry barriers and enhance their chances of successful technology commercialization. Incubators and accelerators have an impact that extends beyond individual ventures, driving regional economic growth, generating employment opportunities, and fostering vibrant entrepreneurial ecosystems that are essential to sustained innovation.

iv. Facilitators

Facilitators, such as the Commercial Law Development Program (CLDP) in the U.S. Department of Commerce, play a foundational role in advocating for appropriate laws on a government-to-government basis and in ecosystem development. CLDP works globally to strengthen legal and regulatory frameworks, fostering transparent and predictable environments that support investment, IP protection, and commercialization. Alongside CLDP, professional associations such as the Association of University Technology Managers (AUTM) and Licensing Executives Society International (LES) serve as another facilitator—bringing together universities, industry, investors, and government to align interests and accelerate innovation. These organizations facilitate critical conversations, share best practices, and

communicate the impact of Technology Transfer, ensuring that promising ideas move efficiently from research to market. Without these facilitators, the gears of innovation would turn far more slowly.

v. Community of Service Providers

A thriving innovation and commercialization ecosystem depends not only on inventors, TTO professionals, and entrepreneurs but also on a robust community of professional service providers who support and sustain its operations. Accountants, lawyers, patent specialists, marketing professionals, and contract research organizations (CROs) play indispensable roles in translating scientific discoveries into viable businesses. Accountants assist start-ups in managing finances, navigating tax incentives, and ensuring compliance. Lawyers and patent specialists ensure that IP is protected, contracts are sound, and regulatory hurdles are addressed. CROs provide specialized research services that allow early-stage companies to validate and develop their technologies without the need for costly infrastructure. These professionals form the backbone of the ecosystem, offering expertise across the ecosystem that enables innovators to focus on what they do best—creating solutions that the marketplace needs. Without a well-developed network of such professional service providers, even the most promising ideas can falter under the weight of operational and legal complexities. The Case Study below describes how a university start-up in the battery sector bridged lab discoveries, government innovation grants, and private sector collaboration to translate groundbreaking science into impactful, market-ready solutions—precisely the kind of ecosystem success described in this chapter.

Case Study: Watercycle Technologies: Bridging university innovation and industry to power sustainable lithium extraction

Watercycle Technologies is a cutting-edge start-up from the University of Manchester, specializing in the sustainable recovery of critical minerals using advanced filtration and membrane systems. The company's breakthrough Direct Lithium Extraction (DLE) technology addresses a pivotal challenge for the battery and electric vehicle sector: cost-effective, sustainable lithium production from subsurface waters. In 2022, Watercycle Technologies secured a £500,000 Innovate U.K. Smart Grant to implement a pilot of its membrane-based DLE system in Cornwall, partnering with Cornish Lithium, the U.K.'s leading developer of lithium extraction from geothermal waters. Their collaboration enables Watercycle to deploy a containerized system onsite, selectively extracting lithium and producing battery-grade lithium carbonate crystals with more than 99.5% purity, while reusing water and reducing the ecological impact typically associated with lithium mining.

The University of Manchester played an essential role throughout Watercycle's innovation journey by providing research expertise, laboratory facilities, and business support through its Graphene Engineering Innovation Centre and the Innovation Factory TTO. The industry partnership with Cornish Lithium has not only validated Watercycle's technology in real-world conditions but has also accelerated the commercialization pathway.[2]

Chapter 4 provides a detailed description of the TTOs, including infrastructure, the distinction between invention and innovation, start-ups, and the commercialization process.

Chapter 4: Technology Transfer Office

Key Takeaways

- An invention and Intellectual Property (IP) management process can assist researchers with invention disclosures, patent filings, and IP strategy.
- Technology Transfer Offices (TTOs) facilitate the formation of start-ups by providing guidance, resources, and connections to entrepreneurs and investors.
- TTOs guide potential conflicts that may arise between a researcher's academic obligations and responsibilities and the researcher's commercialization and consulting activities.
- TTOs conduct outreach and educational initiatives to engage the campus community and external stakeholders, increasing awareness of innovation opportunities, policies, and processes.

4.1 Introduction

Chapter 3 outlines the distinctive roles and contributions of key actors in establishing and maintaining a self-sustaining Technology Transfer ecosystem. Chapter 4 describes the key roles and operations of a TTO, as well as the recommended best practices for starting an office.

4.2 Key Roles of a Technology Transfer Office

Purpose

TTOs play a pivotal role in bridging the gap between institutional research and its practical, real-world impact. Positioned at the intersection of innovation and implementation, the primary

mission of TTOs is to enable the transition of scientific and technological discoveries into tangible products, services, and solutions that benefit society and drive economic development through the strategic use of IP. Figure 4.1 lists the key roles performed by TTOs.

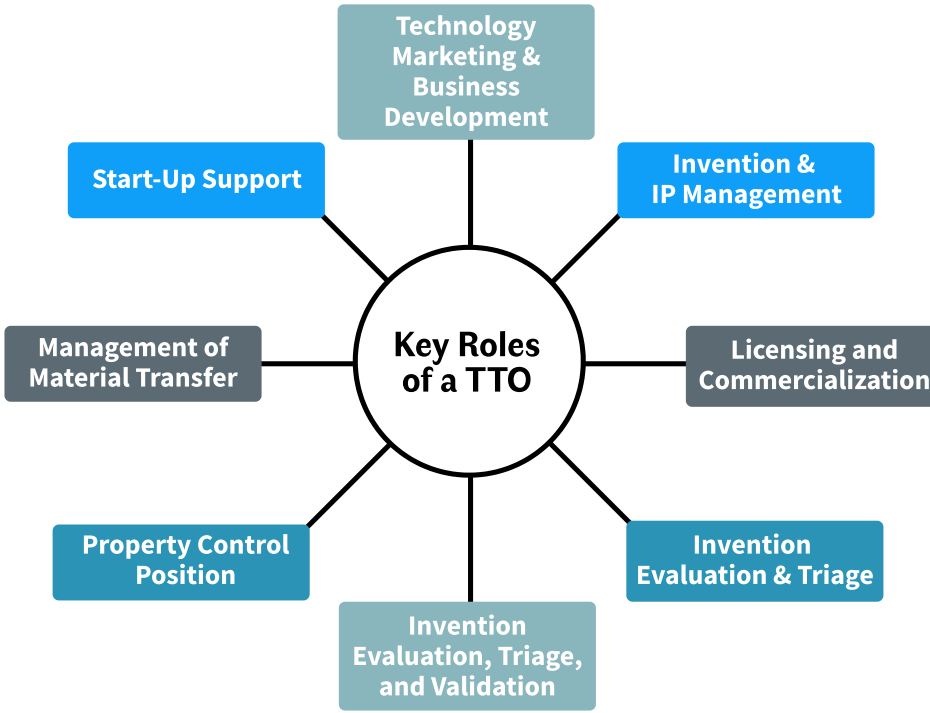


Figure 4.1: An illustration of a TTO's key roles

Through these activities, TTOs foster a culture of innovation, catalyze public-private collaboration, and contribute to the institution's broader mission of promoting societal impact and disseminating knowledge. Figure 4.2 illustrates the timeline of the invention lifecycle.

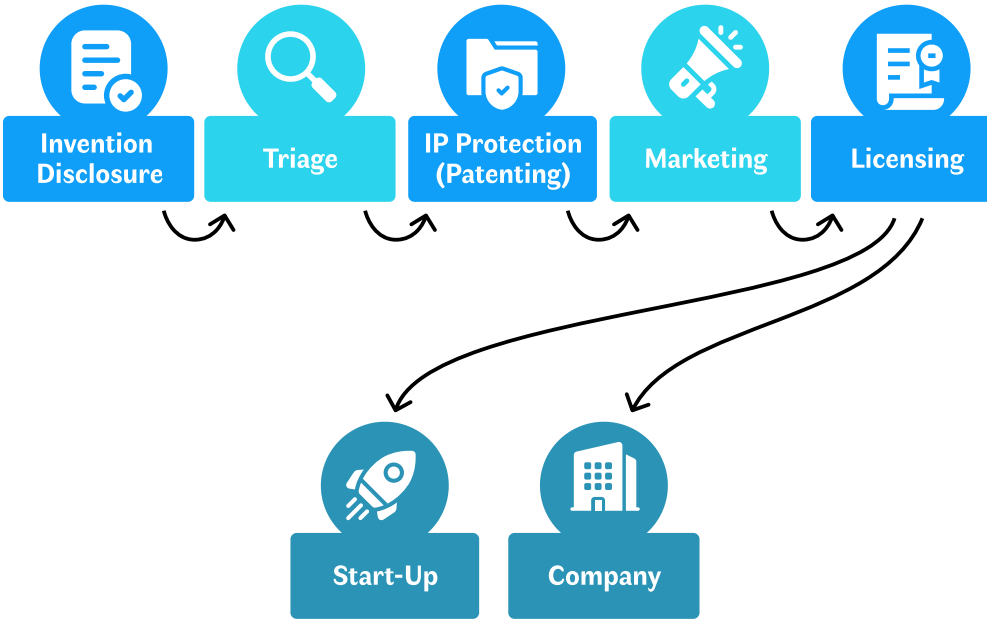


Figure 4.2: An illustration of an invention lifecycle at a TTO

Invention and IP Management

One of the primary roles of TTOs is managing inventions and IP. Effective invention and IP management are essential to the success of a Technology Transfer function at RAIs. IP management is discussed in detail in Chapter 5. TTOs serve as the backbone of RAI's new technology/IP commercialization efforts.

The process begins with TTO interactions with inventors who submit Invention Disclosures that emerge from research and related activities. Appendix 1 includes an Invention Disclosure template. TTOs then conduct a thorough assessment of the novelty, utility, inventiveness, and commercial potential of the invention. Based on these evaluations, TTOs strategically file

patent applications, often starting with domestic applications to secure early filing dates. Managing the resulting IP portfolio requires ongoing decisions about pruning underperforming assets and continuing to invest in valuable assets.

Invention Evaluation, Triage, and Validation

Another key role of a TTO is the evaluation, triage, and validation of disclosed inventions. A checklist for an Invention Disclosure is provided in Appendix 1. This initial assessment, commonly referred to as invention triage, represents one of the most consequential functions performed by Technology Transfer professionals.

Effective invention triage distinguishes between promising innovations that merit substantial investment of time and resources and those with limited commercial potential that may not justify such commitments. Each Invention Disclosure should undergo a systematic and well-documented review processes, regardless of budget constraints or staffing limitations. While no universal evaluation model exists that suits all institutional contexts, successful TTOs develop tailored assessment frameworks that reflect their specific circumstances, including available patent budgets, research focus areas, regional market conditions, and strategic commercialization objectives. Several emerging economies have national Research and Development (R&D) priority strategies. In these countries, triage would also include an assessment of the extent to which a technological innovation developed by an RAI would help the region meet some of its R&D priorities.

Generally, as a first step, TTOs perform a patentability analysis to ensure that whatever is disclosed in the Invention Disclosure merits patent protection. Secondly, TTOs evaluate the extent of additional work required for the invention to become a viable product. Thirdly, TTOs form a market analysis to determine

whether the invention meets an unmet need and does so with significant technical and economic advantages over other technologies that could meet that unmet need.

Patentability Determination: TTOs conduct a patentability analysis to assess the potential patent scope and prospects for enforceability. Technology Transfer professionals must determine whether patent claims can be obtained. This analysis should also consider the appropriate forms of IP protection, recognizing that some innovations may benefit from trade secret protection, copyright, or other IP mechanisms.

Figure 4.3: A chart portraying the Technology Readiness Levels

Technology Readiness: The Technology Readiness Level (TRL) assessment helps evaluate development risk and resource requirements by determining how far the invention has progressed from its initial concept toward commercialization. Figure 4.3 shows well-known TRL levels with their brief definitions. Early-stage inventions at low TRL levels carry higher developmental risks and require substantial additional work and funding to reach market-ready status. Conversely, more mature technologies with demonstrated performance in relevant environments may present lower risk profiles and shorter development timelines.

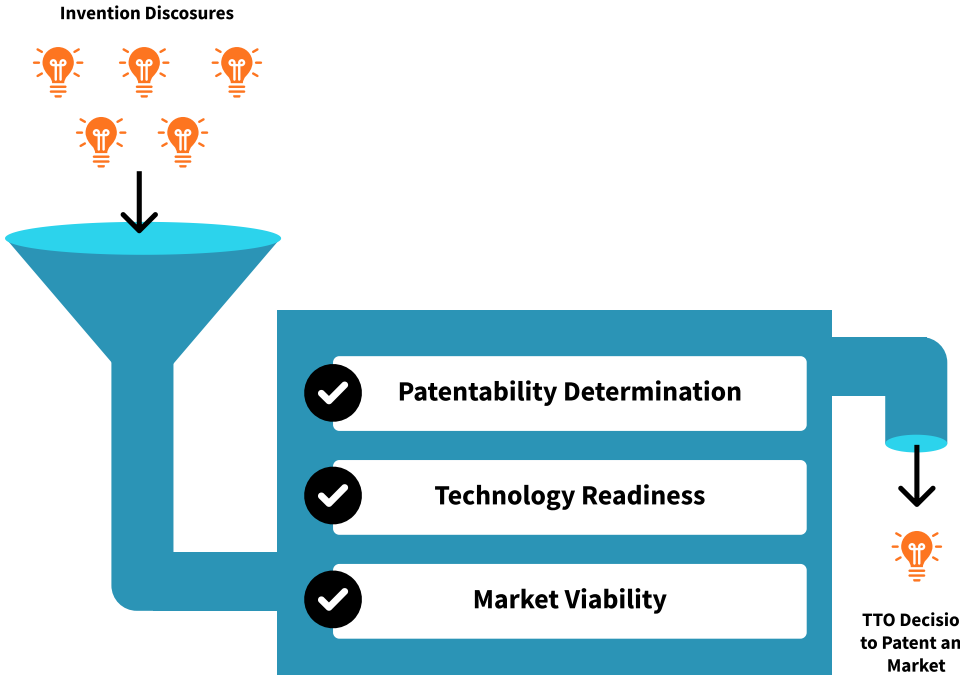


Figure 4.4: An illustration of the TTO assessment process

Market Viability: Market analysis focuses on identifying target customer segments, identifying addressable market opportunities, and evaluating the invention's competitive advantages. Technology Transfer professionals investigate potential end-users, assess the significance and scale of unmet market needs, and conduct preliminary market research to estimate market size, growth trajectories, and competitive dynamics. This process is illustrated in Figure 4.4.

The invention triage process culminates in strategic go/no-go decisions that shape resource allocation and institutional success in commercialization. For technologies that meet these criteria and are a go, TTOs will direct patent professionals to seek patent protection and search for a potential licensee who will further develop the technology. Technologies that fail to meet these criteria may be declined, with rights potentially being released back to the inventors.

Technology Marketing and Business Development

Technology marketing and business development are key roles of TTOs. Successful commercialization/implementation of an invention and its IP requires the identification of a suitable commercialization partner (i.e., a licensee). Effective, proactive, and creative Technology Marketing (the process of promoting an invention suitable for commercialization) involves several different strategies and tools to convey information about the invention to potential licensees.

Licensing and Commercialization

TTOs negotiate and manage licensing agreements that enable external entities, such as companies, start-ups, or nonprofits, to develop and commercialize inventions originating from RAIs. TTOs' responsibilities include structuring enforceable license agreements. TTOs must ensure that all agreements comply with

institutional policies and any obligations tied to public or private funding. Once licenses are executed, TTOs monitor licensee performance to ensure milestones are met and that the technology is being actively developed. They also oversee licensee fees, royalty payments, and other financial obligations, ensuring accurate reporting and revenue collection that can be reinvested in further research and innovation. Chapter 6 provides a detailed discussion of the standard terms of the licensing agreement.

