Incentives in Technology Transfer

A guide to encourage, recognize and reward researchers and professionals

WIPO

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A guide to encourage, recognize and reward researchers and professionals

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Foreword

The innovation environment is full of novel opportunities but also is facing significant challenges, such supply chain disruption, widespread and abnormally high inflation, and armed conflict.

On the other hand, innovation continues unabated, partly due to the new Digital Age and the Deep Science innovation waves. Developments in fields as diverse as artificial intelligence, quantum computing, genome sequencing, several green technologies and robotics show a new, possibly groundbreaking dynamic.

Persistent efforts in innovation investment will be key to promote productivity growth and making use of novel innovation opportunities. In this regard, there are important positive trends. For example, scientific publications grew in 2022 by 1.5 percent (more than 2 million publications) and business R&D grew by 7 percent, spending by corporations in R&D reached USD 1.1 trillion in 2022 – a historic high.

Research conducted at universities and public research institutions is a primary source of new and key knowledge. However, despite significant efforts, a substantial amount of this research fails to reach the market.

This is where WIPO steps in, to empower universities, research institutions, and innovators to commercialize their intellectual property and make their research accessible for the betterment of society.

Our guide on *Incentives in Technology Transfer* underscores the indispensable role of academic research in driving innovation. It emphasizes the importance of providing researchers with incentives and support to translate their research into practical solutions. Equally vital are the professionals at Technology Transfer Offices (TTOs) who facilitate the transfer of knowledge from academia to industry. Despite challenges, including lack, low or ineffective incentives, their commitment to driving innovation remains unwavering.

The guide focuses on two key facilitators: fostering a cultural shift to ensure that technology transfer becomes an acknowledged part of the researcher's mandate, and exploring incentives that attract and retain top talent within TTOs, ensuring the continued success of technology transfer endeavors. It provides an unprecedented level of detail and benchmarking on these two questions.

Drawing from WIPO's prior initiatives, the guide is part of the WIPO IP Toolkit for Universities, encompassing resources such as an IP Policy Template for Academic and Research Institutions and an Institutional IP Policies Database. With the addition of this guide on Incentives in Technology Transfer, its objective is to assist universities and public research institutions in developing robust IP policies and strategies.

We hope that the insights from this guide will serve as a practical tool for governments, universities, researchers, businesses, and funders as they navigate the complexities of technology transfer.

Marco M. Alemán
Assistant Director General, World Intellectual Property Organization

Endorsements

"This guide is a rare combination of deep analysis of complex issues in technology transfer and very practical tips and tools. I highly recommend it to any leader or practitioner in tech transfer as well as policy makers and university leadership."

Gil Granot-Mayer, Executive Vice President of Technology Development and Innovation, Okinawa Institute of Science and Technology Graduate University (OIST), Japan

"The authors very rightly state in the beginning that there is no one size fits all when it comes to incentives: every ecosystem is different. This guide offers a comprehensive overview – probably even the most comprehensive overview so far – of various incentives for people involved in turning research results into applications in society. It provides a wealth of inspiration for all decision makers investigating the optimization of TT structures and environments."

Paul Van Dun, General Manager, KU Leuven Research & Development (LRD), Belgium

"This guide is undoubtedly an excellent tool for researchers, who are willing to enter the world of entrepreneurship and innovation. In general, researchers have many doubts about how to turn the key to the business world. Being aware of incentives can help researchers take full advantage of the opportunities presented by entrepreneurship and knowledge exchange. On the other hand, through the examples here described, technology transfer professionals can be inspired through the cases of how incentives are used in several countries to stimulate technology transfer and academic entrepreneurship. In this sense, given its coverage and detail, the guide fills an important gap in the context of academic and research institutions."

Elizabeth Ritter, Technology Transfer Consultant, Brazil

"With governments across the world looking to their universities to deliver social and economic impact, this detailed guide and consideration of incentives for academics and staff involved in innovation is invaluable. The guide is a timely contribution for all those involved in leading research and innovation in higher education and I have no hesitation in recommending it."

Paul Roberts, Higher Education Researcher and Consultant, Director of CollaborateHE Ltd, United Kingdom

"The new WIPO guide is the first global collection of approaches used to motivate, inspire, and reward creativity at the beginning stages of the innovation pathway. This is an important part of understanding our innovation ecosystems and how best to assure strong commitments towards bringing new products and services to market."

Todd Sherer, Associate Vice President for Research, Executive Director, Office of Technology Transfer, Emory University, United States of America

"This comprehensive guide serves as a global resource for understanding and promoting creativity in the early stages of innovation. It will play a crucial role in enhancing innovation ecosystems but acknowledges that different ecosystems require different incentives at different stages of development – and these incentives should not be considered static. As universities play an ever-increasing role in societal progress, this guide provides a comprehensive overview of different approaches – as well as the debates – for stakeholders interested in optimising structures, environments and processes for innovation."

Jaci Barnett, Former President of the Southern African Research and Innovation Management Association (SARIMA), Head of Consulting Services, Oxford University Innovation, United Kingdom

"This Guide is a very comprehensive overview of incentives for researchers and technology transfer professionals at universities. It is a unique and valuable contribution to technology transfer, for universities, particularly those in developing countries, because of the examples drawn from both developed and developing countries, and thus provides an excellent balanced approach to the subject. Many developing countries are placing a greater emphasis on transforming their economies to be knowledge driven, and look up to universities as main actors working with industry and society at large. It provides a compelling case for the importance of technology transfer in that transformation, whilst expertly addressing the complex subject of technology transfer. It goes further by elaborating on the pros and cons of incentives in technology transfer, and suggests mitigation interventions to address the cons. The last section of the Guide provides a quick reference to the various aspects covered in the other sections together with concise recommendations for rolling out an incentives program. I highly recommend this guide not only for university leadership, TTOs, and TT professionals, but more importantly, for policy makers as it would be a great companion in creating enabling policy environments."

McLean Sibanda, Intellectual Property and Innovation Specialist; Former Chairperson National Intellectual Property Management Office (NIPMO), South Africa

Acknowledgments

This publication is the result of the invaluable collective efforts of World Intellectual Property Organization (WIPO) colleagues and a team of external contributors. It was prepared under the direction of Marco Aleman, Assistant Director General, IP and Innovation Ecosystems Sector (IES). The Guide was supervised by Alejandro Roca Campañá (Senior Director, IP for Innovators Department (IPID), IES), and led by Lien Verbauwhede Koglin (Counsellor, Technology Transfer Section, IPID.

The team included Suma Athreye (Professor of Technology Strategy, Management Science and Entrepreneurship, Essex Business School, University of Essex, United Kingdom), Andrea Basso (Fund Advisor, Progress Tech Transfer Fund, Italy), Tom Hockaday (Consultant, Technology Transfer Innovation Ltd., United Kingdom) and Abhijit Sengupta (Head of Department, Associate Professor, Surrey Business School, University of Surrey, United Kingdom).

The guide was greatly enriched through the thoughtful reviews provided by esteemed experts. Their insights, drawn from practical experiences, have proven invaluable in providing actionable advice and illuminating effective strategies while highlighting areas in need of critical change. WIPO extends also its gratitude to Olga Spasic (Former Head of Technology Transfer Section) for her contributions and support in the peer review process.

Furthermore, this guide incorporates valuable findings from a survey on the motivations of researchers and technology transfer professionals, conducted by Andrea Basso and Claudia Chiavarino (Academic Director, Salesian University Institute Torino, Italy), with the support of WIPO colleagues Mattias Dinnetz (Senior Program Officer), Olga Kusanova (Consultant), Olga Spasic and Lien Verbauwhede Koglin.

The guide was edited by Westchester Publishing Services UK. Thanks also go to WIPO colleagues in the Publications and Design Section for their invaluable support and advice.

About the reviewers

This guide includes reviews and contributions from experts in technology transfer, entrepreneurship, intellectual property (IP), policy and innovation. Their examples, viewpoints and remarks enhance and contextualize the incentives, illustrating that a singular incentives plan is not feasible. Instead, the incentives must be tailored to the specific local circumstances and ecosystem where the university is situated.

Andrew Bailey, Senior Manager: Innovation, Department of Research Contracts and Innovation (RC&I), University of Cape Town (UCT), South Africa

Franz Barjak, Head, Doctoral Advisory Office, School of Business, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland

Piet Barnard, Director, RC&I, UCT, South Africa

Jaci Barnett, Former President of the Southern African Research and Innovation Management Association (SARIMA), Head of Consulting Services, Oxford University Innovation, United Kingdom

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Audrey Yap, Managing Director and Co-founder, Yusarn Audrey LLC, Singapore

Acronyms

COI	conflict of interest
CPD	continuing professional development
HEI	higher education institution
I&E	innovation and entrepreneurship
IP	intellectual property
IPR	intellectual property rights
KE	knowledge exchange
KPI	key performance indicators
MTA	material transfer agreement
NGO	non-governmental organization
P&T	promotion and tenure
PBR	plant breeders' right
PoC	proof of concept
R&D	research and development
SME	small and medium-sized enterprise
TRL	technology readiness level
TRP	tangible research property
TT	technology transfer
TTO	Technology Transfer Office
TTP	technology transfer professional
WIPO	World Intellectual Property Organization

Terminology

Academic engagement

All knowledge-related interactions between academic researchers and third parties. Academic engagement includes both *formal* activities such as collaborative research, contract research, consultancies and continuous professional development (CPD) activities, and *informal* activities such as networking and ad hoc advice. Academic engagement is mainly with industry, but can also take place with government, non-governmental organizations (NGOs), community groups or other entities. The trade-off agreed among the partners may be purely financial, for example the researcher may work for a fee, or may consist of non-financial benefits such as access to materials or data for academic research projects.

Collaboration

Interactions between universities and third parties. There are three main forms of collaboration. *Collaborative (or joint) research* refers to research that is conducted cooperatively by researchers from different organizations, institutions or disciplines. Collaborative research often involves pooling resources, expertise and methodologies to address complex questions or challenges that are beyond the scope of a single researcher or institution. Such collaborations can be formalized through agreements or memoranda of understanding, detailing the roles, responsibilities and rights of each party, especially concerning intellectual property (IP), joint publication, data sharing and commercialization where applicable. *Contract research*, on the other hand, refers to research undertaken on a specific topic as per a contractual agreement, often funded by an external organization, such as a corporation, government agency or non-profit. The funding entity usually sets the objectives to be addressed and, in return, expects results, data or deliverables based on the terms laid out in the contract. Contract research is commonly seen in fields such as pharmaceuticals, engineering and environmental science. *Consulting* refers to research or advisory services provided by academic researchers to their industry clients. Consulting projects are typically commissioned directly by the industry partner and the income derived from them often accrues to the researchers although it can be channeled through university research accounts to support research.

Consultancy

Normally defined as the provision of expert advice which draws upon and applies the existing expertise of members of staff. It is unlike research because it does not have as its prime purpose the generation of new knowledge. Consultancy contracts are usually short term, make limited use of university facilities and always have clear and well-defined deliverables. The client company would normally expect to own the results of the work. It is essential that there is no leakage of university-owned IP during consultancy activity.

Equity

The ownership in a company issued as shares with a monetary value.

Incentive	Can be defined as "something that encourages a person to do something" (Cambridge Dictionary). In this guide, incentives refer to an inducement or external motivation provided to researchers or TTPs to encourage specific behaviors. Incentives are often used to align the individual's goals with the institution's objectives, foster engagement and drive desired outcomes.
Intellectual property rights (IPR)	The rights given to persons over the creations of their minds, such as: inventions; literary and artistic works; designs; and symbols, names and images used in commerce. They usually give the creator an exclusive right over the use of their creation for a certain period.
Performance-based payments	Non-salary payments typically tied to an individual's or a team's performance against set criteria or goals. The criteria can be diverse, ranging from technology transfer targets and project completions to softer measures such as teamwork, leadership qualities or other behavioral aspects. Such incentives are commonly used as a motivational tool to encourage employees to exceed their regular duties or achieve higher standards.
Researchers	Individuals who carry out academic or scientific research at a university or research institution. Researchers can hold different roles or positions within the university or research institution, for example: tenured professors, assistant professors (or lecturers), postdoctoral researchers, research scientists, research assistants, visiting researchers, visiting professors and students.
Royalties	Legally binding fees due from a licensee to a licensor in exchange for the continued use of the licensor's IP and other assets.
Spinouts (also known as university spin-offs)	A new company formed primarily through the transfer of knowledge, technology, assets or people originating from the university, to further develop and exploit the technology. The university will ordinarily hold equity or be licensor of the relevant IP to the spinout.[1]
Students	Individuals who are part of undergraduate and post-graduate programs and who are not employees of the university.
Tangible research property (TRP)	Research products that are not patented or otherwise protected by formal IP, but that are difficult or expensive to create. TRP includes such items as: biological materials, engineering drawings, computer software, integrated circuit chips, computer databases, prototype devices, circuit diagrams, equipment and associated research data.

1 TenU. University Spin-out Investment Term (USIT) Guide, https://ten-u.org/news/the-usit-guide.

Technology transfer (TT)	The process of transferring skills, knowledge, technologies or methods of manufacturing emanating from research conducted at universities or research institutions to other users (institutions, industry, the government, charities or the community) to ensure that scientific and technological developments are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials or services. We can differentiate, essentially, between: – *formal transfer* (carried out through the channels established and controlled by the university staff, legalized through contracts), including patenting, licensing, spinout creation, joint research, contract research and academic consulting; and – *informal transfer* (channels not legalized by signing a contract), including networking with potential investors or licensees, conferences, showcasing of technologies and marketing of university outputs.
Technology Transfer Office (TTO)	Units within the university's administration (sometimes structured as wholly owned companies), where the TTPs help researchers and students. Many research universities have a Research Support Office and a Technology Transfer Office; sometimes these are combined into one office, and these units have a wide range of names.
Technology transfer professional (TTP)	Employees of the university (or wholly owned subsidiaries) in roles that support researchers and students in technology transfer. For the purposes of the guide, these are mainly the staff working in the TTO and other technology transfer structures.
Tenure	A form of job security granted to faculty members at universities or academic institutions in certain countries, such as the United States of America. Tenure is awarded after a rigorous review process that evaluates a faculty member's performance, contributions to teaching, research and service, as well as their potential for continued excellence in their field. Tenured faculty members have greater academic freedom and enjoy a higher level of decision-making authority within their departments or disciplines.
University	Used in the guide as a shorthand for any type of higher education institutions (HEIs) that engage in research activities with substantial funding support.
World Intellectual Property Organization (WIPO)	The global forum for IP services, policy, information and cooperation. WIPO has a long history of supporting universities to develop and institute effective IP policies. The goal of such policies is to boost commercialization of promising research and to stimulate knowledge and technology sharing. One of WIPO's major tools in this respect is the *IP Policy Template for Academic and Research Institutions*, with its Guidelines for Customization, available for download from the WIPO website, which dedicates a segment to incentives for researchers.

Introduction

In the rapidly evolving economy, universities and public research institutions play a pivotal role as catalysts for innovation and progress. The pioneering research and ground-breaking inventions born within their laboratories hold immense potential to drive societal transformation and economic growth. Too often, however, this research doesn't progress further down the pipeline to become innovations, leading to missed opportunities for universities and businesses to commercialize research in ways that benefit both the economy and society. This is where technology transfer activities emerge as a pivotal link, facilitating the transformation of brilliant ideas into tangible solutions that positively impact society.

Successful technology transfer requires researchers and technology transfer professionals to be equipped with the necessary skills, knowledge and engagement to turn fundamental scientific discoveries and insights into practical applications that have societal and commercial impact. Central to their success is fostering a university culture that recognizes and celebrates such competencies and endeavors.

In this guide, we delve into the essential topic of incentivizing academic researchers to actively participate in technology transfer activities. By understanding their unique perspectives, we can develop strategies to effectively motivate them to engage with industry and commercialize promising research outcomes. Simultaneously, we recognize the pivotal role technology transfer professionals play in enabling this process. This underscores the importance of fostering an environment that attracts and retains exceptional talent within Technology Transfer Offices (TTOs). In as much as this guide is intended for universities, the principles and incentives discussed can be applicable to technology research organizations, where research is undertaken by its employees.

By aligning incentives and motivations, we aim to create a dynamic ecosystem that accelerates the journey of inventions from laboratories to the marketplace, thereby maximizing their societal and commercial impact.

This comprehensive guide focuses on the multifaceted landscape of technology transfer, identifying key challenges and opportunities for universities and public research institutions, and delves into aspects of incentives for academics and technology transfer professionals. It comprises a series of insightful sections, each focusing on distinct aspects of incentives for technology transfer. We will analyze motivations and barriers, present a wide range of incentives, explore good practices from successful cases worldwide, learn from innovative approaches and delve into the broader impact that technology transfer can have on industries, economies and societies. Additionally, the guide addresses the common pitfalls of incentive programs, such as the risk of transforming academic researchers and technology transfer professionals into purely commercial outcomes-focused business people and possible loss of curiosity-driven research.

The guide prioritizes aligning the incentive program with the university’s mission and objectives, ensuring that both academic researchers and technology transfer professionals are driven by shared goals. This strategic approach not only strengthens the program’s effectiveness but should also garner support from university administrators.

In addition to thoroughly examining various incentives, the guide also provides:

A comprehensive, step-by-step action plan to facilitate the initial planning process.

An insightful recommendations framework designed to empower universities to select the ideal mix of incentives, leading to desired results and promoting a widespread culture of collaboration and innovation; this framework is adaptable, thus providing a blueprint for success that can be tailored to the unique needs of every institution.

A questionnaire specifically tailored for universities to gather data from students, faculty and staff, focusing on aspects such as motivation, satisfaction levels and priorities relating to research and technology transfer.

Examples of incentives that have been put in place by different universities all over the world;[2] these examples are for illustrative purposes only and it is recommended to refer to the specific policies and guidelines of the individual cited universities for accurate and up-to-date information.

The guide builds on and expands on previous, complementary data and economics work on the topic of technology transfer done at WIPO[3] and serves as an accompanying publication to the WIPO IP Policy Toolkit, which currently encompasses the following documents:

- IP Policy Writer's Checklist;
- IP Policy Template for Academic and Research Institutions; and
- Guidelines for Customization of the IP Policy Template.

Together, let us embark on this exploration, seeking to harness the full potential of academic research for the betterment of our world.

2 We have attempted to collect examples from universities globally. Yet, most of these examples stem from countries with mature innovation ecosystems, which may not always be relevant or applicable to countries with varying circumstances. We plan to develop an online database segmented into various categories to house these incentive examples. Our goal is to enrich this database with more examples from countries around the world, ensuring geographical balance and showcasing a variety of innovation ecosystems.

3 Arundel, A., S. Athreye and S. Wunsch-Vincent (eds) (2021). *Harnessing Public Research for Innovation in the 21st Century*. Cambridge: Cambridge University Press; WIPO (2011). Harnessing public research for innovation – the role of intellectual property. In *World Intellectual Property Report 2011*. Geneva: WIPO, www.wipo.int/edocs/pubdocs/en/wipo_pub_944_2011-chapter4.pdf; and Zuniga, P. (2011). The State of Patenting at Research Institutions in Developing Countries. Geneva: WIPO. www.wipo.int/edocs/pubdocs/en/wipo_pub_econstat_wp_4.pdf.

1 Context

The rationale for incentives programs

The role of universities in the modern innovation ecosystem

Many universities refer to the entrepreneurial and innovative environment in which they operate as an "innovation ecosystem." This ecosystem functions as a sophisticated network or interconnected system designed to maximize benefits for all its participants. To effectively translate university research into economic and societal value, a university's innovation ecosystem relies on the involvement of numerous stakeholders. Nevertheless, two pivotal stakeholders have particular power in positively shaping the technology transfer and commercialization efforts: the researchers, who conduct cutting-edge research and generate novel ideas, technologies and solutions, and university technology transfer professionals, who facilitate the transfer of knowledge and technology from academia to third parties.

Key contributions of researchers

- Generate brilliant ideas which provide the basis for societal solutions.
- Disclose inventions with societal or commercial potential to the TTO.
- Assist the TTO in seeking protection (e.g., patent) before publishing the results of the research.
- Tap into their networks and help raise money, engage with potential licensees, investors, and other partners.
- Support further development of the inventions (e.g., as a consultant to a licensee or as chief scientific officer or founder of a spinout).
- Support students that want to take technologies developed from their studies further.
- Ensure continued enthusiasm from the whole TT team.

Key contributions of TTPs

- Raise awareness and organize training in the field of TT and entrepreneurship.
- Develop good relationships and trust with stakeholders in the innovation ecosystem.
- Promote the smart ideas of the researchers.
- Support the professional disclosure of inventions.
- Support researchers in seeking IP protection, when appropriate.
- With researchers' support, identify potential licensees, investors and other partners.
- Support further development of the inventions.
- Evaluate invention disclosures and technologies, manage the patent portfolio, negotiate agreements and create spinouts.

TTPs face a challenging "Janus-faced" (or middle ground) role, supporting individual research entrepreneurs as well as protecting the interests and budgetary constraints of their employer, which, while mostly aligned, can be a difficult path to tread.

Nurturing a culture of innovation within higher education institutions

- University leadership has a crucial role to play in nurturing a culture of innovation, by establishing an environment that encourages researchers and TTPs to engage in innovative endeavors.
- Beyond the measures taken by universities, governments can significantly influence and support the innovation ecosystem through enabling national strategies and policies.
- Well-planned incentive schemes, including recognition of accomplishments, performance evaluations, promotions, and financial rewards, can help to integrate innovation and social impact into the mainstream of the university's activities.

Channels to bring research to market

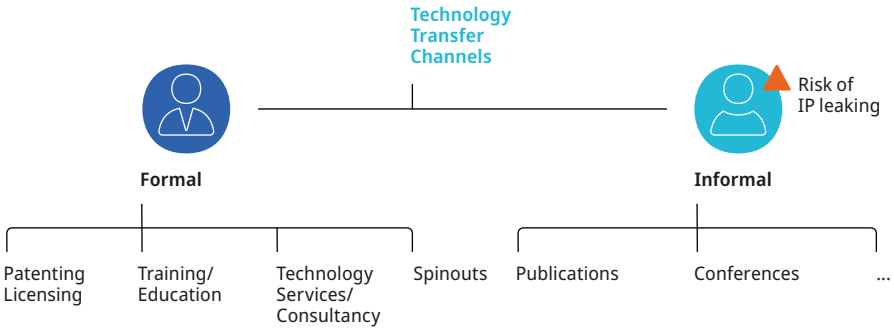
While working across institutional and disciplinary boundaries, universities increasingly face a difficult task as they are expected to play a central role in transferring new knowledge and technologies to businesses and society.

Universities have various channels, as shown in Figure 1, through which they can transfer knowledge, expertise and technologies to businesses and society. In this guide, we will explore both traditional technology transfer mechanisms and collaborative and informal ways of engaging with business and society.

- One of the classic methods of TT includes formal mechanisms such as patenting, licensing, spinout creation, joint research, contract research and academic consulting.
- In addition to formal TT mechanisms, universities can also engage in informal modes of interaction with industry and third parties, including networking with potential investors or licensees, showcasing of technologies and marketing of university outputs.
- Moreover, joint innovation production between industry, research and other stakeholders is possible through public–private partnerships, collaborative research projects, joint patenting, joint publishing and diverse institutional arrangements ranging from joint laboratories to industry-led innovation ecosystems.

In this evolving approach, universities are actively exploring innovative collaborative models that go beyond traditional TT channels, focusing on co-creation of knowledge and coordination of multi-actor innovation processes. Collaborative research, technology transfer and impact-oriented spinouts are therefore essential components of the modern innovation ecosystem within which universities operate.

Figure 1: Technology transfer channels



Source: European Patent Office (EPO)

The power of incentives

Incentives can serve as a powerful motivator for technology transfer, in several ways:

- They can encourage researchers to bring their research results to market, which is often an unfamiliar role for them.
- They can help to create a culture that values IP, entrepreneurship and collaboration, which can attract and retain entrepreneurial faculty, scientists, students and TTPs who view the university as a pathway for career development and giving back to society.

Being surrounded by colleagues who are interested in entrepreneurship can also inspire individuals to make connections between their research and its practical applications.

Incentives can have an immediate or future impact, and they can be tailored to address individual or group needs. Although it may be challenging for universities to implement incentives that address every researcher's or TTP's desires, they can design incentive programs to address various aspects of human nature.

How to group incentives

In this guide, we have divided incentives for researchers and TTPs into three groups, based on their nature:

- **Non-financial incentives** (Chapters 2 and 3). These incentives often include public recognition, appreciation of the individuals for their accomplishments by the university or by external organizations. They frequently reflect the institution's culture and the message that the leadership seeks to convey about the significance of TT activities in the university.
- **Career advancement incentives** (Chapters 2 and 3). These incentives are part of the recruitment into a university, promotion, and retention within a university.
- **Financial incentives** (Chapters 2 and 3).

Wherever possible, in this Guide the incentives are structured according to their targeted outcomes. This can be for general engagement (to bring innovation to the market for the benefit of society), or for specific activities in technology transfer (for example, to encourage invention disclosure, spinout creation, licensing, etc.).

Challenges of incentives programs

Some caveats

Incentives are necessary, but not sufficient for achieving impact.
Creating an entrepreneurial culture at the university is a slow and complex process. Even once the right incentives structures are in place, a myriad of factors can affect TT.

Expectations must remain realistic.
Most TTOs face challenges in generating profit. However, there are other non-monetary values that make investing in TT activities worthwhile. For example: access to unique data, enhanced teaching opportunities, joint projects and events, and contributing to society.

Incentives can be a double-edged sword.
Although incentives can motivate TT, there are also drawbacks. For example: incentives might encourage faculty to focus on applied research at the expense of basic research; incentives may undermine other knowledge creation activities; and researchers or TTPs may prioritize short-term gains over long-term benefits.

The right combination and timing is important.
Some benefits may be too far away in time, for example an innovation award or royalty shares received 5 or 10 years after the invention disclosure. It is important, therefore, to use different short-term incentives at different stages of the TT process.

There is no "one-size-fits-all" approach.
This guide presents a very wide breadth of TT incentives. Certain incentives may be more applicable to specific people, colleges and countries than others. Factors to consider include: national legal and innovation ecosystems, institutional objectives, purposes and perspectives of their role in society, and individual attitudes and visions of academics.

Aim to motivate rather than impose.
Researchers are motivated by both personal reasons and institutional incentives. To create an effective incentives system, it is important to understand the intrinsic motivations of researchers. However, universities should respect the decision of researchers who do not

wish to engage in TT activities, and not force them to participate unless it is a requirement by law. While a strong incentive system is vital, do not overlook the importance of trust, fairness and transparency. These foundational values are crucial not only in incentivizing but also in establishing a conducive and positive environment.

The interrelation between metrics and incentives for technology transfer

Incentives for technology transfer: Rewards or benefits offered to individuals to encourage their active engagement and participation in technology transfer activities.

Metrics for technology transfer: Ways to evaluate the success of transferring research results or technologies from a university to the market. There are two types of metrics typically used: quantitative and qualitative.

- **Quantitative metrics** provide numerical data. Examples include volume of research funding, number of disclosures, number of patents filed or granted, number of licensing agreements, revenue from licensing, number of spin-offs and broader innovation impact statistics.
- **Qualitative metrics** offer insight into non-numerical aspects. Examples include successful case studies, stakeholder satisfaction, impact on the local economy, social impact and the promotion of an entrepreneurial culture within the institution.

Both types of metrics are crucial for an all-encompassing assessment of technology transfer activities, offering a blend of measurable data and valuable contextual insight.[4, 5] Metrics act as markers along the TT process and it can take several years before tangible results can be seen. However, it is important to objectively assess progress that is made, and guard against merely having numbers without regard of their importance to the long-term objective of ensuring that the research becomes innovations that benefit society.

The interrelation between metrics and incentives for technology transfer lies in creating a symbiotic relationship that fosters a thriving TT ecosystem. By measuring the outcomes and success of technology transfer through metrics, the institution can demonstrate the value and impact of commercializing research outputs. This, in turn, can serve as evidence for the importance of TT and justify the allocation of resources, support and incentives for researchers and the TTO. Together, metrics and incentives create a positive feedback loop, driving a dynamic and successful technology transfer process that benefits both the institution and the researchers.

However, incentives and metrics can have a negative side, such as achieving the target – for example, more university patents – but not the goal – for example, the creation of downstream economic value and social impact generated by the invention. Unintended consequences can arise, such as researchers diverting their research attention away from more promising but more basic blue-sky research, or researchers trying to maximize short-term TT goals such as more patents at the expense of true knowledge transfer and value-creation activities. To illustrate these points, consider the examples in Table 1.

4 For a complete review of metrics for knowledge transfer see chapter 12 in Arundel, A., S. Athreye and S. Wunsch-Vincent (eds) (2021). *Harnessing Public Research for Innovation in the 21st Century*. Cambridge: Cambridge University Press.

5 Notable examples of metrics frameworks to benchmark the health of technology transfer work are the Knowledge Exchange Framework (KEF) in the UK and the Survey of Commercial Outcomes from Public Research (SCOPR) report in Australia and New Zealand.

Table 1: Incentives and effects

Metric: faculty promotion	Intended effect	Possible side effect
Researchers rewarded for increased patent applications.	Promote productivity, ensure that researchers declare their inventions and assist the TTO with the patent filing, the ultimate goal being that the patent will be at the origin of marketable inventions down the road. *This metric may be particularly useful where there are no or few patent filings, and the university has taken a strategic decision to increase TT awareness.	A large number of university patents are filed without actually generating any economic value – neither for the university nor for society as a whole. The risk can be mitigated by delaying the award of any incentives until there is a commercialization plan. Reorientation of the direction of research: overemphasis on applied, short-term, more lucrative research. Less diversity in scientific disciplines as focus on patentable outcomes increases. Other university missions such as teaching and training are neglected. Incurring cost undermining the financial viability of the TTO.
Researchers rewarded for increased grant funding.	Ensure that research programs are funded, promote growth, generate overhead.	Increased time writing proposals and less time gathering and thinking about novel research ideas and strategies, and actually conducting research. The prospect of income for universities or public research institutes can reduce government commitment to funding. Researchers can be diverted from working on more strategic research and placing more attention instead on the funders' priorities.
Metric – TTO performance	**Intended effect**	**Possible side effect**
TTPs rewarded for increased patent applications.	Ensure that TTO reaches out to researchers and provides support for patent applications.	Sometimes, filing a patent is not the best option. In fast moving markets especially, there can be greater value in opting for a "trade secret" route.

Therefore, it is imperative for universities and governments to consistently monitor and align incentives with the intended outcomes, emphasizing a broader perspective that encompasses both social and economic impact.

2 Setting up an incentives program for researchers

Motivations and drivers, inhibitors and barriers

Academic researchers are busy people. Their primary activities are doing research, teaching and a large amount of administrative activity. Technology transfer is generally seen by researchers as an additional activity that they may or may not choose to do. Although TT is becoming more commonplace, in most cases it remains for the researcher to choose to get involved. This section describes the range of factors that may motivate, drive and encourage researchers to get involved in technology transfer, and the range of factors that may act as inhibitors and barriers.

Motivations and drivers

Gaining insight into the motivations of researchers is of paramount importance, as it significantly influences their actions, their level of satisfaction and their long-term commitment to their work. Understanding the motivations of researchers will also determine the degree to which incentives can influence and change their behavior.