Start-up Support

TTOs support start-up companies by assisting inventors and entrepreneurs with business plan development, helping them articulate their value proposition, market strategy, and financial projections. They also serve as facilitators, linking researchers with investors, incubators, and accelerators that can provide critical funding, facilities, and support for growth. TTOs help start-ups overcome early-stage hurdles by facilitating access to shared facilities, such as labs and co-working spaces, and offering mentorship from experienced entrepreneurs and industry experts. Additionally, TTOs guide start-ups through complex regulatory and legal landscapes, ensuring compliance with intellectual property and regulatory laws, licensing agreements, and industry-specific regulations, laying the groundwork for sustainable success. Start-ups are discussed thoroughly in Chapter 7.

Management of Material Transfer

Life science inventions often incorporate tangible biological materials (e.g., cell lines, microbial cultures, plant parts, bioproperties) as a critical component of the technology. TTOs manage the transfer of such tangible bioproperty to anyone outside of the RAI. TTOs oversee Material Transfer Agreements (MTAs) to facilitate the responsible exchange of bioproperty, as well as materials, data, and prototypes between RAIs and external parties. A template for an MTA is provided in Appendix 1. These Agreements

protect institutional interests, including intellectual property rights, confidentiality, and the integrity of ongoing research. TTOs ensure that transfers protect RAI ownership of the bioproperty, comply with ethical guidelines, legal laws and regulations, and funding agency requirements by carefully drafting and managing MTAs. This oversight helps prevent misuse of materials, safeguards sensitive information, and promotes collaborative research while maintaining institutional accountability and scientific transparency. MTAs are also used when anyone outside of the RAI requests a sample of this bioproperty for testing purposes.

4.3 Technology Transfer Office Operation

Governance and Structure

TTOs are typically embedded within RAIs or a government agency, serving as a bridge between academic inventions and between academic inventions/IP and commercial applications. To operate effectively, TTOs should have clearly defined reporting lines and sufficient autonomy to make strategic decisions that align with institutional goals. Some RAIs establish an IP Committee or a similar group to advise the TTO and senior leadership on various IP topics.

Function

The core functions of a TTO span IP management, licensing, start-up support, contract review, and stakeholder engagement. These responsibilities require a deep understanding of both the scientific and commercial landscapes. Effective IP management

ensures that inventions are adequately protected and positioned for commercialization, while licensing activities often translate research into market-ready products.

Management

Ideally, TTO directors and senior staff should bring experience in law, business, and science to navigate the complex intersection of research, regulation, and commercialization. While it is often not feasible to have a large TTO staff, if possible, a TTO might develop a multidisciplinary team (including outside advisors), comprised of patent specialists (attorneys and agents), licensing specialists, business analysts, and scientific advisors, that ensures balanced decision-making and effective execution across diverse technologies and industries. Many RAIs have small TTOs, with a staff of 1 or 2 professionals and administrative staff. To evaluate performance, TTOs should track metrics, as described in Chapter 5. These indicators reflect not only financial success but also TTOs' role in translating research into real-world solutions.

TTO Personnel

There are three operational roles in a TTO: Director/Manager, Technology Manager, and Administrative Support, as illustrated in Figure 4.5 below.

Figure 4.5: A chart of the three operational roles performed by TTOs

Director/Manager: A TTO should have a full-time director or manager. The director/manager must be empowered to make everyday decisions to manage the dynamic environment created by the flow of invention, IP issues, technology marketing, and license negotiations.

Technology Managers: The technology manager is responsible for the management of inventions submitted to the TTO. Technology managers should have comprehensive awareness of technology areas, invention evaluation, IP understanding, market assessments, technology marketing campaign design and implementation, business development, license drafting, and negotiations. They should also possess the interpersonal skills to work well with all stakeholders.

Administrative Support: TTOs may benefit from administrative support to assist with all data management, compliance, and organizational tasks within the TTO.

4.4 How to Start a Technology Transfer Office

Starting a TTO begins with securing institutional commitment and defining its mission to support the commercialization of RAI innovations. The process involves establishing a clear organizational structure with reporting lines, allocating initial funding (for TTO personnel and for patent costs), and, if possible, recruiting a staff with multidisciplinary skills, including intellectual property, contract negotiation, business development, and the scientific research process. Foundational policies should be developed to govern invention disclosures, IP ownership, licensing practices, and conflict of interest management.

It is vital to consider sustainably funding a TTO with a share of IP license revenue. In some countries, a standard license revenue-sharing scheme used by many universities provides TTOs with one-third of the net (i.e., after recovery of out-of-pocket IP expenses) license revenue.

Starting small with a focus on high-impact opportunities allows the office to build credibility and demonstrate value, paving the way for growth and long-term sustainability. Early efforts should focus on building relationships with faculty and researchers to encourage participation, establishing systems for tracking disclosures and agreements, and developing outreach strategies to engage industry partners. Additionally, TTOs should implement tools for evaluating the commercial potential of technologies and develop templates for contracts such as license agreements and MTAs. The Case Study below describes the launch of a TTO in the Kyrgyz Republic.

Case Study: Kyrgyz Republic launches a TTO in 2024

To assist the Kyrgyz Republic to utilize Technology Transfer to improve its economy and increase intellectual property rights protection, the US Department of Commerce Commercial Law Development Program (CLDP) has worked with the Kyrgyz government and local universities since 2022 to develop a centralized TTO in the Kyrgyz Republic that would advise academics regarding how to patent and commercialize inventions based on their research.

To that end, on 30 May 2024, Rakhat Kerimbaeva, the director of Kyrgyzpatent, along with Elizabeth Zentos, Deputy Chief of Mission at the US Embassy in Bishkek, officially opened a TTO at Kyrgyzpatent in Bishkek, Kyrgyz Republic. The Kyrgyz TTO will facilitate the process of Kyrgyz research inventions becoming commercialized products, while augmenting intellectual property rights protection in the Kyrgyz Republic.

4.5 Sustainable Technology Transfer Office Funding

Sustainable funding is one of the most critical components of a successful TTO. While initial seed funding may come from government grants, development agencies, or institutional budgets, long-term sustainability requires a diversified revenue model. This can include income from licensing deals, equity in start-up companies, service fees for contract review or IP consulting, and philanthropic contributions. Establishing partnerships with industry and leveraging regional innovation programs can also provide financial support. Importantly, institutions must recognize that while TTOs may not be immediately profitable, their broader economic and societal impact justifies continued investment.

How to Operate a Technology Transfer Office on Limited Resources

TTOs should focus on high-impact activities, such as faculty education, invention intake, and basic IP assessment. Outsourcing specialized tasks, such as patent drafting or legal review, to external experts or leveraging university legal clinics can reduce costs. Additionally, recruiting student interns to assist with prior art searching, technology marketing, and related activities can also be beneficial.

Moreover, the use of Artificial Intelligence (AI) can supplement some of these resources, as described in Chapter 8. Using open-source IP management tools can further stretch limited budgets. TTOs can develop good working relationships with other established administrative offices within the RAI. Building strong relationships with faculty and industry partners can also attract in-

kind support and co-development opportunities. The Case Study below highlights a TTO establishment in one of the academic institutions of the Republic of Armenia.

Case Study: Establishment of a TTO at the American University of Armenia

Established in 1991, the American University of Armenia (AUA) has evolved into a leading research institution in Armenia and the region, securing over USD 12 million in externally funded grants in 2024. AUA's reputation for academic excellence and innovation has attracted distinguished faculty from around the globe, spanning fields such as life and computational sciences, engineering, social sciences, business, and public health. With a growing portfolio of research and scholarly output, AUA recognized the need to establish a TTO to support intellectual property protection and the commercialization of innovations.

Launching such an initiative required careful planning and multiple milestones, including securing leadership and board support, building faculty awareness, engaging expert advisors, identifying funding and resources, and developing institutional policies. In Fall 2024, AUA became the first university in Armenia to establish a fully institutionalized and policy-driven Office of Sponsored Programs and Technology Transfer (OSP&TT). To build capacity and foster engagement, more than a dozen educational and outreach workshops were conducted for faculty, students, and staff. AUA also developed a visual roadmap and IP-protection timeline to guide inventors through the IP protection and commercialization process. Within its first year, the OSP&TT received five invention disclosure submissions, initiated reviews, filed its first international utility patent application, and submitted two trademark applications. For aspiring entrepreneurs, a TTO provides strategic support in launching university start-up companies, offering business development assistance, and facilitating access to funding. [1]

4.6 Research Collaborations

The Technology Transfer function in RAIs often includes research collaborations between RAIs and with private sector entities. Such collaborations are best conducted under a research contract between the RAIs and the private sector, defining the IP ownership and disposition of IP created during the collaboration. If the IP mechanisms of the contract are adequately represented, effective Technology Transfer can be accomplished. Licenses can be combined with research collaborations between the parties to synergize the Technology Transfer function.

RAIs use Interinstitutional Agreements (IIAs) when inventions are conceived collaboratively by individuals from different research institutions. These IIAs establish a clear framework for ownership, management, and commercialization of jointly developed IP. By defining each institution's rights and responsibilities, such as how patent costs are shared, who leads patent prosecution, which TTO will lead the technology marketing and license negotiations, and how license revenues will be shared, IIAs help prevent disputes and ensure that all parties are fairly represented. They also streamline decision-making and foster trust among collaborators, enabling smoother transitions from research to real-world application. In essence, IIAs protect the interests of all involved institutions while promoting innovation through cooperative research.

Chapter 5 discusses the mechanism for developing an IP and commercialization strategy.

Chapter 5: Managing and Marketing Innovations

Key Takeaways

- Successful Technology Transfer requires balanced metrics that track operational efficiency, financial performance, commercial and/or socioeconomic impact, and mission alignment to demonstrate value and guide continuous improvement.
- Start-up formation and equity participation strategies provide crucial pathways for commercializing technologies that require substantial further development or face uncertain market conditions.
- Active Intellectual Property (IP) portfolio management, achieved through strategic pruning and filing coordination, ensures that resources focus on high-value innovations with genuine commercial potential.
- Inventor incentivization systems that combine financial rewards (such as revenue sharing, departmental funding, career development, and promotions) with recognition programs encourage the submission of Invention Disclosures to the Technology Transfer Office (TTO).

5.1 Introduction

Chapter 5 transitions from the infrastructure of a TTO covered in Chapter 4 to the implementation of IP management and the marketing process.

5.2 Establishing the Institutional IP Policy

As discussed in prior chapters, the first step in an IP and marketing strategy is to ensure that a Research and Academic Institution (RAI) has a well-crafted IP Policy.

Institutional Framework

RAIs may consider implementing equitable revenue-sharing arrangements that reward not only individual inventors but also their departments and supporting research units, creating institutional alignment around commercialization goals. Financial incentives that can be considered include:

- ➔ Tiered royalty sharing that increases with commercial success
- ➔ Milestone bonuses for key development achievements
- ➔ Departmental funding allocations based on commercialization activity
- ➔ Research funding opportunities tied to Technology Transfer outcomes
- ➔ Teaching course load reduction based on research activities

Beyond monetary rewards, institutions must cultivate a vibrant culture of discovery through comprehensive recognition programs that celebrate inventors and their breakthroughs. This cultural transformation reinforces the value of creativity, collaboration, and entrepreneurial thinking through the following recognitions:

- ➔ Annual innovation awards and public recognition ceremonies
- ➔ Patent plaques and inventor wall displays
- ➔ Internal newsletters highlighting commercialization successes
- ➔ Peer appreciation programs and innovation competitions
- ➔ Integration of the number of IP assets generated (e.g., issued patents, registered copyrights) and/or commercial metrics into faculty evaluation processes

This institutional framework also initially treats all generated Research and Development (R&D) as confidential information. The premature public disclosure of such information—whether through abstracts, presentations, theses, or other publications—can permanently foreclose both patent filing opportunities and trade secret protection. This makes early strategic decision-making essential for preserving maximum protection options.

RAIs must implement systematic processes for evaluating whether innovations should pursue IP protection or be kept as trade secrets. This decision fundamentally shapes all subsequent commercialization activities and, in most cases, cannot be easily reversed once it is made public.

Patent protection offers limited exclusivity in exchange for public disclosure, making it suitable for innovations that can be reverse-engineered or independently discovered. Market exclusivity during the patent term provides a sufficient competitive advantage, while public disclosure enhances R&D and related reputation and collaborative opportunities.

Provided that the laws of a jurisdiction permit it, trade secret protection can offer potentially indefinite exclusivity, as long as such information is kept in confidence. TTOs can consider trade secret protection when:

- ➔ The information derives economic value specifically from its secrecy (such as the Coca-Cola formula).
- ➔ Reverse engineering or policing infringement would be difficult or impossible.
- ➔ The innovation involves manufacturing processes, algorithms, or know-how that can remain confidential.
- ➔ A long-term competitive advantage often outweighs the benefits of patent disclosure.

Protection Pathways

The formal evaluation process of the innovation begins when inventors complete an Invention Disclosure. A checklist for an Invention Disclosure is provided in Appendix 1. These forms capture essential information, including the problem addressed, supporting data, prior art analysis, and potential applications. The disclosure form serves as the foundation for assessing patentability. Moreover, the form helps establish the scope of confidential information and necessary protection protocols.

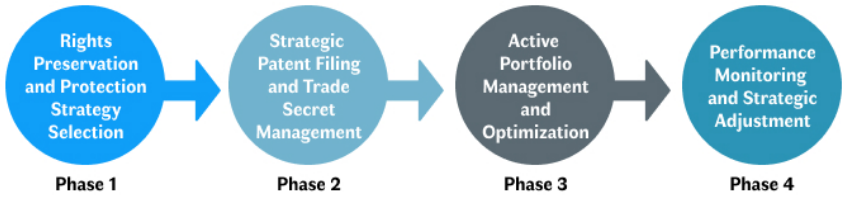


Figure 5.1: A flow chart depicting the four phases of an IP development strategy

The IP development strategy, as reflected above in Figure 5.1, can be delineated into four different sequential phases as follows:

Phase 1: Preserving Rights and Protection

- ➔ Establish protocols to maintain the confidentiality of Invention Disclosure, thereby preserving both patent filing rights and trade secret protection options.
- ➔ Weigh the advantages of patent protection against the benefits of trade secrets.
- ➔ For patents:
  - ▸ Perform the patentability determination as described in Chapter 4.

- For trade secrets:
  - Specifically identifying trade secrets, evaluating the viability of maintaining trade secrets confidentially, and easing the process of reverse engineering.

Phase 2: Patent Filing and Trade Secret Management

- Establish protection strategies that combine patent protection for specific innovations with trade secret protection for manufacturing processes or proprietary knowledge.
- For patents:
  - Prioritize patent applications based on commercial potential, unmet need, competitive landscape, and disclosure implications.
  - Ensure that marketing efforts are appropriately timed to coincide with the date for deciding in which jurisdictions to nationalize a Patent Cooperation Treaty (PCT) patent application.
- For trade secrets:
  - Implement comprehensive trade secret protection programs, including employee confidentiality agreements, restricted access protocols, and security measures.

The Case Study below illustrates the considerations to take into account when deciding where and when to file a patent.

Case Study: Acme Technologies' patent filing strategy

Acme Technologies ("Acme") has developed a breakthrough non-invasive glucose monitoring algorithm and hardware. It wants to protect this invention before launching globally. Acme needs to decide whether and where to file for patent protection, while managing costs.

Acme plans to present (i.e., publicly disclose and launch) its product at the Consumer Electronic Show this January. With this in mind, and since the algorithm and hardware are still in development, Acme files a provisional patent now, giving them 12 additional months to file internationally in the home country (the U.S.), where its headquarters are located and its primary market is based. Just under a year later, Acme files a PCT application claiming priority to the U.S. provisional application.

By filing under the PCT, Acme has up to 30 additional months before filing in individual countries. The decision of where to file abroad is based on several factors, including, but not limited to, the foreign market and the location of its manufacturing facilities. The countries/regions selected for PCT filing include the European Patent Office, which covers major European markets, the China National Intellectual Property Administration, which covers a key manufacturing hub and large market, India due to its growing healthcare market, and Japan and South Korea due to their high-tech markets and strong patent enforcement regimes. Other countries were considered, but patents were not filed due to enforcement issues and/or cost-benefit analysis.