Traditionally, a distinction is made between internal, external and contextual factors supporting motivations.[6]

Internal motivation refers to the inherent drive and interest in engaging in an activity purely for the sake of the activity itself, without any apparent external incentives.[7] Internal motivations to participate in TT and academic engagement include the following:

Valuable intellectual experience. If researchers perceive TT as challenging and exciting, they will attribute greater value to this activity.

Positive impact on society. Knowing that their knowledge can contribute to technological development, support the creation of innovative products, jobs and services and make a positive impact on society is a great natural motivator for researchers.

Insights on industry trends. Interaction with the private sector often results in access to expertise, knowledge, improved skills and techniques, better understanding of market needs and insights into persistent socio-economic problems. It can also provide access to sophisticated equipment.

Testing technical and business validity as well as **practical applications of research.** By collaborating with external entities, researchers have the chance to examine their findings beyond the laboratory setting, from both scientific and commercial viewpoints, on a larger scale.

6 Olaya Escobar, E.S., J. Berbegal-Mirabent, I. Alegre and O.G. Duarte Velasco (2017). Researchers' willingness to engage in knowledge and technology transfer activities: an exploration of the underlying motivations. *R&D Management*, 47(5), 715–726. Closs, L., G. Ferreira, V. Brasil, C. Sampaio and M. Perin (2013). What motivates Brazilian researchers to transfer technology? *Journal of Technology Management & Innovation*, Sept. 13, 2013, 79–90.

7 Ryan, R.M. and E.L. Deci (2000). Intrinsic and extrinsic motivations: classic definitions and new directions. *Contemporary Educational Psychology*, 25, 54–67.

External motivation arises from factors external to the individual, such as money, rewards and compliments.[8] External motivations to participate in TT and academic engagement encompass a wide range of non-monetary and monetary scenarios, which include the following:

Recognition and awards. The results of TT, if publicly recognized and awarded, may give regional, national or international recognition that boosts the researcher's reputation.

Career advancement. With the introduction of the "third mission" researchers', activities in TT (i.e., patenting, spin-off creation, licensing) and academic engagement (i.e., collaborative research, consulting, networking, etc.) have become part of the accomplishments on which promotion and securing "tenure" are based, in addition to "articles published," "papers presented" and "grants received."

Access to in-kind resources. Leading industrial companies often possess laboratories and facilities that far surpass the resources available to university researchers.

Financial rewards. The importance of financial motivations varies significantly across disciplines (e.g., life sciences versus physical sciences) and also across pathways of technology transfer (e.g., patenting, spinouts or industry collaboration).

Additional laboratory or departmental funding and sponsoring. Research partnerships with industry open up additional research opportunities, many with funding attached. Positive results of collaborative research projects may bring new sponsor partners, new projects and better-quality students.

Alternative career paths. Engaging in collaborations with industries opens up new job opportunities, while facilitating staff exchanges between the university and businesses. Additionally, it enhances the prospects of alumni joining companies in relevant fields.

Visibility for further TT activities. A successful TT with a company is likely to lead to follow-ons from a technical side for researchers, and from a business side for the TTPs.

Contextual factors refer to the environmental elements that influence motivations and are part of the surroundings in which individuals operate. The successful implementation of TT relies significantly on the university's capability to inspire and cultivate motivations among its researchers. In other words, the university is responsible for creating the right context and the right incentives for TT. Contextual factors relevant to the university setting include the following:

Strong entrepreneurial culture. If researchers perceive themselves as entrepreneurs, they can identify opportunities from a wider perspective and make better decisions and take calculated risks.

Structured and effective ecosystem for TT. This is crucial for TT development. It includes entities with different coordinated functions such as science parks, accelerators, incubators, financiers, government, industry and TTOs.[9] Depending on their structure, ownership and management, governance and policies, size and location, they may have different effectiveness in addressing the researchers and the industry.

Strong support for the third mission. The third mission refers to the essential multidisciplinary endeavor aimed at expanding the social and economic mission of universities. Strong support for the third mission is key for the success of TT. Establishing university–industry laboratories can serve as a bridge connecting academia and society, while also fostering an entrepreneurial mindset. The social sciences and humanities can contribute by identifying

8 Grote-Garcia, S.A. and F.D. McDowell (2011). External motivation. In Goldstein, S. and J.A. Naglieri (eds), *Encyclopedia of Child Behavior and Development*. Boston, MA: Springer, pp. 624–625. https://doi.org/10.1007/978-0-387-79061-9_1070.

9 Good, M., M. Knockaert and B. Soppe (2020). A typology of technology transfer ecosystems: how structure affects interactions at the science–market divide. *Journal of Technology Transfer*, 45, 1405–1431. https://doi.org/10.1007/s10961-019-09745-w.

the complexities of economic, social and environmental challenges and promoting more comprehensive interaction in university–industry laboratories. Indeed, the potential of research impact and commercialization from the social sciences, arts and humanities is gaining traction.[10]

Avoidance of imitation. Policymakers and university administrators should avoid isomorphism – the tendency to imitate "world-class" institutions – and instead adopt unique policies aligned with the institutional strengths and needs.[11]

Clear communication. In TT, trust is everything. It is essential to establish open and transparent communication channels between researchers and TTPs. Ensuring alignment between the accomplishments in the laboratory and the objectives in the industrial realms heavily depends on the integrity and quality of the information exchanged among successive stakeholders.

Laws and policies that promote researcher engagement in TT. Laws and policies governing the TT process as well as broader institutional policies such as those on reward, recognition, and promotion and evaluation are crucial for the success of the TT ecosystem.[12]

Inhibitors and barriers

There are several reasons why researchers may be reluctant to engage in TT. We analyze the main barriers for involvement in IP protection, spinout creation and other TT engagement.

A number of factors may hinder researchers' participation in obtaining IP protection:

Patents are time consuming and complex to write. Academic researchers are often severely time constrained. TT activities may be seen as time taken away from research. This is especially relevant for more junior staff, often under probation or tenure tracks, with pressure to publish. In addition, inventiveness is often difficult to prove and there may be uncertainty of the prior art analysis (i.e., if relevant patents exist).

Fear for academic right to publish. Researchers may have to risk delaying publication or conference presentations due to patent application procedures. The patent laws of most countries have an absolute novelty requirement and, as such, publication prohibition before a patent application has been filed.

Perceived bureaucratic hurdles. Scarce knowledge of the university's procedures regarding patents and IP can act as a major deterrent. Insufficient support from the institution and the TTO can discourage researchers from disclosing their inventions and legally protecting their ideas.

Ethical dilemma. Some academic researchers believe that making money is unethical, arguing that their knowledge should be shared freely for the greater good.

Several factors can impede researchers' involvement in spinout creation, primarily stemming from gaps in the support provided by the TT ecosystem.

Lack of business and financial skills. Researchers may lack the necessary knowledge and expertise in areas such as business development, marketing, finance and entrepreneurship. This knowledge gap can limit their understanding of market dynamics, customer needs, competitive landscapes and financial management – essential components in successfully establishing and scaling a spinout venture.

10 See, for example, in the UK (www.aspect.ac.uk) and the EU (https://revalorise.eu).

11 Compagnucci, L. and F. Spigarelli (2020). The Third Mission of the university: a systematic literature review on potentials and constraints. *Technological Forecasting and Social Change*, 161, 120284, https://doi.org/10.1016/j.techfore.2020.120284.

12 This has been highlighted in several studies. See, for example, Guerrero, M. and D. Urbano (2019). Effectiveness of technology transfer policies and legislation in fostering entrepreneurial innovations across continents: an overview. *Journal of Technology Transfer*, 44, 1347–1366. https://doi.org/10.1007/s10961-019-09736-x.

Lack of supportive national legislation. Problem areas include IP rights, tax incentives, employment contracts (whether faculty can be involved in a spinout while maintaining academic duties), equity and profit-sharing, and cross-border collaboration.

Mismatched expectations. Researchers might have a different perception of the value of their IP or the potential of their spinout compared to the TTO.

Limited access to spinout funding. Researchers may struggle to secure the necessary resources needed to validate their technology, develop prototypes, conduct market research and attract skilled personnel. A particular challenge arises when seeking translational funding.

Fear of failure to progress. In academia, researchers' success and recognition are often linked to their contributions to traditional academic activities, such as publishing papers in prestigious journals and obtaining research grants. Engaging in entrepreneurial endeavors such as spinout creation can be perceived as a deviation from the conventional academic path and may raise concerns about the potential consequences it could have on their academic trajectory.

Other factors that are likely to hinder researchers' engagement in TT include the following:

Lack of awareness. Researchers often lack understanding of TT, research contracting and patenting, for example. They may not know instinctively when a patentable invention has been created and, as such, may not recognize the duty to disclose.

Internal lack of trust. A lack of trust and appreciation between researchers and university management (including TTO managers) may result in a breakdown of dialogue and loss of potential opportunities for TT.

Misaligned financial rewards. Financial rewards are perceived as short-term benefits; researchers may prefer the longer-term assured career benefits. On the other hand, if financial rewards are too high, researchers may end up chasing short-term gains and not develop a piece of research to its full potential and impact.

Time constraints. University-specified constraints regarding the number of hours or days allowed to carry out consultancies, combined with the lack of workload allocation for innovation and enterprise activities, may be perceived as too stringent, or not worth the effort.

Income constraints. The researcher's "share" of income earned from commercialization may be perceived as "too low" or "unfair," leading to researchers not participating at all.

Variation among disciplines. It is well known that there exists large variation across disciplines in the quantity, quality and nature of TT that occurs. Most university-level incentives don't account for this variation and are generally applied uniformly across departments.

Variation among universities. National-level incentives rarely account for variations among universities in terms of size, reputation, ability, research strengths and other factors. Thus, broad policies (such as Bayh-Dole like legislation), which suit universities with strengths in technology-based disciplines, may not be optimal for smaller or less research-intensive universities which focus on the social sciences or liberal arts.

Bias: outcome versus effort. Incentives typically compensate for "outcomes" (e.g., number of patent applications, number of spinouts, etc.) and rarely compensate for the amount of time and effort that goes into networking and initiation of contacts with potential non-academic partners. The personal time and resources put in by academic researchers in pursuit of TT opportunities is usually disregarded, while similar effort put into basic research is recognized in career considerations (e.g., the number of large grant bids, even when not successful, or the pipeline of papers in the working paper stage).

Template questionnaire

Annex B offers a template questionnaire designed for universities to collect data from students, faculty and staff regarding their motivation, satisfaction levels and priorities.

The questionnaire serves as a valuable tool to determine the most effective and valued incentives for the university community. By administering this questionnaire, universities can:

- Gain insights into the preferences and motivations of their researchers and TTPs. For example, some respondents may be primarily driven by monetary rewards, while others may place a higher value on recognition or professional development opportunities. Preference may also change over time.[13]
- Help identify areas of dissatisfaction or concern that can be addressed through the incentives program. For instance, if the survey reveals that a significant number of faculty members feel undervalued or undercompensated, the incentives program can prioritize improving compensation and recognition for faculty.
- Help build buy-in. Sharing the survey results with the university community demonstrates that their feedback has been taken into account, fostering a sense of inclusion and support. This transparency can also help build enthusiasm for the incentives program among the university community.

WIPO survey on incentives for researchers and TTPs

In 2022, WIPO conducted a worldwide survey to investigate internal and external motivations of both researchers and TTPs, as well as key factors and obstacles to the engagement in TT activities. The main results of the survey are presented in Annex C. The incentives proposed in this guide relate to researchers' external motivations and contextual factors which have been validated in the survey.

Non-financial incentives for researchers

When it comes to encouraging participation in TT and academic engagement, non-financial incentives have proven to be highly powerful, both to develop universities' general entrepreneurial culture and to support individual programs and policies.

Many universities assume that researchers engage with industry to commercialize their knowledge and, for this reason, they provide financial incentives to researchers (mainly benefit sharing) to encourage their commercial involvement. However, empirical studies have shown that the main motivations for researchers to engage with external partners are non-financial.[14, 15]

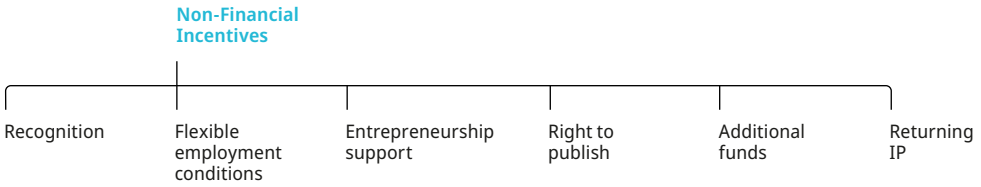
Non-financial incentives can be provided by universities, national or local governments, industry and NGOs. Within the university context, the university leaders play a key role in the effectiveness of non-financial incentives; the attitude toward TT that is set in speeches, yearly reports and committee meetings permeates and influences the institution.

In this section we present and, whenever possible, report examples of six types of non-financial incentives that can effectively be included in incentive programs.

13 There is a growing tendency of the younger generation to favor monetary compensation and equity.

14 Non-financial factors such as intellectual stimulation and professional development, as also confirmed in the WIPO survey results (see Annex C), are the most significant motivators for academic researchers to engage with industry. The study found that researchers valued the opportunity to collaborate with industry partners, which allowed them to broaden their research perspectives, access new resources and work on more applied research projects.

15 Similar studies indicate that academic researchers were more likely to engage with industry when they had the opportunity to conduct research that aligned with their intellectual interests and when they believed that their research could have a broader societal impact. Conversely, motivations that were concerned with financial or commercial gains were generally considered as unimportant. See also Hughes, A., C. Lawson, A. Salter, M. Kitson with A. Bullock and R.B. Hughes (2016). **The Changing State of Knowledge Exchange: UK Academic Interactions with External Organisations 2005-2015.** London: NCUB.



Recognition

According to the WIPO survey results (see Annex C), researchers highly value recognition, praise and moral prestige. Recognizing achievements and providing feedback not only makes individuals feel valued and motivated but also serves as a cost-effective method for inspiring engagement in technology transfer activities. By highlighting success stories, universities can foster a culture of innovation and entrepreneurship. Furthermore, recognition serves as a means to communicate the university's values and desired entrepreneurial culture to other researchers.

There are countless methods to acknowledge researchers. Universities can always explore more creative avenues. Here are just a handful of examples:

Formal recognition for exceptional performance:
- honorable mention on the researcher's business card;
- mention on the office name plate;
- recognition in the job title (e.g., principal, senior);
- lunch with university senior leadership such as the director, provost or dean;
- individual certificate; or
- book of honor or wall of fame.

Direct praise given by the university's senior leadership in speeches and reports or on the internet. This can apply to tasks, teams and individuals:
- "thank you" communication from the director; or
- recognition extended to direct management.

Publicizing successes to showcase the benefits of TT for academia and society:
- success stories;
- announcement of winners of award competitions on the intranet or in the media; or
- annual university brochure showcasing the achievements of researchers.

Prizes and awards to promote top achievement in TT. While the monetary value of these prizes may be modest, the value of recognition they provide is substantial:
- entrepreneurial courses, personalized training;
- major scientific conferences; or
- branded promotional item or wearable.

Recognition schemes can be granted both at national and regional level and at institutional level. Below we report a few examples.

Examples of recognition programs at national or regional level

European Union (EU) – Launched by the European Patent Office (EPO), the European Inventor Award[16] recognizes outstanding inventors or teams, honoring their contributions to social, economic and technological progress. The winners receive trophies in the shape of a sail. As a lasting symbol of exploration and ingenuity, the sail shows how inventive ideas can propel humankind to uncharted shores.

Japan – The Japan Society for the Promotion of Science (JSPS) offers the JSPS Prize[17] to researchers who have made significant contributions to scientific research in Japan. The prize includes a medal and a monetary award, as well as opportunities to attend international conferences and collaborate with researchers from other countries.

New Zealand – The Business Research Translation Competition[18] aims to promote the relevance and impact of New Zealand business research to external stakeholders. The objective is also to enhance scholars' skills and confidence in communicating their research to wider, non-specialist audiences.

People's Republic of China (PRC) – The Challenge Cup Technological Innovation Competition[19] is a national competition for university students' extracurricular academic and technological entrepreneurship. It is reputed as the "Chinese Olympics" of science and technology among PRC college students, covering fields such as management, social science and energy source subject. It is also a window to show PRC college students' creativity in science and technology and an arena to select students of high quality. Since 1989, more than 2,000 colleges and universities have participated in the competition, with a total of 2 million students. The University of Tsinghua,[20] for example, showcases Tsinghua undergraduates' innovative projects covering a wide range of areas, such as information technology, industrial manufacturing, integration of arts and sciences, and environmental improvement.

South Africa – The Department of Science and Technology (DST) and the National Intellectual Property Management Office (NIPMO) issue a Certificate of Recognition every year for all IP creators who are listed as inventors or breeders on a granted patent at the South African Companies and Intellectual Property Commission (CIPC) (South African Patent and Trade Marks Office) or a granted plant breeders' right (PBR) issued by Department of Agriculture, Land Reform and Rural Development.[21]

South Africa – In 2019 the Department of Higher Education and Training (DHET) developed a policy on the evaluation of recognition of creative outputs and innovations (in addition to publication outputs). The purpose of this policy is to recognize and reward quality creative outputs and innovations produced by public higher education institutions. The award is in the form of units to which a monetary value is associated and which is paid over to the institution. A maximum of two units are awarded for first patent application of a patent family granted in a particular substantive examination jurisdiction or first PBR application of a PBR family granted in a particular substantive examination jurisdiction.[22]

South Africa – In 2019, DST and NIPMO handed over 40 IP Creators Awards to scientists and researchers from public funded research institutions across South Africa. The awards initiative

16 new.epo.org/en/news-events/european-inventor-award/about-award
17 www.jsps.go.jp/english/e-jsps-prize
18 www.findworldedu.com/2022/new-zealand-business-research-translation-competition-2022.html
19 https://en.wikipedia.org/wiki/Challenge_Cup_Competition_of_Science_Achievement_in_China
20 www.tsinghua.edu.cn/en/info/1245/10251.htm
21 *Guideline 3.5 of 2019: Operation of the Incentive Scheme for Intellectual Property Creators*, which sets out the terms and conditions for the provision of incentives as per the mandate articulated in Section 9(4)(b) of Intellectual Property Rights From Publicly Financed Research And Development Bill, which states: "NIPMO must, furthermore [...] (b) provide incentives to recipients and their IP creators, to reward them for proactively securing protection for IP and commercialising it and, generally, for promoting innovation."
22 See: Higher Education and Training, Republic of South Africa (revised 2021). Policy on the Evaluation of Creative Outputs and Innovations Produced by Public Higher Education Institutions (2017). Implementation Guidelines (2021).

aimed to acknowledge the most prolific inventors in each institution and award them with a certificate of acknowledgment as one of the incentives.[23]

United Kingdom – The Royal Society of Chemistry has established the Emerging Technologies Competition[24] to encourage the development of innovative technologies by early career researchers. The competition provides a platform for researchers to showcase their technologies to industry and investors. The winners receive mentoring, training and networking opportunities.

United States of America – The National Institute of Health (NIH) offers the NIH Director's New Innovator Award[25] to support exceptionally creative early career researchers who propose innovative, high-impact projects. The award provides significant funding, as well as opportunities for collaboration with other researchers and access to NIH resources.

Examples of recognition programs at institutional level

Canada – University of British Columbia (UBC) grants an Inventor of the Year Award[26] to recognize UBC faculty members who have demonstrated outstanding achievement in the commercialization of their research.

Germany – Technical University of Munich (TUM) awards the honorary title Entrepreneur of Excellence[27] to honor important and committed entrepreneurs with a role model function.

New Zealand – University of Auckland Research Translation Awards[28] recognize researchers for the contribution that their research makes to the economy, society, communities, culture, public policy, health, environment or quality of life, beyond its academic merits. "Translation" means that researchers re-write an existing paper (published over the last three years) for a non-specialist audience, in lay and jargon-free language.

South Africa – University of Cape Town (UCT)'s TTO, Research Contracts and Innovation (RC&I), celebrates innovation at the UCT in person with the annual Inventors' Breakfast. The breakfast also serves as the launch event for the annual "Innovation at UCT" publication,[29] which profiles inventions, UCT inventors, spin-off companies and the activities of RC&I. New inventors are also presented with RC&I's iconic "Inventor" coffee mugs, while those who had a South African patent granted in the past year receive their patent certificates.[30]

South Africa – University of Western Cape (UWC) hosts Research Recognition Awards every year.[31] Nominated by UWC's TTO, the award recognizes researchers whose innovation has had an impact in society in the last two years, has had IP registered, granted or filed in the last two years, or had a novel commercializable or transferable disclosure to the TTO in the last year. It includes a Certificate of Recognition (see above).

United Kingdom – University of Cambridge grants Vice-Chancellor's Impact Awards[32] to recognize researchers who have made a significant contribution to society or industry through

23 www.samrc.ac.za/news/samrc-duo-awarded-top-intellectual-property; www.univen.ac.za/news/univen-top-inventors-receive-the-dst-intellectual-property-creators-awards; and https://pressoffice.mg.co.za/northwestuniversity/content/WnxpE74gRYAvV8XL

24 www.rsc.org/competitions/emerging-technologies

25 https://commonfund.nih.gov/newinnovator

26 prizes.research.ubc.ca/directory-award-opportunities

27 www.ie.mgt.tum.de/en/ent/research/tum-research-excellence-award-peter-pribilla-foundation

28 www.auckland.ac.nz/en/business/our-research/research-impact-competition/about-the-research-impact-case-studies-competition.html

29 https://uct.ac.za/research-innovation-publications/innovation-reports

30 https://uct.ac.za/rci/articles/2022-11-01-celebrating-innovation-uct-2022

31 The theme for 2022's Research Recognition Awards was, "Making research and innovation count through connecting possibilities," see www.uwc.ac.za/news-and-announcements/news/research-recognition-awards-2022-making-research-and-innovation-count-through-connecting-possibilities

32 www.cam.ac.uk/stories/vice-chancellors-awards-2022#:~:text=The%20Vice%20Chancellor's%20Awards%20for,engagement%20with%20and%20for%20research

their research. The awards include a cash prize and public recognition.

United Kingdom – University of Oxford has a program called the Royal Society Rewards,[33] which recognizes exceptional research achievements through a series of prestigious medals and prizes named after great scientists of the past. The awards include a cash prize and support for the development of the researcher's technology.

United States of America – University of California (UC) presents Innovation Awards[34] to recognize exceptional achievements in innovation, entrepreneurship and technology commercialization among UC faculty, staff and students.

United States of America – Massachusetts Institute of Technology (MIT)'s Technology Licensing Office Awards[35] recognize and celebrate MIT inventors, startups and licensees for their contributions to the commercialization of MIT technologies.

United States of America – University of Michigan (UM) Innovator of the Year Award[36] honors UM faculty who have demonstrated outstanding achievements in the commercialization of their research.

United States of America – University of Texas (UT), at Austin, presents an Inventor of the Year Award[37] to recognize UT faculty members who have made significant contributions to the commercialization of their inventions.

Flexible employment conditions

Flexible employment conditions can mean different things for different employees. They may include more flexibility with their schedules, flexibility to perform other activities, or a reduction of academic or administrative work. Researchers value flexibility regardless of how it is defined.

Flexible conditions can include the following:

Commercialization sabbaticals and mobility schemes. Sabbatical leave (either paid or unpaid) is particularly useful for inventors intending to develop a spinout, but it may also be useful to enable researchers to work in house with industry (secondments) or to concentrate on patenting and licensing. When granting sabbatical leave, the department or unit will incur staff losses. Consider compensating the unit, for example in the form of additional resources to replace the absent staff, or a share in the commercialization proceeds (see also "Slicing the pie: how much for the researcher's department?"). Furthermore, when on sabbatical leave, researchers highly appreciate the possibility to return to their positions with the same salary intact. Consider granting this possibility for a defined duration, such as three to five years.[38] For universities that have a tenure system, it is crucial to consider pausing the tenure process when faculty researchers take commercialization sabbaticals.

Teaching and admin reductions. Allow researchers to buy out teaching and administrative time during their working hours to devote exclusively to enterprise development. The researcher maintains their full-time employment status.

Time allocation for consulting and other outside professional activities, in addition to their full-time employment at the university. Though consulting opportunities can make faculty better scholars and teachers, the nature of the consulting process has the potential for diversion of faculty from their primary activities. Both conflicts of interest (COIs) and conflicts of commitment may arise where faculty researchers compromise their professional standards

33 www.ox.ac.uk/news/2022-08-24-oxford-scientists-honoured-eight-royal-society-awards
34 https://ucop.edu/research-initiatives/programs/innovation-opportunities/index.html
35 https://tlo.mit.edu/resources/news-events
36 https://innovationpartnerships.umich.edu/awards/distinguished-university-innovator-award
37 https://discoveries.utexas.edu/for-campus-inventors-entrepreneurs
38 While sabbaticals are an important incentive, one should also consider possible negative effects regarding IP lost and created out of the university.

or allow an outside activity to interfere with their obligations to students, colleagues or the primary missions of the university. Therefore, there needs to be a limit on the time that a faculty researcher may spend in consulting ("one day per week" consulting is commonly permitted). Universities typically have consulting policies and COI policies[39] to set forth time and other conditions that are intended to strike a fair balance between consulting and the obligations of the faculty within the university and serve to safeguard the interests of both parties. Further details about consulting fees for researchers can be found in the section, "Fees from consulting".

Examples of flexible employment conditions

Iceland – Reykjavik University's Strategy 2015.[40] Article 11: "Reykjavik University is committed to creating a stimulating environment for research. This is done in several ways: [...] By limiting the teaching load of those faculty members with high research output; by allowing faculty members to take sabbatical periods; by offering appropriate facilities for researchers, like working space (laboratories), computational power, financial accounting of research grants, etc.; by offering assistance for developing applications for research funding. Depending on the financial possibilities, which may vary from one year to another, active researchers can receive travel funds to participate in conferences. Means for stimulating the research environment are expected to evolve as new ideas emerge."

United States of America – University of Mississippi Faculty Consulting Policy.[41] "Consulting is permitted provided the faculty member's full-time obligation to the University is met. The maximum number of consulting days permissible for a faculty member is 39 days per academic year or 52 days per calendar year for 12-month appointees. This limit is based on a judgment about incentives and is aimed at furthering The University of Mississippi's teaching, research, and service objectives. A limited amount of 'averaging' of consulting time is permissible if, on occasion, a faculty member plans to consult for more than one day per week but no more than 39 days in two academic semesters or 52 days per calendar year for twelve-month appointees. Thirty-nine days of consulting per academic year or 52 days for one calendar year of active duty, is intended to be a liberal allocation, yet one that is fair to the University. The responsibility for adhering to the limit on consulting days, and other aspects of the University's consulting policy, lies first with the individual faculty member. Faculty members should resolve any questions and/or ambiguities with their department chairperson or dean before the fact, so that the University community is not injured by their actions. Faculty members have an obligation to report fully the level (i.e., number of days) of their consulting activities when asked to do so by the University so that it may be determined whether the principles set forth herein are being adhered to."

Entrepreneurship support for researchers

Researchers will be incentivized to participate in TT activities if the TTO can offer them a professional and encouraging environment. The maturity of the ecosystem and the available resources will dictate the type and the amount of support that a university TTO offers to its researchers. For instance, for spinout formation, in uniquely mature ecosystems, such as the Silicon Valley, a company may be formed with support from the many actors surrounding a university (such as very early-stage investment firms, law firms, accounting firms and business advisors). In the less mature ecosystems, in which the majority of universities reside, a university may need to support the academic inventors through all the stages of company formation, development and investment. For example, the university may provide real estate for the company to start and grow; legal services to help with incorporation; and access to university core facilities. In addition to TTOs, university incubators, innovation parks and university laboratories are essential components of the TT ecosystem, providing the resources, expertise and support necessary to turn innovative ideas into successful businesses and products. They can be supportive in a range of ways:

39 For examples of COI and consultancy policies, see the WIPO Database of IP Policies.
40 https://en.ru.is/research/ru-research-strategy
41 www.research.olemiss.edu/sites/default/files/ACA_FG_300_005.pdf

- entrepreneurship training, coaching and mentoring;
- education in patenting;
- business plan competitions, networking;
- specific support for spinout creation;
- development of business concept or preliminary business plan;
- IP due diligence (including internal disclosure, ownership, freedom to operate);
- market assessment and technology positioning; and
- introduction to the financial community (venture capital or angel investors, proof of concept (PoC) funds and seed funding public calls) and guidance on fundraising, helping to prepare communication materials, pitch decks, applications for public calls and so on.

Example of entrepreneurship support program at national level

United States of America – National Science Foundation (NSF)'s Accelerating Research Translation (ART) program[42] looks to boost tech transfer by changing culture and faculty incentives. ART provides funding to build institutional capacity and the infrastructure needed to conduct translational research activities. One of the expected outcomes from this program is creating a network of "ART Ambassadors" from different institutions throughout the United States. The ambassador cohorts will include senior research administrators, faculty members, technology transfer officials, entrepreneurs, postdoctoral researchers and graduate students. The ambassadors will serve as advocates and mentors for research translation, guiding other faculty, postdoctoral researchers and students.

Examples of entrepreneurship support programs at institutional level

Germany – Technical University of Munich (TUM) has an Entrepreneurship Center[43] that provides a variety of resources to startups, including access to funding, mentorship and networking opportunities.

India – Indian Institute of Technology (IIT) Delhi[44] relies on the Foundation for Innovation and Technology Transfer (FITT). FITT is an industry–academia interface organization, established by IIT Delhi to facilitate research translation, technology development, IPR management, technology transfer, research and development (R&D) collaboration, startup incubation and mentoring. The FITT Technology Business Incubator (TBI) has been active since 2000. Its objective is primarily to promote partnerships with new technology entrepreneurs and startup companies.

India – Institute of Technology Roorkee (IIT Roorkee) maintains a unique scheme of personal development funds for its faculty members by transferring some amount from the research and consultancy projects. The fund can be utilized by faculty members for their professional development, for example to meet the expenses for participating in conferences and paying membership of various professional bodies.[45] In addition, IIT Roorkee benefits from the IIT Roorkee Foundation,[46] a public charity with the purpose "to create funds for students, faculty, and supporting staff development, curriculum innovation, research support, entrepreneurial and innovative initiatives, promotion of excellence, welfare funds, community outreach, and to support disadvantaged individuals."

Japan – Okinawa Institute of Science and Technology Graduate University (OIST) Innovation presents a captivating case. Established as a transformative endeavor in Okinawa, OIST swiftly cultivated a comprehensive ecosystem in an environment that was initially sparse. This system, complete with networking opportunities, a PoC program, entrepreneurial

42 www.nsf.gov/pubs/2023/nsf23558/nsf23558.htm
43 www.tum.de/innovation/entrepreneurship
44 https://fitt-iitd.in/web/incubation
45 Unilink (2009). A Comparative Analysis of Institutional Innovation and IP Policies, Strategies and Practices, Results of the Micro-Level Analysis of the IP Unilink Project, p. 53. See also the IIT Roorkee Notification on Professional Development Allowance (PDA).
46 www.iitrfoundation.org

education, acceleration of external groups, incubation spaces and proactive support, is strategically designed to transition technologies from the research phase to the marketplace.[47]

Russian Federation – Moscow Institute of Physics and Technology (MIPT) offers student-support projects and services such as Phystech.Start, which helps students materialize their business ideas.[48]

Singapore – National University of Singapore (NUS) has an entrepreneurship support program called VentureLab. This program offers mentorship, funding and other resources to startups founded by NUS students, faculty and alumni.

South Africa – Stellenbosch University (SU). The Innovus TTO and the Stellenbosch University LaunchLab provide various programs "to foster an entrepreneurial spirit on campus and to create entrepreneurial awareness":

- Entrepreneurship Boot Camp. The TTO hosts an annual boot camp which focuses on the business model canvas and the growth wheel, which are the tools used for startups and young entrepreneurs. Innovus guides the entrepreneurs in understanding the concepts behind the value proposition, customer segment, pricing model and breakeven point for a business, and invites industry experts and startups to advise faculty researchers and students on their entrepreneurial journey. The boot camps lead to valuable educational experiences for students which augment classroom teachings and enhance the "Stellenbosch experience" for the student community.
- Last Friday Pitching Session. The TTO invites SU entrepreneurs to a pitching session on the last Friday of every month. At this session, they are allowed to pitch their idea to the TT team and get advice on the areas of their business which need support.
- Through the SU LaunchLab Incubator, extensive support is provided to spinout companies and student entrepreneurs, as well as external entrepreneurs. SU's TTO also provides free company secretarial support, negotiates discounts with service providers on behalf of the university's group of companies, legal and administrative support, access to investment and funding, access to networks, association with a top university, access to laboratories and access for spinout employees to the university's wellness support programs, to name but a few.

Switzerland – Polytechnic Federal School (EPFL) offers "funding, support and passion" to its entrepreneurs helping them bring their ideas to market:

- The Student Startup Launchpad and Blaze Accelerator programs are designed to forward leading student startups up to a successful market launch.
- The Changemakers Program offers workshops, boot camps and mentoring to EPFL Bachelor's, Master's or PhD students who want to develop an entrepreneurial project.
- Entrepreneurship-related courses are provided at Bachelor's, Master's and doctoral levels. Students also have the option to do their Master's project in their own startup.

United Kingdom – University College London (UCL) has a startup accelerator program called Founders Factory. This program provides funding, mentoring and other resources to early-stage startups in a variety of industries.

United States of America – Massachusetts Institute of Technology (MIT) offers an entrepreneurship support program called the MIT Venture Mentoring Service (VMS). This program pairs startup founders with a team of experienced mentors who provide advice and guidance throughout the startup process.

United States of America – Cornell University offers a range of entrepreneurship support programs through its Entrepreneurship@Cornell initiative. These programs include an accelerator program, a student business incubator and a mentorship program.

47 https://groups.oist.jp/innovation?utm_source=email_signature&utm_medium=email&utm_campaign=email_signature&utm_content=text

48 https://gyanberry.com/blog/moscow-institute-of-physics-and-technology-mipt-dolgoprudny-russia

Protecting researchers' right to publish

Because publication is central to the activity of the scientific community, researchers find it very important that they can publish the outcomes of a research cooperation with industry. Granting them this capability is an important incentive to stimulate collaborations.

In addition, publications also yield indirect rewards. For example, they can affect a researcher's job prospects and ability to be promoted. The publication of a scientific paper can lead to beneficial scientific collaborations, which can in turn lead to financially rewarding opportunities for academic authors. These opportunities can include commercial proposals for collaborations or consulting services.

Many universities, when entering collaboration with industry, will negotiate schemes that let the researcher publish after appropriate consultation with the industry partner to guarantee that no sensitive information is disclosed, and that any IP is properly secured. The length of the confidentiality obligation is typically between three and five years, but much will depend on the nature of the project, the amount of time needed for additional development before commercialization (for example, pharmaceuticals may need more time) and the type of IP (for example, if the research is expected to result in trade secrets, and a know-how license is anticipated, then it may not be possible to negotiate publication rights). This may be a serious issue: as an example, US universities will generally not agree to do research that must be kept secret.

To support academic researchers' needs to publish when entering collaborations with companies, universities and TTOs can take several measures:

- **Clear publication guidelines:** University guidelines can outline the rights and responsibilities of researchers when publishing research outcomes, emphasizing the importance of publication while considering the need for confidentiality and IP protection.
- **Negotiating publication clauses:** TTOs can negotiate agreements with industry partners that include reasonable publication timelines. Consultation processes (limited in time) can be established to review research papers and identify any confidential or proprietary information that should be excluded.
- **Confidentiality and non-disclosure agreements (NDAs):** TTOs can work with industry partners to establish confidentiality and NDAs that protect sensitive information shared during collaborations and establish mechanisms for handling publication-related issues.
- **Education and awareness:** Universities can provide training and education to researchers about the nuances of collaboration with industry and the associated publication considerations, such as the importance of balancing publication needs with industry requirements and learning how patenting and publication can be complementary.

Examples of supporting researchers' need for publishing

Belgium – KU Leuven Research and Development (LRD).[49] The TTO of KU Leuven offers guidance and coaching on how to reconcile publications (both scientific papers and patent applications) with the restrictions and requirements of collaborating with third parties.

Germany – Max Planck Innovation.[50] The TTO of the Max Planck Society facilitates the translation of cutting-edge scientific discoveries into real-world applications. Through strategic collaborations and partnerships with industry, the TTO bridges the gap between research and commercialization, fostering innovation and economic growth. It manages patents, licenses and spin-off companies, and support for result publications.

Sweden – Karolinska Institutet Innovations AB.[51] The TTO at Karolinska Institutet supports researchers in navigating IP considerations and collaborates with researchers to ensure

49 https://lrd.kuleuven.be/en
50 www.mpg.de/knowledge-transfer/technology-transfer
51 https://karolinskainnovations.ki.se/en

successful dissemination of their findings while addressing potential commercialization aspects. By assisting researchers with article publication, the TTO supports the effective communication of research outcomes to the scientific community and beyond.

United Kingdom – Imperial Enterprise.[52] Imperial College London's Enterprise Division provides researchers with guidance in navigating IP considerations, ensuring that their articles can be published while adhering to patent and commercialization interests. By offering assistance in managing potential conflicts, they support researchers in sharing their findings with the academic community while safeguarding innovation opportunities.

United Kingdom – Oxford University Innovation.[53] The TTO of the University of Oxford offers researchers guidance and support on publishing their research results while maintaining confidentiality and protecting IP. The office also helps with licensing and negotiating research collaborations with industry partners.

Provision of additional research funds, PoC funds and translational funds

Researchers spend a considerable amount of time on examining avenues for funding their research. Any incentives that provide funding for additional R&D activities will be welcomed and can influence researcher behavior.[54] These incentives provide money, and so could be considered "financial incentives," but are included here as they are not direct to the individual.

Additional fund incentives can originate from a variety of sources: governments, private funders, donations, crowdfunding, universities, international funding and so on.

Additional research funds

It is possible to design an incentive for researchers who are already engaged in TT activities to receive additional research funding.

- **Financed by the university:** Researchers who have successfully engaged in contract research or consultancies, developed prototypes or successfully patented technology, for example, may receive funds to carry out additional research as a reward. These rewards would be financed from the university's central resources, for example the income received from TT activities.
- **Financed by the researchers:** Researchers who participate in academic engagement activities may earn personal consulting income or may receive personal licensing revenue shares. They usually have the option of transferring this money to their departmental research accounts. The university must be prepared for this possibility and make the process easy. For more information, see the section "Allocation in research accounts."

Examples of additional research funds at institutional level

People's Republic of China (PRC) – Kunming University of Science and Technology (KUST).[55] Anyone applying for a research project granted by the university must agree to the requirement of seeking protection prior to publication; the effort to seek protection of research results would be considered in the subsequent research funding.

52 www.imperial.ac.uk/enterprise

53 https://innovation.ox.ac.uk

54 Closs, L., G. Ferreira, V. Brasil, C. Sampaio and M. Perin (2013). What motivates Brazilian researchers to transfer technology? *Journal of Technology Management & Innovation*, Sept. 13, 2013, 83.

55 Unilink (2009). A Comparative Analysis of Institutional Innovation and IP Policies, Strategies and Practices, Results of the Micro-Level Analysis of the IP Unilink Project, p. 52.

Switzerland – Converting revenue sharing into additional research funds, University of Geneva.[56] The University of Geneva provides a larger share of the licensing revenues as unrestricted research funds for its researchers. In summary, net license revenues within research institutions are usually distributed between three groups: 1) the contributors of the invention, 2) their research units and 3) the institution. Some of the contributors may decide to assign their share of revenue to the research unit in order to use them as additional funds for their research. In order to incentivize further TT-related activities, the university decided to match such assignment with a proportional allocation of its share to the research unit. If all the contributors assign their share to the unit, the university would do the same, resulting in 100 percent of the net licensing revenues being made available for further unrestricted research (subject to potential limitation for high amounts). This "creative" way of redistributing revenues from licensing IP maximizes the incentive for researchers to engage in TT-related activities.

PoC funds, translational funds and risk funds

There is typically a gap between the progress made through research funding and what industry and investors view as an interesting commercial opportunity. While researchers may receive funding to explore new concepts and conduct early-stage research, there can be challenges in transitioning those ideas into practical applications or commercial products. This is often referred to as the "valley of death" funding gap. To bridge this funding gap and facilitate the transition from research to practical application or commercialization, PoC, translational and risk funding are essential.

- **PoC funding** is typically provided at an early stage of research or innovation. Its main objective is to validate the feasibility and commercial potential of a new technology, concept or idea. It supports activities such as building prototypes, conducting initial experiments, assessing market viability and generating preliminary data to demonstrate proof of feasibility. It aims to provide resources that enable researchers to validate their ideas and attract further investment for the subsequent development and commercialization stages. This process can also cater to the needs of IP enhancement. It is paramount to manage this funding as a distinct, non-academic venture, marked by well-defined objectives, deliverables and critical "go–no go" decision points.
- **Translational funding** usually comes into play after the PoC has been established. Its primary purpose is to support the process of translating research findings or innovations into practical applications, products or services that can be utilized or commercialized. It provides resources for activities such as prototype refinement, preclinical or clinical trials, market research, IP protection, regulatory compliance and scaling up production. The emphasis is on bridging the gap between academic research and real-world implementation or commercialization.
- **Risk funding**, also known as seed funding or early-stage funding, supports high-risk, high-potential research projects or ventures to be capitalized in spinouts. It focuses on supporting innovative ideas with a higher level of uncertainty and risk but with significant commercial or societal potential. Uses include product development, market research, hiring of additional personnel or operational expenses.

In summary, each type of funding serves a specific purpose within the university setting, addressing different stages of research and innovation with varying levels of risk and potential. These additional resources serve as incentives for researchers to further develop their research results by building prototypes, conducting market research, generating additional data, scaling up experiments and more. Below are a few examples that illustrate this concept.

56 Granot-Mayer, G., K. Ku and L. Mieville (2019). Licensing invention patents: the challenge of TTOs. *les Nouvelles – Journal of the Licensing Executives Society*, LIV(2), June, 93–96. https://ssrn.com/abstract=3380413

Examples of PoC, translational and risk funds at national or regional level

The government plays a crucial role in providing PoC, translational and risk funding schemes to support TT activities in universities. These funding schemes serve as a crucial source of financial support for research projects that are considered too uncertain or risky for traditional funding sources. By offering this support, the government can actively foster innovation and entrepreneurship, ultimately driving economic growth and job creation. Moreover, it is imperative for the government to ensure the sustainable implementation of these funding schemes, enabling continuous support for TT activities in the long run. This may involve close collaboration with universities to identify areas of need, as well as providing ongoing assistance and guidance to ensure effective utilization of the funding.

Central Eastern European Technology Transfer (CEETT) Platform[57,58] is a regional PoC fund that aims to support TT and commercialization activities in Central and Eastern European countries. The CEETT Platform operates as a consortium of universities, research organizations and TTOs from various Central and Eastern European countries. It is often supported by national or regional funding agencies, governments and international organizations to provide financial resources and support for early-stage research projects with commercial potential. Through the CEETT Platform, researchers can access funding for activities such as prototype development, market validation, IP protection, feasibility studies and initial validation experiments. The fund aims to de-risk early-stage projects, making them more attractive to potential investors and industry partners. In addition to financial support, the CEETT Platform also offers guidance, mentorship and networking opportunities to enhance the commercialization potential of supported projects.

EU – Horizon Europe.[59] Horizon Europe is the EU's key funding program for research and innovation. It supports various aspects of research, including TT and commercialization. Through Horizon Europe, funding is provided to universities, research organizations and businesses to collaborate on projects aimed at bringing research findings to market. The program supports creating and better dispersing of excellent knowledge and technologies. Mandatory open access to publications and open science principles are applied throughout the programme.

Italy – ITAtech Platform.[60] This platform is the first joint initiative of development bank Cassa Depositi e Prestiti (CDP) and the European Investment Fund (EIF) dedicated to financing "technology transfer" processes by creating a bridge between the world of academic and university research, investors and the market. The basic idea is that the development of appropriate instruments for financing innovation processes, throughout all phases of the birth and development of innovative startups, is a fundamental pillar of national competitiveness. The platform is proposed as an equity investment tool to encourage, support, catalyze and accelerate the commercialization of IP with high technological content and, more generally, the translation of research results into new business ideas. ITAtech wants to play the role of an "agent for change," first and foremost cultural, for academic institutions. In the project, EUR 200 million has been earmarked for venture capital (equity). ITAtech's objectives are to a) accelerate and foster TT from Italian research results and b) promote and foster the establishment of dedicated TT teams with strong expertise in selected technology sectors.

Japan – JST-Mirai Program[61] is a notable example of a government-funded risk funding scheme for technology transfer in Japan. The program is operated by the Japan Science and Technology Agency (JST), an independent administrative institution under the Ministry of Education, Culture, Sports, Science, and Technology (MEXT). The JST-Mirai Program aims to promote innovative R&D by providing funding and support to universities, research institutions and small and medium-sized enterprises (SMEs). The program focuses on projects

57 www.eif.org/what_we_do/equity/technology_transfer/index.htm
58 www.eif.org/what_we_do/resources/ceett/index.htm
59 https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en
60 www.cdp.it/sitointernet/page/it/nasce_itatech_piattaforma_dinvestimento_cdp_fei_che_trasforma_progetti_di_ricerca_in_imprese_a_elevato_contenuto_tecnologico?contentId=CSA11180
61 www.jst.go.jp/mirai/en

that have high technological potential but may carry higher risks or uncertainties, making them less attractive to traditional funding sources. The JST-Mirai Program operates through competitive calls for proposals, where researchers and organizations submit project proposals for evaluation. The selected projects receive financial support, technical assistance and networking opportunities to facilitate the successful transfer of their research outcomes. Overall, the JST-Mirai Program exemplifies the government's commitment to promoting risk funding schemes for technology transfer.

South Africa – Technology Innovation Agency (TIA).[62] TIA has various funding instruments:[63] The Technology Development Fund supports innovators to advance technologies along the innovation value chain, from prototype to technology demonstration. The fund is designed to make early stage technology development more attractive and less risky to the market (TRL 4–7 and PoC established). The Pre-Commercialisation Support Fund prepares innovators for follow-on funding, through limited support for market testing and validation. TIA connects innovators with business and investment opportunities. The Seed Fund[64] supports innovators at universities, science councils and SMEs to advance their research outputs into prototypes and fundable ideas for commercialization. The Seed Fund enables innovators to de-risk research outputs for follow-on funding from TIA and other funders (TRL 3–8 and project beyond basic research). The Industry Matching Fund is to leverage TIA funding, through risk sharing with other funders and to attract industry participation that offers market access and incubation to TIA-invested companies.

A case study shows the impact of the TIA Seed Fund at four universities in the Western Cape. According to the Second South African National Survey of IP and Technology Transfer at Publicly Funded Research Institutions,[65] 70 percent of South African public research institutions had access to seed funding by 2018. For the period 2021–22 the TIA Seed Fund funded 82 projects, of which 67 percent originated from universities and science councils and 32.9 percent came from small, medium and micro enterprises. Of the funded projects, 28 percent came from women and 23 percent were youth-based projects. In 2021–22, 64 knowledge innovation products were successfully developed, including prototypes and IP-registered technology demonstrations and three projects reached the market from the Seed Fund portfolio.

South Africa – University Technology Fund (UTF).[66] UTF is the first fund of its kind for the African continent. It was initially established by the SME Fund in its endeavor to partner with South African universities to commercialize the technologies and business concepts arising from these institutions. UTF funds projects that possess tenable patents, prototypes and IP originating from South African universities.

United Kingdom – Innovate UK[67] is a government agency in the United Kingdom that provides funding and support to businesses, including universities, to drive innovation and promote economic growth. It offers various funding programs, such as grants and competitions, targeting different sectors and innovation stages. Innovate UK plays a pivotal role in fostering collaboration between academia and industry, encouraging knowledge exchange and commercialization of research outcomes.

United States of America – Small Business Innovation Research (SBIR) program. The SBIR program is a federal initiative in the United States that encourages small businesses, including those associated with universities, to engage in R&D activities with commercial potential. The program provides grants to small businesses to conduct feasibility studies and prototype development, leading to the commercialization of innovative technologies. SBIR

62 TIA, an entity of the Department of Science and Innovation (DSI), promotes the development and exploitation of discoveries, inventions and innovations to improve the quality of life for all South Africans by bridging the gap between research and commercialization. www.tia.org.za/core/uploads/2023/02/TIA-brochure.pdf

63 www.tia.org.za/funding-instruments/#1574413821664-67e9c57e-2ee6

64 www.tia.org.za/core/uploads/2017/12/Seed-Fund-Brochure.pdf

65 www.sarima.co.za/wp-content/uploads/2021/06/Second-SA-National-IP-TT-Survey-Report_Web-Ready.pdf

66 https://utfund.co.za/about. The link has great success stories for university innovations.

67 www.ukri.org/councils/innovate-uk

funding is distributed across multiple government agencies, creating opportunities for diverse research areas.

Examples of PoC, translational and risk funds at institutional level

Universities can establish their own internal university PoC, translational and risk funds or partner with external funders.

Canada – Pivotal Experimental Fund (PEF), University of Toronto.[68] This is an example of a PoC fund targeted directly at projects within the regenerative medicine technology area with a PEF in the Medicine by Design program. The PEF aims to bridge a critical gap within the innovation ecosystem by supporting early-stage regenerative medicine research discoveries to a point where follow-on investment from third parties is attractive. A pivotal experiment is one that enables a "go–no go" decision on the merits of a product concept, based on outcomes that drive a value inflection in the development plan. The PEF is a strategic and competitive program intended to advance translation of select Medicine by Design team (Cycle 2) projects. The PEF provides funding of up to CAD 250,000 over 6 to 12 months. In exceptional cases, consideration may be given to a larger investment.

Estonia – Feasibility Fund, University of Tartu.[69] The University of Tartu started a Feasibility Fund in order to support experimental projects that have potential to reach a new innovative product or service. The fund started as a support method in the Science and Technology field in 2019 and since then the focus has widened to the university as a whole. In 2020, the fund received approximately 50 applications, and a total of ten of them were granted funding, amounting to EUR 263,440. The university also has a Strategy for the Involvement of Private Funds.

Italy – PoC Fund, Polytechnic University of Turin.[70] This fund is designed to provide researchers with the necessary resources and funding to bring their ideas from the laboratory to the market by supporting the development of prototypes, market analysis, and other activities aimed at proving the feasibility of the proposed technology. The PoC Fund is open to researchers and staff of the Politecnico di Torino, who can apply for funding of up to EUR 60,000 per project. The program has been successful in fostering innovation and entrepreneurship, with many projects leading to the creation of spin-off companies and the transfer of technology to industry.

Japan – POC Program, Okinawa Institute of Science and Technology Graduate University (OIST).[71] This competitive funding program for OIST researchers is designed to help bridge the gap between laboratory discoveries and commercialization. POC Program provides funds that can be used for direct project-related expenses, including hiring staff, small equipment purchases, research supplies, and travel that directly supports the project and contract research services. In addition, the program provides hands-on guidance, IP management, entrepreneurship education, mentoring by external experts and community building. The program is structured into (1) an internal grant with three funding phases depending on the status of technology development and IP protection and (2) a fellowship for entrepreneurial-minded researchers.

Slovenia – Innovation Fund, University of Ljubljana.[72] In April 2020, the University of Ljubljana established the Innovation Fund to support promising projects in the field of knowledge transfer. With the received funds, the projects will reach higher technology readiness level (TRL) and thus increase the appeal of such technologies for potential buyers and the market. The Innovation Fund's budget for 2020–2021 amounted to EUR 70,000.

68 https://mbd.utoronto.ca/opportunities/pef
69 https://ut.ee/en/content/university-tartu-establish-intellectual-property-investment-company;
70 www.polito.it/en/innovation/connecting-research-to-the-market/proof-of-concept
71 https://groups.oist.jp/innovation/proof-concept-program
72 https://ppz.uni-lj.si/en/ul-innovation-fund

Slovenia – PoC Fund, Jozef Stefan Institut (JSI).[73] This fund is an initiative designed to support technology transfer and raise the TRL of new technologies developed at JSI. The PoC Fund is primarily financed through the allocation of one-third of the royalties received by JSI's TTO.

South Africa – Translational Fellow Programme (TFP), Stellenbosch University.[74] To enable recent graduates to kick-start their entrepreneurial journey, the TFP provides commercialization support and incubation, along with a stipend of up to ZAR 325,000 for the period of one year to cover living expenses. This stipend ensures that the graduate can pursue their entrepreneurial journey and is not lost to the job market due to financial constraints.

United Kingdom – Medical and Life Sciences Translational Fund (MLSTF), Oxford University.[75] This program is designed to support the translation of medical and life sciences research into practical applications that benefit society. The program is aimed at Oxford researchers and academics who are interested in commercializing their research by establishing a spinout company or licensing their technology to an established company. The MLSTF provides a range of funding options to support the development of new technologies, including PoC funding, project funding and follow-on funding. The program also offers a range of support services to help researchers navigate the complex process of commercialization, including access to legal, financial and commercial expertise. To be eligible for funding, applicants must demonstrate that their project has significant commercial potential and can address an unmet need in the market. Projects are also evaluated based on their potential to improve patient outcomes, reduce healthcare costs or generate economic benefits for the United Kingdom.

In conclusion, while government funding schemes have shown success in supporting TT and incentivizing researchers, universities can also play a crucial role by establishing their own funds to nurture and commercialize innovative research within their institutions. A collaborative approach involving both government and university-led initiatives can maximize the support for TT and enhance the impact of research outcomes on society and the economy. However, it is important to note that the private sector remains the primary source of risk funding. The complexities and considerations of private sector funding lie beyond the scope of this guide.

Returning IP to the inventor

The route to commercialization begins when an invention is disclosed to the TTO. TTO staff critically assesses whether the technology can satisfy a market need, and whether it can be patented or otherwise IP protected. In some cases, a TTO may decide not to protect or commercialize the invention, if there are too many negatives. These instances may include: insufficient interest among licensees or investors; difficulty scaling up; competition and regulatory risks; and a slew of other issues that prove too difficult to overcome. Sometimes, even after an initial pursuit, a TTO might abandon the invention at a later stage based on further developments or changed circumstances.

Return to inventors typically happens when the TTO decides that:

- it will not commercialize university-owned IP;
- returning the technology to the inventors is in the best interest of the university and the public; and
- the release will not violate the terms of any external agreement.

Inventors generally agree with the decision to abandon their invention, but there are instances where an inventor disagrees and wishes to pursue the invention independently. In such cases, having a clear and efficient process for returning IP rights to inventors becomes crucial, as it can

73 https://projects.research-and-innovation.ec.europa.eu/sites/default/files/kvp/files/kvp-poc-fund.pdf
74 https://innovus.co.za/translational-fellow-programme.html
75 www.medsci.ox.ac.uk/research/internal-research-funding/funding-directory/medical-and-life-sciences-translational-fund

serve as an important incentive and create opportunities for development of a technology that would otherwise be abandoned. To provide support and streamline the return of IP rights to inventors, several measures can be implemented:

Relationship with the inventor. The university should communicate why the IP is being released and what led to the decision. This justifies the decision and allows the inventor to understand any shortcomings in the invention, necessary steps for improvement and the required resources to pursue further development. It is also a good opportunity to get the researcher's perspective and explanations.

Efficient procedure. The process for returning the IP is not automatic and requires official procedural steps and assignment documents. Universities should establish a clear policy and procedure that is not unduly burdensome and allows prompt abandonment and release decisions.

Clarify restrictions and rights. The inventor needs to understand the scope of the return, the rights retained by the university, and obligations the inventor may have to the university, funding sources and faculty. This includes:

- Scope of the assignment: The invention is returned "as is," meaning that any new developments will be owned by the university and must be disclosed.
- Conditional return: The inventor may be requested to reimburse patent costs or to share future revenues as a condition for the return.
- Reservation of rights: To mitigate any potential negative consequences of the return, it is important for the university to retain the right to use the IP for research and educational purposes.

It is important that the decision to return IP to the inventor is not made for incorrect reasons. These can range from the TTO's inability to identify the market potential correctly, being understaffed or needing to prioritize other tasks. When IP is returned under such circumstances, there is an apparent lack of support for the inventors. Without the TTO's backing, academics often find themselves seeking external advice and assistance, which can be a cumbersome process.

Examples of methods for returning IP

New Zealand – Massey University. Article 3 of its IP policy[76] states: "Unwanted IP.

- 3.1 Where the Commercial Office notifies the Creator(s) that it does not wish to Commercialise any new IP Right or continue to commercialise any new IP Right, the Creator(s) may request that the new IP Right be transferred to him, her or them. The continuation of the dissemination embargo would then be at the discretion of the Creator(s). That transfer will then be negotiated with the Commercial Office in good faith and in a timely manner. The Commercial Office may require some form of consideration for that transfer, including (for example) ongoing royalty payments or the provision of an ongoing licence back to the University for research and teaching purposes or both. However, the Commercial Office must not unreasonably withhold its consent to a transfer or seek to impose unreasonable consideration obligations or other conditions in relation to any transfer under this clause 3.1.
- 3.2 Without limiting the Commercial Office's discretion, the Commercial Office may decide not to assign any new IP Right to the Creator(s) where: (i) that new IP Right arose out of, or is closely related to, any ongoing research or development work at the University and the Commercial Office wishes to assess the future outputs from that research or development work before determining whether or not to assign any new IP Right to the Creator(s); or (ii) the Commercial Office can demonstrate that any use or disclosure of the new IP Right may: (a) endanger public safety; (b) prejudice the teaching and research activities of the University; or (c) prejudice the commercialisation of any other IP by the University or its clients, licensees or collaborators."

76 www.massey.ac.nz/massey/fms/PolicyGuide/Documents/Research/Intellectual%20Property%20Policy.pdf

United Kingdom – Cambridge Enterprise goes a step further and gives the inventors the choice to collaborate with the TTO:

- "Although the University's IPR Policy requires inventors to disclose their registerable ideas to Cambridge Enterprise, they may choose whether to 'opt-in' or 'opt-out' of working with Cambridge Enterprise.
- If you 'opt in' we will explore with you whether there is a commercial opportunity we can work on together and how best to help you achieve your commercial goals. Further information about the process can be found in 'Develop a commercial opportunity'.
- If the inventors choose to opt-out, then we will perform limited assessment of the funding which supported the invention to identify any third party rights, and put in place an agreement which hands back the University's rights to the inventors, subject to the University IPR policy, if no other rights preclude this. It should be noted that the decision to opt-out should be made at the initial disclosure stage, although in exceptional cases Cambridge Enterprise and the inventors may agree (subject to third party rights) to put in place a handback assignment at a later stage, which would be on terms negotiated between the parties to reflect the investment and work done to date by Cambridge Enterprise."[77]

United States of America – Virginia Commonwealth University (VCU).[78] In cases where there is insufficient commercial interest, or in cases where the projected market size is insufficient to justify the expenses of commercialization, VCU TechTransfer and Ventures may return the invention to its inventors. If the invention came about using federal funding, a form must be completed and submitted to the funding agency by the inventor(s) in order to have the invention released by the government. Generally, this return is made at such time that the inventors would have enough time to file a patent on their own.

An example of release of IP agreement can be found at the AUTM website.[79]

Academic career advancement

Misalignment between promotion criteria and the university's goal of encouraging entrepreneurship

"Under current industrial relations arrangements there is little career incentive for university researchers to pursue commercialisation opportunities given the focus on publications and citations in competitive grant assessments and in internal promotion decisions in many institutions."
Australian University Research Commercialisation Action Plan (2022)

Numerous governments and universities recognize the value of faculty innovation and entrepreneurship in mission statements and strategic plans. Yet, commensurate career advancement processes and policies are not always in place.

For a very long time, academic researchers have been evaluated, rewarded and promoted based on the traditional metrics of academic research activity: the quantity and location of journal articles published, the sums of research funding received and the number of students they instruct and supervise. This traditional reward system does not match well with the daily tasks performed by faculty researchers at today's entrepreneurial universities.

The higher education sector is beginning to recognize the need for more nuanced promotions criteria with multi-dimensional career options. This includes advocacy specifically for enterprise and innovation.[80] As a result, a rising number of universities are addressing this divide and

77 www.enterprise.cam.ac.uk/contact/faqs
78 https://innovationgateway.vcu.edu/inventors/technology-transfer-process
79 https://www.autm.net/AUTMMain/media/About/Documents/ReleaseIPRights.pdf
80 The PTIE Coalition in the United States and APPLE Project in the United Kingdom are notable examples of such advocacy movements.

starting to expand the criteria for faculty promotion and tenure to include patenting, spinouts and other aspects of commercialization.

Challenges

Developing effective amendments to the university promotion system is not an easy task. Common challenges are as follows:

Criticism. A number of universities remain opposed to the inclusion of patents and commercialization success in tenure and promotion criteria; they believe this will either detract from their traditional obligations or pose a COI in regard to revenue generation. Supporters argue this will inspire professors to engage in innovative activities earlier in their careers, but they should not replace scholarly pursuits such as teaching, laboratory work, student mentoring and publications.

Lack of harmonization. There are calls from universities, associations and coalitions to incorporate TT activities in career advancement but none of these initiatives has yet led to widely adopted measurements. However, new efforts are arising to identify best practices for the inclusive recognition of innovation and entrepreneurship impact within promotion and tenure guidelines (see box *Trends towards harmonization*).

Lack of transparency. A significant number of universities do not publish their promotion and tenure criteria, making it difficult to benchmark.

Quantifying individual contribution. TT is the result of numerous inter-individual interactions, making it difficult to quantify the specific contribution of a particular researcher. Individual quantifiable evaluations are based on the number of patents and other IP generated. In the other cases, the researcher is usually evaluated on qualitative factors such as group behavior or creativity.

Time lag. When effort is put forth, the desire for career advancement is immediate, whereas the success of TT may not be evident for many years.

Informal channels. A significant portion of TT occurs through less formal means, where no contractual or royalty payments are made to the university. Examples include co-authorship of papers with industry scientists, invited talks by industry scientists and representatives in academic meetings, invited talks by academic researchers in industry and other general events, placement of students in non-academic jobs where they maintain contact with their academic supervisors, and memberships of industry bodies and company boards. These factors are rarely taken into account when determining career advancement and evaluation.

Unintended consequences. A numerical criterion may drive inappropriate activity unless strong safeguards are put into place. This problem has already been highlighted. For example, if researchers are evaluated based upon the number of patents, then they might put pressure on the TTO to patent their research results, irrespective of whether there is commercial potential. This may lead to vanity patents.