By filing a provisional patent application early and then strategically selecting countries for national phase entry through the PCT route, Acme has secured its early filing date before its competitors, enabling it to raise funds, assess market viability, and avoid unnecessary costs in low-return markets.

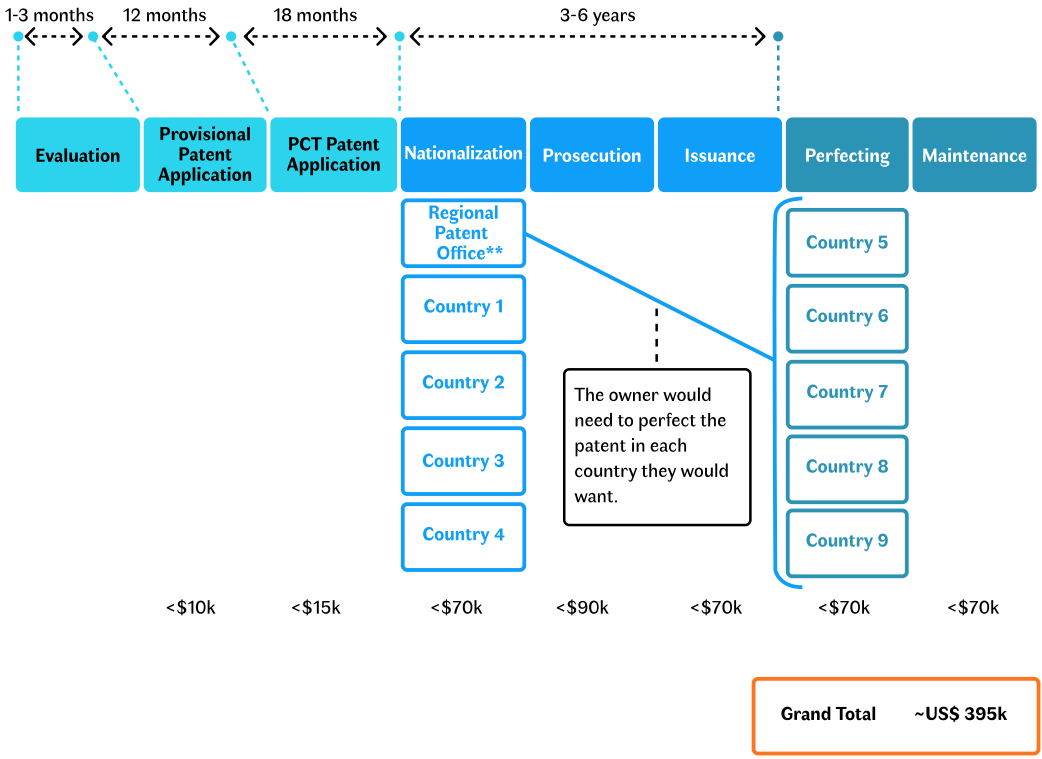
Phase 3: Active Portfolio Management and Optimization

- ➔ Conduct periodic reviews of both patent portfolios and trade secret assets to assess commercial relevance and strategic value.
- ➔ Implement systematic pruning processes, meaning to review and keep assets or eliminate low-potential patents.
- ➔ If a TTO has trade secrets, monitor trade secret security protocols and update protection measures as needed.

Phase 4: Performance Monitoring and Strategic Adjustment

- ➔ Establish key performance indicators for both patent portfolio effectiveness and trade secret commercial impact.
    - ▶ Track licensing revenues, startup formations, and industry partnerships across all IP protection types.

Academic patent strategies should prioritize licensing potential and Technology Transfer opportunities. Patent prosecution involves significant costs throughout the patent lifecycle, as illustrated in Figure 5.2. Costs can vary significantly based on the field of invention and the length of the application.



* If available in your jurisdiction, otherwise file a PCT directly

** Regional Patent Offices, such as: European Patent Office, African Regional Intellectual Property Organization, Organisation Africaine de la Propriété Intellectuelle, Eurasian Patent Organization, and Gulf Cooperation Council

Figure 5.2: Sample costs for the life of a patent

Many academic patents begin with provisional applications in the U.S. that provide low-cost filing date protection while allowing 12 months for further development and market assessment. The PCT route facilitates cost-effective international protection in the following ways:

- ➔ 30 months to assess commercial potential before expensive national filings
- ➔ A search report citing prior art relevant to the claims for purposes of reassessing patentability
- ➔ Allowing for market validation during the extended evaluation period
- ➔ Enabling strategic selection of key markets based on licensing interest
- ➔ Maintaining flexibility to abandon applications in less promising markets

A successful patent strategy also requires ongoing portfolio management that goes beyond initial filing decisions. Regular portfolio reviews enable TTOs to:

- ➔ Eliminate applications lacking industry interest or market relevance
- ➔ Focus resources on high-potential innovations with demonstrated commercial traction
- ➔ Signal to investors and licensees that the institution values its innovation pipeline

This strategic pruning approach ensures efficient resource allocation while maintaining a high-quality, competitive patent portfolio that supports successful Technology Transfer outcomes. The disciplined management of patent assets demonstrates institutional commitment to effective commercialization and builds confidence among potential commercial partners.

While patents and trade secrets form the foundation of most academic IP strategies, research institutions must also consider additional forms of intellectual property protection that complement their overall commercialization approach.

Copyright

Copyright protection plays an increasingly important role in academic Technology Transfer, particularly for software, educational content, and creative works. Copyright automatically safeguards original works of authorship—including software code, research publications, educational materials, and multimedia content—once they are fixed in a tangible medium of expression. Unlike patents, copyright protection does not extend to underlying ideas or concepts, only to the specific expression of those ideas.

For software innovations, copyright provides immediate protection for source code while allowing others to implement similar functionality through different code structures. This dual-layer approach, combined with patent protection for novel algorithms or methods, creates robust intellectual property portfolios for technology-based startups.

International copyright enforcement, particularly for software applications, typically requires registration with a national copyright office. The Berne Convention facilitates international recognition of copyright across member nations, enabling institutions to protect their creative works globally without requiring separate registration in each jurisdiction. This book will not focus on copyright licensing.

Trademarks

TTOs should also understand the role trademarks play in the broader commercialization ecosystem and be cognizant of when such opportunities might arise (e.g., the University of Florida's development of an electrolyte-rich drink and the associated trademark for the GATORADE brand). Trademarks protect brand identities related to products and services, and trademarks are typically developed by commercial partners or startup companies

rather than academic institutions. However, TTOs should ensure that License Agreements appropriately address trademark usage and brand development to protect institutional reputation and maximize commercial value. This book will not focus on trademark licensing.

5.3 Marketing

Having established comprehensive IP protection strategies, TTOs should identify pathways for bringing innovations to market. These implementation approaches require careful alignment with RAI goals, market conditions, and the specific characteristics of each technology.

Licensing represents the primary mechanism through which research institutions transfer technology rights while maintaining ownership and control. Licensing Agreements can be structured in multiple configurations to optimize commercial outcomes, as described in Chapter 6.

Beyond the traditional licensing arrangements, startup formation has emerged as a pathway for maximizing the commercial and societal impact of academic research. This approach addresses a fundamental challenge in Technology Transfer: the significant gap between laboratory proof-of-concept and market-ready solutions that often cannot be bridged through licensing alone.

5.4 Metrics

The complexity of Technology Transfer requires sophisticated measurement approaches that capture both immediate operational efficiency and long-term strategic impact. Effective

metrics systems provide insights necessary for improvement while demonstrating value to RAI stakeholders. Examples of metrics that can be considered are:

- ➔ Invention disclosure quality and quantity
- ➔ Patent filing rates and portfolio development
- ➔ Licensing revenue generation and growth trajectories
- ➔ Equity investment returns and portfolio performance
- ➔ Cost recovery rates and operational efficiency measures
- ➔ Job creation and economic development contributions
- ➔ Industry partnership development and collaboration metrics
- ➔ Number of educational and outreach activities

These measurement systems should evolve, incorporating new metrics as Technology Transfer practices mature and RAI priorities develop.

Successful metrics balance operational efficiency with strategic impact, demonstrating how effectively RAIs transform research investments into real-world solutions that benefit society while generating appropriate returns to support continued innovation. This balanced approach ensures that Technology Transfer operations remain aligned with RAI values while achieving sustainable commercial outcomes.

Chapter 6 discusses the structure of a Licensing Agreement.

Chapter 6: The Licensing Agreement

Key Takeaways

- A License Agreement is a legal contract that grants rights to use, for example, technology covered under an intellectual property right, such as a patent or copyright, from the owner (the licensor) to another party (the licensee).
- The core elements of a License Agreement include the parties, grant of rights, term/termination, financial terms, performance obligations, Intellectual Property (IP) management, and confidentiality.
- The financing terms are the most negotiated in a license agreement.
- A Technology Transfer Office (TTO) should develop a standard License Agreement template to increase efficiency and reduce costs, particularly where a TTO office has staffing constraints.
- A Term Sheet, which provides a clear definition of the key terms of a potential license agreement, can help the licensor and licensee agree on the basic elements to include in a license agreement.

6.1 Introduction

Chapter 5 examines strategic approaches for developing a plan to manage intellectual property and facilitate commercialization. Chapter 6 outlines the elements and structure of an IP license agreement.

6.2 Elements and Structure of a License Agreement

A License Agreement is a legal contract that grants rights to use IP—such as patents, copyrights, trademarks, know-how, or trade secrets—from the owner (licensor) to another party (licensee). These agreements are central to Technology Transfer, commerc-

ialization, and collaborative innovation. A well-drafted License Agreement balances the interests of both parties, defines the scope of rights, and sets the terms for financial compensation, control, and enforcement. Ideally, a TTO should develop a standard License Agreement template to increase efficiency and reduce costs, particularly where a TTO office has staffing constraints.

The following Figure 6.1 outlines the elements contained in a License Agreement:

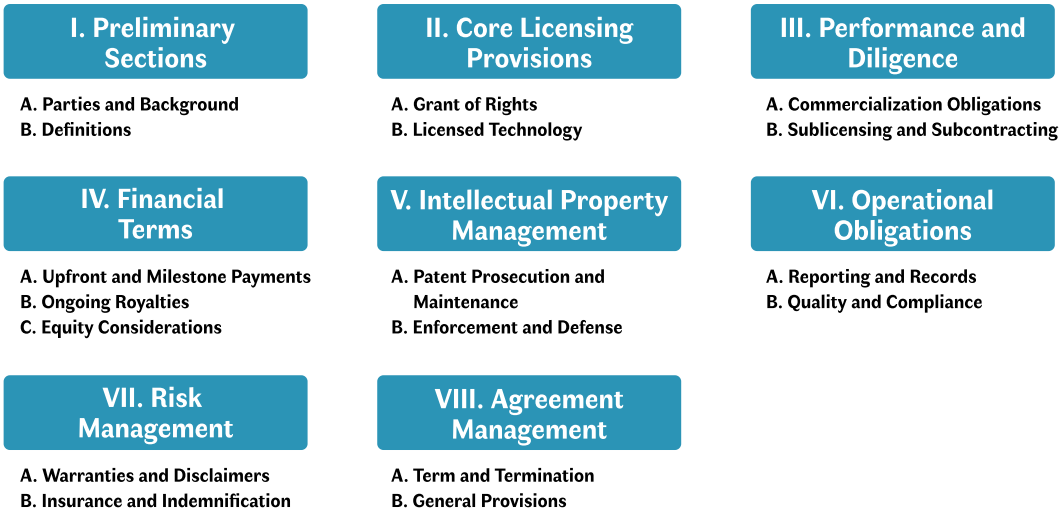


Figure 6.1: A chart outlining the elements of a License Agreement

Please refer to a sample License Agreement in the Additional Resources section of this book. We will discuss each of these clauses below. Understanding these elements is crucial for drafting agreements that strike a balance between the interests of licensors and licensees, while facilitating successful commercialization.

A. Core Elements of a License Agreement

i. Parties to the Agreement

The License Agreement begins by identifying the parties involved: the licensor, who owns the IP, and the licensee, who is granted the right to use it. The licensor may be a university, research institution, corporation, or individual inventor, and is responsible for ensuring the IP is valid and enforceable. The licensee can be a company seeking to commercialize the technology, a distributor, or a developer integrating the IP into a broader product. Clearly defining the parties ensures legal clarity and sets the stage for the allocation of rights and responsibilities throughout the License Agreement.

ii. Grant of Rights

The grant of rights clause outlines exactly what IP is being licensed—such as a specific patent, software code, copyright, know-how, trade secrets, or trademark—and defines the scope of the license. This includes whether the license is exclusive, giving sole rights to the licensee; non-exclusive, allowing multiple licensees; or sole, where only one licensee is granted rights but the licensor retains usage. The clause may also specify whether the licensee has the right to sub-license the IP to third parties, which is particularly important in complex supply chains or global commercialization strategies. Precision in this section prevents future disputes over usage boundaries. The section below provides a detailed discussion of license structures and field/geographic restrictions.

iii. Term and Termination

This section specifies the duration of the license agreement, which may be a fixed number of years or tied to the expiration of the underlying IP (e.g., the life of a patent). It also outlines the conditions under which the License Agreement may be terminated early, such as breach of contract, insolvency, or failure to meet commercialization milestones. Termination provisions

protect both parties by providing a clear exit strategy and ensuring that the IP can be reclaimed or reassigned if the licensee fails to perform.

iv. Financial Terms
Financial terms define how the licensee compensates the licensor for access to the IP. These may include upfront fees paid at the time of signing, royalties based on product sales or usage, and milestone payments triggered by specific achievements, such as regulatory approval or product launch. In start-up scenarios, the licensor may also receive equity in the licensee's company, aligning long-term interests. These financial mechanisms balance risk and reward, incentivizing the licensee to maximize the IP's commercial potential. More details on financial terms are provided below.

v. Performance Obligations
To ensure the IP is actively developed and commercialized, License Agreements often include performance obligations. These may involve timelines for product development, minimum sales targets, or royalty thresholds. The licensee may be required to submit regular reports detailing progress, sales figures, and marketing efforts. These obligations help the licensor monitor the licensee's commitment and ensure the IP is not left idle, especially in exclusive arrangements where the licensor cannot license the IP to others.

vi. IP Management
Effective management of the licensed IP is critical, and this section addresses control over patent prosecution, including who files and maintains patents and how costs are shared. It also defines responsibility for maintenance fees to keep the IP in force. Additionally, the License Agreement may specify who has authority over litigation and enforcement, such as pursuing infringement claims or defending against challenges. These

decisions impact the IP's strength and commercial value, making transparent governance essential. More information on IP management is provided below.

vii. Confidentiality

Confidentiality provisions safeguard proprietary information exchanged during the licensing relationship, including technical data, business plans, and financial terms. Both parties agree not to disclose or misuse this information, often for a defined period even after the agreement ends. This clause is vital for protecting know-how or trade secrets and maintaining competitive advantage, especially in industries where early disclosure can undermine market position.

vii. Additional Legal Terms

a. Representations and Warranties

Representations and warranties provide legal assurances from both parties. Representations are what are promised at the time of entering the agreement and warranties are what are promised during the term of the agreement. The licensor typically warrants that they own the IP, that it is valid, and that they have the right to license it. The licensee may warrant that they have the financial and operational capacity to fulfill the License Agreement's obligations. These statements establish trust and serve as a basis for legal recourse if any representations prove to be false or misleading.

b. Indemnification and Liability

This clause allocates risk and responsibility for legal claims arising from the use of the IP. The licensee may agree to indemnify (e.g., licensee agrees to compensate the licensor for certain damages, losses, or liabilities arising from the License Agreement) the licensor against third-party claims, such as IP infringement or product liability, especially if the IP is integrated into commercial products. The License Agreement may also

require the licensee to carry insurance to cover potential damages. These provisions protect both parties from unforeseen legal and financial exposure.

c. Dispute Resolution

To manage potential conflicts, the License Agreement includes a dispute resolution clause specifying the governing law and jurisdiction, as well as the preferred method of resolving disputes—whether through mediation, arbitration, or litigation. These mechanisms provide a structured process for addressing disagreements and can help avoid costly and prolonged legal battles. Selecting neutral venues and efficient procedures ensures fairness and expedites resolution. Mediation offers a non-binding, collaborative approach to resolving conflicts with the assistance of a neutral third party. Arbitration provides a binding decision outside of court, often faster and more confidential than litigation. Litigation, while more formal and public, may be necessary for complex or high-stakes disputes. The License Agreement may specify the preferred method, the rules governing the process, and the location of proceedings. These procedures help ensure that disagreements are addressed constructively, minimizing disruption to the business relationship. Ideally, before any formal dispute resolution mechanism is triggered, the parties can escalate the conflict to their respective management.

d. Insurance Requirement

License Agreements often include insurance provisions to mitigate risk and ensure that the licensee is financially prepared to handle potential liabilities. These may require the licensee to maintain commercial general liability, product liability, or intellectual property infringement insurance, depending on the nature of the licensed technology. The License Agreement typically specifies minimum coverage amounts, the duration of coverage, and whether the licensor must be named as an addit-

ional insured. These requirements protect both parties from unforeseen claims and reinforce the licensee's commitment to responsible commercialization.

e. Governing Law and Jurisdiction

The governing law and jurisdiction clause establishes the legal framework under which the License Agreement will be interpreted and enforced. It identifies the specific country, state, or region whose laws will apply and where any legal proceedings must be initiated. This provision is crucial in international agreements, where differences in legal systems can lead to uncertainty (e.g., licensor is in country A, licensee is in country B, ideally, the Research and Academic Institution (RAI) would prefer to choose the law of country A as the governing law; however, that may not be agreeable to the licensee, in which case, the law of country C, a neutral jurisdiction, may be selected as the governing law). By clearly defining the applicable law and forum, both parties gain predictability and reduce the risk of jurisdictional disputes, ensuring smoother resolution of any contractual issues.