Evaluation capacity. A change in evaluation criteria requires that the relevant personnel evaluating faculty researchers' innovation and entrepreneurship activities are adequately equipped to do so in promotion and tenure cases.

Possible models

There are many possible ways of incorporating TT activities into career advancement criteria.

Bottom-up or top-down. In a bottom-up model, the university typically includes commercialization in its mission statement, but each faculty or school at the university has its own promotion document. Some specifically include TT activities whereas others do not. This model can be slow, however. In a top-down process, universities play a leadership role by explicitly including TT activities in university-led tenure and career advancement documents (policies, evaluation guidelines, etc.). However, redefining criteria for academic assessment

is not a simple top-down process. Involvement and support of the faculty and the research community are essential.

Strong or weak endorsement. In weak instances, patents are simply listed as one of the many items that can count. In strong instances, the criteria are explicitly spelled out using descriptive language that better captures the spectrum of entrepreneurial and innovation activities.

Methodology

Adding TT and commercialization activities in the tenure and promotion process typically comprises four key steps, shown in Figure 2.

Figure 2: Key steps to modify career advancement criteria

1. Defining goals. To determine which metrics to use for evaluating faculty members for promotion, establish the goals you wish to achieve. People will do what you reward them to do, so the metrics must align with and support accomplishment of the university goals.

2. Selection of criteria. Accurately define which TT undertakings will be included in the criteria for faculty career progression to reach your goals. Little research has been done on the ideal criteria to reach specific goals, and there is no one-size-fits-all approach. In general, this would depend on the channel and nature of the TT activity, and the local context (history of commercialization and engagement in the university and the department, nature of the research, resources available).

Examples of criteria that have been recognized include the following:

- number of publications of applied research;
- number of invention disclosures filed with the TTO;
- patenting: number of patent applications filed, number of patents granted;
- licensing: number of licenses executed, income generated from licenses, number of products that arose from licenses;
- spinouts: number of spinouts formed, revenues generated, external investment raised, market value at exit (initial public offering or trade sale), physical migration of students to industry;
- contract research: number and value or income of contracts, market share, percentage income relative to total research income, length of client relationship;
- collaborations with industry: collaborative research, consulting;
- number of prototypes developed;
- networking effort with non-academics, including memberships of the board of directors of companies, social enterprises and NGOs;
- industry reports, white papers and other "non-academic" outputs
- number of funded internal and external research grants;
- research or creative work undertaken which has demonstrable impact; and
- knowledge of innovation and commercialization imparted to students (through coursework, certificate programs, guided entrepreneurial activities).

Typically, universities prioritize factors other than income. Companies that faculty members collaborate with for contract research and consultancy can be more effective metrics.

Examples of criteria that have been used for specific goals are shown in Table 2.

Table 2: Example of criteria used for specific goals

Goal	Criteria
Increased TT activity	# patents filed; # patents granted; # license or option agreements executed on a faculty's technology
Increased local or regional economic development	Faculty's level of involvement and contracts with local or regional companies

Goal	Criteria
Entrepreneurship	# spinouts formed, revenues generated, external investment raised, market value at exit (IPO or trade sale), physical migration of students to industry
Research impact	Licenses (both commercial and research focused); potentially even material transfer agreements (MTAs)

3. Setting out equivalence criteria for various research and TT outcomes. The university usually has multiple goals and will need to prioritize or give weight to the metric for each. There is no general rule; these equivalences need to be set at a departmental and university level, depending on contextual factors.

Universities still struggle with how TT activities are valued and how they will compare to traditional metrics, like the number of published journal articles or number of research grants. Some universities decide that for certain criteria there are minimums that must be met, such as a minimum number of papers published in a given time or a minimum level of research funding.

A note of caution needs to go into setting out equivalences. For example, consider the act of filing patents. Policies need to make sure that just filing patents is not sufficient without action to capitalize on that IP registration. If promotion or tenure committees are measuring impact, they will value those accomplishments that best demonstrate impact. Thus, for example, invention disclosures may have relatively little value, patent applications slightly more, granted patents still more and licensed patents will be highly valued, especially those that produce royalties.

4. Constituting the evaluation committee. Normally, academic career progression requires feedback from neutral referees who can comment on a researcher's overall portfolio . When it comes to career progression on the basis of TT outcomes, care has to be taken to include referees who are able to judge the relevant outcomes appropriately. Hence, apart from academic referees, non-academic stakeholder feedback should be incorporated within the decision-making process.

Examples of evaluation criteria at institutional level

The sector is beginning to change and some institutions have already changed their promotions criteria to allow greater recognition of technology transfer activities. Some examples are listed below.

Mexico – National Autonomous University of Mexico (UNAM). Among the "main elements to be considered in the evaluation" are: completed technological developments, prototypes, patents, standards, experimental instrumentation and specialized software. "Additional elements" include: promotion and management of sponsorship of research projects, TT agreements, academic liaison actions and R&D projects for industry or the public sector.[81]

Qatar – Qatar University (QU)'s Faculty Consulting Policy[82] stipulates that "QU colleges and Centers shall recognize faculty 'consultancy' in the annual appraisal as a distinct category under community service for which the faculty consultant is rated. In addition, the faculty member's disclosed and approved consultancy may be taken into account in the arrangement of his/her teaching schedule, meetings, and other service functions at the college or department but must not adversely affect teaching and other duties."

United Kingdom – University of the Arts London proposes parallel academic career pathways specifically for technology transfer alongside those of research and teaching.[83]

United Kingdom – University of Birmingham has Enterprise, Engagement and Impact as one

81 Criterios generales para la evaluación del personal académico del Subsistema de la Investigación Científica (2001). Mexico: UNAM. www.atmosfera.unam.mx/wp-content/uploads/2017/06/4-2-Criterios-generales-para-la-evaluacion.pdf

82 See WIPO Database of IP Policies, Consulting Policies.

83 www.jobs.ac.uk/enhanced/employer/university-of-the-arts-london/#:~:text=As%20a%20member%20of%20our,3%20areas%20as%20a%20university

of the five separate contribution areas for academic promotion.[84]

United Kingdom – University of York. The promotion applications are reviewed against a number of criteria, including "knowledge transfer activities, such as involvement in licensing of IP or spinouts."[85]

United States of America – College of Engineering at the University of Michigan has recently made changes in the tenure process to provide encouragement and credit for faculty positively engaged in TT activities. Rather than focusing on individual metrics, the goal was to take a more holistic view. The following "Technology Transfer and Entrepreneurship" criteria are considered for tenure: US and international patents awarded; patents submitted; licensing, startups and entrepreneurial activities; other major technology transfer activities; industry interactions.[86]

United States of America – Virginia Polytechnic Institute and State University. The tenure and promotion document[87] explicitly lists what faculty members may include under "economic contributions and entrepreneurship": "1. Start-up businesses (including competitive grants and contracts such as SBIR [Small Business Innovation Research] awards and other notable business achievements), 2. Commercialization of discoveries, 3. Other"; and under "Intellectual properties": "1. Software, 2. Patents, 3. Disclosures (pre-patent)."

Other universities that have implemented TT activities in their evaluation criteria:

- Canada: University of Saskatchewan; University de Moncton.
- Chile: Pontífica Universidad Católica de Chile.
- United States of America: George Mason University; Medical College of Wisconsin; New York University; University of Illinois at Urbana-Champaign; University of Nebraska; University of Texas Austin; University of Texas Dallas Science School of Engineering and Computer Science; University of Texas Health Science Center San Antonio; Utah State University.

In some countries there is national legislation which stipulates the requirements for obtaining an academic title or being promoted. These can include patenting activity, engagement with enterprises and wider impact of research activities. Some examples are reported below.

84 www.birmingham.ac.uk/jobs/academic-applicants/birmingham-academic-career-framework
85 www.york.ac.uk/admin/hr/pay-and-grading/promotion/research
86 https://provost.umich.edu/resources-policies/faculty-resources/promotion-tenure-review
87 Virginia Tech Promotion and Tenure Dossier Guidelines 2023-2024.

Examples of national models for academic career advancement that are designed for entrepreneurship

Brazil. The primary venue for scientific and technological research in Brazil is its federal public universities, reliant heavily on federal funding. CAPES,[88] a government entity, is in charge of evaluating postgraduate programs and academic researchers in these institutions. Recognizing the growing significance of innovation and knowledge transfer in academia, in 2019 CAPES shared outcomes from a dedicated working group outlining new evaluation criteria in these areas. The working group's focus on knowledge transfer consisted of two main sub-categories:

- Licensing of Intangible Assets. This sub-group assessed products concerning the licensing of intangible assets, registered or otherwise. For a product to be considered under this category, it needs to have catalyzed innovative outcomes. Products such as IP assets, social technology, software, new plant varieties or know-how fall under this category.
- Creation of New Enterprises or Social Organizations. This subgroup concentrates on entities originating from intangible assets that have a palpable market presence. These organizations must induce employment and income generation, like cooperatives repurposing plastic PET bottles or biotech firms introducing new drugs.

The GT-Technical Products then offered a classification structure for the Innovation and Knowledge Transfer evaluation. Products were ranked from A to E based on their importance in the context of knowledge transfer. "A" ranked products demonstrated high importance, whereas "E" listed products were of lesser relevance in this sphere. While CAPES' evaluation system has become standard across universities, including private ones, it is noteworthy that many institutions, despite the system's prominence, neither utilize innovation and knowledge transfer as a metric in faculty promotions nor develop unique researcher incentive programs.[89]

Trends towards harmonization

Europe – The League of European Research Universities (LERU)[90] published a Framework for the Assessment of Researchers.[91] The paper started from an exchange of current practices at LERU universities regarding the assessment of researchers in the context of hiring, promotion or evaluation, and develops a common framework that can inspire and support universities in this crucial responsibility. The underlying perspective is to reward and recognize a diversity of profiles and contributions, as they are all important for the overall success of the institution, be it in research, education or service to society.

Poland. The Act on Higher Education and Science is the primary legislation governing higher education in Poland. It includes provisions related to the promotion of academic staff, including those involved in technology transfer. The law stipulates those scientific achievements, including the transfer of knowledge and technology to the market, which should be taken into account when evaluating candidates for promotion. The evaluation of academic staff members includes assessing their achievements in technology transfer as part of periodic assessments. This criterion is taken into consideration when deciding on promotions within the university and during state procedures such as habilitation and professorship. The assessment questionnaire includes a section on "Information on cooperation with the social and economic environment," which covers a range of information including a list of technological achievements, details on collaboration with the economic sector, industrial property rights acquired through patents (national or international), information on implemented technologies and expertise conducted for business purposes.[92]

88 Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Higher Education Personnel Improvement Coordination).

89 www.gov.br/capes/pt-br/centrais-de-conteudo/2020-01-03-relatorio-gt-inovacao-e-transferencia-de-conhecimento-pdf

90 LERU is an association of 23 leading European research-intensive universities that share the values of high-quality teaching within an environment of internationally competitive research.

91 A Pathway towards Multidimensional Academic Careers – A LERU Framework for the Assessment of Researchers (2022). LERU Position Paper.

92 www.gov.pl/attachment/d6975935-4b24-4be3-96f1-09c51589958a

United Kingdom – Academic Promotion Pathways Linked to Entrepreneurship (APPLE)[93] is in the process of analyzing 78 promotion criteria from UK higher education institutions. This project explores how systems underpinning academic career progression can be better aligned to support meaningful engagement with entrepreneurship and innovation. It examines the current state of play with ASPECT[94] partners (a network of universities seeking to enhance research commercialization within the social sciences, arts and humanities) in terms of recognition, reward and workload allocation and co-creates solutions.

United States of America – the Promotion & Tenure – Innovation & Entrepreneurship (PTIE) Coalition[95] is a rapidly growing group of universities who leverage their collective experiences to develop a plan for inclusively recognizing the impact of innovation and entrepreneurship (I&E) within promotion and tenure guidelines. This coalition represents a growing movement within academia to acknowledge and reward the contributions of faculty members who engage in entrepreneurial activities and make a tangible impact on society through their entrepreneurial endeavors. The PTIE Coalition recognizes that the evaluation of entrepreneurship impact requires a multidimensional approach. It involves considering not only the traditional academic outputs such as peer-reviewed publications but also other indicators such as successful technology transfers, commercialization of research, patents, startup creation, industry partnerships, community engagement and economic development.[96] By broadening the criteria for evaluation, the coalition aims to provide a more comprehensive and accurate assessment of the contributions and impact of entrepreneurial faculty members.

The PTIE Coalition recommendations contain four core elements needed to initiate changes that could meaningfully and inclusively account for I&E:

1. University-wide language directly linking the evaluation of faculty to institutional mission, values and goals across the multiple levels at an institution (unit, department, school, college, university and system). Sample text: "Evaluation of faculty for promotion and/or tenure includes their contributions to the institution's mission and stated priorities. Evidence for broader (societal) importance of the work, either now or in the near future, should be included within their personal statement and/or other appropriate portions of their dossier."
2. I&E metrics to serve as indicator data to be used in a narrative thesis of impact. Metrics are grouped into six subcategories: IP, sponsored research, use and licensing, entity creation, I&E career preparation and I&E engagement.
3. I&E text for evaluation criterion to be incorporated into the (i) research (scholarship and creative activity), (ii) teaching and advising, and (iii) service categories typically evaluated for promotion and tenure (P&T).
4. Process changes for supporting systemic culture change, improving transparency and addressing bias (for example, directions for personal statement, external reviewer resource and guidance, involvement of P&T process consultants, expanded training, and reframing and importance of diversity, equity and inclusion).

Financial incentives for researchers

As mentioned above, most studies suggest that faculty researchers are generally more interested in career advancement, intellectual freedom, peer recognition and societal impact than in financial rewards. At the same time, most university employees are not evaluated for promotion based on their number of inventions or entrepreneurship activities. Therefore, the potential for receiving an additional income, along with a well-crafted program of non-financial and career advancement incentives, can create a higher level of energy and excitement and provide an additional inducement to encourage researchers to participate in the TT/KE

93 https://aspect.ac.uk/funded-project/apple/?_sft_post_tag=phase-3

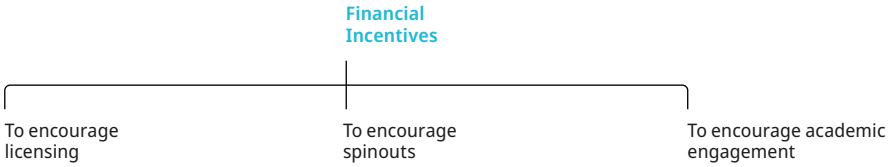
94 Aspect (A SHAPE Platform for Entrepreneurship, Commercialisation and Transformation) is a network for organizations looking to make the most of commercial and business opportunities from Social Sciences, Humanities and Arts (SHAPE) research. See https://aspect.ac.uk/about.

95 Promotion & Tenure – Innovation & Entrepreneurship (PTIE) is a global movement to support the inclusive recognition of innovation and entrepreneurship impact by university faculty in promotion, tenure and advancement guidelines and practices. See https://ptie.org/content/.

96 The PTIE Coalition suggested six sub-categories of suggested metrics, with specific examples provided within each category. For more information, see: www.science.org/doi/10.1126/science.abj2098.

(knowledge exchange) process.[97] Academics in countries where the overall salaries are low may be comparatively more sensitive to additional income sources.

The below financial incentives are structured based on the desired outcomes and behavior changes.



Financial incentives to encourage licensing

Researchers share in commercialization revenues

The university may generate revenues from the commercialization (licensing, sometimes sale[98]) of patentable inventions, copyright works and TRP. Almost all universities provide their researchers with a direct financial stake in the success of such commercialization by sharing revenues with inventors or creators. Most universities use a formula-based approach to implement this incentive. The revenue-sharing policies vary greatly, but some elements are common in the computation of the royalties. In the sections that follow we will discuss different approaches to license revenue sharing.

Downsides of revenue sharing are (1) success stories remain the exception, especially in middle- and low-income countries – inventors will rarely receive a high amount – and (2) it takes a long time to commercialize inventions and receive royalties. This means that inventors will only receive their rewards some time, often several years, after their efforts. This may diminish the effectiveness of the incentives. Figure 3 shows the steps involved in setting up a revenue-sharing policy.

Figure 3: Steps to setting up a revenue-sharing policy

1. Defining revenues

Before a TTO can distribute revenues, it must define – in its IP policy or revenue-sharing policy – what types of revenues will be distributed.

Typical agreements that generate revenue subject to distribution are:

- IP license agreements (exclusive or non-exclusive);
- option agreements;[99] and
- TRP license agreements.

97 Several studies showed that universities that give higher royalty shares to faculty researchers generate greater license income. Researchers seem to respond both to cash royalties and to royalties used to support their research laboratories, suggesting both financial and internal (research) motivations. See, for example, Lach, S. and M. Schankerman (2008). Incentives and Invention in Universities.

98 The majority of universities do not assign or sell IP rights, or only do so under strictly defined circumstances. On rare occasions, a university may sell or assign ownership of IP to a business, in which case the revenue-sharing rules are the same as those for licensing income.

99 In the case of an option agreement, a fee is charged to a potential licensee for the opportunity to evaluate the IP, but not to exploit products or services commercially during the option period.

Agreements that typically do not generate revenue subject to distribution are:

- MTAs;[100] and
- internal (non-commercial) research agreements.

Types of licensing revenues that are typically distributed include:

- one-time payments (lump sum): this could sometimes be associated with sub-licensee payments;
- milestone payments: payable when certain "milestones" are reached, such as the granting of a patent or the approval of a drug by the Food and Drug Administration (FDA);
- royalties: payable generally on an annual or semi-annual basis and defined as a percentage of the revenue generated from the sale of products or services based on the IP that has been licensed; and
- equity.

Distribution of gross versus net income:

- A university may incur external expenses directly associated with a licensed technology before or after it is licensed. It is common practice to deduct these expenses from licensing revenues before distribution.
- The university's IP policy will typically define gross revenue, IP-related expenses and net revenue, as well as the parameters for revenue distribution. See the WIPO IP Policy Guidelines, Article 10.2, for standard definitions and examples. An IP policy may also detail what percentage of the gross licensing revenue will be used to distribute the direct costs. For example, some universities may choose to apply 100 percent of the gross licensing income toward these expenses until they are fully reimbursed. The drawback is that it may prolong the time that inventors have to wait to receive income distribution for a licensed technology or even prevent them from getting anything if the costs are high and the revenues are low.

Examples of gross and net income approaches

South Africa. The Intellectual Property Rights from Publicly Financed Research and Development Act (IPR Act), Section 10 prescribes minimum benefit sharing arrangement to inventors to a portion of the (gross and net) revenues[101] that accrue to the institution from their IP.

IP creators at an institution and their heirs are granted a specific right to a portion of the revenues that accrue to the institution from their IP in terms of this Act until such right expires.

"Intellectual property creators [...] are entitled to the following benefit-sharing:

(a) at least 20 percent of the [gross] revenues accruing to the institution from such intellectual property for the first one million rand of revenues, or such higher amount as the Minister may prescribe; and
(b) thereafter, at least 30 percent of the net revenues accruing to the institution from such intellectual property".

Regulation 9 to the IPR Act provides that inventors must be paid no later than 12 months after receipt of revenues, sets out which cost must be deducted to determine net revenues and further provides that institutions must develop policy provisions to regulate benefit sharing of non-monetary benefits with IP creators.

100 It is not unusual in MTAs to request a fee to reimburse for the costs of making the materials, but such money is a reimbursement and not revenue in a traditional sense.

101 The IPR Act defines revenue quite broadly and states "all income and benefits, including non-monetary benefits, emanating from IP transactions, and includes all actual, non-refundable royalties, other grant of rights and other payments made to the institution or any other entity owned wholly or in part by an institution as a consideration in respect of an IP transaction, but excludes a donation." According to the Second South African National Survey of IP and Technology Transfer at Publicly Funded Research Institutions, for the period 2014 to 2018, over ZAR 23 million commercialization revenue paid was to more than 270 IP creators or enablers.

"Net income": examples of costs that are deducted

- The institution's expenses incurred by payment to external entities for securing, maintaining and enforcing IP protection. These may include search costs (including novelty and freedom to operate searches); IP attorney fees (or the like) for drafting the application, filing the application (international or national application), preparation of any formal documents required during filing or subsequent prosecution (including an assignment or a power of attorney), and for prosecuting the application to grant (including a correction or amendment; receiving, preparing and responding to an official action, translation fees, validation of a granted application; and all related foreign associate fees and IP office official fees); overhead charges (for example, printing, faxing, telephone, etc.) incurred by the service provider and reflected on their invoice for services rendered.
- Patent (or other IP) application, renewal or maintenance fees.
- Marketing fees charged by outside consultants, advertising fees for posting technology summaries.
- Attorney fees for the drafting of the licensing agreement, royalty audit charges and so on.
- The institution's expenses incurred in licensing of IP, such as costs for performing a due diligence on the third party to whom the IP will be licensed.
- In addition, some universities deduct an administration fee (typically 10 to 15 percent) for operational costs. Then, they share whatever is left.

Examples:

Saudi Arabia – King Abdullah University of Science and Technology (KAUST). According to the IP policy, "deductible expenses" encompass all costs incurred by KAUST for the assessment, legal protection, maintenance, marketing and commercialization of KAUST IP, including legal fees, taxes, government fees and costs related to legal proceedings. "Gross revenue" refers to all monetary compensation received by KAUST for the sale or transfer of KAUST IP rights, encompassing one-time fees, ongoing royalties, proceeds from equity liquidation and other cash benefits, but excluding funds from sponsored research, ancillary services, leases, philanthropy and similar sources, with equity holdings becoming part of gross revenue only upon liquidation.[102]

United Kingdom – University of Glasgow. The IP policy allows employees to participate in the net income generated by the university through the licensing of their IP to third parties. For the purposes of this policy net income is defined as gross cash (milestone payments or royalties) paid by the licensee under the terms of a license agreement less any external legal, patent or other deductions. Examples of "other deductions" include revenue-share obligations to research funders under their terms and conditions or to joint IP owners where there is an obligation to share revenue.[103]

What if it isn't cash?

There are good reasons for requiring licensing income to be paid as cash, and not in the form of company shareholdings or other securities that may change in value. But spinout and startup companies are generally much more willing to give equity than cash, and many TTOs accept equity ownership in some of the companies to which they license their IP.
Equity poses a challenge in revenue distribution:

- First, the equity may never become liquid. It may take many years, if ever, before the company goes public or gets acquired and allows the university to cash out and distribute its equity.
- Second, it may be difficult for the TTO to value the shares received from a license, meaning that the TTO cannot distribute cash to the inventors as an equivalent to the equity held.

102 https://innovation.kaust.edu.sa/wp-content/uploads/2018/08/KAUST-Intellectual-Property-Policy-December-2017.pdf
103 University of Glasgow, Policy for Intellectual Property and Rewarding Participation in Commercialisation.

The TTO has basically two options:

1. Hold on to the inventor's share of the equity until it becomes liquid. In this case it should be decided in advance when to sell the equity and generate cash that is distributed to inventors. Many TTOs have a policy to sell the equity as soon as possible rather than to wait until the equity gains value.
2. Distribute the inventor's share of equity as soon as it is received by the TTO at the time the license is executed.

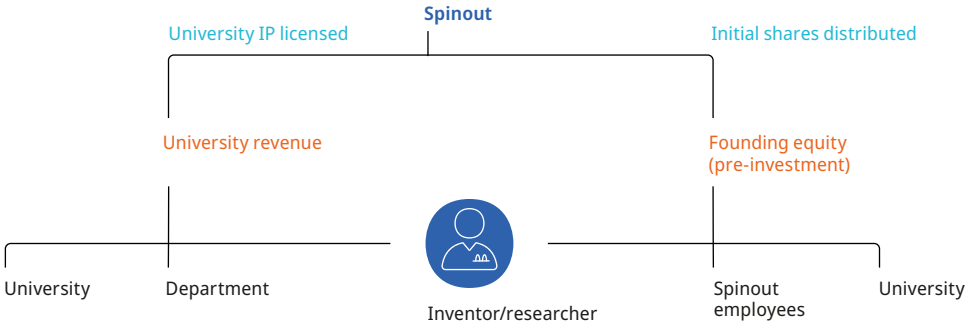
Examples of policies with references to sharing of income in the form of equity

United Kingdom – University of Glasgow. Article 6.1 of its IP policy[104] states: "University Licensing Income (Excluding Licensing Income from Spinout Companies). Employees are entitled to share in net income generated by the University from the licensing of their employee IP to third parties. [...] In some cases, net income may include shares in the licensee. In such scenarios, if the employee does not receive the shares personally, then all shares are held by GU Holdings Ltd. and any share dividend payments or cash from the disposal of shares will be subject to this policy. Disposal of any shares will be at the sole discretion of GU Holdings."

Should the university vary its rules when it comes to managing the distribution of licensing income from its own spinouts?

In most cases, license revenue-sharing policies remain unaltered for licensing revenues received from a university spinout company.

Figure 4: Equity and licensing revenues



Source: WIPO

The most common practice is to allow founder researchers to hold equity and benefit from licensing revenues – most universities do not consider it "double dipping," or taking income twice for the same thing, as the rewards are for different things: equity is generally because they have some involvement in the company and they want to make it work, and license revenue is generally for the IP licensed to the company. Equity very often dilutes quickly depending on the technology and investment required and the involvement of others. However, clear COI management policies need to be in place and all founders have to sign a COI management plan. Some universities, however, have policies that restrict researchers from earning both equity from participating in a spinout company and a share of the licensing revenues.

104 University of Glasgow, Policy for Intellectual Property and Rewarding Participation in Commercialisation.

Examples of revenue-sharing policies with references to equity in spinouts

New Zealand – Massey University is an example of a university that does vary licensing revenue sharing in cases of licensing to a spinout company, as described in its IP policy:[105]

"Where a creator(s) has been allocated shares under clause 3 of this Schedule [i.e., shares in a company or other entity into which the applicable IPRs have been licensed or assigned]:

(i) that Creator(s) will not be entitled [...] to any Net Revenue from revenue received by the university in relation its shareholding, including revenue received by the university from distributions, share sales or similar;
(ii) half of the portion of Net Revenue that would otherwise have been allocated to that Creator(s) will be allocated to the College and half will be retained by the university [...]."

South Africa – Stellenbosch University (SU). The SU TTO, Innovus, instead allows researchers to benefit from both equity and revenue sharing. The SU Spinout Information Guide[106] indicates that rewards are for different roles and that "participants in spinout companies are generally compensated for their contributions in one or more ways:

1. If a patent generates royalty income, a portion of the income goes to the researchers who made the invention for their role as inventors.
2. If a spinout company is established, the founders receive equity and any dividend payments and other income associated with their shareholding serve as reward for their role as entrepreneurs.
3. The employees of the spinout company receive salaries and sometimes bonus payments to reward them for their role in managing the company.

A fourth possible reward may be paid to researchers who consult to a spinout company as reward for contributing to the success of the company through transferring their knowledge."

2. Distributing revenues: which groups receive a share?

Distribute to research sponsors and partners: The funding used in the development of an invention may have an impact on the distribution of licensing income for that invention.

- Occasionally, some research grants require that revenues received from the licensing of technologies developed under that grant shall be used for further research and not be distributed according to the IP policy.
- Some non-profit funding foundations require a share of the license revenues. Usually, their share is taken off the top before any revenues are distributed according to the university IP policy.
- There may be requirements to split revenue with other institutions where the IP covered by the license was created by researchers at many institutions. Typically, the lead institution for licensing will first distribute the income between the institutions and then each institution will distribute according to its own policies.
- In such situations, universities should clearly communicate any stipulations concerning the distribution of licensing revenues to the researchers at the time a funding award is made or an inter-institutional or collaboration agreement is signed.

105 Massey University Intellectual Property Policy (2014), Schedule 5, Articles 2 and 3, pp.11–12.
106 Stellenbosch University Spinout Information Guide.

Examples of revenue-sharing policies with reference to obligations to sponsors and partners

United Kingdom – University of Glasgow. Article 6.1 of its IP policy[107] states: "For the purposes of this policy net income is defined as gross cash (milestone payments/royalties) paid by the licensee under the terms of a license agreement less any external legal, patent or other deductions. Examples of 'other deductions' include revenue-share obligations to research funders under their terms and conditions or to joint IP owners where there is an obligation to share revenue."

Distribute across the different groups at the university:

- Universities commonly distribute revenue from licensing activities to three groups: the specific researchers working on the project, the department(s) of the university where these researchers work, and the university as a whole.
- Revenues are often divided in equal thirds among these three groups. However, there is a great deal of variation among institutions on how the split is done.
- A number of countries have passed laws establishing minimal benefit-sharing systems. In this case, the university's benefit-sharing arrangements would have to be in line with the law.[108]

Within the researchers' group: who receives a share?

- Inventors and authors: The individual researchers involved in a successful project, generating income from a license agreement, will receive a share of the money. Sharing such income can be complicated. The researchers' share is often called the "inventor's share," since the named inventors on a patent or application are those to receive the money. There are several aspects that need to be considered in managing such a "share."
- Contributors: Financial incentives may also be designed for others who contributed in a very meaningful way but are not inventors. For example, a technician who performs GC-MS[109] analysis, tissue culture and DNA sequencing followed by cleaning up of the resulting sequence data. Universities often use the notion of "contributors" for two practical reasons: (1) to motivate these stakeholders to participate in the TT process and (2) to avoid contributors incorrectly being included as "inventors" on the patent or application, possibly leading to a patent challenge. The inventors typically work with the TTO to identify the contributors who should receive a share of any future income and identify them in the laboratory notebooks and disclosure forms.

Numerous questions can arise concerning researcher inventors and contributors:

- Software projects pose specific challenges when determining who is entitled to an allocation of benefits. For instance, Version 1.1 may have had five contributors, Version 2.0 an additional three and Version 3.0 may have been rewritten by a different team of four individuals. In terms of distributing licensing income from Version 3.0, how much should the Version 1.0 team receive?
- If a researcher, who is entitled to an allocation of benefits, retires, dies or otherwise leaves the university, the university needs a clear position on whether the allocation of benefits will continue and whether the royalty stream becomes part of the deceased's estate. Moreover, who bears the responsibility of maintaining contact? In the event that the university cannot reach the researcher, how long should they retain the funds before appropriating them for their own use? South Africa's IPR Act makes provision that benefit sharing continues even after the death of the inventor, and the benefit accrues to the deceased inventor's heirs.
- Researchers may choose to divert their personal share to their department research account, raising potential considerations regarding taxation.

107 University of Glasgow, Policy for Intellectual Property and Rewarding Participation in Commercialisation.

108 The Guidelines for Customization of the WIPO IP Policy Template and the WIPO Database of IP Policies contain examples of legislation and institutional benefit sharing formulas.

109 Gas chromatography–mass spectrometry (GC–MS) is an analytical method that combines the features of gas-chromatography and mass spectrometry to identify different substances within a test sample.

– Lastly, university research is increasingly collaborative, involving multiple departments, institutions and organizations. The contributors who receive a portion of the university's net income typically do not include external organizations.

3. Distributing revenues: linear or non-linear?

There are two basic ways to distribute the (net) licensing income among the different groups: linear and non-linear. These are shown in Table 3.

Table 3: Revenue-sharing models

Linear model		**Non-linear model**	
The revenue share to the stakeholders is set as a fixed percentage of revenue generated by an invention.		The revenue share to the stakeholders varies with the level of income.	
Fixed % applied under all circumstances.	Fixed % varies, depending on certain conditions (e.g., the amount of patent expenses, source of funding for IP generation).	Regressive for the inventor: the higher the revenues get, the lesser the share for the inventor.	Regressive for the inventor and also sliding scale (progressive to regressive) within the internal groups (school, department, university, etc.).

Linear model

In the linear model, a specific proportion of an invention's revenue is allocated to each of the categories; there may be only one set of fixed percentages or the set of fixed percentages to be applied may change based on certain circumstances (e.g., the amount of patent expenses, source of funding for IP generation).

Examples of linear revenue-sharing

Chile – Pontificia Universidad Católica de Chile.[110] The economic benefits that the university perceives as a result of the commercialization or exploitation of the IPRs, licensing, or any other way of industrial property rights commercialization, are distributed in the following way: a) 15 percent to the licensing office (TTO) handling the documentation and processing of the patent, licensing or IPRs, and b) The remaining part will be distributed according to the following proportions:

– Creator(s), investigator(s) or inventor(s): 50 percent
– Faculty, department: 30 percent
– University: 20 percent

Singapore – National University of Singapore (NUS)[111] divides net revenues according to a simple linear formula as follows:

– University member (i.e., the researcher): 50 percent
– Faculty (i.e., the researcher's department or center): 30 percent
– University: 20 percent

South Africa – North-West University (NWU) provides an example of a linear revenue-sharing arrangement where an initial amount is distributed before deduction of any costs, in accordance with the national legislation (see section above, page xxx, "Defining revenues"):[112]

The division of the first ZAR 1 million of income is made before the deduction of any expenses, that is, on the gross income:

– 30 percent to the inventors which is to be divided among them as per agreement;
– 20 percent to the focus area or school to which the project is linked (pro rata if more than one focus area is involved);

110 https://vicerrectoriadeinvestigacion.uc.cl/images/politicas_procedimientos/IP_Regulation_en.pdf
111 NUS IP Policy, Article H3.
112 Policy on the Management of IP at the NWU, Part 5.

- 20 percent to the faculty concerned (pro rata if more than one faculty is involved);
- 15 percent to the Incubation Fund of the university; and
- 15 percent to the Technology Transfer and Innovation Support (TTIS) Office.

Thereafter, any further income is distributed after the deduction of commercialization and patenting expenses, that is, on the net income. The same distribution percentages are used as above.

South Africa – Stellenbosch University distributes royalty income, according to their royalty distribution policy[113] as follows:

Less than ZAR 1 million income:[114]

- 25 percent of gross income to the inventors – shared equally between inventors unless otherwise agreed.
- Thereafter all direct costs relating to the process of protection and the process of commercialization and other costs agreed to be recoverable may be recovered from the gross income by the parties who incurred such direct costs.
- The balance of the "first tier" net income shall be allocated as follows:
  50 percent – SU's internal innovation fund
  50 percent allocated as follows:
  30 percent SU research account / 10 percent department / 10 percent faculty

Income greater than ZAR 1 million is distributed as follows: Direct costs are subtracted. The balance of the "second tier" net income shall be allocated as follows:

- 35 percent of the net income to the inventors
- 35 percent is allocated to SU's internal innovation fund
- 30 percent allocated as follows:
  10 percent SU research account / 10 percent department / 10 percent faculty

Non-linear model

In this scenario the amounts and percentages given to the different groups change depending on how much money the invention brings in. These are typically structured with high initial percentages to researchers which decrease as levels of income rise (regressive model). They may also include an initial cash amount to researchers as a direct reward.

The simplest formula is a sliding scale, whereby the percentage of the inventor decreases as more and more royalties are earned. UK universities typically follow such regressive models.

The most complex formula has a sliding scale between the inventor and the university, but the university also keeps a sliding scale within and among the internal groups eligible for royalty income.

The structure of the royalty scheme can have behavioral implications for researchers. When a regressive structure is in place, smaller-scale projects that are more achievable receive a higher percentage of royalties, while larger and more challenging projects receive smaller percentages. Such regressive royalty schemes may encourage scientists to prioritize smaller projects instead of potential breakthroughs. If the inventor is uncertain about the value of the technology initially, they are more likely to prefer these regressive schemes.

113 Stellenbosch University Royalty Distribution Policy.
114 As of November 2023, the exchange rate between the USD and South African Rand (ZAR) was USD 1 = ZAR 19.

Examples of non-linear revenue sharing

New Zealand – University of Massey.[115] Each year, the university will allocate a percentage of the net revenue received in that year in accordance with this clause. The percentage of net revenue allocated to the creator(s) and the applicable college, and the percentage retained by the university will depend on the total cumulative value of net revenue received by the university over the life of the commercialization up to the date of the allocation, as follows:

Cumulative net revenue (over life of commercialization)	Creator(s)	College	University
USD 1 to USD 15,000	100%	0%	0%
USD 15,001 to USD 50,000	50%	25%	25%
More than USD 50,000	30%	35%	35%

Where there is more than one creator, their percentage of net revenue set out above will be shared equally between them, unless they have otherwise agreed in writing.

United States of America – Temple University.[116] Depending on the amount of the university's share of net income, two scenarios are used:

University's share of Net Income is less than or equal to USD 500,000	University's share of Net Income is greater than USD 500,000
40% to inventors	40% to inventors
20% to OTT	20% to OTT
14% to department or research unit	4% to department or research unit
6% to college or school	4% to college or school
20% to university	32% to university

United States of America – University of Florida (UF).[117] All royalty payments are collected by UF Innovate, Tech Licensing. Distributions of income are made semi-annually. This allows the university to assure that all applicable licensing and related expenses have been accounted for. About any work or invention owned by the university, net income less any foreseeable development expenses UF deems necessary to defend or maintain the work or invention ("net adjusted income") will be distributed as follows:

For net adjusted income up to USD 500,000:	For net adjusted income USD 500,000 or over:
40 percent individual creator(s)	25 percent individual creator(s)
10 percent program(s)	10 percent program(s)
7.5 percent creator(s)' department	10 percent creator(s)' department
7.5 percent creator(s)' college	10 percent creator(s)' college
35 percent university	45 percent university

Department and college royalties must be used for research or educational purposes only and represent an important additional source of unrestricted funds for these entities. In the case of multiple inventors, Tech Licensing will divide the inventors' share equally unless all the inventors have agreed to a different allocation. In the case of multiple technologies licensed as a portfolio, Tech Licensing makes a good faith, reasonable determination of the relative value of each technology (often with input from the licensee) and allocates royalties among the various technologies.

Frequency

The frequency of payments to the researchers and distribution to departments must be made explicit in the university policy. As royalty statements, invoices and payments are made and received throughout the year, licensing income may be received at various points. Given the amount of labor required, care must be taken to balance the administrative costs of the system. In the above example of the University of Florida, payments are made twice a year: on or before June 1 and December 1.

115 Massey University Intellectual Property Policy (2014), Schedule 5, Article 2.1, p. 11.
116 https://research.temple.edu/sites/research/files/documents/otdc-invention_patent_policy_072216.pdf
117 UF Innovate Innovator's Guide, Article 8.

4. Slicing the pie: how much for the researchers?

The actual percentage offered to the inventors can vary significantly from university to university.

- A 30 percent to 40 percent part of the net license revenue is the typical revenue split given to inventors and creators. However, while some universities offer high percentages to faculty (up to 90 percent), others offer only modest rates (like 10 percent).
- As seen above, quite often those percentages are variable according to the amount of revenue generated by the invention (typically with a regressive rate, whereby the inventor's share falls as net returns increase).
- Various countries have adopted legislation that provides for minimum revenue-sharing arrangements. The university's revenue-sharing policies will in that case need to be compliant with such legislation.[118]

How to avoid disputes in the case of multiple inventors/authors/contributors.

Co-inventor scenarios. Faculty researchers often collaborate with different people. This results in a number of possible co-inventor scenarios:
- multiple inventors from one university (e.g., a faculty member and one or more graduate students);
- inventors from more than one university; or
- inventors from one or more universities and one or more persons or entities with independent ownership: companies, national labs, foundations, students, consultants or independent collaborators with no obligation of assignment.

Distribution of researchers' share: two models. The next question is what proportion does each person receive from the researchers' share? There are two possible ways to deal with this situation, and there are pros and cons to both models:[119]
- Equal among inventors. One possible default policy is that each inventor or contributor gets an equal share, unless they agree in writing otherwise. This may seem unfair if one inventor made a significantly larger contribution. However, it does prevent power disparities from influencing proper attribution to subordinate inventors.
- Inventors or contributors decide. The other common model is that inventors decide among themselves what their relative contributions might be. This is arguably a fairer approach if one inventor or others made unequal contributions to an invention. However, this model can be challenging if inventors do not agree on each others' relative contributions. In addition, when there are both faculty and non-faculty inventors involved, there can be a negotiation power imbalance. It is not uncommon for faculty researchers to deny that students are inventors, and students are likely to capitulate to university and faculty demands and wait until after graduation to bring any lawsuit.

The importance of accurate contribution assessment. The fact set of each individual's contribution will be critical in determining ownership and how revenues need to be distributed (who, when, where, relative contribution). In case of difficulty, the TTO can assist in managing the conversation. If the researchers are not able to agree among themselves, nor with some support from senior academic leadership or the TTO, then the matter can be referred to the university's dispute resolution procedures; this is often a sufficient disincentive to encourage amicable resolution. An alternative would be applying the default of sharing equally among all involved, although there is no logic to this, other than resolving the dispute. It is very sensible to include all these detailed points in the university's written description (IP policy or other) of how licensing income is managed.

Documenting contributor agreement. It is essential to write down the agreed contributors and the proportions each will receive and to have the form signed off by each of the contributors. It is essential to do this before licensing deals are signed, or else the university and

118 Examples of legislative provisions and of institutional benefit-sharing formulas can be found in the Guidelines for Customization of the WIPO IP Policy Template and the WIPO Database of IP Policies.

119 Source: Distance learning program "Revenue Splits for Multiple Inventors: How to Split the Pie and Prevent Future Disputes," Tech Transfer Central, Sept. 20, 2022.

TTO will not be able to distribute the money and aggrieved individuals can delay the distribution for everyone involved.

Detailed licensing revenue reports. When negotiating licensing agreements, it is important to get licensees to agree to a very detailed report on the revenue payments. If there are multiple pieces of IP licensed, it is preferable that the report details what specific licensed IP is practiced in the product, so that the university can properly distribute the revenue to the inventors concerned.

Examples of revenue-sharing structures between multiple inventors

South Africa – Stellenbosch University (SU) allocates 35 percent of the net income (if the income exceeds ZAR 1 million) or 25 percent of the gross income (if the income is less than ZAR 1 million) to the inventor pool, but leaves it up to the individuals to come to an arrangement on how that 35 percent will be split among them. In the absence of a subdivision, the default distribution will be an equal split among the inventors.[120]

South Africa – University of Cape Town (UCT) opted for a default "equal among inventors": "If there is more than one Creator in respect of any particular Intellectual Property, the allocation will be shared equally between them unless another arrangement has been reached by written agreement."[121]

United Kingdom – University of Glasgow opted for an "inventors decide" approach.[122] "If more than one individual is involved in the creation and exploitation of the employee IP, the employees involved are solely responsible amongst themselves for determining the distribution of the employee share of net licensing income. The University will not become involved in this determination. No distribution of employee net licensing income can be made until all the employees involved have reached an agreement and agreements are in place between employees and the University regarding these revenue sharing arrangements."

5. Slicing the pie: how much for the researcher's department?

As explained above, many universities practice a three-way split, where the inventors, the department or unit and the university share the revenue from commercialization. The department is typically given a share to compensate for the temporary loss of work force due to the researcher's involvement in commercialization.

Incentivized departments will be more inclined to be supportive of individual researchers in their endeavors towards commercialization. This support can take various forms, such as reducing teaching and administrative responsibilities and providing research support in cash or in kind. Research indicates that favorable perceptions of departmental support for TT and KE have a positive influence on individual researchers' intention to engage in such activities.

On the downside, uncapped payments to university departments can pose a substantial drawback. It is essential to maintain funding based on scientific merit and competitive standing. A singular success, rooted in work from years prior to the actual revenue generation, often has little to do with the department or school at the time of distribution.

6. Slicing the pie: how much for the university?

The university centrally will receive a share, usually into some category of "central funds" to be used at the discretion of the university governing body. Some universities specifically allocate a part of these funds for TT activities, or reward researchers whose efforts surpass the average.

120 Stellenbosch University Royalty Distribution Policy.
121 UCT IP Policy, Article 14.2.
122 University of Glasgow, Policy for IP and Rewarding Participation in Commercialisation, Article 6.1.1.

Examples of IP policies that explicitly state what the money generated from TT will be used for

Israel – Tel Aviv University

- 40 percent of the total net receipts will be allocated to the relevant inventors of the inventions. […]
- 60 percent of the total net receipts will be given to the university. From the amount given to the university, one third (20 percent of the total net receipts) will be dedicated to research purposes: half of this amount (10 percent) will be allocated to the R&D vice president's budget for research infrastructure development and financing; the second half (10 percent) will be divided among relevant inventors who are senior academic staff members or active researchers at the university. The distribution will be based on their proportional contribution to the relevant inventions and will serve as a research budget.[123]

United States of America – University of California, San Francisco (UCSF)

According to UCSF's IP policy,[124] income generated from technology transfer will be allocated in the following manner:

- 35 percent of the net income will be distributed to the inventor(s) and their department(s) for research purposes, scholarships and awards.
- 15 percent of the income will be allocated to the university's Research and Development fund for further research and development activities.
- 25 percent of the income will be distributed to the campus.
- 25 percent of the income will be distributed to the inventor's school.

Allocation in research accounts

Many researchers are interested in benefiting from funds allowing them to pursue no-strings-attached basic research activities. Some universities capitalize on this strong incentive by allowing researchers to divert their shares of incomes into their personal research accounts, to be used for furthering their research (see also the section, "Additional research funds"). The researchers benefit from putting their money into a research fund because research funds are usually exempt from taxes and other deductions.

Examples of universities that allow allocation in research accounts

- **Belgium – KU Leuven** has initiated a unique approach to promote KE activities by creating individual researcher accounts: "For each member of the research group we have a certain account which he can use to structure one's own activities. All commercial income (contract and collaborative research with companies, consultancy done via the university, the part of licensing income that belongs to the university, etc.) goes in to this account. The professor can thereafter decide how and where to invest – e.g.: into new IP, staff, or lab equipment for further developments. This individualized approach for getting money from IP generation is an incentive on both a structural as well as an individual level, as such account can be set up for one specific faculty member, but also for a group of faculty members, even belonging to different faculties – thus also facilitating interdisciplinary activities."[125]

Other examples include:

- Most UK universities
- South Africa – University of South Africa (UNISA)[126]

123 https://ramot.org/uploads/TAU-PATENT-REGULATION-ENGLISH-VERSION.pdf

124 https://innovation.ucsf.edu/policies#:~:text=Invention%20Income%20Distribution,the%20inventor%20share%20of%20income

125 Unilink (2009). A Comparative Analysis of Institutional Innovation and IP Policies, Strategies and Practices, Results of the Micro-Level Analysis of the IP Unilink Project, p. 52; and Paul Van Dun, General Manager, LRD.

126 IP Policy of UNISA, Article12.2.1.b.

– Switzerland – University of Geneva – see also their creative way of redistributing licensing revenues by matching the researchers' share.

Example of a university that does not allow such allocation

– **Israel – Weizmann Institute of Science** sticks to a very conservative policy. Commercial success cannot be directed to support specific research in any lab. The proceeds are divided between the institute and the inventors, but the inventors are not allowed to contribute a share from their personal gain to their laboratories. The laboratories have to keep their focus on curiosity-driven science and to seek support through competitive grants.[127]

Royalty monetization

It is possible to sell a future royalty stream for up-front cash payments.[128] There are a number of specialist investment funds set up to purchase royalty streams. These investment funds have developed sophisticated models to offer to purchase some or all of the royalty beneficiaries in the university – the individuals or the institution. It is sensible for a university to be open to considering approaches from royalty monetization firms, rather than an unwillingness to engage, whatever the decision taken.

Good practices for revenue sharing

Compliance with national legislation: Universities should adhere to the revenue-sharing requirements outlined in national legislation, if applicable.

Clear communication and clarity in the ground rules around revenue sharing are essential.

Definition of inventors and contributors: The university should have well-defined rules for defining and identifying "inventors" and other "contributors." The use of laboratory notebooks, invention disclosure forms and databases can be helpful in this regard.

Definition of net income and deductible expenses: Each TTO should determine which costs may be deducted from commercialization income before distribution. The definition and calculation of net income should be clearly described in an IP policy or similar document.

Tax considerations: In many jurisdictions, revenue sharing from commercialization can be considered taxable income for the recipient. Researchers need to be made aware that they may need to report such revenues on their tax returns and may have to pay taxes on this income.

Behavior considerations: Revenue-sharing policies should anticipate the behaviors they will encourage, such as licensing or spinout activities, and take into account that returns can often be small but on occasion can be significant.

Revenue-sharing approach: A strategy that is gaining popularity is as follows: first, give a portion of the gross revenues directly to the individual inventor as a direct incentive;[129] then, let the TTO recover external costs; and after these two steps, distribute whatever is left among the researchers, the department and the university or TTO.

127 Granot-Mayer, G., K. Ku and L. Mieville (2019). Licensing invention patents: the challenge of TTOs. *les Nouvelles – Journal of the Licensing Executives Society*, LIV(2), June, 93–96. https://ssrn.com/abstract=3380413

128 Royalty monetization involves the sale of future royalty streams for upfront cash payments. This approach provides the holder of the royalty with an immediate infusion of capital, while the purchaser of the royalty hopes to receive steady future returns. Investment funds or companies specializing in royalty monetization play a crucial role in this ecosystem. They have developed sophisticated valuation models to estimate the future revenue streams of these royalties. These models often consider factors such as market potential, historical revenue data, growth projections and other industry-specific metrics.

129 To reduce the time lag between invention and reward, some universities use a revenue-sharing formula based on gross rather than net returns. But, in this case, the university will be assuming a higher level of risk.

Determining fair share: Each university must decide what constitutes a fair share for researchers and what it can afford to pay. The shares may vary within the university depending on norms, practices and motivations across the research community. Sometimes universities are changing their attitudes toward the share distribution for researchers:

- Some universities used to fight for a high share for the university (and a low share for the researchers), being overexcited about the possibilities to generate huge revenues. Later, when they realized it was almost certainly not going to happen, they modified their IP policies to give a higher share to the researchers.[130]
- Other universities, instead, have shifted from sharing a high percentage to a lower percentage for the researchers.[131] They seem to question the notion that increasing the inventor's share incentivizes commercialization. Such universities find it preferable to retain a larger share of royalties, and then reinvest this money in science research and education.

Distribution among joint inventors: Clear guidelines should be established on how the inventors' share will be distributed among joint inventors, along with a corresponding dispute resolution policy. Options include:

- share the revenues equally among all named joint inventors on a patent;
- distribute revenue based on each inventor's individual contribution;
- let the joint inventors decide among themselves what they believe is an equitable distribution; or
- allocate a larger percentage to the principal investigator to recognize their work and encourage disclosure.

Understanding researcher preferences: Ultimately universities need to understand the preferences and motivations of their researchers, considering financial versus non-financial, short-term versus long-term goals, impact versus prestige and so on. Universities should not assume that preferences will be similar between institutions or across all departments within the same institution. Internal surveys and questionnaires (see Annex B) can be used to gauge preferences and design appropriate incentives.

Education and explanation: Researchers should be informed on why a particular revenue distribution policy has been adopted, and what other sources of income or other incentives the university offers.

Performance-based payments

Sharing commercialization revenues serves as a direct incentive for licensing, but it might be a while before royalties start flowing. To encourage researchers who have played a pivotal role in the early stages leading to licensing and to sustain their zeal, several universities provide additional compensation over and above their regular salary, for those whose contributions or performances stand out, especially in areas such as disclosures, patent filings and granted patents with licensing potential.[132]

Different reward structures may be considered, based on the nature of the activity and effort required by the researchers concerned.

130 For example, the University of Iowa switched from 25 percent to 100 percent of initial patent revenues in 2005. Ouellette, L.L. and A. Tutt (2020). How do patent incentives affect university researchers? *International Review of Law and Economics*, 61(March), 105883. www.sciencedirect.com/science/article/pii/S0144818819302522.

131 For example, the University of Washington switched from sharing 100 percent of initial revenues to a flat rate of 33 percent in 2004.

132 Increasing researchers' salaries would be the most straightforward financial incentive, but in terms of encouraging licensing this approach is not effective, as the rewards are not explicitly linked to the success of the venture.

Note of caution

It is worth mentioning that several TTOs are skeptical about such performance-based or result-driven payment incentives for researchers, fearing they might encourage researchers to promote subpar work, placing TTOs in a challenging situation. Thus, if performance-based payments are introduced, it is crucial to ensure they promote the right work behavior.

- Performance-based rewards need to be accompanied by transparent and clearly defined criteria on which researchers' performance will be gauged.
- The amount of the reward should be directly linked to the specific criterion being used. For example, universities that give a reward for completing an invention disclosure may offer a slightly larger reward for a patent application, still a larger sum when the patent is issued and an even larger sum when there is a license deal associated with the patent.
- Careful consideration should be given to ensure that adverse behaviors are not incentivized through indiscriminate use of financial rewards or by setting them too high (as discussed in Chapter 2.2 above). For instance, offering high rewards for filing patents may lead to filing of low-quality patents. Closely monitoring researchers' activities can minimize the likelihood of such adverse behaviors.
- Before implementing performance-based rewards, an assessment of equality, diversity and inclusion should be conducted to ensure fair distribution (e.g., to avoid only benefiting senior male white professors).

Financial incentives to encourage spinouts

Universities are increasingly promoting the creation of spinout companies to bring new technologies and solutions to the market. However, to encourage researchers' active participation in spinouts, universities must also provide the right incentives. In this section, we explore the financial incentives that universities can employ to support their researchers in this exciting journey. A more comprehensive overview of recommendations for using incentives to promote spinouts is also provided.

Spinout dynamics in a nutshell

When a spinout is established, it usually starts with a specific number of shares divided among its founders, which might include the researcher or inventor, the university and maybe early employees or initial investors.[133]

- The university typically acquires initial shares (formation equity) in the spinout. This equity recognizes the innovative ecosystem developed by the university, its contributions as an employer and manager of the laboratory and research facility, and the support it provides to academics to develop the technology and business. The university's formation equity share varies very widely, ranging between 5 percent and 50 percent or more.[134, 135]
- The inventors or researchers are usually given academic founding equity in the spinout. While most researchers continue their academic roles at the university and define their roles in the company through consultancy agreements, some might opt to leave the university and fully commit to the spinout, rendering consultancy agreements unnecessary. The section "Slicing the pie" discusses whether academic researchers are allowed to receive such founder equity and explores the appropriate amount they should be granted.
- Employees of the spinout can be given an option scheme (spinout team options).

When the spinout issues new shares to raise capital, existing shareholders see a reduction in their ownership percentage, a phenomenon known as "shareholder dilution."

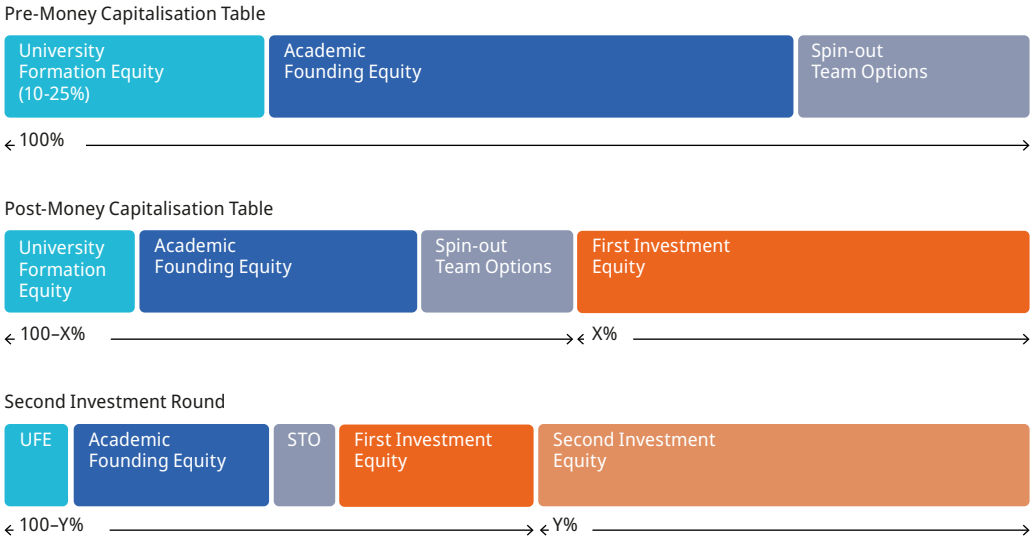
133 TenU. University Spin-out Investment Term (USIT) Guide, https://ten-u.org/news/the-usit-guide.

134 TenU has designed a Quick Start Guide to University Equity Stakes in Spinouts, outlining the main reasons why there is no one-size-fits-all approach to sharing equity from a university's perspective, and why in fact most of the approaches taken are often more equivalent than they would appear. The TenU University Spinout Investment Terms (USIT) Guide 2023 offers common negotiation approaches to help accelerate spinout formation deals. The guide recommends that the pre-investment equity "landing" zone position for a university that is supporting a spinout company with a license of a foundational piece of technology be between 10 percent and 25 percent of the company.

135 The prevailing sentiment among most universities is that anything above a 30 percent stake is exceedingly high. Such a sizable share might complicate future financing rounds or potentially leave insufficient equity to motivate the founders.

- New shares are allocated to the investors (investment equity), which dilutes the ownership of the original shareholders. This change impacts factors such as control, voting rights and the value of one's shareholding. With each subsequent investment round, more shares are given to the new investors, leading to further dilution for the existing shareholders.
- While dilution might sound negative, it is essential to remember that, ideally, the company's value increases during the course of its development. Thus, even though the existing shareholders own a smaller percentage of the spinout after each investment round, the value per share and the total worth of their shares may consistently grow.

Figure 5: Distribution of shares and dilution



Source: TenU University Spinout Investment Terms (USIT) Guide 2023.

Founder shareholding

Can researchers be founder shareholders in spinouts?

- The rules governing the financing, equity ownership and reward structures of spinouts vary among universities and countries. In some countries, academic researchers cannot own shares in spinouts.[136] In other countries they can, and many universities give the academic founders equity in the spinout, to recognize their contributions.
- Occasionally, universities might ask academic inventors to waive their right to a portion of the licensing revenues if they hold direct founding equity in the spin-off (see also "Defining revenues"). However, this is not a universal approach.
- If the researcher is a shareholder, they can hope for personal gain through dividends or added value in capital in case of stock market flotation or acquisition by a large company.

Reasons universities award equity to academic researchers

1. Recognition of intellectual contribution: Often, the foundational idea or technology for the spinout stems directly from the academic researcher's work. Equity is a way to recognize and reward this foundational intellectual contribution.
2. Retention: Equity can act as a retention tool. Researchers are more likely to stay involved and contribute to the spinout's success if they have a significant equity stake that might appreciate in value.

136 The main reason is that COIs may arise if the inventor is involved at the same time in the spinout and the university. In some countries, researchers are not allowed to maintain their civil servant status during their involvement in a spinout. For example, until 2017, researchers working in universities in Colombia were forbidden by their status to undertake activities in the private sector. If they wanted to create a company, become shareholders in a spinout or belong to a company board, they had to resign from public service and to give up their privileges as a civil servant. This was obviously a strong disincentive to any entrepreneurial behavior. The law 1838 of 2017 changed this situation and empowered universities to create spin-offs, with the active participation of researchers who can receive equity (https://minciencias.gov.co/normatividad ley-1838-217).

3. Risk compensation: Spinouts are inherently risky endeavors. Equity serves to compensate the researchers for the risk they take on by investing their time and intellectual capital in an unproven venture.
4. Market norms: It is a common practice in the startup ecosystem for founders, which includes researchers in the case of academic spinouts, to receive equity. This standard has been established as a fair practice and is therefore expected by many involved in the creation of such companies.
5. External stakeholder expectations: External stakeholders, such as venture capitalists, often expect that the key people driving the company's technology and vision (i.e., the academic researchers) will themselves have invested in the project.

Distribution of initial equity: how much should the researcher get?

There are many discussions about how many shares the founding researchers should receive at the start. Universities do not always have a fixed stipulation for the distribution of initial equity. The inventor's share is usually decided on a case-by-case basis. Factors that may play a role in the decision are:

- the roles of the individual researchers in the company;[137]
- the type and novelty of the IP, and the maturity of the technology;[138]
- the amount of help the founders will get from the TTO;
- the terms of the license agreement;[139]
- the terms and conditions of third-party funders of the research that led to the technology;
- the chance of the spinout company and investors to grow value; and
- the extent to which the researchers will be able to make follow-on investments,[140] so that they can maintain their shareholding and avoid dilution.

As the company grows, the original percentage of the researchers' equity will, if they do not invest more, dilute[141] over time (for example, the founding researchers may start with 40 percent and end with 5 percent). Researchers should be informed about the implications when participating in such ventures.

Here are several recommendations for allocating researcher shares in spinouts:

- Allocate a percentage of shareholding for the founding researchers which is generous enough to provide them with a strong incentive, but ensure that the people needed for the spinout's future success (employees) are also appropriately rewarded.
- Keep equity ranges negotiable instead of having fixed levels that cannot be deviated from. Every spinout case is unique and complex, so negotiable equity shares allow better to adapt to the circumstances and be fair to researchers, funders and the university.
- Encourage academic founders to take tax advice in relation to any tax consequences.
- Regardless of the chosen approach, it is important to engage in transparent discussions regarding equity allocation. This ensures that all involved reach a fair and mutually acceptable agreement. It may be helpful also to have a spinout guide[142] or online FAQs (frequently asked questions).

137 Active founder researchers may receive a larger equity portion and could also have opportunities to acquire more shares over time, either by reclaiming initial shares, by augmenting them or through an employee stock option plan (ESOP).

138 In most cases, more pre-investment equity will be held by the founders than the university. For spinouts that have minimal IP assets, the majority of equity leans towards the founders. Conversely, for spinouts possessing advanced technologies and a wide IP portfolio, the equity distribution tends to lean more towards the university. See USIT Guide, p. 41.

139 The terms of 1) the investment and equity for spinout formation and 2) the university-derived IP license are closely intertwined, often complementing or counterbalancing each other. Collectively, they represent the perceived value of the deal. However, the equity distribution and IP licensing terms are typically documented in distinct agreements and may be discussed by different university teams. See USIT Guide, p. 34.

140 Follow-on investments refers to additional investments made by an investor (in this case, the founder researchers) in the spinout company following their initial investment. Pre-emptive rights give existing shareholders (in this case, the founder researchers) the first option to buy any new shares the company issues, usually in proportion to their existing ownership, before the shares are offered to external investors. The main goal is to allow the researchers to prevent dilution of their ownership percentage when new shares are issued. Of course, the ability to make a follow-on investment assumes that the founders have the necessary funds to do so.

141 The concept of shareholder dilution is explained in the section "Spinout dynamics in a nutshell".

142 The WIPO IP Policy Database contains examples of such spinout policies and guidelines.

TTOs appear to adopt different strategies regarding the equity share allocated to researcher inventors, as highlighted in the two extended remarks shown.