B. Grant of Rights: Types of License Structures

i. Exclusive License

An exclusive license grants the licensee sole rights to use the IP within a defined scope—such as a specific field, territory, or application—meaning the licensor cannot use or license the IP to any other party within that scope. This arrangement often demands stronger commercialization obligations from the licensee, such as milestones, performance benchmarks, or royalty commitments, to ensure the IP is actively developed and monetized. Exclusive licenses are standard in industries such as pharmaceuticals or biotechnology, where significant investment is required and exclusivity can justify the associated risk.

ii. Non-exclusive License

A non-exclusive license allows the licensee to use the IP. Still, the licensor retains the right to grant similar licenses to other parties and may continue using the IP. This flexible model is widely used in software, research tools, and technologies intended for broad application, where widespread adoption is beneficial and exclusivity is not essential. Non-exclusive licenses typically involve lower fees and fewer commercialization obligations, making them attractive for academic collaborations, open innovation, and scalable digital products.

iii. Co-exclusive License

A co-exclusive license is a hybrid between exclusive and non-exclusive models: only one licensee is granted rights to the IP, but the licensor retains the right to use the IP to commercialize it themselves. However, they cannot license it to others. For example, when an RAI develops educational material, this material may be licensed to a company seeking to provide it to its students; however, the RAI retains the right to sell the same material to its students. This structure strikes a balance between exclusivity and the licensor's continued involvement, often seen in partnerships where the licensor contributes ongoing expertise or development. Co-exclusive licenses can be ideal when the licensor wants to maintain operational control or pursue internal use while still offering the licensee market exclusivity. Technology Transfer Offices (TTOs) rarely use co-exclusive licenses.

C. Grant of Rights: Field and Geographic Restrictions

i. Field of Use Restriction

A field of use restriction narrows the scope of a license by limiting the licensee's rights to a specific application, market, or industry. This allows the licensor to segment the IP across different

industry sectors, maximizing its value through multiple targeted licenses. For example, a drug delivery patent might be licensed exclusively for veterinary use, while the licensor retains rights for human medical applications. Field restrictions are beneficial when the IP has broad utility, enabling tailored commercialization strategies while preserving opportunities for future licensing in other sectors.

ii. Geographic Restriction

A geographic restriction confines the licensee's rights to use and commercialize the IP within defined countries, regions, or territories. This approach supports global commercialization strategies by enabling licensors to grant different licenses in various markets, each tailored to local regulations, distribution channels, and market dynamics. For instance, a technology might be licensed to one company for North America and another for Asia. Geographic restrictions help manage international IP portfolios, reduce overlap, and ensure that licensees focus on their designated regions.

D. Financial Structuring: Front-loaded vs. Back-ended

Financial terms in a License Agreement define how compensation is exchanged between licensor and licensee, shaping the commercial dynamics and long-term success of the deal. These terms may be structured as: front-loaded agreements with substantial upfront payments and lower ongoing royalties for mature, market-ready IP; back-ended agreements with minimal initial costs but higher royalties, milestone payments, or success-based fees for early-stage or high-risk technologies; or hybrid models that blend upfront fees, equity stakes, and performance-based payments to balance risk and reward.

Royalty structures and amounts can take many forms, including a percentage of net sales, fixed per-unit rates, tiered or step-down

rates, or blended rates, with careful consideration given to factors such as technology maturity, exclusivity, market size, competitive landscape, and complementary rights. Benchmarking against industry norms through market data, comparable transactions, and professional valuations helps ensure fairness and competitiveness. Additional provisions, such as minimum annual royalties to maintain commercialization obligations and momentum, royalty stacking clauses to manage multiple IP obligations, and equity components for alignment in start-up scenarios, can further refine the financial structure. A well-crafted financial package strikes a balance between immediate value and risk, offering long-term incentives that protect the licensor's return on investment while enabling the licensee to develop, launch, and scale the innovation profitably.

Determining Structures

License Agreements can be structured to align with technology maturity, risk, and strategic objectives. Standard models—front-loaded, back-ended, and hybrid—balance cash flow, risk, and long-term incentives in different ways.

i. Front-loaded Agreements

Front-loaded agreements prioritize high upfront payments with lower ongoing royalties, making them ideal for IP that is mature, validated, and ready for market deployment. These deals provide immediate capital to the licensor and reduce long-term administrative burdens associated with tracking royalties. Licensees benefit by securing rights to proven technologies with predictable costs. This structure is often favored in industries such as pharmaceuticals or software, where the IP has already undergone development and regulatory approval, thereby minimizing risk and accelerating Commercialization.

Case Study: Front-loaded license

A university licenses a fully developed and patented medical device to an established medical equipment manufacturer. The agreement requires the manufacturer to pay a $1 million upfront license fee with no ongoing royalties. Because the device already has regulatory clearance and proven market demand, the manufacturer can begin production immediately, and the university receives substantial immediate revenue without the need to monitor long-term sales.

ii. Back-ended Agreements

Back-ended agreements feature low upfront costs but compensate the licensor through higher royalties, milestone payments, or success-based fees. These are common in deals involving early-stage technologies, start-ups, or high-risk innovations, where the commercial potential is uncertain. This model enables licensees to access promising IP without incurring heavy initial investment, while licensors share in the upside if the technology proves successful. It aligns incentives and supports innovation by reducing barriers to entry for emerging companies, thereby fostering a more competitive environment.

Case Study: Back-ended license

A research institution licenses an early-stage cancer drug candidate to a biotechnology start-up. The license requires only a $50,000 upfront payment. Still, it includes royalties of 8% on net sales, as well as milestone payments of $500,000 upon completion of Phase II clinical trials and $2 million upon regulatory approval. This structure lowers the start-up's initial financial burden while giving the institution a share in future success.

iii. Hybrid Models

Hybrid models blend elements of both front-loaded and back-ended structures, incorporating upfront fees, equity stakes, and performance-based payments. These agreements are designed to strike a balance between risk and reward, promoting long-term value creation and strategic alignment among parties. For example, a licensor might receive a modest upfront payment, equity in the licensee's company, and royalties tied to sales milestones. Hybrid models are instrumental in complex deals where both parties seek flexibility, shared risk, and mutual growth potential.

Case Study: Hybrid model license

A university licenses a novel AI-driven diagnostic software to a mid-sized health technology company. The agreement includes a $250,000 upfront payment, 5% royalties on net sales, and equity representing 3% ownership in the company. Additional milestone payments are triggered by securing U.S. Food and Drug Administration (FDA) clearance and achieving $10 million in cumulative sales. This model shares risk and aligns incentives for both parties to invest in long-term growth.

iv. Determining a Royalty Rate

Setting a royalty rate is one of the most sensitive and strategically important aspects of a licensing agreement, as it directly impacts both the licensor's return on investment and the licensee's profitability. The process involves balancing the commercial value of the IP with the risk, cost, and time required for successful product development. For licensors, the rate must provide a fair reward for transferring rights and enabling commercialization. For licensees, it must leave sufficient margin to cover development, manufacturing, marketing, and distribut-

ion expenses while achieving competitive pricing in the market. In the U.S. several organizations publish statistics on average royalty rates by industry. A general rule of thumb defined by Robert Goldscheider, states that in a technology license agreement it is equitable for the licensor to receive royalties amounting to 25% of the profits generated for the licensee as a result of the license.

Royalty rates can be structured in several ways:

- *Percentage of Net Sales:* the most common approach, calculated as a percentage of the revenue generated from product sales after allowable deductions (e.g., returns, discounts, taxes).
- *Fixed per-unit Rate:* a set monetary amount paid for each unit sold, often used for high-volume, lower-margin products or where pricing varies significantly between markets.
- *Tiered or Step-down Rates:* rates that adjust based on sales volume thresholds or time, encouraging licensees to scale sales and rewarding early-stage commercialization efforts.
- *Blended Rates:* combining a percentage of sales with other metrics, such as usage fees or service charges, for technologies integrated into larger systems or platforms.

Factors influencing royalty rates include:

- *Gross Profit of Licensed Products:* the price minus the cost of goods sold.
- *Stage of Development:* Early-stage technologies, especially those requiring regulatory approval, generally command lower rates due to higher uncertainty and investment needs. Mature, proven technologies may justify higher rates.
- *Risk Factor:* Evaluating risk is critical in determining valuation, which leads to reasonable royalty rates.

- *Exclusivity:* Exclusive licenses often command higher royalties, reflecting the value of market exclusivity and the competitive advantage they provide.
- *Market Size and Potential:* Larger, fast-growing markets may allow for higher rates, while niche markets may require more modest rates to maintain licensee viability.
- *Competitive Landscape:* The availability of competing technologies can drive rates down; conversely, a unique, hard-to-replicate innovation may command a premium.
- *Complementary Rights:* Inclusion of know-how, trade secrets, or ongoing technical support may justify higher rates.

Benchmarking against industry norms is critical. This can be achieved through:

- *Market Data Sources:* Researching licensing industry reports, deal databases, and published surveys, for example, those available from the Licensing Executives Society International.
- *Comparable Transactions:* Reviewing similar agreements in the same sector and geographic market.
- *Professional Valuations:* Engaging IP valuation experts to provide an objective, data-backed recommendation.

Finally, licensors and licensees may negotiate minimum annual royalties to ensure continued commitment to commercialization, as well as royalty stacking provisions to manage cumulative royalty obligations when multiple IP rights are involved in a product. These mechanisms safeguard the interests of both parties, protecting licensors from stagnation and preventing licensees from facing unsustainable royalty burdens.

E. Control of Patent Prosecution

i. Licensor-controlled

In a licensor-controlled model, the licensor retains full authority over patent prosecution, including managing filings, responding to office actions, and setting strategic direction. This approach ensures consistency across jurisdictions, maintains alignment with the licensor's broader IP portfolio, and protects long-term value. It is especially beneficial when the IP is licensed to multiple parties or spans diverse markets, as centralized control helps avoid conflicting claims or fragmented protection strategies. This model is preferred by TTOs in the U.S.

ii. Licensee-controlled

Under a licensee-controlled arrangement, the licensee assumes responsibility for prosecuting the IP, which is common in exclusive licensing deals where the licensee has a vested interest in securing and maintaining protection. This model often includes provisions for reimbursement of prosecution costs by the licensor or shared financial responsibility. Licensee control can accelerate market-specific filings and tailor protection to the licensee's commercial strategy, but it requires trust and alignment with the licensor's original intent.

iii. Joint Control

Joint control involves shared decision-making and cost allocation between the licensor and licensee, requiring a well-defined governance framework to avoid disputes. This model is suitable for collaborative ventures or co-development agreements where both parties contribute to and benefit from the IP. Clear mechanisms for resolving disagreements, allocating responsibilities, and managing timelines are essential to ensure smooth coordination. Joint control fosters transparency and mutual investment in the IP's success, but demands careful planning and communication.

F. Control of Litigation and Enforcement

i. Licensor-controlled

In a licensor-controlled enforcement model, the licensor retains the right to defend and enforce the IP, ensuring consistent protection of the brand and portfolio across markets. This centralized approach helps maintain the integrity of the IP and avoids fragmented or conflicting enforcement strategies. The licensor typically bears the costs of litigation and controls settlement decisions. If enforcement leads to monetary recovery, such as damages or settlements, the licensor usually retains the proceeds, although some agreements may provide the licensee with a share if their business was directly impacted or if they contributed to the enforcement effort. Alternatively, the TTO may request that a portion of the proceeds, once the expenses are deducted, are owed to the licensor.

ii. Licensee-controlled

In a licensee-controlled enforcement scenario, the licensee initiates and manages infringement actions, often under exclusive licensing arrangements where they have a strong commercial interest in protecting their market. This model empowers the licensee to act swiftly against infringers, especially when the licensor lacks the resources or incentive to pursue action. The licensee typically covers litigation costs and makes strategic decisions. If successful, proceeds from enforcement, such as damages or settlements, are typically retained by the licensee, although some agreements may require sharing with the licensor or reimbursement for the use of the IP.

iii. Shared Enforcement

Shared enforcement involves joint decision-making on litigation strategy, with both parties contributing to costs and participating in enforcement actions. This model is common in co-development or strategic partnerships where both the licensor and

licensee have a stake in the IP's protection. Agreements must clearly define governance mechanisms, cost-sharing arrangements, and recovery provisions to avoid disputes. When enforcement yields financial proceeds, they are typically split proportionally based on each party's contribution to litigation costs or as otherwise agreed in the license. This approach fosters collaboration but requires careful coordination and transparency to ensure effective implementation.

G. Commercialization and Performance Metrics

i. Development Milestones

Development milestones are critical checkpoints in the product lifecycle that reflect meaningful progress in turning IP into a marketable product. These milestones are often tied to technical achievements, regulatory approvals, or commercial readiness, and are used to monitor the licensee's commitment and performance. License Agreements typically require the payment of a milestone fee to the licensor upon successful completion of each stage, compensating the licensor for the increasing value of the IP.

Examples of Development Milestones include:

- *Proof of Concept Completed*: Demonstrating that the technology works in a lab or controlled setting.
- *Initiation of Clinical Trials:* Beginning Phase I trials for a pharmaceutical or medical device.
- *Regulatory Submission:* Filing for regulatory body approval. For example, the U.S. Food & Drug Administration, U.S. Environmental Protection Agency, and European Medicines Agency.
- *Regulatory Approval Granted:* Receiving clearance or approval to market the product.
- *First Commercial Sale:* Launching the product in a designated market.