"In our experience in the UK, the rate of university spinout formation increases when all the parties involved can see enough benefit to encourage them to form the spinout. Management teams, investors, founder researchers, and universities are all essential, and all need a share. In 2023, an international group of leading universities launched the widely-consulted University Spinout Investment Terms (USIT) guide which sets out a 'landing zone' for expected equity and licensing terms for university spinouts in the UK. The guide sets out a typical pre-money equity position for the university of 10-25% with no antidilution provisions, with the remaining 90-75% for academic and other founders.

In 2021 Oxford moved to a fixed 20% for the university in nearly all cases (pre-money, with no antidilution provisions) in support of the University's aim to foster innovation and entrepreneurship in order to maximise the global impact of the University's research and expertise. This fixed position provides upfront clarity to researchers and investors about how equity is shared."
Mairi Gibbs, Chief Operating Officer,
Oxford University Innovation

"Equity and royalties are balanced. The more equity is given, the lower the royalties are. This may change the distribution between the university and the researcher. I do not understand the approach to granting significant equity positions to the scientific founders that stay in academia. I would recommend the opposite. If you need future engagement – give equity through consultancy."
Gil Granot Mayer, Executive Vice President of Technology Development and Innovation,
Okinawa Institute of Science and Technology Graduate University (OIST)

From an incentives perspective, it is important to have a clear approach agreed upon by the university, not the TTO alone. Researchers will be influenced by their perceptions of where financial value may come from, the timescales involved, their ability to avoid shareholder dilution by themselves making follow-on investments and how involved they may wish to become in the company.

Examples of distribution of equity shares in spinouts

There is no magical or universally adaptable formula for the distribution of equity shares among founders. Several factors must be considered and harmonized. Nevertheless, we offer the following examples by way of illustration.

Belgium – KU Leuven. The university's FAQ on Spin-offs[143] state: "In exchange for the scientific and technological know-how that is brought into the spin-off company, a number of company shares are awarded to the company founder(s) as individuals and to the research group as a whole. The amount of shares that is awarded to both parties depends on a number of factors, such as:

- the uniqueness and market potential of the knowledge, intellectual property or technology that is brought into the company;
- whether or not the intellectual property is protected through patents;
- whether or not commercial contracts are transferred to the company;
- the composition of the management team; etc.

An additional factor consists of the so-called 'time to market' – that is, the time that is necessary to translate the knowledge into marketable products or services. If the time to market is relatively long and a significant amount of additional research still has to be conducted, the uncertainty and risk involved will be higher and the valuation of the intellectual property will consequently be lower."

143 https://lrd.kuleuven.be/en/spinoff/faq-spinoff#benefits

Switzerland – ETH Zurich. Article 6 of ETH Zurich's Spin-off Guidelines[144] outline how equity stakes are allocated to researchers who have contributed to the creation of spinout companies. The guidelines ensure that researchers are appropriately rewarded for their efforts in translating research into commercial applications.

Article 6.1: "It is permitted for professors to participate in the company as private individuals using their private funds either directly (e.g., via shares) or indirectly (e.g., via options, convertible loans). The amount of the participation that a professor may have in a spin-off company at the time of incorporation is limited to a maximum of 20%. If more than one professor participates in the spin-off company, the overall participation of all professors is limited to a maximum of 30%. Furthermore, the professor or professors may not hold any preferential rights vis-à-vis the other founders at company incorporation. If there are no investors involved, it is recommended that the operational team owns the majority of shares at company incorporation."

United Kingdom – Imperial College London (UCL): UCL previously experimented with a Founder Choice Program, offering researchers a menu of support options with equity percentages tied to their choices. This approach had mixed results, as some researchers initially opted for minimal university support only to later seek additional assistance. However, effective from Aug. 1, 2023, significant changes have been introduced to the program. Academic and research staff interested in forming spinout companies can now do so immediately, without the need to select from various support levels. Instead, all founders will receive personalized guidance and tailored support to meet their specific needs. In a bid to encourage entrepreneurship, academic founders can now retain up to 95 percent of the founding equity in new spinouts. Additionally, they can benefit from technology licensed to these spinout companies through the Rewards to Inventors scheme, bolstering the university's commitment to fostering innovation and entrepreneurship.[145]

United Kingdom – University of Edinburgh. The share of the founders is decided case by case but typically the university's own share would be equal to that of the academic founders.[146]

United Kingdom – University of Glasgow (GU). Article 6.2 of the IP policy gives a large share of spinout founding equity to the founding researchers, but they cannot accumulate equity with a share of university licensing income:

"1. Founding equity will be shared [...] as follows: University (held by and GU Holdings Ltd) receives 30% shareholding and University Employee Founders 70%. Variations:
   (i) Initial shareholdings may vary where third party rights or joint IP needs to be taken into account (in which case the holder of the joint IP may require a share of the founding equity).
   (ii) The University's policy for founder equity in any spin-out companies may be subject to negotiation under exceptional circumstances. In these instances, a robust case must be made to the VP (Corporate Engagement & Innovation) stating the grounds for requesting a variation to this policy.
4. Employees who receive founder shares will not be entitled to receive a share of any University licensing income. However, employees involved in the creation of the employee IP being exploited but who are not receiving founder shares, may be entitled to share in University licence income [...].
6. Employee founders and GU Holdings Ltd. will dilute their shareholdings pro-rata to engage/reward executive talent; to create share option pools to reward/incentive company staff; and accept investment."

For existing practices in the United Kingdom, with some international comparisons, see the Study on Best Practice in Equity Stakes for University Spinouts.[147]

144 https://ethz.ch/en/industry/entrepreneurship/spin-off.html
145 www.imperial.ac.uk/news/246584/imperial-announces-improved-founders-choice-programme
146 University of Edinburgh Spinout Support Guide, Article 2.2.
147 IP Pragmatics Policy Information Study, February 2020, Commissioned by Research England.

Other financial incentives for spinouts

Receiving fees as a director of the company
Researchers who are founders of spinout companies may become directors of the board of the company and may receive a payment as a director. These payments are usually modest for early-stage companies. COI must be addressed, and the integrity of research should remain uncompromised.

Receiving consultancy fees from the spinout
Similarly, researchers who establish spinout companies may become consultants to the company and be compensated for their services. It is essential to address this during the spinout's formation to ensure transparency for all involved, particularly investors who should be at ease with this arrangement. Additionally, it is crucial to be aware of the university's related policies, ascertain who has the authority to make the decision, and ensure COI is appropriately managed.

Founders' own research benefiting from research funding by the company
Researchers' own research projects can directly benefit from research funding provided by the spinout company. Such funding can be used to support research activities within the founders' laboratories. Although significant COIs need to be carefully addressed, this arrangement can serve as a compelling incentive for researchers to actively participate in spinouts.

Financial incentives to encourage other engagement

This section deals with incentives to encourage all knowledge-related interactions between academic researchers and external parties, other than the conventional practices such as patenting, licensing and spinout activities, which we discussed above. Examples are externally funded contract research, consultancies, continuing professional development (CPD) activities, access to IP of other institutions, networking and ad hoc advice. Properly incentivizing researchers is of paramount importance in academic engagement, as the activities often entail significant financial implications for the university.[148]

Fees from consulting

As outlined in Chapter 4.2, the ability of researchers to consult with industry partners is primarily contingent on the policies set forth by their respective universities. While many universities do permit and even encourage such engagement, seeing the potential for KE, TT, collaborative research and funding opportunities, it is not a universal practice. Each institution typically has a unique set of policies and procedures that govern these activities, which require balancing potential COIs and commitment.

In situations where consulting activities are permitted, practices can vary significantly in terms of the percentage of consultancy earnings that a researcher is allowed to retain as personal income.

- Some universities allow researchers to keep all their consultancy earnings, while others implement a profit-sharing system where a portion of the consultancy fees must be shared with the university.
  - This sharing can employ a non-linear scheme; researchers are allowed to retain 100 percent of their income up to a certain threshold, and any earnings beyond this limit are shared with the university at a set percentage.
  - In other countries, such as the United Kingdom, a common approach is for the university to charge a fixed management fee. The non-linear model is not common in the United Kingdom.
- How the university's share in consultancy or contract research income is determined usually depends on the specifics of the academic's employment contract and the degree to which university facilities are utilized in the research or consultancy.

148 Perkmann, M. *et al.* (2021). Academic engagement: a review of the literature 2011–2019. *Research Policy*, 50(1), 104114. www.sciencedirect.com/science/article/pii/S004873332030189X

- Additionally, some universities may restrict the types of services for which consulting fees can be charged.
- It is also worth noting that when researchers consult for industry, they either do it as independent contractors[149] or, in the case the university manages the consulting agreement, as university employees,[150] not as representatives of their university. This can have important legal and financial implications.

Furthermore, researchers should be aware that national legislation can also impose constraints on consulting activities, meaning external legal factors can shape these practices alongside university policies.[151]

Examples of regulations regarding consultancy fees

Various universities have specific guidelines or regulations in place that dictate how consulting fees should be determined and allocated.

Australia – University of Queensland upholds a comprehensive policy framework to oversee its external consulting activities, encompassing key documents such as the Intellectual Property Policy and the Research and Consultancy Costing and Pricing Procedure. This policy framework provides a structured foundation for addressing various aspects of consultancy, including revenue-sharing arrangements. The specific revenue-sharing percentage is determined on a case-by-case basis.[152]

India – Babasaheb Bhimrao Ambedkar University has detailed rules for consultancy fees:

"4. Permission to undertake consultancy work up to 1 lakh rupees may be given by the officer in charge of the Liaison Cell (CIIPP) on the recommendation of the Head of the Department or by any another person authorized to do so. Consultancy work of above 1 lakh of rupees shall be approved by the Vice Chancellor.

4.1 The total annual income of an individual from consultancy work shall not exceed his/her total emoluments for six months in the Calendar year.

6. All payments will be received by the University under a separate budget head of 'Consultancy Services'.

9. The distribution of consultancy amount received will be as under: 9.1 In case of advisory Consultancy, 50% of the amount received [...] (cost of consultants' time, including intellectual fee) will be paid to the consultant(s) and 50% will accrue to the University. 9.2 Similarly, in case of Service Consultancy, 50% of the amount received [...] will be paid to the consultant(s) involved and 50% will accrue to the University."[153]

149 In the case of private consultancy, staff members act as individuals and not as agents of the university. The contract is between the client and the individual member of staff. The staff member is personally liable with regard to any claims arising from the work. Usually permission must be sought prior to undertaking personal consultancy to ensure that there is no COI. There are often a number of conditions in relation to private consultancy (such as no use of facilities, consultancy work must be undertaken in the staff member's own time, etc.).

150 In the case of university consultancy, the contract is between the university and the client, and the academic consultant acts as an authorized agent of the university. The university carries out the contractual arrangements and typically provides the member of staff with indemnity insurance.

151 A number of factors can come into play: (1) COI laws: Many countries have laws designed to prevent COI, particularly when public funds are involved. Researchers may need to disclose their consulting activities and, in some cases, may need to seek approval. (2) IP laws: Researchers must be aware of the laws that govern the use and sharing of IP. If they are consulting in an area that is related to their academic research, they need to be cautious about not infringing upon the IP rights of their university. (3) Employment laws: Some countries have strict laws about what constitutes full-time employment, what other activities employees can engage in, and how much they can earn from other sources. (4) Government research funding: In countries where academic research is heavily funded by the government, there may be additional restrictions on consulting activities to prevent COI and to ensure that the funded research is the researcher's primary focus. (5) Ethical guidelines: Some nations have specific ethical guidelines for researchers, which can influence the possibilities for consulting. Universities and researchers are advised to fully understand these legal aspects and, if necessary, seek legal advice to ensure compliance.

152 https://ppl.app.uq.edu.au/content/4.30.01-intellectual-property-policy#Policy; https://ppl.app.uq.edu.au/content/research-and-consultancy-costing-and-pricing-procedure

153 www.bbau.ac.in/dept/ciipp/Rules%20for%20Consultancy%20work.pdf

India – Jawaharlal Nehru University (JNU). Article 6 of the Academic Rules and Regulations[154] state: "The faculty members may be allowed to accept consultative or similar assignments subject to the following conditions: 1. The Vice-Chancellor would examine each request for permitting a member of the faculty to accept a consultative or similar assignment keeping in mind that the proposed assignment would be in the interest of the university in the long run and will not adversely affect the faculty member's work at the University; 2. They may be allowed to retain a fee up to 30% of their basic pay in a year, and if the fee received in any year is in excess of the 30% ceiling limit, the excess should be shared by the faculty members and the University in the proportion as given below: [...]"

Ireland – Dundalk Institute of Technology (DKIT) aims to encourage and reward all participants involved in consultancy projects and, to do so, DKIT has put in place a specific income distribution process that considers the institute's expenses. It is important to note that DKIT retains the flexibility to tailor income distribution on a case-by-case basis. These decisions are reached through discussions involving the consultant, head of school or department, DKIT's TTO, and the vice president for finance and corporate affairs (or their representatives), ensuring that the distribution aligns with the unique circumstances and needs of each project.[155]

Qatar – The University of Qatar allows faculty members on a full-time appointment to engage in consultancy for maximum one working day per week, and to retain the monetary reward.[156]

United Kingdom – Universities in the United Kingdom often provide support to their staff to negotiate consulting agreements and may keep a percentage of the fees.

- **University of Essex:** The university differentiates between two types of consultancy channels: university consultancy and private consultancy. In the case of university consultancy, Essex's Consultancy Policy[157] states that "Engagement in consultancy activities should provide a financial incentive for the consultant [...]. Therefore the University [...] allows for the individual consultant to receive 100 percent of the consultancy, once all costs have been recovered." In the case of private consultancy, the "University makes no claim on any money earned by staff undertaking Private Consultancy, although any use of University services, facilities or staff-time will have to be paid for."
- **University of Oxford** has a policy on consultancy that allows staff to do consultancy of up to 30 days per annum, either privately or via Oxford's wholly owned subsidiary, Oxford University Innovation (OUI). If staff undertake consultancy privately, they must get permission but can retain 100 percent of the fee unless they need to pay for use of facilities. If they consult via OUI, a fee of 10 percent is retained by OUI and the balance gets paid to the staff member.

United States of America – Several universities in the United States permit faculty researchers to engage in consulting work for external companies, provided it aligns with their obligations to the university. These obligations typically include adhering to COI policies and IP policies. Although there is often a restriction on the number of consulting days allowed (typically one day per week), many universities do not intervene in determining the consulting fees.

- **Penn State University**: "The University will not comment on or offer input regarding the rate of compensation or the tax consequences associated with faculty consulting activities."[158]
- **Northwestern University**: "Northwestern considers consulting activities to be private endeavors between the faculty member and the outside company. Accordingly, consulting agreements are private agreements between the consultant in their individual capacity, and the university does not review, approve, or disapprove, or provide legal advice for these agreements."[159]

154 www.jnu.ac.in/sites/default/files/ACADEMIC_RULES_REGULATIONS.pdf
155 www.dkit.ie/assets/uploads/documents/Policies-and-Guidelines/Regional-Development-Centre/Dundalk_Institute_of_Technology_Consultancy-Policy.pdf
156 See WIPO Database on IP Policies, Consulting Policies, Qatar.
157 https://www.essex.ac.uk/staff/knowledge-exchange-and-commercialisation/academic-consultancy-with-external-organisations, 2016.
158 Penn State Altoona Guidelines for Faculty Consulting Agreements.
159 Northwestern guidelines on University Faculty Consulting Agreements.

The WIPO IP Policy Database provides a list of faculty consultancy guidelines and policies from universities all over the world.

Fees from other academic engagement activities

Universities may have regulations comparable to those governing consulting when it comes to other academic engagement activities, such as faculty researchers engaging in external contract research or teaching continuing education courses.

Examples of regulations regarding fees from other activities

Kenya – University of Nairobi has regulations for externally funded research contracts. While the specific provisions may differ depending on the contract, the university generally encourages faculty members to allocate a portion of the revenues obtained from externally funded research projects towards supporting research-related activities and infrastructure within their departments.

United States of America – The University of Utah permits full-employment faculty to engage in academic outreach and continuing education up to 38 contact hours per semester, and does not seem to interfere with the fees.[160]

160 The University of Utah Policy 5-204: Remunerative Consultation and Other Employment Activities.

3 Setting up an incentives program for TTPs

The main reason for providing incentives to TTPs differs significantly from the motivations for academic staff. Similar to employers all over the world, universities are struggling with an increase in employee turnover and staffing shortages in their TTOs, a phenomenon referred to as the "Great Resignation."[161] This trend involves individuals leaving their jobs in search of better lifestyles and better financial prospects, resulting in challenges for employers to find suitable replacements.

In response, universities must devise new strategies for recruiting fresh TTPs and retaining existing employees. This is particularly important given the time it takes to train TTPs, and their role in building trust with the researchers and other stakeholders in the innovation ecosystem. These strategies may include measures such as peer recognition, increased flexibility for remote work, training opportunities and innovative approaches to offering higher salaries or fringe benefits. We first analyze the underlying motivations, followed by an examination of various potential incentives.

Motivations and drivers, inhibitors and barriers

By understanding the motivations and drivers for TTPs to stay in the TTO rather than transitioning to the private sector, where they may receive better salaries, universities can develop targeted strategies and incentives that address their needs. If these staff members leave, the TTO may experience a significant loss of institutional knowledge, making it challenging to maintain continuity and effectively support future TT initiatives. Consistency in personnel also strengthens relationships with industry partners and faculty researchers, and enhances the reputation of the TTO as a reliable and trusted intermediary.

Insights on various issues have been derived from the WIPO Survey (Annex C) and several other surveys:

Perceived enhancement of research: TTPs, more so than researchers, believe that TT enhances the quality of research.[162]

Incentive impact: Stronger internal and external motivations correlate with higher levels of satisfaction in working in a TTO, meaning that incentives do matter.

Key satisfaction drivers: The most important motivations linked to satisfaction include the challenging and intellectually valuable nature of TT, the opportunity to gain insights into industry trends (as internal motivations), and the recognition received for their work (as external motivations).

161 Schwartz, J. (March 16, 2022). 'Great Resignation' hits TTOs with staff shortages, changes to recruiting. Tech Transfer eNews Blog.

162 TTPs often influence direction to realize more "commercially relevant" research. Better aligned research in turn supports the ongoing research function through establishing better industry partnerships and increasing chances of sponsored research.

Differentiating TTPs in TTOs from their industry counterparts: TTPs working in TTOs are motivated by factors including the opportunity to engage in a diverse and stimulating job while collaborating with renowned researchers, as well as the satisfaction of supporting their university and facilitating the dissemination and uptake of research results.

Benefits and perks to recruit: Attracting new candidates to TTO positions can be achieved by offering benefits such as competitive time off, comprehensive retirement options, quality health insurance, autonomy in the role and an improved work–life balance.

Age-based dynamics: Younger TTPs are often driven by the desire to gain experience, learn and have career growth opportunities. More experienced TTPs prioritize factors such as salary, organizational culture and the flexibility to work remotely.

The findings from the survey underscore the necessity for a blend of monetary, non-monetary and career advancement incentives.[163]

Non-financial incentives for TTPs

Below we will see that there are considerable constraints regarding financial incentives and opportunities for career advancement. Therefore, non-financial incentives play a crucial role for TTPs.

Recognition

Non-financial incentives for TTPs primarily revolve around recognition and appreciation, often in the form of small, low-cost, but highly valued tokens. These tokens of recognition, similar to those provided to researchers, may include acknowledgments such as "employee of the month or year" or "transaction of the month or year." Recognition can be bestowed by the university or TTO itself, as well as at the national or regional level. Technology transfer associations also play a role in providing recognition awards to TTPs.

Examples of recognition awards offered by TT associations

Association of University Technology Managers (AUTM). Every year, AUTM recognizes the hard work and successes achieved by TTPs in the United States and Canada with awards and a scholarship.[164] Renowned examples include the Volunteer of the Year Award and the Chair's Award.

Knowledge Commercialisation Australasia (KCA). The Australasian Research Commercialisation Awards[165] celebrate the achievements of members and highlight "top tier work" in Australasian tech transfer. Awards are given for, among others, best industry collaboration, best licensing deal, best spinout and best KE initiative.

Knowledge Transfer Ireland (KTI). The annual Impact Awards[166] celebrate the work of TTOs around Ireland and their role in helping transform academic research into commercial impact. It has, among others, an award for the "Knowledge Transfer Achiever of the Year," which recognizes the personal achievement of a TTP.

Licensing Executives Society (LESI). The Frank Barnes Award was established to memorialize

163 The survey's insights have resulted in the following key strategic takeaways: (1) Professional acknowledgment of tech transfer work: Recognize technology transfer as a distinct profession within the academic and research environment. (2) Institutional representation: Incorporate the TTP role into the institution's organizational structure or organigram to underline its importance. (3) Competitive remuneration: Ensure the provision of a competitive salary for TTPs, striving to match the compensation offered by the private sector where possible. (4) Continuing professional development: Invest in ongoing professional education to meet the increasingly sophisticated demands of the TT role and to further develop this profession within the institution.

164 https://autm.net/membership/get-involved/awards-scholarships

165 https://techtransfer.org.au/kca-awards

166 www.knowledgetransferireland.com/Events/KTI-Impact-Awards/KTI-Impact-Awards-2021

Frank Barnes' vast contributions to the field of licensing through mentorship. Each year at the LES (USA & Canada) Annual Meeting an award is presented to an LES member who, like Mr. Barnes, has dedicated considerable time and energy to mentoring fellow licensing professionals.[167]

PraxisAuril. The United Kingdom's professional association for KE practitioners recently refined its existing awards and introduced some new award categories. These have been designed to engage new audiences and to extend the profile and understanding of KE activities by a broader range of influential stakeholders. PraxisAuril KE Awards include, among others: Place-Based KE Initiative of the Year; Commercialization Achievement of the Year; KE Strategic Partnership; KE Team of the Year; Award for Supporting Equity, Diversity and Inclusion through KE; and KE Professional of the Year.[168]

Southern African Research and Innovation Management Association (SARIMA) offers multiple Excellence Awards,[169] which serve as strong incentives due to the recognition they provide among peers, holding significant value for individuals. Typically, these awards come with financial rewards, including funding for an overseas trip. The awards are distributed across various categories, acknowledging achievements at the TTO level, recognizing more experienced professionals, newcomers and even those who have made a "lifetime/ distinguished contribution." Overall, these awards effectively incentivize TTO professionals at different career stages.

Examples of recognition awards offered by TTOs

United States of America – University of Kentucky (UK) Innovate[170] recognizes staff each year with awards based on its own unique operating model. Winners are announced at the annual holiday party, with one exception, and acknowledged in its newsletter, which has a distribution of more than 5,000 recipients. There are four awards:

- The Relationships Award is given to the person who best exhibits the UK Innovate operating model principle to put relationships on a pedestal and build and maintain solid ties with key individuals or groups outside the office.
- The Service Award is given to the staff member who best provides exemplary customer service to others outside the office in their work responsibilities.
- The Support Award is given to the staff member who best practices the UK Innovate operating model principle to support others within the office to complete work activities, projects or goals.
- The Exemplary Staff Award is given to the person who best represents UK Innovate's mission statement and actively exhibits its operating model in all work activities.

UK Innovate staff vote anonymously for the first three award categories, but they cannot vote for themselves. The winner of the Exemplary Staff Award is chosen by UK Innovate's leadership team.[171]

Continuing professional development for TTPs

CPD refers to the continuous learning and skill development undertaken by individuals to enhance their abilities in their respective professional domains. Typically, TTPs join a TTO with a solid education in science, technology or law. However, they often need to acquire specialized

167 www.lesusacanada.org/frank-barnes-award
168 www.keawards.org.uk/categories-2
169 www.sarima.co.za/2022-sarima-excellence-awards-winners/#1
170 UK Innovate at the University of Kentucky is the innovation, entrepreneurship and economic enterprise for University of Kentucky Research.
171 UK Innovate matches staff recognition awards to operating principles. *Technology Transfer Tactics*, 17(4), April 2023.

skills and knowledge through on-the-job training. Offering CPD opportunities can reduce turnover and improve how employees engage with their daily work.[172]

Determining the appropriate training approach to develop a diverse and skilled workforce for TTOs is a complex task. The varying skillsets of TTPs may affect the outcomes of TT activities.[173] For example, TTPs with research-oriented capabilities tend to contribute positively to new invention disclosures and licensing agreements, whereas those with marketing-oriented capabilities are likely to facilitate the conclusion of licensing agreements.

CPD can combine different learning methodologies, including the following:

- Mentoring and coaching: Mentoring involves pairing a seasoned employee with a less experienced colleague to foster skill and knowledge development. Coaching provides personalized guidance for individuals to attain specific objectives.
- Exchange programs with established TTOs, either reputable domestic TTOs or international partners, providing valuable learning and networking opportunities.
- Unconventional learning paths including short-term secondments at venture or spinout companies.
- Trainings and networking events including accredited training courses, webinars, e-learning programs and TTO lunch-and-learn sessions. Training abroad, particularly attending foreign conferences that allow individuals to extend their stay, can be a highly appealing incentive.
- Free memberships to esteemed technology transfer and IP management associations, and access to valuable TT-related publications.

Benefits that the TTO can expect to see when offering CPD:

- Higher TTP engagement
- Better qualified staff
- Improved TT performance
- Cultivation of a learning culture
- Improved career progression
- Improved staff commitment to job positions
- Development of various management styles
- Improved retention.

In developing countries, TTPs face a critical need for training to enhance their skills. However, the challenge lies in accessing suitable and affordable training opportunities. Many well-established organizations that offer TT training programs tend to charge high fees. Moreover, the nature of some training programs may not fully address the specific needs of TTOs in developing countries. These TTOs often operate in distinct ecosystem settings and cultural contexts, which can significantly impact the TT landscape. In many cases, the knowledge and strategies that work well in developed countries may not be directly applicable or effective in the context of developing countries. To address these challenges, it is essential to develop training initiatives specifically tailored to the needs of TTOs in developing countries. These programs should be culturally sensitive and contextually relevant, addressing the unique challenges and opportunities present in the developing country's TT landscape. WIPO offers an extensive array of resources tailored to fulfil the training requirements of organizations in the domains of IP management, TT and commercialization.[174]

172 See, among others: www.betterbuys.com/lms/professional-development-impact

173 Thiago, J. and A. Torkomian (April 2021). TTO's staff and technology transfer: examining the effect of employees' individual capabilities. *Technovation*, 102, 1022213. www.sciencedirect.com/science/article/abs/pii/S0166497220300857?via%3Dihub

174 See, among others, WIPO's website on Technology Transfer, WIPO INSPIRE and the WIPO Technology Transfer Training Needs Assessment Manual and Toolkit.

Examples of CPD programs for TTPs at institutional level

Belgium – KU Leuven Research and Development (LRD). LRD is the knowledge and technology transfer office of the KU Leuven Association. All new LRD employees attend introductory training courses offered by ASTP.[175]

South Africa – Stellenbosch University (SU). SU's TTO, Innovus, follows a "cradle to commercial" approach whereby TTPs are involved in every step of the TT process in their projects, from disclosure to spinout company formation or licensing. Although they may not be responsible for every aspect, they remain responsible for facilitating the entire process. For example, they may not draft shareholders' agreements, but they appoint the legal advisors and facilitate the negotiations. Anita Nel, Chief Director, Innovation and Commercialisation at SU explains: "In the case of spinout companies, they may also become directors on the boards of these companies. In order to manage conflict of interest and ensure good directorship, Innovus also sends TTP staff on Institute of Director training programmes. This approach broadens the skills level of our staff significantly and makes them excellent all-rounders in industry and thus also more experienced and employable in the sector. It is also very rewarding for them to be involved in the entire process. As part of their personal development plan, staff also get opportunities to attend international and local conferences, but they are expected to submit an abstract for those conferences they want to attend. In the cases where these abstracts are accepted it adds to the employee's CV and personal achievements if he/she was a speaker at a conference."

Innovus TTO also collaborates very closely with a local IP law firm. Senior partners of the firm rotate to spend one day per week (free of charge) in the TTO. They meet inventors with TTPs and have "Coffee and IP" sessions where both senior and junior TTPs can discuss any IP matters with the partner.

United Kingdom – Cambridge Enterprise. The TTO of the University of Cambridge provides training and development opportunities for its staff through a range of initiatives, including a staff development program and an internal mentoring scheme. The TTO also offers external training courses and conferences for its staff.

United Kingdom – Oxford University Innovation. Oxford University's TTO offers a range of training and development opportunities for its staff. These include on-the-job training, mentoring and coaching, as well as external training programs and conferences.

United States of America – Columbia Technology Ventures. Colombia University's TTO implemented an onboarding program whereby new hires are paired with two mentors, one more at a senior level and one at a peer level.

Examples of public funding for capacity building at TTOs[176]

Few countries offer direct funding for CPD of TTPs, but a handful of examples exist where such funding is provided.

Canada – College and Community Innovation (CCI) Program – College and Community Social Innovation Fund (CCSIF).[177] The Canadian government's CCI Program, through its CCSIF component, supports colleges and universities in building their capacity for technology transfer and social innovation. This includes providing funding for staff training and professional development in areas related to technology transfer and commercialization.

175 ASTP is Europe's association of knowledge transfer professionals.

176 It is essential to stay up to date with the latest funding initiatives and programs as they may have evolved or new ones might have been introduced.

177 As of April 2022 the CCI program has transitioned to the Tri-agency Guide on Financial Administration for all CCI grants.

Republic of Korea – KISED Technology Transfer Academy. The Korea Institute of Startup & Entrepreneurship Development (KISED)[178] offers the Technology Transfer Academy, providing training and capacity-building opportunities for TTO staff, researchers and entrepreneurs involved in technology commercialization.

South Africa – The Innovation Fund (predecessor to TIA), until 2010, funded on-the-job experiences for young TTO professionals, such as exchange and training programs with international partners. The fund also seconded patent attorneys and commercialization specialists whom it had employed at its IP management office, to various institutions' TTOs. This program has continued to some extent, under the National Intellectual Property Management Office (NIPMO), which supports interns at TTOs and provides access to training for TTPs.

South Africa – The Technology Innovation Agency (TIA)'s Innovation Skills Programme aims to strengthen innovation capabilities and support the progression of technologies from PoC stage through to pre-commercialization (TRL 3–8).

United Kingdom. Several government public funding initiatives in the United Kingdom have supported capacity building for TTO staff at universities:

- Higher Education Innovation Fund (HEIF):[179] This fund is the main fund designed to encourage and support KE activities between universities and external partners. Most universities in the United Kingdom use the HEIF to fund the entirety of their TTO and KE activities. It can be used to strengthen the capabilities of TTOs and foster closer relationships with industry.
- Research England's Connecting Capability Fund (CCF):[180] This fund aims to drive university collaboration and KE activities. It supports projects that enhance the effectiveness and capacity of TTOs in transferring knowledge and technologies to the industry and society.
- Innovate UK's Knowledge Transfer Partnerships (KTPs):[181] Although not exclusively aimed at TTOs, KTPs provide funding to facilitate collaborations between universities and businesses. These partnerships often involve TTO staff working closely with businesses to transfer knowledge and innovation.
- Industrial Strategy Challenge Fund (ISCF):[182] While primarily aimed at driving innovation in specific industries, the ISCF indirectly supports TTOs by encouraging universities to engage in TT activities and strengthen their capacity in the process.

United States of America – The National Science Foundation's Accelerating Research Translation (ART) program.[183] The intent of ART is to support institutions where the fundamental research activity is high, but the level of translational research activity is relatively low.[184] The ART program is not intended to support institutions that already have high levels of translational research activity as part of their R&D enterprise.

Flexible employment conditions and well-being

Since the COVID-19 pandemic, numerous TTPs have expressed a desire for increased work flexibility. Certain universities have responded positively to this demand. Nonetheless, technology transfer still remains a "contact sport" – it relies heavily on personal interactions, necessitating the presence of staff in laboratories and university halls to engage with researchers. As a result, many TTOs are currently adopting a hybrid office model, striving to strike the right balance between remote work and on-site presence.

178 www.kised.or.kr/_eng
179 www.ukri.org/what-we-do/our-main-funds-and-areas-of-support/browse-our-areas-of-investment-and-support/higher-education-innovation-fund
180 www.ukri.org/about-us/how-we-are-doing/research-outcomes-and-impact/research-england/connecting-capability-fund-ccf-project-impacts
181 www.ktp-uk.org
182 https://committees.parliament.uk/work/1006/the-industrial-strategy-challenge-fund
183 www.nsf.gov/pubs/2023/nsf23558/nsf23558.htm
184 In addition, the ART program seeks to train graduate students and postdoctoral researchers in translational research.

Examples of programs aimed at enhancing work–life balance for TTPs

United Kingdom – University of Oxford Innovation (OUI) has a new (post-COVID-19) hybrid working policy which states that people can work up to 50 percent of their time at home.

United States of America – Massachusetts Institute of Technology (MIT). MIT's human resources department offers various programs and resources aimed at enhancing work–life balance, well-being and professional development for all employees, such as flexible work arrangements, childcare and parenting support, elder care resources and employee wellness programs, including MyLife Services, which provides round-the-clock access to a network of experts available to help with life's challenges.[185]

United States of America – PCI[186] Ventures, University of Pennsylvania focuses very heavily on the office culture. A social committee helps with organizing activities that bring people together, such as soccer games at lunchtime.[187]

Career advancement incentives for TTPs

TTPs, like any other employees, are motivated by the prospect of career advancement. To effectively meet this expectation, TTO leadership must establish clear job descriptions, competency profiles, objectives and an evaluation process for TTPs. However, this can be challenging due to the diverse and flexible nature of their roles.

The success of performance evaluations relies on well-defined criteria. These criteria encompass both the achievements and the manner in which they were accomplished.

- The "what" aspect (achievements) can involve the number of projects progressed from one stage to another or the number of transactions concluded.
- The "how" aspect (manner) can involve endorsements from researchers who have collaborated with the TTPs and feedback from industry partners. Leading TTOs have started implementing regular customer feedback surveys to gather performance feedback using market research-style questionnaires.

The "what" aspect: examples of criteria for evaluation of TTPs

Many universities appear to find the number of transactions to be the most holistic measure. Their objective is to disseminate research results to the wider world, be it through multiple licenses granted to charities without any revenue, or a license to a biotech spin-off.

Other evaluation criteria include:

- number of new invention disclosures;
- number of new lead inventors;
- number of projects progressed from one stage to another;
- number of new external collaborations;
- number of licenses;
- up-front fees;
- R&D funding raised;
- number of spinout companies established;
- investment raised; and
- jobs created.

185 https://hr.mit.edu and https://hr.mit.edu/worklife/mylifeservices.

186 The Penn Center for Innovation (PCI) consolidated and unified the University of Pennsylvania's Office of Technology Transfer with other Penn commercialization resources, allowing for a more streamlined experience. PCI Ventures is a division of PCI specifically focused on creating early-stage businesses founded on Penn technology.

187 Technology Transfer Tactics Distance Learning Program: "Staffing your TTO: Managing turnover, quiet quitting, remote work and other HR challenges," December 2022.

The "how" aspect: example of use of feedback surveys

United Kingdom – Cambridge Enterprise. The approach to TTO services is especially crucial at Cambridge due to its unique "opt-out" provision for academics – the only one of its kind in the United Kingdom. Thus, TTPs must offer excellent services to encourage researchers to utilize the TTO. In contrast, many TTOs are mandated for use by university policy, leading some to overlook the importance of service quality, resulting in subpar offerings.

Dr. Tony Raven, at the time Director of Cambridge Enterprise, stated: "You ask for some figures, numbers. I am not a great fan of figures, metrics, key performance indicators, as I don't think they apply very well to this business. Our key figures are how our academic community perceives us. We do a survey as a measure of how we are performing. We survey all 5000 researchers: 27% respond; of those, 68% know what we do; 27% have worked with us; most important one for us, 92% of that 27% said that they would recommend us to a peer or colleague. For us word of mouth is our most effective marketing tool."[188]

Financial incentives for TTPs

Most TTOs refrain from offering financial incentives to their staff. There are several factors that may contribute to this reluctance. TTOs may simply lack the funding. Some TTOs may seek to avoid any perception of impropriety, particularly when public funding is involved in the research or when their programs are operating at a deficit[189] for the university. Concerns over potential COIs may also arise if staff members are incentivized to prioritize reaching incentive goals over securing optimal agreements.

However, it is worth noting that TTOs that do offer financial incentives report positive impacts on performance, recruitment efforts and budget management.[190]

Competitive salaries

TTPs often have salary expectations for their positions that exceed what many universities are able to provide. This is primarily because most TTPs are university employees and are subject to the institution's employment practices, including standardized scales, pay awards and assessments. However, in cases where TTPs are employed by university wholly owned subsidiary companies (which are a small minority), there tends to be more flexibility in employment conditions, including salary arrangements.

"There are relatively few tech transfer professionals in the entire world [...]. TTOs are all essentially competing for the same candidates – not to mention the industry roles many tech transfer professionals are opting for, with their often higher pay scales."
Glen Gardner, recruiter

188 Talking Tech Transfer: Tony Raven, Global University Venturing (GUV) Interview, Oct. 7, 2020.

189 The activities of the TTO are sometimes seen as not generating enough revenue or benefits to cover their costs. This perception could arise due to several factors. It could be due to the inherent "valley of death" in TT, where there is often a significant time and resource investment needed before financial returns are realized. It might also be due to unrealistic expectations, where university administrators or the public expect immediate or very high returns from TT activities. In such cases, providing additional financial incentives to TTO staff might be seen as an unnecessary expenditure or as contributing to the deficit, especially if the incentives are perceived as not directly contributing to better commercialization outcomes.

190 Incentive plans for TTOs staff are rare but effective if properly structured. *Technology Transfer Tactics*, 17(4), April 2023.

Example of a salary payment scheme

Belgium – KU Leuven Research and Development (LRD) made efforts to offer a competitive base salary that aligns with industry standards. Right from the beginning, LRD was set up as an autonomous entity. This has proven crucial to the TTO's success because it has enabled them to pursue an entrepreneurial approach to serving academics. Moreover, it has provided flexibility to adapt to changing environments and opportunities. To incentivize and retain qualified staff, LRD and the university decided to adapt the TTO's payment scheme some 10 years ago. Because the academic payment scheme is designed for either scientists or admin staff – both of which are not fully appropriate for legal experts or business developers with industry backgrounds – LRD performed a benchmark study to determine the average income of people with similar profiles in the Leuven region and adapted its remuneration structure accordingly.[191]

United States of America – Vanderbilt University (VU). To ensure salaries are competitive and fair in the market, VU has a procedure to align jobs with the correct pay grade. This includes (1) gathering and analyzing job details; (2) comparing the role to similar positions; and (3) taking into account relevant market factors. Relevant competitive market salary studies are conducted by the Office of Compensation, Human Resources to establish and adjust pay levels as necessary.[192]

Performance-based payments[193]

A comparative analysis between corporate sector and TTOs

Performance-based systems (also called "incentive compensation plans") are designed to reward employees for achieving levels of performance. While performance-based payments are commonplace in the private corporate sector, they are much less common in TTOs. Rarely do TTOs offer their TTPs financial rewards beyond salary linked to their performance in TT. The reasons for this disparity include the following:

Differing objectives. While private corporations are profit driven, with performance-based incentives aligning to increase shareholder value, universities prioritize knowledge generation and societal impact including metrics such as service quality, departmental contributions and societal outcomes. As a result, a performance-based incentive system focused solely on financial returns may not reflect the holistic contributions of a TTP.

Complex metrics. While revenue from licenses is an obvious metric, TTPs might also be evaluated based on other less tangible outcomes, such as researcher satisfaction, community services or fostering a culture of innovation.

Cultural differences. Universities have a distinct culture and values compared to the private sector. There might be concerns about potential COIs or the perception of compromising academic integrity for financial gains.

Budget constraints. Universities, especially public ones, often have tighter budgets than large corporations. There may be limitations in offering lucrative performance bonuses or incentives.

Policy barriers. TTOs may have institutional regulations that limit the types of incentives they can offer.

191 The adaptation of the payment scheme has been done in 2008. ASTP. www.astp4kt.eu/development/third-party-projects/progress-tt-creating-a-tto-and-organising-it-for-sustainable-growth.html

192 https://hr.vanderbilt.edu/compensation/compensationprograms.php

193 TTOs often refer to such non-salary compensation using various terms such as "bonuses," "incentive compensation" or "variable compensation." While many of these are tied to performance, it is not always the case. Some might be awarded pro forma for expected standard performance or as a retention bonus, which may not provide strong motivation. In this Guide, our emphasis is solely on payments based on performance.

Longer R&D cycles. Academic research often takes longer to commercialize. This may not align well with annual performance reviews or short-term incentive structures typical in the corporate sector.

Faculty relationships. The relationship between TTPs and faculty researchers is crucial. Overemphasizing performance incentives might strain these relationships if faculty feel pressured into commercializing their research.

Challenges and considerations in implementing performance-based payments for TTPs

Initiating a performance-based payment plan for TTPs requires careful consideration, as there are several potential downsides:

Luck. There will always be an element of luck about which cases are assigned to a particular TTP, and the actual returns may be influenced by the case assignments rather than individual performance.

Bias risks. Performance-based payments might lead to biases among TTPs, tempting them to "cherry-pick" higher-value technologies and potentially sidelining other innovations. They may also prioritize up-front licensing fees over downstream royalties. Potential COIs can arise if TTPs know they may benefit financially from advancing certain projects over others.

Internal tensions. Performance-based payments can lead to tensions within the university, as researchers and employees in other revenue-generating offices (such as those involved in sponsored research) might not get similar payments.

Complex alignment. Tying incentives to TT goals is complex due to a blend of process-driven metrics, impact and income.

Impact on team cohesion. Collaboration and teamwork are important among TTPs, and differential bonuses may not foster a cooperative environment.

Time challenges. Rewards for individual achievements may not work well, as the person responsible for a deal may be long gone by the time that the deal matures into a revenue-generating stage.

Designing performance-based payments for TTPs

Despite the above-mentioned challenges, some universities are considering performance-based rewards for TTPs, tailored to academic settings. Occasionally, TTOs might give small awards like "employee of the month" for outstanding work. A few TTOs, particularly in the United States, have adopted a structured incentive plan, noting its value in attracting and retaining staff.[194]

Although every university has its unique approach to providing performance-based incentives to TTPs, certain questions and trends are universal. The formulation of a performance-based incentive plan typically involves the key considerations and phases shown in Figure 6.

Figure 6: Key steps to formulate performance-based payments for TTPs

194 Interview with Alan Bentley, Assistant Vice Chancellor, Vanderbilt University. Other reasons for having performance-based payments cited by universities are to reward good work and to promote team cooperation (AUTM Salary Survey 2022).

Applicability. Identify under which circumstances performance-based payments are awarded to TTPs: Are they given automatically? On an annual basis? Do specific conditions or thresholds need to be met? What triggers the payments? Some payments may be structured as bonuses, while others are linked to incentives with set conditions.

- Often, performance-based rewards require the TTO to achieve a specified income level. Such thresholds must be clearly defined and communicated to the TTPs.
- The method of distributing performance-based payments to TTO staff generally falls under one of two approaches: automatic (or ad hoc) payments and contractual agreements. Each has its own set of characteristics and implications:
  - Automatic (ad hoc) payments are discretionary bonuses given out by the university to reward specific achievements or accomplishments. They are not regularly scheduled and are not based on a predetermined structure or set of criteria. The advantage is that this approach provides flexibility for the university. It allows them to reward unexpected successes or address particular needs that arise over time. The disadvantage is that the ad hoc nature can lead to perceptions of favoritism or inconsistency. There is also less predictability for staff, who may not know when or if they will receive a bonus.
  - Contractual payments are based on a formal, written agreement, often integrated into employment contracts. This agreement delineates the conditions under which a bonus or performance-based payment will be paid, the metrics used for assessment and other pertinent details. These arrangements bring transparency and predictability to the incentive process. Employees know in advance the performance metrics they need to meet to receive their bonuses, which can motivate consistently high performance. The downside is that the rigid structure might not account for unforeseen circumstances or changes in the TTO's goals or priorities. Additionally, if not well designed, these contracts might inadvertently incentivize undesirable behaviors if they focus too heavily on particular metrics.
  - Some institutions may use a combination of both approaches to leverage the advantages of each while mitigating their respective downsides.

Eligibility. Who qualifies for performance-based incentives? Is the entire TTO staff eligible? Or is it exclusive to standout contributors? Is it open to all job roles or limited to specific positions?

- While some universities, such as Emory (United States), extend incentives to the whole office, institutions such as Vanderbilt (United States) restrict it to select roles and only to those who exhibit exceptional performance (see the case study below, "Vanderbilt's Compensation Program").

Evaluation criteria. Which metrics will be used, and how many? Will they focus solely on individual performance or incorporate team dynamics as well? How do financial-driven metrics compare to service-driven ones, such as researcher satisfaction or contributions to other units?

- Metrics, which are influenced by employees' actions throughout the year, should serve as authentic motivators. Some universities advocate for a monthly review of these metrics with the TTPs in a public setting, as this has been found to enhance motivation, sharpen focus and increase the effectiveness of the incentives.
- Overloading with too many performance metrics dilutes their impact; employees cannot excel across numerous metrics simultaneously. Conversely, utilizing only one or two metrics might skew behaviors. A range of four to five individual metrics is frequently regarded as optimal.
- The focus should be on valuable contributions, not solely on revenue, keeping in mind the distinctive nature of TTOs compared to purely corporate entities.
- Striking a balance between financial and non-financial metrics is essential.
- Most TTOs avoid basing performance incentives on individual projects. Instead, payments often derive from the TTO's collective performance or a specific team or department, either independently or alongside individual achievements.

Incentive amount. What constitutes an appropriate incentive? Performance-based reward structures often define a range, setting both minimum and maximum percentages of an employee's salary that can be awarded.

- When setting the highest possible performance-based payment, it is important to strike a balance. It should not be excessively high, yet it should be enticing enough to be a strong motivator.

– The minimum percentages typically vary between 0 percent and 8 percent of the TTP's annual salary, while maximum percentages often range from 6 percent to 30 percent.

Monitoring and evaluation. Effectively monitoring the activities of TTPs is essential to ensure that the incentives contribute to the achievement of university goals and do not inadvertently distort the management of the IP portfolio. The performance-based incentives program should also be continuously evaluated and revised as needed to ensure that the intended objectives are met.

Examples of performance-based payments for TTPs

Belgium – KU Leuven Research and Development (LRD) introduced a variable remuneration scheme for high performers. The employees who can benefit from the program may change from year to year and are selected by LRD's leadership. They receive extra payments based on an individual evaluation of soft skills including loyalty, teamwork, commitment and creativity, and on hard facts relating to the LRD's general performance. Remuneration is never directly linked to the outcome of individual TT projects to prevent an internal competition for "low-hanging fruits," or easy targets, and to make sure teamwork is not hampered. However, while financial rewards are certainly important, recognition is (at least) equally relevant. Many TTPs work hard, and progress may be rarely visible over long periods of time. TTO leadership must therefore help create an environment where the staff's work is appreciated, not only internally but also by the university's researchers and leadership, for example by celebrating successes.[195]

South Africa – University of Cape Town, Research Contracts and Innovation (RC&I). Andrew Bailey, Senior Manager, Innovation, explains: "UCT offers a performance bonus to all university staff, including those in the TTO. The bonus structure includes a discretionary bonus of up to 5% of the annual salary, the 'Exceeds 1' category awarding up to 10% of the annual salary, and the rarely awarded 'Exceeds 2' providing 15% of the annual salary. This structure aims to avoid disproportionate salary increases for top performers and ensures that employees don't become complacent after years of high performance. This system enables us to evaluate staff based on their performance in specific areas and how they meet their individual objectives. It allows one to reward general performance, without setting specific targets per se."

United Kingdom – Oxford University Innovation (OUI) has a staff award scheme but it is not for specific projects. Rather, it is based on performance evaluation over the year and whether the company does well, and support staff are also eligible.

United States of America. At the **University of Utah,** an incentive plan is in place that relies on the overall profitability of the TTO program. Bonuses are only awarded in years when the TTO program generates a profit. In such profitable years, 10 percent of the net revenue, after deducting all other costs of distributing to inventors and covering operations, is allocated for bonuses. The incentive plan follows a structured approach that divides the bonus pool into two distinct buckets:

– Equal Participation Bucket: This bucket comprises one third of the bonus funds and ensures equal participation among all TTPs. The amount in this bucket is divided equally across all TTPs.
– Tiered Distribution Bucket: The remaining two-thirds of the bonus funds are allocated in this bucket, following a three-tier structure based on senior management levels and staff roles considered as revenue drivers compared to more administrative functions.

Individual bonuses within this structure can range from 20 percent to 40 percent of base pay. However, it should be noted that only a very limited number of TTOs are profitable and thus able to implement such incentive plans.[196]

195 www.astp4kt.eu/development/third-party-projects/progress-tt-creating-a-tto-and-organising-it-for-sustainable-growth.html

196 Incentive plans for TTO staff are rare but effective if properly structured. *Technology Transfer Tactics*, 17(4), April 2023.

United States of America. The **2022 AUTM Salary Survey**[197] includes key findings on performance-based payments (referred to as "incentive compensation"), among others:

- Incentive compensation plan type: Of the 121 institutions that participated, 23 reported having an incentive compensation plan for their tech transfer employees. Eleven (48 percent) reported having an ad hoc plan (that is, an occasional or impromptu bonus paid to an employee or group for a specific accomplishment or achievement, not a guarantee or contractual obligation on the part of the employer), and 13 (56 percent) have a contractual plan (that is, a formal, written ongoing arrangement, possibly as part of an employment offer or agreement, which addresses the details and rules of an incentive plan for an employee or group of employees in which certain employees have guaranteed eligibility for consideration in the plan).
- Incentive compensation plan maximums and minimums: 5 of 11 ad hoc incentive compensation plans specify minimum and maximum percentages of an employee's base salary that can be earned. Minimum values range from 0 percent to 1 percent and maximum values range from 4 percent to 160 percent. All 13 contractual incentive compensation plans specify minimums and maximums. Minimum values range from 0 percent to 8 percent; and maximum values range from 6 percent to 30 percent.
- Level of performance considered in determining incentive compensation includes:
  - overall office performance at 17 institutions (74 percent)
  - performance of a specific team at 12 institutions (52 percent)
  - individual performance at 17 institutions (74 percent)
- Performance metrics used to determine employee rewards, from most to least cited:
  - number of license/option agreements (65 percent)
  - number of startups formed (52 percent)
  - gross licensing income (44 percent)
  - inventor/developer customer satisfaction (26 percent)
  - net revenue (22 percent)
  - legal expenditures reimbursed (22 percent)
  - number of invention disclosures (17 percent)
  - licensee customer satisfaction (17 percent)
  - central administration customer satisfaction (17 percent)
  - number of patents filed (13 percent)
  - number of patents issued (13 percent)
  - number of departments or faculty members served (9 percent)
  - other revenue metrics (9 percent)

The 2022 AUTM Salary Survey also includes information on the compensation plan rationale, eligibility criteria and funding, and a list of institutions offering incentive compensation plans.

United States of America. In a **2023 Salary Survey of TT personnel conducted by Technology Transfer Tactics,**[198] TTOs that reported offering bonuses were asked on which factors their bonuses were based. Twenty-six percent responded that their bonus was based on revenues, 14 percent cited deal volume, 11 percent cited faculty service measures and just 6 percent reported incentives based on disclosure volume. The remaining 43 percent was based on "other," such as the director's decision, metrics being met by the end of the fiscal year, a combination of team metrics and personal performance, and a percentage of their salary, with a cap.

197 The Association of University Technology Managers (AUTM) Salary Survey, conducted every three years, is a comprehensive, worldwide survey of salaries, incentives and office staff organization – offering valuable insights on compensation and the tools to map successful careers within the TT profession.

198 Incentive plans for TTO staff are rare but effective if properly structured. *Technology Transfer Tactics*, 17(4), April 2023.

Fringe benefits

Additional financial fringe benefits or perks can also serve as attractive incentives for recruiting top talent at TTOs:

- Retirement plans: Contributions to pension funds or matching contributions to retirement savings accounts, for example, can be an appealing long-term benefit for staff.
- Health insurance and benefits: Coverage for employees and their dependents, along with additional benefits such as dental and vision care, can enhance the overall employee package.
- Tuition reimbursement for the children of employees.
- Relocation assistance: For candidates who need to relocate for the position, financial assistance or relocation packages can help ease the transition and attract top talent from a broader pool.
- Professional development funds: Funds for conferences, workshops, training programs or certifications can demonstrate a commitment to the growth and advancement of TTPs.

4 Recommendations and action plan

In this section a variety of recommendations are outlined, focusing on best practices for universities and governments to contemplate while formulating their incentives schemes. Subsequently, an action plan is presented, aiming to facilitate the initial planning process.

Recommendations

Tips for using incentives to improve research quality

For universities aiming to increase their research quality, consider the following steps:

Recruit researchers with a track record of active involvement in research:
- In the areas of applied research, prioritize candidates who also have experience in private companies or have been exposed to commercial work with practical application, as they are more likely to be inclined towards TT.
- Some middle-income countries have successfully transformed their research culture by recruiting scientists who were trained abroad into influential positions within the university.[199]

Implement incentives to boost research intensity and quality, especially:
- Introduce *graded* financial incentives, which vary based on the publication's tier.[200]
- Allocate additional research budgets to support projects.
- Provide funding for researchers to attend international conferences.

Create explicit incentives to promote applied research and encourage active participation in commercialization and TT activities:
- Reassess the university's system for promotions and performance evaluation.
- Recognize that junior-level faculty may view involvement in applied and commercially relevant research, as well as TT activities, as a diversion from career-advancing pursuits such as traditional publications.
- Consider broadening the scope of recognized achievements for career progression to include applied research publications and TT-related contributions.

Foster connections with the scientific and business communities to enrich the research programs:
- Incentivize CPD for industry: Universities primarily focused on teaching should evaluate the uniqueness of their courses and modules, considering external demand for CPD and executive education. This approach can attract industry engagement in the university's areas of expertise and kick-start collaborative research teams. Faculty involved in such CPD

199 For example the People's Republic of China, under its Hundred Talent program (1994) and Thousand Talent program (2008) – see Cao, C., J. Baas, C.S. Wagner and K. Jonkers (2020). Returning scientists and the emergence of China's science system. Science and Public Policy, 47(2), April, 172–183, https://doi.org/10.1093/scipol/scz056.

200 Publication tiers refer to a categorization system used to assess the quality and impact of academic and scientific journals. The most common categorization of publication tiers includes top-tier journals, second-tier journals and lower-tier journals.

and executive education should receive additional financial compensation, beyond their regular salary, to recognize their contributions and dedication to these specialized activities.
- Facilitate staff secondments between the university and industry, encouraging collaboration and TT.
- Host academy–industry showcase events, where researchers can profile their achievements and inform industry about research outcomes.

Tips for using incentives to bolster TT

For research intensive universities or those with high research quality but limited TT activities, the following steps can be taken:

Attract entrepreneurial faculty with appropriate incentives: Recruit faculty members who demonstrate an entrepreneurial mindset and provide them with incentives that encourage engagement in all aspects of TT.

Have a clear IP policy and familiarize researchers with its content. (See the WIPO Guidelines to Customize the IP Policy Template[201] for more details.)

Assess and adapt the TTO structure: Evaluate the existing TTO and make necessary adjustments to meet the specific TT needs of the university.
- Resource allocation: Ensure that the TTO has sufficient financial resources to carry out its activities.
- Appropriate expertise: Staff the TTO with individuals experienced in industrial R&D to foster a culture of interaction with industry and awareness of commercialization possibilities.
- TTO structure: Tailor the TTO structure based on the university's needs. In some cases, where faculties and departments are heavily engaged in TT activities and applied research, it may be worthwhile to follow a disaggregated structure, where TTPs are directly placed within the academic structures and work closely with researchers in those units specifically. In some universities, a centralized TTO may be more appropriate, with managers able to address the needs of various researchers centrally. A mixed model may also be suitable for universities where inter-departmental and inter-faculty variations are high in terms of quality, quantity and nature of research.
- Incentivize TTO staff: Offer attractive incentives to attract, retain and motivate experienced TTO staff to excel in their roles.

Apply incentives to all stakeholders involved:
- Faculty inventors: To address inventorship–authorship disputes, use disclosure forms and laboratory books to accurately identify inventors, especially in the context of patent filing.
- Student researchers: Students' involvement in research is increasingly common. However, their situation is quite different from that of staff. In most cases, universities cannot automatically claim ownership of IP and research results generated by students. Incentives for students may encourage them to exploit their IP through the university or TTO by entering into assignment agreements or collaboration agreements.
- Non-academic (technical) staff: Acknowledge the contributions of non-academic staff or enablers, such as their know-how and prototype development, especially if it extends beyond their regular duties. Adequate rewards should be provided for their valuable input.
- Department or unit: Acknowledge the indirect contributions of the department or unit where the invention or research result originated. Some universities share licensing revenue with the unit to foster its support and others may offer employees from the unit preferential opportunities to invest in university spinouts.

Maximize researcher involvement in decision-making: Avoid imposing behaviors on researchers, as this approach tends to be ineffective. While the university may own the IP, researchers are the inventors and may have strong feelings about how their technology is utilized.

201 www.wipo.int/technology-transfer/en/ip-policies.html, p. 31.

Develop an incentive program that takes into account the TT *efforts* put forth by researchers and TTPs, not solely the *outcomes*. Define a clear set of criteria to effectively incentivize and recognize these efforts.

Whenever feasible, adopt personalized incentive plans for individual researchers:
- Customize based on feedback: Talk to researchers to find out what they value most and what type of incentives would be most appealing to them. Tailor the offerings accordingly.
- Tailor to specific groups: Not all employees are motivated by the same things. For example, scientists may be more motivated by recognition and prestige, while administrative staff may find financial rewards more motivating. Women can potentially be motivated by different rewards than men.
- Offer choice: Offer a possible mix of incentives, where within each category researchers may choose from a range of offers, instead of a single fixed offer. This way, researchers with different needs and preferences will be able to self-select the most appropriate reward scheme. Here are some examples of flexible reward strategies:
  - Individual researcher accounts: These allow researchers to use the funds as they see fit, including for further research, staffing, equipment, conferences or other KE or TT activities (see "Allocation in research accounts").
  - Spinout formation choices: Some universities allow founder researchers to choose between equity or shares in the proceeds generated by the spinout company.
  - Spinout support and equity choices: Researchers can determine the level of support they desire for their spinout ventures, and the corresponding equity stake they would acquire as a result (see the example of Imperial College London).

Government support to encourage patenting and licensing

Countries are increasingly offering support for academic patenting and licensing. Denmark, Japan, Germany and South Africa, for example, are providing direct and indirect support to help universities cover the costs associated with patenting or commercializing inventions. Indirect support includes initiatives such as reducing patent application fees for universities and conducting awareness creation programs.

However, the effectiveness of public support for IP activities at universities largely depends on the leadership demonstrated by senior university or research management. Without strong leadership, the impact of such support may be limited, leading to an increase in the number of patents filed but not necessarily translating into successful TT outcomes.

Tips for using incentives to encourage spinout creation

To promote the creation of spinouts in universities, the following steps can be taken:

Offer dedicated assistance:
- Hire TTO staff with adequate skills and offer TTO staff access to spinout training to update their skills. These can include memberships of distance learning programs.
- Provide mentoring support and expert advice.

Facilitate participation:
- Allow researchers extended leave of absence to lead or join spinout ventures.
- Develop appropriate training courses, combined with a spinout information guide or FAQs on the TTO's website.
- Formulate transparent policies for student startups or spinouts. Address whether students are permitted to establish companies while enrolled at the university and outline whether the university is entitled to shareholding in such ventures.
- Recognize spinout-related efforts in internal staff promotion assessments.
- Celebrate new spinouts through public events, speeches, brochures, prizes and the like.
- Explore the option to let the department where inventors are based benefit from the returns of the spinout. This ensures incentives for department heads. One option is to give a share of the equity to the department (but returns can be uncertain and may take a long time). Or provide the department additional resources which they can use to replace staff time.

Explore financial incentives:

- Offer founder shareholding opportunities in the newly formed company. Allocate a large percentage of shares to the founding researchers right from the outset.[202] Some universities prefer to give the researchers a greater share of equity in the spinout company than that of the university. This is particularly so in cases where the researchers will be actively involved in the growth of the spinout and have strong networks with the market or industry. Others seek a balance between equity and royalties. As such, the researchers receive a smaller share of the equity together with entitlement to some royalties.
- Provide researchers with the potential for additional future shareholdings in the company.
- Allow researchers to receive fees as directors of the spinout company.
- Facilitate consulting opportunities with the spinout for researchers.
- Enable researchers' own research to benefit from research funding provided by the spinout company.

Organize financial resources:

- University pre-seed funding.
- PoC funding.
- Business plan competitions.
- Venture capital (VC) firms specialize in providing early-stage financing to spinouts and typically invest in exchange for equity in the company.
- Angel investors: Similar to VC firms, these individuals offer early-stage funding to startups in return for equity.
- Grants and subsidies: Governments and non-profit organizations may offer these to startups and spinouts in specific industries, such as clean energy or healthcare.
- Crowdfunding platforms, where individual investors contribute in exchange for rewards or equity.

Establish a COI policy and committee. Examples can be found in WIPO's Database of IP Policies by selecting the focus "conflicts of interest."

Government support to encourage spinout creation

In fostering the creation of academic spinouts, national governments assume a vital role and implement diverse public policies. These policies generally encompass critical areas, including the following:

- determining whether state-owned public research institutions are allowed to hold an equity stake in spinouts;
- establishing guidelines and conditions under which researchers can engage in activities within spinout ventures and hold equity;
- addressing potential COIs that may arise in the context of academic spinouts;
- allocating funds to support the establishment of spinouts, which can include:
  - POC funds, seed funds, business plan competitions, public venture capital and so on;
  - accelerator programs;
  - financial support to TTOs to host industry researchers temporarily;
  - performance-based funding systems to reward linkages with industry and spinouts;
  - funding for infrastructures such as science parks and business incubators;
  - funding for TTO capacity building; and
  - spinout company awards.

202 The University Spinout Investment Terms (USIT) Guide (2023), supported by TenU, provides useful direction and advice in such areas as equity share and IP.