Each of these milestones would trigger a predefined payment to the licensor, often increasing in value as the product moves closer to commercialization. These fees help the licensor share in the success of the development process and incentivize timely progress.

ii. Sales Targets
Sales targets set minimum annual sales thresholds or royalty benchmarks that licensees must meet to retain rights or avoid default. These targets ensure that licensed IP is being effectively commercialized and generating value. If the licensee fails to meet the targets, the licensor may have the right to terminate the agreement, convert it to non-exclusive status, or reclaim rights in underperforming territories. Sales targets are particularly useful in exclusive licenses, where the licensor depends on the licensee's performance to realize the IP's market potential.

iii. Reporting Obligations
Reporting obligations require licensees to provide regular updates on the progress of development, commercialization efforts, and financial performance. These may include technical reports, marketing plans, and financial statements, often submitted quarterly or annually. Licensors may also reserve the right to conduct audits to verify the accuracy of royalty payments and compliance with the agreement. Transparent reporting fosters trust, enables strategic oversight, and ensures that both parties remain aligned throughout the lifecycle of the license.

H. Audit and Compliance

License Agreements often grant the licensor the right to audit the licensee's records to ensure accurate calculation and payment of royalties. These audits typically focus on financial documents, sales reports, and any data relevant to royalty-bearing activities. The goal is to verify that the licensee is complying with the economic terms of the License Agreement

and that the licensor is receiving its fair share of revenue. Audit rights are a key mechanism for maintaining transparency and trust between parties. The frequency and scope of audits are clearly defined in the License Agreement to strike a balance between oversight and operational efficiency. Audits may be permitted annually or biannually and often require advance notice, typically 30 to 60 days. The scope may be limited to specific records, periods, or geographic regions, and an independent third party usually conducts audits. These provisions help prevent excessive disruption while ensuring the licensor can effectively monitor compliance. If an audit reveals underpayment or non-compliance, the License Agreement typically outlines remedies to protect the licensor's interests. Common treatments include immediate reimbursement of unpaid royalties, interest penalties, and, in some cases, termination of the license for material breach. If discrepancies exceed a certain threshold—typically 5–10%—the licensee may also be required to cover the audit costs. These enforcement mechanisms ensure accountability and deter intentional or negligent misreporting.

I. Renewal, Assignment, and Exit Strategies

i. Renewal Terms

Renewal terms govern how a license may be extended beyond its initial duration, either through automatic renewal or negotiated extensions. These terms are often contingent upon the licensee's performance metrics, such as meeting sales targets or achieving development milestones, or on broader market conditions, including continued demand or regulatory changes. Automatic renewals offer continuity, while negotiated renewals allow both parties to reassess the value and scope of the license. Renewal provisions help ensure that the permit remains relevant and beneficial over time.

ii. Assignment Rights
Assignment rights determine whether the licensee can transfer the license to another entity, such as through a merger, acquisition, or sale of business assets. These rights are often restricted or subject to licensor approval to prevent dilution of the IP's value or unintended use by third parties. Licensors may allow assignment only to affiliates or successors that meet specific criteria, ensuring that the IP remains in capable hands. Clear assignment clauses protect the licensor's strategic interests and maintain control over how and by whom the IP is used.

iii. Exit Clauses
Exit clauses provide mechanisms for early termination of the license, offering flexibility in response to changing business strategies or unforeseen challenges. These may include buy-out options, where the licensee pays a lump sum to end the License Agreement, or termination for convenience, allowing either party to exit with notice. Strategic exit rights are fundamental in long-term or high-risk deals, enabling parties to pivot without excessive liability. Well-crafted exit clauses strike a balance between flexibility and fairness, ensuring a clean and predictable separation if needed.

6.3 Term Sheet

Before exchanging a draft License Agreement with the other party, start with a Term Sheet—a clear definition of the key terms of a potential License Agreement. The Term Sheet is not a legally binding contract and avoids the use of legal language. Still, it can help the licensee and licensor agree on fundamental elements to include in a License Agreement. Negotiating with a Term Sheet, before an initial draft of the agreement, can help make the process more efficient in achieving a License Agreement.

A term sheet is generally exchanged between the licensor and licensee soon after the initial meetings and discussions of the technology, the licensee's industry and business practice, and the joint opportunity. As the owner of the IP, the licensor typically creates the initial Term Sheet to facilitate the inclusion of key terms. Terms Sheets can vary in font and format, but generally tend to be concise. They can be in the form of bullet points, rather than sentences, and tables. While a typical License Agreement may be 15-20 pages long, a term sheet is usually 2-3 pages long. A sample Term Sheet that can be tailored is provided in Figure 6.2.

Figure 6.2: An illustration of the key terms found in a term sheet

An MOU, a Term Sheet, and a Letter of Intent are interchangeable names used to refer to the same document.

In some instances, when a licensee requires more time to evaluate or negotiate a License Agreement but wants to ensure that the rights to the desired IP are not granted to anyone else, the TTO may offer, for a fee, an option to license the technology to the prospective licensee.

In Chapter 7, we address the use of License Agreements by TTOs during start-up formation.

Chapter 7: Start-ups in the Innovation Economy: Principles and Practices

Key Takeaways

- Start-ups bridge the gap between innovations from academic research and market applications, accelerating Technology Transfer, generating employment opportunities, and driving regional economic growth.
- Research and Academic Institutions (RAIs) formalize the transfer of Intellectual Property (IP) to start-ups through licensing agreements, creating distinct obligations, such as royalties and/or equity stakes, milestones, and development restrictions.
- RAIs must manage conflict of interest matters that may arise when an RAI employee is involved in the start-up.

7.1 Introduction

While Chapter 6 describes the terms of a License Agreement, Chapter 7 outlines principles and practices for start-ups, which are potential licensees of IP originating from Technology Transfer Offices (TTOs). More specifically, this chapter examines foundational principles and practical guidance tailored to Technology Transfer professionals and prospective founders, with illustrative examples provided to contextualize core concepts.

When a researcher, student, or research team at an RAI develops a new technology, medical breakthrough, or innovative algorithm, they face a critical decision about how to bring their invention to market. There are two primary commercialization pathways: 1) license the invention to an existing company or 2) license it to a newly formed start-up company, commonly referred to as a university start-up, formed by the inventing team or other entrepreneurs.

These university-affiliated start-ups differ fundamentally from those start-ups that develop and own their intellectual property independently of institutional connections. University start-ups

operate under licensing arrangements that typically involve ongoing obligations to the originating institution, including royalty payments, milestone requirements, and often restrictions on future development rights. This chapter will focus on these start-ups.

Throughout the chapter, we use the term "start-up" to refer specifically to university start-ups, unless otherwise noted, emphasizing their role as bridges between academic innovation and real-world commercial applications.

7.2 Contributions and Benefits of Start-ups

A start-up is a company established to commercialize research-based intellectual property or technological innovations developed within RAIs using the RAI's facilities, equipment, personnel, and funding resources. These ventures are typically founded by faculty members, researchers, and/or students who seek to translate university-developed technologies into viable market solutions. Because RAIs generally retain ownership rights to inventions created using their resources, successful commercialization requires negotiating licensing agreements that enable the new company to bring these innovations to market.

Start-ups serve as critical intermediaries in the innovation ecosystem, transforming laboratory discoveries into real-world applications that benefit society and drive economic growth. These ventures accelerate the translation of cutting-edge research into products and services that address market needs, while simultaneously creating employment opportunities and stimulating regional economic development.

The scale and impact of university-based entrepreneurship are substantial.

In the U.S. alone, according to data by the Association of University Technology Managers (AUTM), 69% of university licenses are granted to start-ups, resulting in over 149,000 U.S. patents issued between 1996 and 2020, which contributed approximately $1 trillion to the nation's gross domestic product. These figures underscore the significant role that university start-ups play in national innovation systems and economic competitiveness.[1]

Figure 7.1: An illustration of the benefits of a vibrant start-up culture within a society

Start-ups hold particularly transformative potential in smaller markets and emerging economies, where they serve as powerful catalysts for innovation, employment generation, and regional economic resilience. In markets less dominated by multinational corporations or established industry leaders, university-based

ventures often deliver disproportionate impact by advancing local technological capabilities, cultivating specialized talent pools, and strengthening the broader innovation infrastructure. Figure 7.1 outlines the significant benefits that start-ups provide. Each of these benefits is discussed in greater detail below.

Innovation Acceleration: In emerging economies, where Research and Development (R&D) budgets may be limited, start-ups serve as efficient mechanisms for translating academic discoveries into market-ready solutions. Unlike RAIs, start-ups can draw investment capital for the development of RAI innovation. Whether developing biotechnology breakthroughs, sophisticated software platforms, or novel engineering solutions, these start-ups can achieve significant impact with this investment.

Talent Retention and Development: University start-ups offer compelling opportunities for graduates and researchers to build their careers locally, rather than migrating to established innovation hubs. This talent retention strengthens regional human capital and creates mentorship networks that support subsequent entrepreneurial ventures.

Ecosystem Development: Successful start-ups often catalyze broader entrepreneurial activity within their regions. Experienced founders frequently become mentors and angel investors, while universities enhance their capabilities for commercialization. The demonstration of local success also attracts external investment and partnership opportunities.

Economic Diversification: Start-ups can generate high-value employment in areas such as R&D, engineering, marketing, and business development. As these companies scale, they often attract additional investment and partnerships that further strengthen the regional economy.

Understanding these fundamental principles and advantages provides the foundation for examining the practical aspects of university start-up formation. The following sections will explore the step-by-step processes that Technology Transfer profess-

ionals and prospective entrepreneurs navigate when transforming academic innovations into successful commercial ventures.

7.3 Best Practices for Licensing University Innovations to Start-ups

This section provides Technology Transfer professionals with a methodology for assessing faculty inventions and navigating the complex decision-making process that determines whether innovations should be licensed to faculty-led start-ups or established industry partners.

The following framework addresses core competencies, including invention assessment, IP strategy development, entrepreneurial capacity evaluation, commercialization pathway selection, and start-up licensing negotiation. Throughout, practical approaches are emphasized, demonstrating how effective Technology Transfer can flourish even with limited resources and staffing constraints.

Invention Triage and Valuation Process

Upon receipt of a faculty member's Invention Disclosure, TTOs critically evaluate the trajectory potential of commercialization efforts. Details on invention triage and valuation are discussed in Chapter 4.

Strategic Considerations for Start-up Formation

Following successful completion of the invention triage and valuation process, Technology Transfer professionals face a critical decision point: determining the optimal commercializat-

ion pathway for each innovation. These two pathways are traditional licensing to existing companies and licensing to a start-up company.

Traditional licensing to established companies offers access to proven commercialization capabilities, existing market channels, and substantial financial resources. Conversely, start-up formation provides greater control over technology development, the potential for higher returns, and the ability to pursue specialized market niches that may not be attractive to established industry players.

Established companies generally refrain from licensing technologies requiring substantial additional development. Start-ups may be the only viable pathway for high-risk development projects, providing the focused attention necessary to advance technologies through critical validation phases.

For example, agricultural technologies specifically designed for small farmers may not appeal to multinational agribusiness companies, which are focused on large-scale commercial operations. In such cases, local start-ups can effectively serve these specialized markets while building sustainable businesses centered on meeting the targeted needs of their customers.

Start-up formation enables inventors and RAIs to maintain greater control over technology development priorities and application focus. This control becomes particularly valuable when innovations serve social missions or require careful stewardship to ensure appropriate utilization. For instance, biomedical technologies designed for affordable healthcare in resource-constrained environments might be better advanced through mission-driven start-ups rather than licensing arrangements with multinational corporations whose priorities may not align with original development intentions.

Additional Factors to Consider

Successful start-up formation also requires business models with clear paths to revenue generation and financial sustainability. Technologies with long development timelines or uncertain monetization prospects may be better suited for licensing arrangements with established companies that possess greater financial resources and a willingness to invest in long-term development.

Technology Transfer professionals should provide comprehensive evaluation processes that bring together inventors, external advisors, and relevant stakeholders to analyze these critical factors systematically. This collaborative approach ensures informed decision-making while building consensus around the selected commercialization strategy.

Decision-making and Managing Expectations

Technology Transfer professionals should provide transparent, data-driven recommendations based on thorough due diligence findings, while diplomatically communicating concerns about market size, technology maturity, or other relevant risk factors. The Case Study below highlights the cross-section of key stakeholders involved in the creation of a university start-up in the Philippines.

Case Study: Fish-i: Harnessing AI and university innovation for sustainable fisheries—A UP Diliman success story

Fish-i is an innovative start-up that emerged from the University of the Philippines (UP) Diliman, built around a semi-automated fish census system designed by Professors Prospero Naval and Laura David. The company's flagship technology combines an underwater camera rig with Artificial Intelligence (AI) to automate the rapid assessment of reef fish, enabling the collection of data on fish size, population density, species distribution, and biomass with high precision and speed. Fish-i's hardware-software platform enables divers with minimal marine science expertise to conduct efficient underwater visual censuses, a crucial need for marine management and conservation. The technology received a Philippine patent in 2024 and has been deployed in more than 50 sites across the Philippines, Indonesia, Hawaii, and other countries, demonstrating its real-world impact on sustainable fisheries research and practice.

UP Diliman played a central role in transforming Fish-i from research to commercialization. The university supported the technology's development through its Technology Transfer and Business Development Office, facilitating patenting, licensing, and the formal creation of the start-up process. Additional backing came from government funding bodies, notably the Department of Science and Technology (DOST) and its Philippine Council for Industry, Energy and Emerging Technology Research and Development (PIEERD), which provided grants, incubation, and commercialization support. The researchers themselves established Fish-i, Inc. as a start-up to bring their laboratory innovation to the broader community—a milestone celebrated by UP's leadership as a model for deploying university-generated innovations to markets and communities that need them most. This collaborative ecosystem, linking academic research, government funding, and entrepreneurial activity, showcases UP's commitment to translating science and technology into tangible benefits for Philippine society.[2]

Entrepreneurial Readiness and Commitment

The success of a start-up depends on the founding team's entrepreneurial capabilities, commitment levels, and business acumen. Not all researchers possess the inclination or skills necessary for entrepreneurial success and making a candid assessment of the faculty inventor's entrepreneurial readiness is essential for selecting the most suitable pathway.

Key evaluation dimensions include the inventor's genuine interest in company formation, understanding of start-up demands, and relevant entrepreneurial experience. Technology Transfer professionals must determine whether inventors are actively interested in building companies and possess the passion necessary to navigate the inevitable challenges of start-up development. This assessment should evaluate inventors' understanding of the requirements for starting a business, including substantial time commitments, financial risks, and the diverse skill sets necessary for success.

Many academic researchers excel in their scientific domains but often lack experience in areas such as product development, marketing strategy, fundraising, or operational management. This gap in skills does not preclude success but requires strategic planning to address capability deficits. Successful start-up programs often structure arrangements where faculty members serve as scientific founders or technical advisors, rather than as full-time chief executives, allowing them to maintain their academic appointments while contributing their expertise to commercial ventures.

In emerging economies, where academic entrepreneurship remains uncommon, TTOs should provide substantial mentorship and guidance to help faculty navigate the start-up process. This support includes educating inventors about business fundamentals, connecting them with local innovation ecosystems and accelerator programs, and facilitating honest self-assessment regarding their preferred level of commercial involvement.

Technology Transfer professionals serve dual roles as educators and facilitators, ensuring inventors develop realistic expectations about start-up challenges while identifying appropriate support mechanisms. This may involve connecting faculty with experienced co-founders, external Chief Executive Officers (CEOs), or entrepreneurship training programs. In the United States, programs like I-Corps provide structured methodologies for academic inventors to explore commercial potential and develop entrepreneurial skills.

Institutional policy management represents another crucial support function, particularly in relation to conflict of interest regulations. When faculty members launch companies based on their research, universities typically require oversight through specialized committees to ensure that appropriate boundaries are maintained between academic responsibilities and commercial activities. TTOs should guide inventors through these approval processes while establishing clear protocols for managing dual roles.

The Case Study below highlights a successful University start-up from South Africa where the university sought equity.