Tips for using incentives to promote recruitment, retention and engagement of TTPs

Clarify career paths, roles and promotion criteria:
- Develop performance metrics that mirror university strategic goals and motivate TTPs.
- Enhance trust and engagement through open communication, sharing expected outcomes.
- Apply peer review in performance evaluation, and reward achievements.
- Frequently converse about growth opportunities.
- Offer mentorship, as well as professional and personal development opportunities.

Foster a balanced working environment:
- Ensure that TTOs have sufficient resources, including funding, personnel and infrastructure, to carry out their activities effectively.
- Enable hybrid working, permitting days at home, to facilitate the highly desired balance.
- Promote diversity and inclusion within TTOs, to ensure that staff reflect the diverse perspectives and backgrounds of the university community.
- Encourage and reward good workload management. Stimulate strategic talks about both team and individual workload and offer resources where needed.

Design recruitment and reward schemes to suit different needs:
- For junior staff: consider recognition schemes and spotlight awards that create visibility across the company.
- For senior staff: consider pension benefits.
- For women: consider gender neutral job descriptions; anonymous application procedures; flexible working arrangements; mentorship programs that specifically support women in their career growth.
- Many TTPs may welcome time off or a performance bonus.

General tips for using incentives

Make sure that the criteria for earning incentives are clear and transparent: Ensure researchers and TTPs understand what they need to do to qualify for an incentive. This will help prevent misunderstandings or disagreements.

Make incentives challenging but achievable: If the criteria for earning incentives are too difficult, researchers or TTPs may become demotivated and give up.

Celebrate success publicly: This will help encourage others to strive for similar achievements.

Cultivate an entrepreneurial culture:
- Foster collaboration and knowledge sharing among TTPs, researchers, entrepreneurs and industry partners.
- Build partnerships with industry, government and other stakeholders to leverage their expertise, networks and resources.
- Nurture a culture of entrepreneurship that encourages risk taking, innovation and creativity, and supports the commercialization of research outcomes.
- Stay up to date with best practices in TT by engaging in professional associations, attending conferences and networking with peers.

Review and refine your incentive program on a regular basis to ensure that it continues to motivate researchers and TTPs. Collect feedback and adjust your incentives as needed to ensure that they are aligned with your goals and values.

Creating an incentives scheme – an action plan

This section provides simple steps to develop an incentives plan in your university to bring innovations to market.

I. Understand the contextual environment

1. Investigate the national laws, regulations and guidelines concerning TT and incentives within universities. What do they dictate regarding the implementation of incentives?
2. Familiarize yourself with your institution's mission and overall way of doing things. What incentives does your university currently have in place? When was the last time they were reviewed, and what are the mechanisms for conducting such reviews? Gain a full understanding of the current performance environment of the researchers and TTPs, and the main causes of performance shortcomings, such as barriers and disincentives.
3. Explore what drives your researchers and TTPs. Have you considered conducting a survey? How will you involve researchers and TTPs in the design of your incentives plan?
4. Determine the source from which the incentives will be financed. What funding channels or budget will you allocate to ensure sustainable implementation?

II. Define the scope and target beneficiaries of your incentives program

5. Researchers and TTPs: Consider who you would like to incentivize among researchers and TTPs. Just the inventors? Those who contribute often referred to as enablers? Only the top achievers? Whole teams?
6. External stakeholders: Deliberate on strategies to influence incentives in the business, industry, investor and professional environments, with the aim of fostering greater engagement with universities. Identify ways to encourage these stakeholders to collaborate more effectively with academic institutions.
7. Government policy: Evaluate how you can potentially impact the government policy framework concerning incentives in the realm of TT.

III. Explicitly identify what needs to be accomplished and why that is important

8. Consider *what* you want to achieve and *why*, and then how best to achieve it.
   - Stakeholders will want to understand how the incentives program and the resulting actions will create economic, social or cultural impact, and why those actions are so critical for the improvement of the university and the researcher's department.
   - Substantiate university priorities and determine where incentives will have the greatest impact.
   - Align your incentives plan with the university's long-term mission, vision and values on one hand in terms of strategy, and also with immediate short-term goals on the other.
9. Consult widely with all staff in the university, including the TTO.

IV. Develop your incentives program

10. Consider the prevailing culture of the university when creating your incentive scheme.
11. Consult widely with everyone involved.
12. Explore the full range of incentives provided in this Guide, categorizing them into three groups: non-financial, career advancement and financial.
13. Seek to balance simplicity and fairness and varieties of approaches – no single plan will fit all researchers or TTPs involved.
14. Constantly think "what is in it for me" from the researcher's or TTP's point of view – is it their behavior that you are trying to incentivize?
15. Keep the momentum: A successful incentives plan will have a set of incentives to stimulate researchers and TTPs at different stages of the TT process.

V. Reflect the incentives in your university policies

16. Consider, among others, the following policy areas:
    - flexible employment conditions;
    - ownership of intellectual property;

- spinout equity;
- consultancy arrangements;
- directorships of companies;
- COI;
- promotion criteria; and
- dispute resolution.

VI. Monitor the results

17. Establish a monitoring process to ensure that the incentives are encouraging the desired behavior and are effective. The following steps can be considered:
    - Identify the key performance indicators (KPIs) that would indicate the success of the incentive system. The metrics should align with the university's strategic goals for technology transfer.
    - Regularly collect data on these metrics and analyze the results. The frequency of monitoring will depend on the nature of the incentives and the activities involved.
    - Regularly survey the researchers and TTPs to gather their feedback on the incentive system. Are they aware of the incentives? Do they find them motivating? Are there any barriers to participation?
    - Compare the performance of the university with other similar institutions. This can provide a benchmark for what can be achieved and highlight any areas where the university is underperforming.
    - Regularly review your incentives system. Are the incentives achieving the desired results? Are they cost-effective? Do they need to be adjusted or changed?
    - Share the results of the monitoring process with the researchers, TTPs and other stakeholders.

Conclusion and key messages

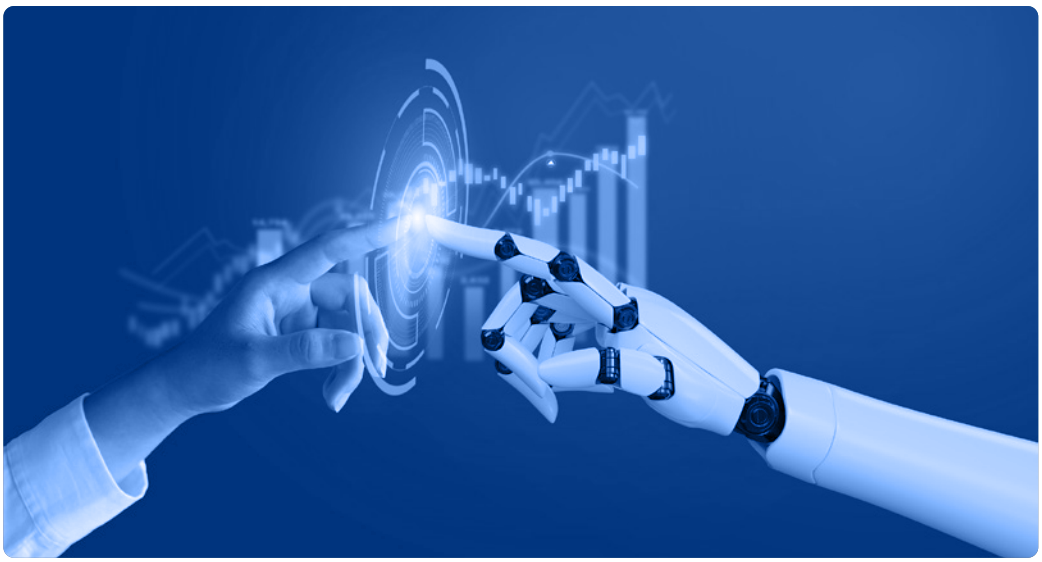
Incentives can shape how people behave. This guide has explored how to motivate academic researchers and TTPs to boost innovation and entrepreneurship. The goal is to benefit society and make university research more impactful. Here is what we have learned:

- **Incentives should encourage working together, not competing:** Universities are hubs of innovation, and researchers and TTPs are key players. They need to collaborate to turn ideas into real-world benefits.
- **Different times, different incentives:** Incentives matter when hiring, keeping people engaged and making sure they stay. We have talked about changing how faculty members get promoted and finding creative ways to recruit and keep TTPs.
- **No one-size-fits-all approach:** There is no perfect plan that works for everyone. Incentives should match the goals and values of the people they are meant for. The best way to design good incentives is to ask researchers and TTPs what motivates them.
- **Balancing incentives:** The foundation of a successful incentives plan is a multifaceted approach that combines financial, non-financial and promotional incentives. Striking the right balance among these elements is the key to cultivating a culture of enthusiasm and commitment.
- **Cultivating a positive atmosphere beyond incentives:** Alongside implementing a robust incentive system, it is imperative to emphasize values such as trust, fairness and transparency. These soft factors play a pivotal role in motivating individuals and fostering the right environment.
- **Support from governments:** The guide primarily targets universities, concentrating on incentives they can implement to inspire their researchers and TTPs. However, a university's innovation ecosystem requires governmental support, which is equally crucial. The guide also provides instances of government incentives, with the aspiration that universities will advocate for increased government backing.
- **Keep sharing:** The Guide ends by encouraging everyone to share their experiences and ideas. By learning from each other, we can make incentives even better.

Looking to the future, we expect the guide to be updated and completed with a broader range of incentives examples drawn from various global regions. We invite you to reach out to WIPO to share your success stories and lessons. Your input will play a key role in making academic research and TT have a bigger impact on the world. Contact WIPO at universities@wipo.int.

Case studies

Case study 1: Towards translational innovator tracks in the health care sector



Credit: David Gyung

In the United States, despite the growing movement of the PTIE Coalition, there is no clear national model for academic career advancement that is specifically designed for the entrepreneur in the health care sector. Several authors are making calls to address this critical gap.[203]

David A. Shaywitz, co-author of the article "Tech tonics: can passionate entrepreneurs heal healthcare with technology?"[204] stated:

"If start-ups are going to be an increasingly prominent part of the academic medical center landscape – as I hope they are and believe they should be – then there should be a meaningful career opportunity for faculty members who focus their efforts on advancing this translational interface.

More generally, while some translational innovators might choose to pursue careers in industry, I suspect many [...] might envision a professional life in the university, and there should be a career path designed to recognize, support, and encourage this vitally important trajectory.

203 For example, a new "clinician innovator" career track has been proposed for faculty at academic health centers. The clinician innovator pathway includes relevant curricular training, time allocated for innovation projects, a mentorship structure that includes industry, and redefined metrics of success and criteria for promotion. See: https://academicentrepreneurship.pubpub.org/pub/aqi19jo2/release/2.

204 www.forbes.com/sites/davidshaywitz/2012/08/02/a-translational-innovator-career-track-to-support-health-entrepreneurs

Yes, the requirements for a 'translational innovator' would look different from those of traditional physician-scientists or of clinician-educators, and yes, this would require some adjustment of traditional beliefs.

But if academic medical centers are going to continue their historical role of leading biomedical innovation, if they are going to create health's future rather than just be carried along with the tide, then a good first step would be supporting and enabling the careers of the translational innovators who are willing to work across disciplines and domains, and use startups as an innovation vehicle to drive change, catalyze progress, and improve human health."

Case study 2: How Wehi creates incentives that drive commercialization success

Established in 1915, the Walter and Eliza Hall Institute of Medical Research (WEHI) is Australia's oldest medical research institute and leading medical innovation center, with over 1,200 staff and students.

To ensure the ongoing impact of their research, WEHI's Business Development Office frequently provides skill development opportunities to its research and professional staff, including internships and programs to upskill its employees in areas of technology transfer, business development, commercialization and entrepreneurship. Commercialization outcomes are included in staff evaluation and promotion criteria.

Additionally, payments from commercialization of research are distributed to people who contribute to that commercialization, including those who have published a paper in the relevant scientific area, are listed on a relevant patent, have contributed to commercial negotiations or have contributed to clinical translation.

These practices recognize and reward those whose efforts lead to successful commercial outcomes. Importantly, they also cultivate an environment which enables WEHI to support 90 laboratories committed to basic and translational research, and enable discoveries that have benefited over 30 million patients around the world.

Source: Australia University Research Commercialisation - Action Plan 2022[205]

205 www.education.gov.au/university-research-commercialisation-package/resources/university-research-commercialisation-action-plan, p. 80.

Case study 3: Vanderbilt's compensation program

Photo credit: anyaberkut

Vanderbilt University (VU), a private research university in Nashville, United States of America, employs an incentive compensation structure for its TTO licensing staff whose actions generate tangible financial gains to the institution and have distinct performance metrics to achieve. Unlike certain universities that have compensation systems encompassing their entire office, only a segment of VU's TTO is eligible for incentive compensation. This is because, while rewarding the entire office does create a sense of shared success, it may not consistently offer robust performance incentives. A significant portion of the employees might not have the capacity to influence the metrics that result in larger bonuses.

The structure for Vanderbilt's incentive compensation is as follows.

Setting TTO overall metrics and individual employee metrics at the beginning of each year:

- Office metrics include certain primary metrics such as total licensing income, total research dollars generated, faculty satisfaction, number of disclosures, number of startups; and certain secondary metrics such as total up-front fees, deal quality, patent reimbursement rate; only primary metrics are relevant to the bonus calculation.
- Individual metrics include individual transactions, up-front fees, deal quality, contributions to non-licensing transactions, and the like. There are secondary metrics for individuals as well, based on their specific job responsibilities, but only the key individual metrics factor into bonus calculations.

Bonus payment conditions and trigger points:

- Bonuses are distributed only if a specified licensing income level is attained by the office by the fiscal year's conclusion.
- Metrics come with three defined performance levels: Threshold (lowest acceptable performance), Target (expected performance) and Reach (exceptional, top-tier performance).
- For total licensing income, the Threshold must be reached, or else nobody is eligible for a bonus.

Performance evaluation:

- If the office's total licensing income exceeds the Threshold, each employee undergoes an assessment on their individual metrics, scored between 0 and 10, based on their achievement in relation to the set Threshold, Target and Reach. An employee will have four to five individual metrics.
- The entire office's performance is also evaluated using three to four overarching TTO performance metrics, each graded on a 0 to 10 scale.
- When assessing employees for bonus payments, VU incorporates a team-oriented evaluation in addition to assessing individual performance. This dual approach promotes a collaborative culture where employees work together towards shared goals. For an individual employee, the maximum bonus percentage is computed with a majority weightage on their individual performance and a minority weightage on the office's performance. (However, for directorial roles with more managerial duties, this ratio is flipped, with the majority weightage for office performance and minority weightage for individual achievements.)

Bonus calculation:

- Employees have a ceiling on their bonus, contingent on their role. For core staff members, the maximum bonus is either a fixed sum or 10 percent of their base pay. This maximum is multiplied by the employee's weighted composite score to arrive at the bonus payment amount. For managers and directors, the thresholds may be higher.
- While the exact bonus fraction varies among employees based on their individual performances, on average, the yearly payout is approximately 70 percent of the highest possible bonus across all employees.

Effectiveness:

Vanderbilt's TTO acknowledges that there exists only anecdotal evidence that its current incentive compensation plan provides a consistent and measurable increase in individual performance throughout the performance period, but indicates that there have been clear benefits in recruiting and retaining personnel. The office is considering implementing more frequent (monthly) review of performance-based metrics to determine if the effect of the plan can be enhanced.

Source: Center for Technology Transfer and Commercialization, Vanderbilt University.

Case study 4: Emory's innovative incentive program[206]

Credit: Foryou13

Emory University, United States of America, has put in place an innovative incentive program for its TTPs, as well as all other Office of Technology Transfer (OTT) staff, that has helped to recruit, retain and incentivize staff to be strong partners to faculty and companies. Emory is a private institution and may have more flexibility than public institutions have for individual compensation. The incentive program (including the OTT Incentive Plan) of Emory consists of the following mix.

The little things:

- Perks: Hybrid and virtual work schedules. Regular technology (laptop) updates and service awards. Review of market salary rates across all of research administration.
- Training: Atlanta is a large metropolitan area and holds many local events. OTT also has an extensive onboarding process for new staff.
- Team-fostering events: Office lunches, receptions, annual awards, team meetings, field trips and the like.

The important things:

- Autonomy: One of the appealing aspects of working at a university, compared to in industry, is the independence. TTPs at Emory can negotiate deals and see them through without excessive organizational scrutiny, truly possessing the authority to decide on the arrangements.
- Team focus: Making decisions such as technology or patent decisions in a group setting, licensing deal review, aged agreements meetings and so on.
- Additional support to the licensing TTPs: For example, (1) a contracting team that handles MTAs and data use agreements (DUAs) off the desk of the licensing associates; (2) hiring a pre-licensing value creator (someone who focuses on creating value on Emory's technology at a stage before a license gets done or before the technology gets disclosed), in this case to relieve the licensing associate of the responsibility of scouting and startup support; (3) a compliance associate who is responsible for government reporting; (4) a finance team that handles the processing legal invoices; (5) volunteer interns that help triage new inventions

206 Todd Sherer, Associate Vice President for Research, Executive Director, OTT, Emory University, United States. See also: Tech Transfer Central Distance Learning Program: "Create a winning incentive system for tech transfer staff," May 14, 2009.

and write tech briefs; and (6) an in-house Emory Patent Group that drafts, files, prosecutes and oversees all unlicensed technology. This division of labor has an additional advantage: by creating different positions with different focuses, there are more possibilities for promotion and career advancement within the OTT.

Competitive compensation:

- Competitive salary: Helping human resources understand the particularities of the TT profession and the salary needs to attract talented people. OTT's philosophy is to hire high, because incremental increases can be harder to get.
- Salary increases: All staff are eligible for annual merit increases as well as promotional opportunities.
- OTT Incentive Plan: The objective of the OTT Incentive Plan is to encourage team performance by creating a sense of urgency among all staff. Emory offers up to 10 percent or 15 percent of an employee's compensation as a bonus, to encourage team performance and maximize key metrics. The plan outlines the eligibility criteria, performance metrics (see below) and how the pay-out amount is calculated. This program is based on nine metrics, including TTO revenues, AUTM-reportable licenses, licensing revenue, material transfer agreements, startup companies, number of disclosures, proof of principle funding and patents. The goal of the program is to incentivize team performance and maximize license revenue.
- Benefit package: Universities often present appealing benefits, such as tuition fees, insurance, pension, relocation assistance and more. Emory explicitly highlights these benefits during their recruiting process.

Incentive Plan – metrics:

- Total license revenue: 24 percent – The total Emory share of all funds, during the relevant fiscal year, generated by the licensing of Emory technology, in accordance with the AUTM Annual Licensing Survey.
- AUTM licenses: 9 percent – All licenses (exclusive or non-exclusive) with a payment greater than USD 1,000 executed during the fiscal year, in accordance with the AUTM Annual Licensing Survey.
- High net worth licenses: 14 percent – Any AUTM license (exclusive or non-exclusive) that has a reasonable probability of generating in excess of USD 1 million over its lifetime executed during the fiscal year.
- Average running royalty for high net worth licenses: 14 percent – The average maximum running royalty rate in a high net worth license executed during the fiscal year.
- Turnaround time for MTAs: 4 percent – The average time from Emory receipt of an incoming MTA until the Emory sign date with a sign date during the fiscal year.
- Startup companies: 9 percent – A company that is dependent upon licensing Emory technology for the initiation of the company and the agreement was executed during the fiscal year, in accordance with the AUTM Annual Licensing Survey.
- Disclosure: 9 percent – All disclosures to OTT from an Emory investigator concerning a potential invention, in accordance with the AUTM Annual Licensing Survey.
- Proof of principal funding: 9 percent – Funding received by an Emory investigator that will be used in the promotion of an Emory technology (e.g., Georgia Research Alliance, Biolocity).
- Issued US patents: 8 percent – Total of all issued US patents having an issue date during the fiscal year that are assigned to Emory, regardless of counsel.

Annex A
Overview of incentives

	Researchers	TTPs
Non-financial	– Recognition – Flexible employment conditions – Entrepreneurship support – Right to publish – Additional funds – Returning IP	– Recognition – Flexible employment conditions – CPD
Career promotion	– Adding TT in promotion and evaluation process	– Career promotion opportunities and evaluation process
Financial	– Share in commercialization revenues – Salary increase – Performance-based payments – Spinout equity – Spinout director's fees – Consulting fees – Own research benefiting from research funding by spinout company	– Competitive salaries – Performance-based payments – Fringe benefits

Annex B
Assessing university dynamics: a questionnaire for researchers and technology transfer professionals[207]

Introduction and privacy notice

This questionnaire is aimed at assisting universities and research institutions to understand the motivations, opinions and potential barriers faced by researchers and technology transfer professionals in engaging with technology transfer (TT) activities. Whether you are presently involved in TT activities or are still exploring this avenue your perspective is invaluable. By sharing your views you will contribute valuable data that reflects both your personal opinion and your behavior, which can help identify and rectify any obstacles to effective TT. The completion of the questionnaire is expected to take only 5 to 10 minutes depending on your profile, and your participation is greatly appreciated. Thank you for your invaluable contribution!

This questionnaire is designed with utmost respect for your privacy. It does not gather information linked to specific individuals or identities. The collected data will be utilized solely in an aggregate form to provide general insights, and in full compliance with current legislation on the protection of personal data. We are committed to maintaining your trust by safeguarding your information.

Abbreviations used in the questionnaire

ICT	information and communication technology
IP	intellectual property
TT	technology transfer
TTO	technology transfer office

Questionnaire

Section 1 - Socio-demographic and academic information

- Gender [F; M; other; prefer not to say]
- Age [<30; 30-34; 35-39; 40-44; 45-49; 50-54; 55-59; ≥60]
- Nationality
- How much do you consider TT as part of a researcher's duties? [0=Not at all to 5=Completely]
- How much do you think TT increases quality of research? [0=Not at all to 5=Completely]
- Role [TTO Head of Unit; TTO Staff; Researcher]

If Role = TTO Head, go to Section 2
If Role = TTO Staff, go to Section 4
If Role = Researcher, go to Section 5

207 This prototype questionnaire, which can be administered to researchers and technology transfer professionals, is made available to facilitate the evaluation procedure as outlined in the action plan segment.

Section 2 – Current situation and desired changes in behavior for researchers

- Name of TTO [free text]
- TTO year of foundation [number]
- TTO size (nr. Personnel) [number]
- Share your perspective on the problem:
  - Identify the issue: What is the central issue that you want to address? Is it a lack of participation in TT activities, or is the quality of the transferred technology not up to the mark? Concerning participation in TT activities, do you observe deficiency in applied research, insufficient invention reporting, too few patents, too few spinouts, scarce researchers' involvement with industry?
  - Describe the context: From your personal view, why do you think this issue is occurring? Are there systemic barriers, lack of awareness, or insufficient incentives for researchers to engage in TT?
- Assess the current situation:
  - Evaluate participation levels: How many researchers are currently involved in TT and commercialization activities? What has been their experience?
  - Identify barriers: From your personal view, what do you think are the existing barriers that prevent or discourage researchers from participating? This could include bureaucratic hurdles, poor entrepreneurial culture at the university, lack of resources, insufficient rewards, etc.
  - Describe motivations: From your personal view, what do you think motivates researchers in their current roles?
- Define desired behavior changes:
  - What specific behaviors do you want to encourage among researchers? This could be increased participation in TT, enhanced collaboration with industry, or more innovative product development, etc.
  - If possible, establish clear and measurable goals for the desired changes in behavior.

Go to Section 3

Section 3 - Good TTO practices to incentivize researchers

Please describe the current activities that your TTO applies to incentivize researchers, emphasizing what you believe may become good practices to be shared with other TTOs:

- What was the the central issue or problem that the TTO wanted to address?
- What was the objective (with reference to researchers' motivations, i.e. improve university's entrepreneurial culture; increase researchers' internal motivations towards TT; increase researchers' recognition for their TT activities)
- The solution (please detail any activities that you activated or improved towards the objective)

Go to end of questionnaire

Section 4 - TTO staff motivation

- Scientific sector(s) of activity [Life Sciences; Biotech; ICT (including AI); Environmental Technology; Pharmaceuticals; Traditional Industry (automotive, infrastructure, non-ICT engineering); Other – multiple selection allowed]
- How much are you satisfied with working in a Technology Transfer Office? [0=Very dissatisfied to 5=Very satisfied]
- How much do the following motivations to engage in technology transfer apply to you? [from 0=It doesn't apply to me at all to 5=It very much applies to me]
  a. It is challenging and exciting
  b. It is a valuable intellectual experience
  c. I want to contribute to technological development
  d. I want to have a positive impact on society
  e. It allows me to get insights on industry trends
  f. It allows me to get recognition for my work
  g. It increases my chances to be considered for promotions
  h. It increases my chances to receive monetary rewards
  i. It gives me the possibility to start a different career
  j. It gives me visibility for further technology transfer activities

End of survey

Section 5 - Researcher's profile

- Main Scientific sector of activity [Life Sciences; Biotech; ICT (including AI); Environmental Technology; Pharmaceuticals; Traditional Industry (automotive, infrastructure, non-ICT engineering); Other]
- Current type of contract [Fixed term contract; Permanent contract; Other]
- Prior experience outside academia [No outside academia experience; Previously worked outside academia]
- How much are you engaged with the TTO of your institution? (if there isn't a TTO in your institution please answer NA) [from 0=Not engaged to 5=Highly engaged + NA option]

Go to Section 6

Section 6 - Technology transfer related behavior

- How frequently were you engaged in the following types of activity in the last five years? [0, once or twice, 3 to 5 times, 6 to 9 times, and 10 times or more]
  a. Contract research agreement with industrial partners
  b. Consulting for industry
  c. Patenting or other IP protection (integrated circuits design, utility models, protection of trade secrets, ...)
  d. Licenses and royalty agreements
  e. Spin-off/start-up company establishment
  f. Joint ventures
  g. Open innovation

If =0 in all response options, go to Section 9
If c. Patenting >0, go to Section 7
If c. Patenting =0 AND e. Spin-off/start-up company establishment >0, go to Section 8
Otherwise, go to Section 10

Section 7 - Focus on patents

- Please rate how much the following factors motivated you to engage in patenting: [from 0=It doesn't apply to me at all to 5=It very much applies to me]
  a. Patenting facilitates the establishment/success of a spin-off/start-up company
  b. Patenting facilitates cooperation with industry
  c. Patenting facilitates open innovation
  d. Patenting helps secure my own technological space
  e. Patents increase my reputation as a researcher
  f. Patenting provides licensing income
  g. Patenting is part of the third mission
- Please rate how much the following factors hindered your engagement in patenting: [from 0=Not at all an issue to 5=A critical issue]
  a. Patents have high litigation and legal costs
  b. Patents are time consuming / complex to write
  c. Inventiveness is difficult to prove
  d. Uncertainty of the prior art analysis (i.e., if relevant patents exist)
  e. Patents are an obstacle to publications
  f. Patents are not taken into account for promotion/tenure
  g. Scarce knowledge of my institution's procedures on patent

If e. Spin-off/start-up company establishment (in previous question)>0, go to Section 8
Otherwise, go to Section 9

Section 8 - Focus on spin-off/start-up company establishment

- Thinking of your spin-off/start-up company, please rate, on a scale from 0 to 100, the relative contribution to its success of the following five stakeholders: The sum of the five scores will need to be 100.
  a. You and your research team
  b. Business mentors, including senior university management
  c. Technical-scientific mentors
  d. Fundraising mentors

    e. Intellectual property (IP) mentors
- Please rate, on a scale from 0 to 100, the relative contribution to your satisfaction with your spin-off/start-up company of the following factors: The sum of the five scores will need to be 100.
    a. Have a constant flow of funds from internal/external sources
    b. Have shares of the spin-off/start-up company
    c. Have external mentoring support
    d. Keep my academic position, but still be involved in the spin-off/start-up company as advisor/consultant
    e. Other
- Please rate, on a scale from 0 to 100, what is the fair amount of shares of the spin-off/start-up company that you and your research team should get.
- What are the main difficulties you are encountering? [from 0=Not at all an issue to 5=A critical issue]
    a. Lack of business skills
    b. Lack of technical-scientific skills
    c. Lack of financial skills
    d. Lack of intellectual property support and/or of clear national legislation for academic spin-offs
    e. Fear of not being able to provide stable funding for my spin-off/start-up company
    f. Fear that the spin-off/start-up may become an obstacle for my academic career
    g. Fear of not being recognized by my institution

Go to Section 9

Section 9 - Technology transfer related intention

- If the results of your research or the use of your abilities led to an opportunity for technology transfer, would you consider it? [no, yes]
- If No: Why aren't you interested in technology transfer activities? [from 0=Completely disagree to 5=Completely agree]
    a. It is not part of my duties as a researcher
    b. I don't have time to dedicate to it
    c. I don't have the required skills
    d. I don't find it intellectually motivating
    e. I don't find it professionally and economically rewarding (e.g., it is not recognized as a criterion for career promotion)
    f. I don't trust the TTO of my institution (if there isn't a TTO in your institution please do not answer this question)
    g. It is a barrier for publishing my research

Go to Section 10

- If Yes: Under which forms would you consider it? [no, yes]
    a. Contract research agreement with industrial partners
    b. Consulting for industry
    c. Patenting or other IP protection
    d. Licenses and royalty agreements
    e. Spin-off/start-up company establishment
    f. Joint ventures
    g. Open innovation
    h. Other
    i. If Other>0 "Please specify"

Go to Section 10

Section 10 - Individual motivations

- How much do the following motivations to engage in technology transfer apply to you? [from 0=It doesn't apply to me at all to 5=It very much applies to me]
    a. It is challenging and exciting
    b. It is a valuable intellectual experience
    c. I want to contribute to technological development
    d. I want to have a positive impact on society
    e. I want to check the validity and practical application of my research

f. I want to increase my network of professional relationships with industry
g. It allows me to get insights on industry trends
h. It allows me to get recognition for my work
i. It increases my chances to be considered for promotions
j. It increases my chances to receive monetary rewards
k. It gives me access to in-kind resources (materials, equipment, infrastructure, expertise)
l. It gives me the possibility to start a different career
m. It gives me access to funding for my research
n. It gives me visibility for further technology transfer activities
o. Other
p. If Other>0 "Please specify"

Go to Section 11

Section 11 - Contextual factors

– Please state how much the following statements apply to your institution (university, research organization): [from 0=It doesn't apply at all to my institution to 5=It very much applies to my institution]
  a. In my institution there is a strong entrepreneurial culture
  b. In my institution there is a structured and effective ecosystem for technology transfer
  c. My institution strongly supports the third mission
  d. My institution provides services that facilitate technology transfer (training programs, market analyses, patenting, spin-off creation)
  e. In my institution the importance of technology transfer is clearly communicated
  f. The internal rules of my institution encourage researchers to get involved in technology transfer
  g. The TTO of my institution encourages researchers to get involved in technology transfer (if there isn't a TTO in your institution please do not answer to this question)

End of questionnaire

This *Guide on Incentives in Technology* aims to encourage creative thinking around incentives for researchers and technology transfer professionals (TTPs) by challenging existing orthodoxies, generating fresh insights, and stimulating a productive debate within the field. To achieve this goal, incentives are categorized into non-financial, career advancement and financial. Examples and case studies are provided to examine initiatives that challenge the status quo of incentives for researchers and TTPs, aiming to realign them in support of translating research findings into real-world applications that tackle urgent societal issues.

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