Case Study: MariHealth Solutions—Transforming aquaculture through university innovation and partnership at the University of Cape Town

MariHealth Solutions is a pioneering marine biotechnology start-up founded at the University of Cape Town (UCT), focused on transforming animal health management in global aquaculture. Founded by researchers leveraging advanced proteomics and data analytics, the company offers technology that enables proactive health monitoring of fish and shellfish, with applications including probiotic

feed products and non-lethal health assessment tools. Originating from research on probiotics for abalone larvae conducted at UCT's Molecular and Cell Biology department, MariHealth Solutions was officially incorporated in October 2021. Seed funding from the Technology Innovation Agency and the University Technology Fund (UTF) facilitated product development and initial market validation. The company has since expanded into international markets and formed strategic partnerships.

UCT has played a central role in the creation and growth of MariHealth Solutions, both through Technology Transfer and as an equity-holding partner. The university provided business and entrepreneurial training, early-stage funding through its Evergreen Fund, and critical support via its Research Contracts & Innovation (RC&I) office—guiding the start-ups from research commercialization to company formation. As part of the university's commitment to supporting impactful innovations, UCT acquired an equity stake in MariHealth Solutions alongside UTF, ensuring that the institution remains invested in the venture's long-term success and its mission to drive sustainable innovation in the aquaculture industry.[3]

Start-up Licensing Agreements

Once a TTO agrees to license the technology to a start-up, the faculty begin by establishing a legal entity. At the same time, Technology Transfer professionals structure a license agreement between the RAI (IP owners) and the start-up company (licensees).

Start-ups typically require exclusive licensing arrangements (at least in the field of use) to attract investment and establish competitive positioning. Investors demand assurance of clear market runways, free from competing licensees using identical technologies. RAIs should explicitly reserve academic research

and educational use rights, protecting scholarly access while supporting commercial development. Standard reservations allow continued research and teaching applications without interfering with exclusive commercial arrangements. Chapter 6 describes the key terms for any License Agreement.

The Case Study below illustrates the role of the License Agreement in the development of a start-up in South Africa.

Case Study: Immobazyme—Powering precision fermentation through university innovation at Stellenbosch University

Immobazyme is an innovative South African biotechnology start-up specializing in precision fermentation and enzyme immobilization. Founded in 2019 by Dominic Nicholas, Ethan Hunter, and Nick Enslin, the company has developed modular protein expression systems to produce affordable, animal-origin-free growth factors and high-value recombinant proteins for industries such as cellular agriculture, cosmetics, and food production. Immobazyme's technology platform also includes the PepTrap™ enzyme immobilization system, which enhances the efficiency and stability of enzymes for use in industrial processes—for example, providing solutions for the sugar and food industries. Driven by a mission to catalyze global innovation and sustainability, Immobazyme has rapidly expanded its capabilities, facilities, and commercial reach, as highlighted by recent successful funding rounds and its entry into international markets.

Stellenbosch University (SU), through its TTO Innovus, played a pivotal role in Immobazyme's formation and success. The university provided initial resources by granting the start-up an "Instant Access License" for the patented enzyme immobilization technology, enabling the founders to commercialize their scientific discoveries.

Innovus guided the trio through the patenting and Technology Transfer process, facilitated access to laboratory space via the SU LaunchLab, and supported the company in securing substantial investments from the University Technology Fund and University of Stellenbosch Enterprises. Such hands-on involvement—from intellectual property support, seed funding, infrastructure, and mentorship—demonstrates Stellenbosch University's commitment to nurturing entrepreneurial scientists and advancing the commercialization of university-driven biotechnology innovations in South Africa.

For Faculty Founders: A Practical Start-up Readiness Guide

Faculty seeking to commercialize university-developed innovations face a unique entrepreneurial journey that combines academic expertise with business acumen. Successfully transforming research discoveries into viable commercial ventures requires systematic preparation across legal, strategic, and operational dimensions.

Figure 7.2 below illustrates the systematic approach faculty founders should follow when preparing to launch university-based start-ups.

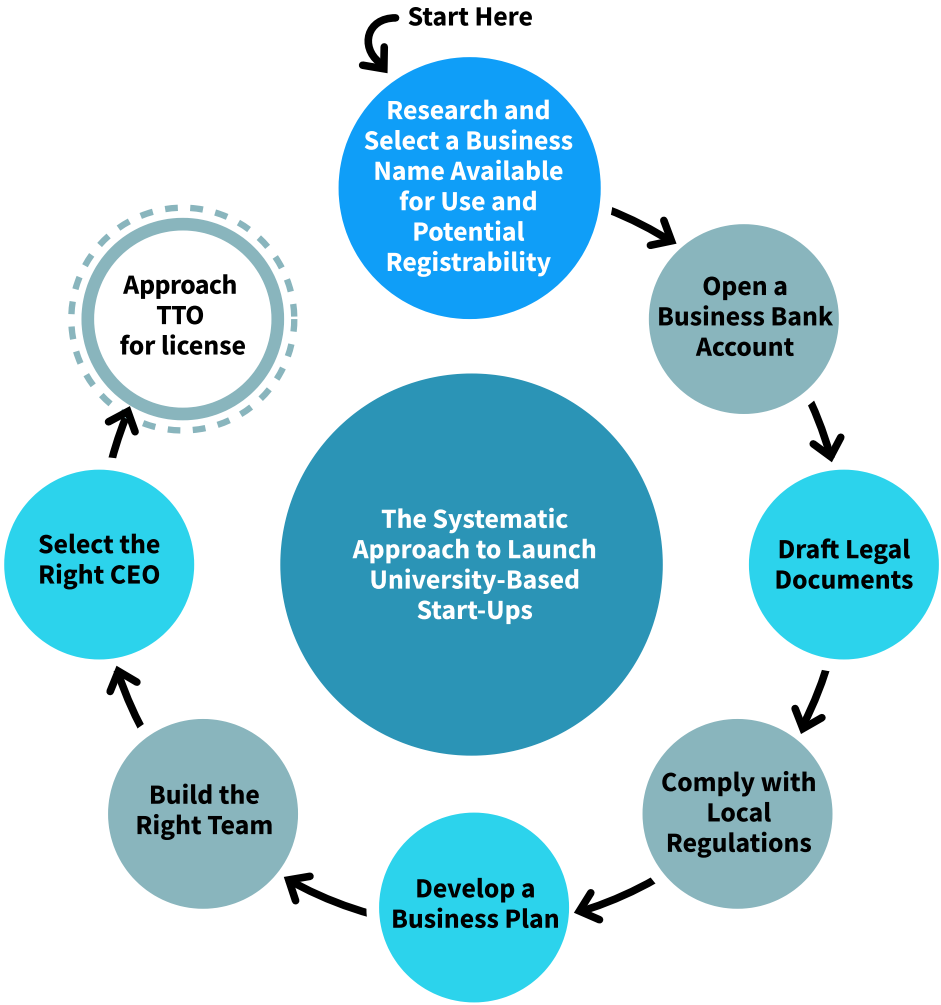


Figure 7.2: An illustration of the sequential steps a start-up company will need to take before being ready to obtain a license from a TTO

This circular diagram in the figure above illustrates the interconnected nature of start-up preparation activities. Starting with business name selection and domain acquisition, progressing clockwise through company registration, identification number acquisition, business banking establishment, legal documentation development, regulatory compliance, business plan creation, team building, and CEO selection. Figure 7.2 helps faculty founders understand the comprehensive preparation necessary before engaging with university TTOs for licensing negotiations, ensuring they approach commercialization with professional readiness and strategic clarity.

Strategic Foundation and Legal Framework

Establishing a strong strategic and legal foundation is essential for transforming academic innovations into sustainable, investor-ready start-ups. This section provides a checklist for the key steps to set a start-up on the path to commercial success, focusing on 10 factors, in no particular order: Business Name, Entity Formation and Legal Structure, Banking and Financial Management, Founder Agreements and Governance, Key Contracts and IP Protection, Regulatory Compliance, Business Plan Development, Building the Core Start-up Team, CEO Selection, and Preparation for University Licensing and Scaling.

1. Business Name Selection

Selecting a business name is a strategic branding decision that influences how investors, customers, and partners perceive a company.

Reflects Value and Market:

- ➔ Choose a name that embodies the technology's core benefit or target audience—avoid overly technical or confusing terms.

Memorability and Credibility:

- ➔ Ensure the name is easy to pronounce, memorable, and professional.

Availability and Protection:

- ➔ Conduct worldwide trademark searches in relevant intellectual property databases to prevent infringement.
- ➔ Check for domain name availability—preferably a .com—and consider alternatives (.io, .co, or industry-specific extensions) to protect a brand.
- ➔ Secure consistent social media handles to reinforce brand recognition.

Professional Impact:

- ➔ Strong, well-chosen names build credibility with investors and customers.

2. Entity Formation and Legal Structure

Establishing the legal entity of a start-up forms the backbone for future growth and legal protection.

Liability Shield:

- ➔ Separates personal and company assets.

Entity Options:

Some examples are available in some jurisdictions:

- ➔ LLC: Offers flexibility and simpler taxes—suitable for early-stage or modest investment needs.
- ➔ C-Corp: Preferred for ventures seeking significant funding and offering stock options.

Formation Process:

- ➔ File the necessary documents and pay the registration fees.
- ➔ Appoint a registered agent for legal notices.
- ➔ If applicable in the jurisdiction, secure a business's tax identification number.

3. Banking and Financial Management

Separating personal and business finances is vital for both legal protection and credibility.

Dedicated Accounts:

- ➔ Clarifies tax matters and simplifies due diligence for investors.
- ➔ Requires business registration and possibly operating agreements/bylaws.

Bank Selection:

- ➔ Choose banks that cater to start-ups—look for low fees, robust online tools, and accounting integrations.
- ➔ Some institutions provide start-up-focused programs and professional support.

Financial Records:

- ➔ Maintain meticulous records to facilitate effective fundraising and operational management.

4. Founder Agreements and Governance

Well-crafted founder agreements protect both the company and its founders by laying out expectations, roles, and rights.

What to Include:

- ➔ Roles, responsibilities, equity splits, and time commitments.
- ➔ IP contributions, compensation, and vesting schedules (typically four-year vesting with a one-year cliff).
- ➔ Clear protocols for decision-making and procedures for founder departure, disability, or death.

Legal Customization:

- ➔ Adapt templates as needed with the assistance of an attorney experienced in start-up law and local regulations.

5. Key Contracts and IP Protection
Robust legal agreements safeguard your technology and business relationships. Appendix 1 includes a checklist of key contracts, and Chapter 6 consists of a summary of the key terms of a License Agreement.

6. Regulatory Compliance
Understand and anticipate the regulatory landscape to avoid delays or penalties.

Varies by Industry and Geography:

- ➔ Tech start-ups may require data privacy compliance or export licenses.
- ➔ Healthcare or biotech ventures face complex paths (e.g., U.S. Food and Drug Administration (FDA) device certifications).

Professional Advice:

- ➔ Engage specialized legal advisors or consultants early to assess and plan for regulatory requirements.

Proactive Planning:

- ➔ Regulatory compliance must be factored into timelines and budgets to prevent bottlenecks and ensure seamless operations.

7. Business Plan Development
A comprehensive business plan transforms an idea into an actionable strategy, thereby enhancing its appeal to stakeholders. Figure 7.3 illustrates the elements of an effective business plan.

Figure 7.3: The essential elements of an effective business plan

8. Building the Core Start-Up Team
The founding team is a primary driver of success.

Skill Mix:

- ➔ Pursue diversity of expertise: technical, strategic, operational, and creative.
- ➔ Balance deep specialization with adaptability.

Traits:

- ➔ Value problem-solving, resilience, and high emotional intelligence.
- ➔ Prior experience in a start-up or fast-paced environment is a plus.

Cultural Fit:

- ➔ Prioritize effective communication, collaboration, and alignment with the company's values.

Role Definitions:

- ➔ Establish initial roles, but remain flexible as business needs evolve.

9. CEO Selection (Faculty Start-Ups)

Faculty-led ventures must carefully consider CEO leadership to bridge the gap between academia and the business world.

Essential Qualities:

- ➔ Strategic vision and tactical discipline.
- ➔ Communication prowess and fundraising skills.
- ➔ Leadership under pressure.

Domain Experience:

- ➔ Increases market credibility.

Role Assessment:

- ➔ Founders must honestly assess whether to serve as CEO or recruit externally, taking into account university roles and potential conflict-of-interest issues.

10. Preparation for University Licensing and Scaling

This preparation lays the foundation for successful licensing negotiations and sustainable growth.

Chapter 8 explores future trends for start-ups, TTOs, RAIs, and various industries, highlighting both opportunities and challenges.

Chapter 8: Opportunities and Challenges for Technology Transfer

Key Takeaways

- In Technology Transfer, AI tools provide a promise of efficiency to Technology Transfer Offices (TTOs), but with some obstacles.
- As digital platforms and data become central to innovation ecosystems, their evolving use and governance present both strategic advantages and ethical challenges for Technology Transfer.
- Open innovation is transforming Technology Transfer by replacing traditional linear Intellectual Property (IP) licensing models with collaborative, cross-boundary approaches that accelerate the flow of knowledge from research to market.

8.1 Introduction

Technology Transfer has evolved significantly—from its early days marked by trial and error and the search for workable standards to its current role as a strategic function embedded within institutional missions. This chapter explores the opportunities and challenges that will affect the future of Technology Transfer.

8.2 Artificial Intelligence

Artificial Intelligence (AI) refers to the field of computer science that focuses on creating systems and algorithms capable of performing tasks typically requiring human intelligence. These tasks include learning from data without explicit programming, reasoning, problem-solving, understanding natural language, recognizing patterns, and making informed decisions. For example, AI can analyze market potential, identify prior art, and

pinpoint marketing targets, thereby helping TTOs evaluate and decide which innovations to prioritize for marketing efforts much more quickly.

In the context of the Technology Transfer process, AI can be used to evaluate the market potential of a technology, estimate the technological readiness of a product/service, assist with the drafting of legal agreements, and assess existing publications regarding research similar to the proposed technology in furtherance of the patenting process (e.g., improvement of patent quality, reduction in associated costs).

Consider the following:

Evaluating Market Potential: AI can help to identify potential marketing targets. AI models can identify potential use cases for the invention, target specific sectors, and highlight associated trends in the industry.

Estimating Automated Technology Readiness Level (TRL): AI can support TRL estimation by extracting key features from technical descriptions and matching them to past technologies with known TRL scores. This can result in a more standardized and faster assessment, helping professionals who specialize in Technology Transfer to prioritize technologies for funding or marketing.

Drafting Legal Agreements: Drafting legal documents, such as License Agreements and Non-disclosure Agreements (NDAs), can be time-consuming, especially for Research and Academic Institutions (RAIs) handling numerous cases or for TTOs with staffing constraints. AI tools can assist by generating draft agreements based on templates, previous cases, and the specific details of the current deal. This should not replace legal review, but can speed up the process and reduce repetitive legal work. Reference is made to Chapter 6 (The Licensing Agreement) and Appendix 1 (Templates) for further details.

Evaluating for Patentability: Before the emergence of modern large language models (LLMs), such as ChatGPT, Gemini, Grok, and

DeepSeek, manual prior art searches were conducted by reviewing and comparing relevant existing literature, publications, and patents to the invention for patentability purposes. Such tasks can now be performed using LLMs.

The use of AI can help enable and expand the abilities of Technology Transfer professionals. For instance, AI can reduce the time required to complete prior art searches. As further discussed in Section 8.3, AI data analytics are being increasingly used in connection with the convergence of digital platforms and automation in redefining the future of Technology Transfer.

Case Study: USPTO pilots AI to assist with patent examination

In 2020, the U.S. Patent and Trademark Office (USPTO) began incorporating AI into processes for conducting prior art searches and assisting with assigning patent examiners to certain cases based on the examiner's knowledge of the invention. The office has highlighted two initiatives in particular. First, the formation of an AI/Emerging Technologies Partnership to convene academia, inventors, industry, government, and non-governmental organizations about policy issues related to the use of AI in the IP sector. Second, the USPTO sought public comments around a series of questions regarding the use of AI with the examination process, including the impact of AI on prior art, the impact of AI on a person having ordinary skill in the art, and whether the use of AI could require updated examination guidance and/or legislative change. It remains to be seen how the USPTO and patent offices worldwide balance the growing number of applications with their metrics to evaluate such applications thoroughly and efficiently. [1]

As the Case Study above highlights, the use of AI is not always immediately adopted by entities, given the challenges and limitations of AI. These can include biases in AI models, privacy concerns, and potential inaccuracies in the data.

Bias in AI models/LLMs and results: LLMs heavily depend on the data they have been trained on. Notably, LLMs are limited by the type of data, documents, and databases they have access to, and will provide answers based on the scope of their access. This can lead to biased answers or inaccuracies.

Data Privacy: One of the most pressing privacy concerns with LLMs is the potential exposure of sensitive documents or proprietary data. When you upload confidential information, you may unknowingly risk it being accessed, shared, or even used to retrain the model. This not only jeopardizes your intellectual property but could also compromise your ability to secure patents—once your innovation enters the public domain, its novelty may be lost. In short, a single upload could cost you your competitive edge.

Inaccuracies: As stated above, one of the main risks when using LLMs is "hallucination." In the context of Technology Transfer or prior art search, this can lead to fabricated references, inaccurate summaries, or misleading interpretations of technical content. Since LLMs do not truly understand the information they generate, they may fill in gaps with plausible-sounding but false statements. This becomes especially problematic when the output is used without proper expert validation. Therefore, while LLMs can support many tasks, their results must be carefully reviewed and constantly monitored—especially in legal, scientific, or IP-related use cases.

8.3 The Increasing Role of Data and Digital Platforms

As the use of data and digital platforms increases, their collection and governance raise opportunities and dilemmas for TTOs.

Consumer Data and Personalization: Data harvested from consumer behavior, including purchase history, digital interactions, and geolocation, fuels hyper-personalized experiences across various sectors. However, this convergence increases scrutiny around data ownership, consent, and the ethical boundaries of private-sector usage. Emerging regulations and decentralized data models redefine how personalization is balanced with privacy.

Healthcare and Biomedical Data: The life sciences and healthcare sectors are poised for a data-driven revolution. Advanced diagnostics, wearable technologies, and AI-enabled clinical tools will generate vast datasets that inform treatment, accelerate drug development, and support the advancement of precision medicine. Yet, as data sources diversify—from hospital systems to smart devices—the challenge of maintaining patient confidentiality and ensuring equitable access to insights will grow. Regulatory frameworks, such as the U.S. Health Insurance Portability and Accountability Act (HIPAA) and the E.U. General Data Protection Regulation (GDPR), are subject to ongoing evolution. Still, data protection may not be as well-developed in other jurisdictions.

Cross-Border Data Governance: As Technology Transfer becomes more global, navigating varied data protection standards across jurisdictions will be increasingly complex. RAIs need to develop compliance strategies and guidelines to manage international data flows, especially in collaborative research and Licensing Agreements.

Data as a Strategic Asset in Licensing: Data is becoming a core asset in licensing negotiations, particularly in the biotech, diagnostics, and digital health sectors. Future licensing models may include data-sharing provisions, AI training rights, and co-development clauses that reflect the strategic value of proprietary datasets. Ensuring transparency and trust between licensors and licensees will be essential.

Ethical and Legal Frontiers: As data-driven technologies advance, questions related to informed consent, algorithmic bias, and the secondary use of data will become increasingly pressing. Policymakers, institutions, and Technology Transfer professionals will need to engage in ongoing dialogue to shape frameworks that protect individuals while enabling responsible innovation.

Digital platforms are increasingly central to accelerating Technology Transfer by streamlining collaboration, discovery, and commercialization processes. From IP management systems and virtual incubators to matchmaking tools that connect inventors with investors, these platforms enhance visibility and reduce friction across the innovation pipeline. They enable real-time data sharing, remote stakeholder engagement, and scalable outreach, particularly valuable for universities and RAIs navigating global partnerships. When thoughtfully designed, digital platforms not only support compliance and transparency but also foster inclusive access to innovation ecosystems, bridging geographic and institutional divides.

The convergence of digital platforms and automation is redefining the future of Technology Transfer, offering unprecedented efficiency, scalability, and strategic insight. Automated workflows, from invention disclosure to IP valuation and licensing, are streamlining traditionally manual processes, reducing bottlenecks, and enabling faster decision-making. AI-driven analytics can identify commercialization potential, match technologies with market needs, and even forecast licensing

outcomes. As platforms become more interoperable and data-rich, they will empower institutions to manage portfolios dynamically, engage stakeholders globally, and adapt to shifting innovation landscapes with agility. This shift not only enhances operational capacity but also positions TTOs as proactive engines of innovation rather than reactive gatekeepers.

8.4 The Emerging Role of Open Innovation

Open innovation is increasingly recognized as a transformative trend in the future of Technology Transfer, reshaping how knowledge and inventions move from research institutions to the market. Traditionally, Technology Transfer followed a linear model, where IP developed within RAIs was licensed to external entities for commercialization. Open innovation disrupts this paradigm by promoting a more porous and collaborative approach. It invites external stakeholders, including startups, corporations, investors, and end-users, into the innovation process more often and earlier than closed innovation. This shift enables faster iteration, broader validation, and more diverse pathways to impact, particularly in complex fields such as biotechnology and AI.

As ecosystems become more interconnected, open innovation also fosters strategic partnerships that transcend geographic and disciplinary boundaries. RAIs are increasingly co-developing technologies with industry partners, sharing data, infrastructure, and necessary expertise. Crowdsourcing platforms, innovation challenges, and open IP repositories are gaining traction as tools to democratize access and accelerate problem-solving. For TTOs, value can be created not just through patents and licenses, but through relationships, shared purpose, and adaptive models of

collaboration. The challenge for TTOs is curtailing the free disclosure of potentially valuable innovation into the open innovation model of a commercial entity.

8.5 Emerging Trends of Convergence

With science evolving into a dynamic ecosystem where life sciences intersect with data analytics, materials science merges with AI, and public policy informs entrepreneurial strategy, TTOs need to adapt to new ways of licensing such innovations. This convergence is not merely technical; it is organizational and cultural, demanding new modes of collaboration across academia, industry, government, and civil society.

At the heart of this trend is the recognition that addressing complex global challenges, achieving health equity, and ensuring cybersecurity require integrated solutions. RAIs are responding by fostering interdisciplinary centers, hybrid IP frameworks, and translational platforms that support cross-sectoral innovation.

This is yet another reason why Technology Transfer professionals are expanding their fluency beyond patents and licensing to include regulatory strategy, stakeholder engagement, and systems thinking. It may require new metrics of success that capture long-term value creation, rather than just transactional outputs.

As convergence deepens, the most effective TTOs will be those that embrace ambiguity, broker trust across boundaries, and cultivate innovation cultures that are both rigorous and relational.

APPENDIX 1: Templates

This Appendix 1 provides a list of checklists and templates for the suite of agreements and forms that can be used by a Technology Transfer Office (TTO) from pre-conception through licensing phases. Developing a standard template for these agreements can help an office run more efficiently by minimizing time for negotiating contracts with inventors and industry. While these checklists and templates serve as a starting point, they can and should be tailored for a particular use.

Five types of agreements/forms are described in this section: Memorandum of Understanding; Non-Disclosure Agreement (NDA); Invention Disclosure Form; Employer-Employee Agreement; and Consulting Agreement. Figure XX below illustrates the differences between these agreements/forms concerning confidentiality, Intellectual Property (IP) ownership, IP licensing, and the parties involved.

Appendix 1 also discusses several key terms and points that may be included in the Institutional IP Policies.

Document Type	Scope	Obligations of Confidentiality	IP Ownership by Receiving Party	IP Licensing to Receiving Party
Memorandum of Understanding	Non-binding list of agreed-upon principles that can be made into a complete agreement at a later stage	No	No	No
Non-disclosure Agreement	Exchange of confidential information	Yes	No	No
Invention Disclosure	Form for the disclosure of inventions	Yes	Yes	Yes
Employer-Employee Agreement	Confidential Information and IP developed during and after employment	Yes	Yes	Yes
Consulting Agreement	Agreement for providing services	Yes	Yes	Yes
Material Transfer Agreement	Agreement for exchange of tangible materials	No	No	Yes
License Agreement (Discussed in Chapter 6)	Grants the right to use others' IP in exchange for funds and/or use of IP or non-assert (e.g., cross-license)	Yes	No	Yes

Figure XX: Overview of Agreement/Forms

Memorandum of Understanding (MOU): A list of the key non-binding provisions. It is recommended to explicitly exclude any form of license, ownership, or use of IP other than for the specific stated purpose of the MOU. In some jurisdictions, a signed MOU may be interpreted by a court as binding. It is good practice to have "NON-BINDING" at the top of this document and not to have any party sign it.

Non-Disclosure Agreement: Limits the disclosure and use of confidential information, thus permitting the exchange of information between the parties. It is recommended to avoid any IP terms in an NDA. The typical provisions of an NDA include:

- *Date of Agreement*: The date the exchange begins, which can be a specific date or the date the last party signs the NDA.
- *Parties*: List both parties (Disclosing Party—party disclosing the information; Receiving Party—party receiving the information), including whether any of the Parties' affiliates will be included in the exchange.
- *Purpose*: The reason for the disclosure and use of confidential information.
- *Information to be Exchanged:* Describe, does it include samples as well? NDA about the exchange of samples is also referred to in a Material Transfer Agreement (MTA). Are both parties disclosing information, or only one party?
- *Labeling requirements*: Requiring the identification of information as confidential, secret, or similar labeling.
- *Prohibitions*: Prevents the receiving party from disclosing the information received to anyone without the disclosing party's prior approval or the use of the disclosed information by the receiving party outside of the Purpose.
- *Duration of exchange, confidentiality, and use obligations:* Some length of time following the end of the exchange period.

- *Exceptions to confidentiality:* Known/on record by the receiving party, becomes part of the public domain without unauthorized, lawfully obtained by a third party, independently developed without reverse engineering.
- *Permitted disclosure:* Disclosure required by law.
- *Permitted recipients:* List of any other individuals who are authorized to receive the information.
- *Obligations at the end of the NDA*: Consider requiring that information/samples be destroyed or returned to the provider (by certification).
- *Intellectual Property*: Disclosing party retains ownership, recommends that no IP is generated under the NDA, nor are licenses granted under the NDA; each party retains its IP.
- *General legal language:* Governing law, cross-reference to other agreements, and material breach.

Invention Disclosure Form: Form for the disclosure of inventions

- *Title:* Proposed title of invention.
- *Public Disclosure:* Past/upcoming details of public disclosure information in the next six months, and if so, date and form of publication (posters, presentations, abstracts, manuscripts, theses, etc.).
- *List of Potential Inventors:* Include institutional/company affiliation, citizenship, and location (e.g., address) of inventors.
- *What problem does the invention solve?* Identify the unmet need.
- *Describe the invention in sufficient detail:* attach any relevant lab notebooks and supporting data.
- *Date invention made:* when was the invention devised (no need for building of any prototype).

- *Source of funding for invention:* government research support, industry-sponsored contract.
- *Any obligations to sponsors of funding for the invention:* For example, a requirement to disclose the invention.
- *Prior Art:* Any literature/publication/prior art searches conducted.
- Are any further research plans in place to validate the invention within the next 12 months? (This is important if a provisional patent application will be filed).

In addition to a standard template, the institution should consider developing a mechanism/process for submitting invention disclosure forms, ideally electronically. Some jurisdictions may require a hard copy of the invention disclosure form with original signatures.

Employer-Employee Agreement: An agreement between an employer and employee regarding the ownership and use of information or disclosure/assignment of any IP generated during their employment.

- *Confidentiality and use restrictions*: during and after employment.
- *Upon termination of employment:* Return all confidential information to the employer.
- *IP:* Disclose and assign to the institution or company promptly all inventions, technical and business information, including works of authorship developed or conceived during employment.
    - Includes any line of business that the employer is in or is anticipated to expand to in the future.
- *Assistance:* Provide the Employer with appropriate support.
- *Outside the scope:* Information from prior employment.

Consider periodic recertification of obligations under this agreement, particularly for individuals who work on sensitive or highly confidential matters.

Consulting Agreement: This agreement provides professional advisory services in exchange for compensation (e.g., money). This agreement typically contains the following provisions:

- Term
- Scope of consulting services
- *Confidentiality:* similar provisions to NDA.
- *IP ownership:* goes to the entity engaging the consultant.
- *IP license:* for any background information relevant to any product delivered.

Material Transfer Agreement: Agreement to exchange material/samples in which the provider retains ownership of the materials, while allowing the recipient to possess and use those materials. General provisions of an "MTA" typically include:

- Name and contact info of provider and recipient institutions
- Description of the material being transferred
- Clear statement of ownership of the material by the provider
- Purpose of the transfer (e.g., research, testing, commercialization)
- Unique identifiers or catalog numbers (if applicable)
- Prohibition of transfer of materials to any third party without prior written consent of the provider (owner) of materials
- Restrictions on use (e.g., non-commercial, research-only)
- Intellectual property rights (existing and arising from use)
- Confidentiality clauses
- Export control compliance

- Biosafety and regulatory approvals (e.g., Institutional Review Board (IRB), U.S. Institutional Animal Care and Use Committee (IACUC))
- Right to publish results
- Requirement to acknowledge the provider in publications
- Return or destruction of material after use
- Liability and indemnification clauses
- Reporting obligations (e.g., results, adverse events)
- Duration of agreement
- Termination conditions
- Governing law and dispute resolution
- Signatures of authorized representatives

Data Transfer Agreement: Agreement to govern the exchange of data.

General Information

- Description of the data (type, format, volume)
- Purpose of the data transfer (e.g., research, analysis, collaboration)
- Data origin and ownership
- Identifiability of data (e.g., anonymized, pseudonymized, identifiable)
- Compliance with data protection laws (e.g., General Data Protection Regulation (GDPR) in the European Union, Health Insurance Portability and Accountability Act (HIPAA) in the U.S., and California Consumer Privacy Act (CCPA) in California)
- Data classification and sensitivity level
- Security measures (e.g., encryption, access controls)

- Breach notification procedures
- Data subject rights (e.g., access, deletion, consent)
- Permitted uses and restrictions
- IP rights
- Confidentiality clauses
- Third-party sharing restrictions
- Data retention and deletion policies
- Right to publish findings
- Requirement to acknowledge the data source
- Audit and compliance rights
- Liability and indemnification clauses
- Duration of agreement
- Termination conditions
- Governing law and jurisdiction
- Signatures of authorized representatives

IP Policy for Research and Academic Institutions (RAIs): World Intellectual Property Organization (WIPO), the Association of University Technology Managers (AUTM), and other organizations provide a wide range of templates and guidelines for developing institutional IP policies. The following are key provisions typically included in RAI IP Policies:

- Ownership of IP
  - Who owns the rights to the invention created by employees, faculty members, and students?
  - Clear clarifications on joint projects and external collaborations, dual affiliations, etc.
- Disclosure requirements

- Obligations to disclose key findings to the TTO or other responsible body
- Timelines for how the TTO will process

➔ Confidentiality, Publications, and Non-Disclosure

- Balancing academic freedom with IP protection (e.g., delaying publication for patent filing)
- Clear clarification on not to publish key findings before contacting the TTO

➔ Evaluation and protection

- How will inventions be reviewed?
- What happens when the TTO decides not to proceed with the invention?

➔ Commercialization and Licensing

- Guidelines for how the commercialization licensing (exclusive, non-exclusive) and sale will happen.

➔ Revenue sharing

- How will the net revenue (after expenses like patent filing and legal fees) be distributed between the University, Faculty, the TTO, and the Inventor?
- Some best practices are:
- Equal sharing
- 50% to the inventor
- 50% to the Institution, then the institution decides how to distribute
- Distribution formula
- 33% to the inventor
- 33% to the Faculty or lab where the invention was developed

- 34% to the University or Research Institution
- Tiered Revenue Sharing
- First $X amount: Inventor 100%
- Next $Y amount: Inventor 50%, Faculty 25%, Institution 25%
- Above $Z amount: Inventor 33%, Faculty 33%, Institution 34%
- Equity-based sharing
- For startup licensing, IP policies often allow equity instead of (or in addition to) royalties, especially for early-stage start-ups.

➔ Use of institutional resources

- How does the usage of institutional resources, like laboratory equipment, research funding, office space, and computational resources, affect the IP rights?

Glossary

Artificial Intelligence: A field of computer science focused on creating systems and algorithms that can perform tasks typically requiring human intelligence.

Accelerators: Programs and facilities that offer seed funding, expert coaching, and direct access to investor networks for start-ups that already have a minimum viable product. Accelerators typically operate on shorter, more intensive timelines and help start-ups validate their market fit and accelerate growth.

Angel Investors: Individuals of wealth motivated to invest for return on investment but also for other reasons such as interest in the entrepreneur, mission of the start-up, philanthropic/humanitarian issues. Angel Investors tend to be patient investors.

Anti-dilution: Provisions in stock-ownership agreements that prevent a stockholder's equity from being reduced.

Arbitration: A mechanism where conflicting parties have to have their case heard by an independent third party with binding, decision-making authority, instead of litigation.

Back-ended Agreements: A License Agreement provision where payments are designed to be lower upfront but higher at later stages.

Bayh-Dole Act: Enacted in 1980, the U.S. Federal Law that granted universities ownership of inventions created using federal funds and also mandated commercialization action on the part of IP-owning institutions.

Berne Convention: An international treaty (adopted in 1886) focused on the protection of works and the rights of their creators. The treaty provided creators such as authors, musicians, poets, painters, etc., with the legal basis to register their created works in their jurisdiction and be able to enforce them in member jurisdictions.

Bioproperty: Tangible biological material; personal property.

Co-exclusive License: When two or more parties share the exclusive right to use the Intellectual Property (IP).

Commercialization: The process of preparing and implementing a plan for bringing an innovation to consumers.

Connectors: A person or entity that facilitates the process of transferring research and technological advancements from one organization to another, typically from research institutions like universities and federal laboratories to businesses or the public for further development and commercialization. These connectors also serve as intermediaries between investors, entrepreneurs, and other stakeholders of the technological ecosystem.

Copyright: A type of IP right that protects original works of authorship reduced into a tangible medium.

Crowdfunding: A dynamic and democratized way to fund start-ups, allowing entrepreneurs to raise capital directly from the public, often without relying on traditional investors or venture capital.

Disclosure: The act of revealing new or confidential information to others.

Exclusive License: A grant of sole rights to a licensee to use IP within a defined scope—such as a specific field of use, territory, or application—meaning the licensor cannot use or license the IP to a licensee within that scope.

Facilitators: Individuals or entities that make a process or action more effective, efficient, or easier.

Field of Use: Restriction that narrows the scope of a license by limiting the licensee's rights to a specific application, market, geography, or industry.

Front-loaded Agreements: A License Agreement provision that requires a larger payment to the licensor early in the term and less in the later stages.

Government Grants: A mechanism for a government to fund an idea or project that provides public services and/or stimulates the economy. Grants support critical initiatives, innovative research, and many other programs.

Grant of Rights: A clause in a License Agreement that defines the IP rights that are licensed—such as a specific patent, software code, trade secrets, know-how, copyrights, or trademark—and defines the exact usage scope for the licensee.

Jointly-controlled Patent Prosecution: Shared decision-making and cost allocation between two parties in the process of obtaining a patent.

Hallucination (in the context of Large Language Models (LMMs)): LLM-generated information that seems convincing but is factually incorrect.

Hybrid Models: A License Agreement provision that requires a licensee to pay both at the beginning and end of the term.

Impact Funds: Investment funds specifically designed to generate positive, measurable public impact alongside financial returns. Unlike traditional investment funds that focus solely on profit, impact funds intentionally seek out opportunities where their investments can address societal or public challenges.

Incubators: An environment that offers access to shared facilities, infrastructure, mentorship, and business development resources to start-ups. Incubators help support start-ups refine their ideas, build sustainable business models, and navigate the initial hurdles of commercialization.

Initial Seed Funding: Capital raised by a start-up to launch its operations and develop its inventions and ideas into a viable business opportunity.

Innovation: A process of developing and implementing a new technology that involves idea generation to produce novel solutions.

Innovation Ecosystem: A network where stakeholders play different roles in the overall process of the transformation of invention into new products, services, new ventures, and jobs.

Intellectual Property: Intangible assets resulting from conception or creation, such as patents, trademarks, copyrights, know-how, designs, and trade secrets.

Interinstitutional Agreements (IIAs): A document executed between two or more entities whose employees are co-inventors on a patent. The IIA covers who manages patent prosecution, marketing, and how the proceeds will be divided.

Invention: A novel composition, device, idea, method, or process that has unique features that confer some form of performance advantage or technical value.

Invention Disclosure: A document, in which a Research and Academic Institution (RAI) employee describes a device, method, composition, or process they conceived or created.

Investors: Those who commit capital to a project with an expectation of real or financial benefit.

IP Policy: Written rules and procedures that define ownership, control, and disposition of inventions, discoveries, and other creations made by RAI employees.

Jointly-Controlled Patent Prosecution: When both parties share in the decision-making and cost allocation of patent prosecution.

Key Performance Indicators: Quantifiable measurements of the performance of an activity. Such measurements are typically used to determine the improvement or deterioration of the activity.

License Agreement: A contract in which an owner transfers IP rights—but not ownership—to another party intending to use them.

Licensee: The recipient of the transferred IP rights in a License Agreement.

Licensee-Controlled Patent Prosecution: The licensee assumes responsibility for directing and paying for patent prosecution of the licensed IP.

Licensor: The owner of IP rights in a License Agreement.

Licensor-Controlled Patent Prosecution: The licensor assumes responsibility for directing and paying for patent prosecution of the licensed IP.

Litigation: The process of enforcing IP rights in court.

Large Language Model: A model of AI that generates human language and performs related tasks (e.g., answering questions, summarizing text, translating between languages, and writing content).

Market Viability: The potential for an innovation to be commercially successful.

Market Ready Product: A finished, tested, and viable offering that meets customer needs and has a viable strategy for marketing and selling to its target audience.

Material Transfer Agreements: A document in which the owner of tangible, personal property transfers the right to physically control that property to another for a specific use, without transferring ownership.

Mediation: When a third party assists two or more parties in coming to a mutual nonbinding agreement.

Minimum Viable Product: An early version of an invention that meets the minimum requirements for use but can be adapted and improved in the future.

Non-exclusive License: A contract in which a licensor grants a licensee IP rights, while retaining the right to grant similar rights to other parties.

Non-disclosure agreement: A contract in which parties agree to: maintain certain information in confidence and only use the information for an agreed-upon purpose.

Patent: A temporary, limited government-granted right to exclude others from making, using, and selling the invention claimed.

Patentability: The criteria that an invention must meet to be eligible for a patent, granting the inventor exclusive rights to their creation.

Patent Application: The document submitted to a government office describing the invention(s).

Patent Cooperation Treaty: A treaty that simplifies the process of seeking patent protection in 158 countries. It provides a cost-effective means to seek patent protection for inventions in multiple countries. A single international patent application filed according to the PCT (e.g., a "PCT" application) has the same legal effect as filing separate patent applications in any of the signatory countries.

Patent Prosecution: The process in which a patent applicant engages with a patent office in the examination of a patent application to assess whether the invention described in the application satisfies all criteria for a patent.

Plant Breeders' Rights: Intellectual property rights granted to breeders of new plant varieties.

Plant Variety Protection: A type of IP right specific for asexually or sexually propagated plant varieties.

Prior Art: Information publicly known before the filing date of a patent application. Typically, prior art refers to published patents and patent applications, and technical publications.

Proof-of-concept: Converting a concept into a tangible form.

Public-Private Partnership: Agreements between public and private entities for a specific project.

Reporting Obligation: Reporting obligations require licensees to provide regular updates on development progress, commercialization efforts, and financial performance.

Research and Academic Institutions: Organizations dedicated to the pursuit of knowledge, innovation, and education. Typically includes universities and government research institutes.

Research and Development: The systematic process of investigating, experimenting, inventing, and innovating to create new products, processes, or technologies.

Revenue Sharing: Dividing revenue derived from the sale of a product or service.

Research Outputs: Inventions and discoveries that arise from scientific and technical investigation and experimentation activities.

Research Parks: Physical environments and facilities in which public and private entities engage in R&D, new venture creation and incubation, and acceleration. Typically, research parks generate, attract, and retain personnel who work with sponsoring research institutions.

Royalty: A payment pursuant to a license linked to the sale and/or use of licensed products or services that fluctuates with the amount of purchase or use. This is distinguished from license fees that are set amounts (that do not fluctuate), not linked to sales or use of the licensed product. Typically, royalties are set as a percentage of net sales or use.

Sales Target: A minimum annual sales threshold or royalty benchmark that licensees must meet to retain rights or avoid default.

Small Business Innovation Research/Small Business Technology Transfer: Jointly known as America's Seed Fund, the SBIR/STTR programs provide technology-focused entrepreneurs, startups, and small businesses with U.S. Government funding to develop their ideas and pathways to commercialization. Powered by a network of federal agencies, entrepreneur support organizations, and the Small Business Administration (SBA), America's Seed Fund advances federal missions and fosters a culture of innovation in the U.S.

Sponsored Research Agreements: Contracts between RAIs and funding entities to enable scientific and technical investigation and experimentation activities.

Stakeholder: A party having a vested interest in an enterprise and is affected by the performance and outcome of the enterprise's activity.

Start-up: A newly formed company designed to commercialize inventions through the sale of products or services.

Start-up Exit: Arrangements and mechanisms for investors and other equity holders to sell their equity.

Technology: Application of scientific and engineering knowledge to solve problems and achieve practical goals; includes both tangible tools (like machines) and intangible systems (like software).

Technology Marketing: The process of promoting and commercializing new technologies developed in research institutions (e.g., universities) to external entities. Such methods typically include business development strategies and campaigns to find commercialization partners.

Technology Readiness Level: A type of measurement system used to assess the development stage of a technology. Typically, this measurement is used to design plans for further development and commercialization.

Technology Transfer Office: A unit within an RAI or commercial entity that identifies, protects, and manages IP to facilitate the IP's transfer to external entities, particularly for commercialization. These units guide inventions from research to real-world application.

Term Sheet: A definition of the terms to be incorporated into a future agreement.

Trademark: A word, phrase, design (e.g., logos) or combination that identifies goods and/or services as produced by the owner, and distinguishes them from the goods or services of others.

Trade Secret: Information not generally known or easily reverse-engineered that derives economic value from its secrecy, and is protected by reasonable efforts to maintain its confidentiality.

Triage: The systematic evaluation and selection of inventions based on their potential IP quality and commercialization viability.

Valley of Death: A stage in the R&D process in which a new technology has reached a proof of concept, but lacks validation for significant commercialization investment. Due to high risks, the private sector typically will not invest in a technology that remains in the proof-of-concept stage, and research funding sources will not fund further development.

Venture Capital: Private equity investment for funding start-ups and early-stage companies that show high growth potential, usually in exchange for an equity stake in the start-up/early-stage company.

Additional Resources

World Intellectual Property Organization (WIPO)
https://www.wipo.int/portal/en/index.html
This link leads to the World Intellectual Property Organization (WIPO) website, which contains a range of valuable resources, including information on various Intellectual Property (IP) types and databases, supporting materials for innovation, case studies, policy samples, training materials, and Technology Transfer support materials.

U.S. Patent and Trademark Office (USPTO)
https://www.uspto.gov/
This link leads to the U.S. Patent and Trademark Office website, which serves as a primary tool for U.S. patent submissions and contains a range of valuable resources related to patents, trademarks, IP policies, educational materials, open portals, and databases.

European Patent Office (EPO)
https://www.epo.org/en
This link leads to the European Patent Office website, which serves as the leading site for European patent submissions and contains a range of valuable resources related to patents, IP policies, educational materials, and databases.

Association of University Technology Managers (AUTM)
https://autm.net/surveys-and-tools/tools
The link leads to the Tools section of AUTM's website, which contains useful toolkits, such as the TTO Director's Toolkit, the Educational Toolkit, and the Marketing to Industry Toolkit, among others. Each toolkit is designed to support the effective setup, management, and growth of Technology Transfer Offices.

https://autm.net/careers-and-courses/webinars/webinar-packages
The link leads to a section of AUTM's website that offers a wide range of informative webinars tailored for faculty members, early career professionals, operational professionals, and those interested in specialty topics within the field of Technology Transfer.

https://autm.net/surveys-and-tools/agreements
This link leads to a section of AUTM's website that offers templates for a Material Transfer Agreement (MTA), an Inter-Institutional Agreement, and a sample License Agreement.

Intellectual Property and Industry Research Alliances (IPIRA)
https://ipira.berkeley.edu/licensing-practices-support-startups
This link leads to the Intellectual Property and Industry Research Alliances site published by the University of California, Berkeley, and contains useful resources for negotiation management, including 12 licensing practices to support start-ups.

Intellectual Property Owners Association (IPO)
https://www.ipo.org
This link leads to the Intellectual Property Owners Association, an international trade association representing a vast array of industries and fields of technology that own or are interested in IP. Among its many activities, IPO supports member interests relating to legislative and international issues; analyzes current IP issues; and provides IP-related educational services.

Kickstarter
https://www.kickstarter.com
This link leads to Kickstarter, a website where creators share new visions for creative work with the communities that will come together to fund them. Kickstarter's mission is to help bring creative projects to life.

Indiegogo
https://www.indiegogo.com
This link leads to Indiegogo, a crowdfunding website that allows people to solicit funds for an idea, charity, or start-up business. Indiegogo empowers people to unite around ideas that matter to them and, together, bring those ideas to life.

GoFundMe
https://www.gofundme.com
This link leads to GoFundMe, a crowdfunding platform that allows people to raise money for a variety of personal, charitable, or community causes.

The Technology Readiness Level (TRL)
https://www.nasa.gov
This is the link to the NASA website, which describes the Technology Readiness Levels developed by NASA. TRLs are a method for estimating the maturity of technologies based on a scale from 1 to 9. During a technology readiness assessment program, concepts, technology requirements, and demonstrated technology capabilities are examined.

I-Corps
https://www.nsf.gov/funding/initiatives/i-corps
This is the link to the U.S. National Science Innovation Corps 7-week experiential training program, which prepares scientists and engineers to extend their focus beyond the university laboratory, accelerating the economic and societal benefits of NSF-funded and other basic research projects that are ready to move toward commercialization.

Acronyms

AI — Artificial Intelligence

AUTM — Association of University Technology Managers

CCPA — California Consumer Privacy Act

CEO — Chief Executive Officer

CLDP — Commercial Law Development Program

CRO — Contract Research Organizations

DLE — Direct Lithium Extraction

EPO — European Patent Office

FDA — Food and Drug Administration

GDPR — General Data Protection Regulation

HIPAA — Health Insurance Portability and Accountability Act

IIA — Interinstitutional Agreement

IP — Intellectual Property

IPIRA — Intellectual Property and Industry Research Alliances

LLM — Large Language Model

MTA — Material Transfer Agreement

MVP — Minimum Viable Product

NDA — Non-disclosure Agreement

PBR — Plant Breeders' Rights

PCT — Patent Cooperation Treaty

PVP — Plant Variety Protection

RAIs — Research and Academic Institutions

R&D — Research and Development

SBIR — Small Business Innovation Research

STTR — Small Business Technology Transfer

SRA — Sponsored Research Agreement

TRL — Technology Readiness Level

TTO — Technology Transfer Office

USTR — Office of the U.S. Trade Representative

USPTO — U.S. Patent and Trademark Office

WIPO — World Intellectual Property Organization

Endnotes

Chapter 3

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