

The role of universities in IP-driven technology transfer

Fostering innovation through policy and practice

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Abstract

This article explores how universities increasingly leverage intellectual property rights (IPRs) to foster innovation and enable technology transfer. It discusses the evolving role of academic institutions as commercialisation engines through the creation of robust IP policies, Technology Transfer Offices (TTOs), and university spin-offs. With case studies from India, the article illustrates how institutional mechanisms, policy frameworks, and public-private collaboration contribute to successfully transforming research into market-ready solutions. The article concludes with recommendations to enhance IP-driven technology transfer ecosystems in developing countries.

Introduction

Technology transfer is a collaborative process that facilitates the transfer of scientific knowledge and intellectual property (IP) from the developer, for instance, from universities or a research institute to users in the form of new products and services for the benefit of society¹. It is a movement of information, materials, inventions, technical knowledge or trade secrets and software from one organisation to another for use with different purposes². In the context of universities, IP-driven technology transfer commercialises the university's intellectual property rights-protected research findings, such as copyrights, patents, or trade secrets. The transfer is often executed

through licensing agreements with industry associates.

In the broader context, effective technology transfer is important for promoting economic growth around the world³. Technology transfer supports the dissemination of encouraging innovation, new technologies, economic growth, and worldwide collaborations among competent institutes. It fosters the practical applications of newly developed knowledge into practical applications and enhances the productivity and overall well-being of the world⁴. It leads to the creation of new organisations, industries, and employment, and promotes economic activities. Technology transfer

allows new technology and knowledge for more users worldwide and involves training and development for skilled human resources. Hence, countries enhance their overall national innovation capacity by adopting new technologies through technology transfer.

Role of universities as innovation hubs

Universities play an important role in the economy, serving as centres for developing and disseminating new knowledge that fosters technological advancement and economic growth (Hsu et al., 2014). Historically, universities primarily emphasised generating new knowledge, making it accessible to all, and leveraging industry with this knowledge for commercial applications (Sattiraju et al., 2022). Universities have become the catalyst for economic growth by actively collaborating in transferring knowledge from their research labs to the industry (Cai et al., 2020; Meléndez et al., 2020). This is possible because the universities have developed innovation strategies and intellectual property rights (IPR) policies that protect and empower them to create and commercialise the innovations they developed (Sattiraju et al., 2022; Bulsara et al., 2013). In recent times, universities have strategically managed their IPR policies to manage technology transfer activities (Urze & Abreu, 2015). Universities adopt various mechanisms to translate the technologies to commercialisation (Phan & Siegel, 2006). It includes patented and non-patent knowledge, such as data, software, and know-how (Marr & Phan, 2020). An effective technological

1 <https://www.wipo.int/en/web/technology-transfer>

2 <https://www.twi-global.com/technical-knowledge/faqs/what-is-technology-transfer#:~:text=Tech%20transfer%20allows%20research%20to,Transfer%20is%20Adapted%20by%20SMEs>

3 <https://www.wipo.int/en/web/technology-transfer>

4 <https://thelegalschool.in/blog/advantages-of-technology-transfer>

transfer is achieved through a strong innovation ecosystem, collaboration among industry, government, and universities, and the collection of resources and expertise that jointly foster economic development (Bandt, 1999). The successful technology transfer required bridging the gap between academia and industry and resolving areas of concern where universities' knowledge remains as just a publication and uncommercialised, as industry's unawareness of the presence of new know-how (Новородовська et al., 2020).

Collaboration between universities and industry is crucial for technology transfer and promoting innovation by working together. They can fuel the development and commercialisation of new knowledge that fosters innovation in products and services (Hailu, 2024). These collaborations create opportunities for entrepreneurship, employment, and economic growth (Hailu, 2024). However, the relationship between universities and industry faces many challenges, such as conflicts of interest and accountability (Merrill & Mazza, 2010). Despite the challenges, these collaborations are key ecosystems to develop and commercialise university research (Kneller et al., 2014). For successful partnerships with industry and technology transfer, a deep understanding of industry and market needs is important (Benam et al., 2021). Universities need to adapt and customise their curricula to identify the knowledge with practical applications (Sharma & Garg, 2019). The collaboration requires effective leadership and management skills within the universities to become successful centres of technology transfer (Seppo & Roolah, 2012).

Universities work with their technology transfer offices, incubation centres, and technology or science parks to nurture and create knowledge within the universities (Łobacz, 2018). These catalysts are important in translating academic research into marketable products and services and provide an ecosystem to support university entrepreneurship activities (Hench, 1990). These support structures, therefore,

play a pivotal role in helping universities meet their technology transfer objectives and contribute to economic growth. It helps to create new companies based on IPs developed within the universities.

Improving university-based research commercialisation will allow academic researchers to be more active and successful entrepreneurs. Intellectual property will progress more freely in the marketplace to benefit inventors, universities, and society (Vanderford & Marcinkowski, 2015). Startups can focus on technology transfer and eventually become financially independent and self-sustaining in this enabling environment. Academic entrepreneurship and the university model of technology business incubation offer benefits to the country, local community, and university in terms of economic development, diversification, job creation, technology development, viable firms, successful products, and increased university income and prestige (Lyken-Segosebe et al., 2020). However, university and faculty culture and faculty members' knowledge and skills in entrepreneurship and social capital may restrain this potential. Enhancing the commercialisation of university-based research will enable academic researchers to become more active and prosperous businesspeople, facilitating the free flow of intellectual property to the market for the benefit of society, universities, and inventors (Vanderford & Marcinkowski, 2015). In this supportive atmosphere, startups can concentrate on technology transfer and eventually achieve financial independence and self-sufficiency. In terms of economic development, diversification, job creation, technology development, viable firms, successful products, and increased university income and prestige, academic entrepreneurship and the university model of technology business incubation benefit the nation, local community, and the university (Lyken-Segosebe et al., 2020). However, this potential may be limited by the culture of the university and its staff and their expertise in social capital and entrepreneurship.

Government policies and the public's desire for technology-based economic development have propelled universities to become centres of knowledge transfer and entrepreneurship (Ahamat et al., 2021). Government policies significantly contribute to the growth of university knowledge transfer and entrepreneurship by implementing measures like financing programs and tax incentives. By promoting involvement and establishing new businesses, these policy initiatives support the development of entrepreneurial environments within the universities. Governmental initiatives have been developed to boost economic advancement and innovation via university knowledge transfer and entrepreneurship (Duruflé et al., 2018). Nonetheless, it is crucial to create regulations supporting technology transfer initiatives while protecting the integrity and objectivity of scholarly research.

Universities play a crucial role in encouraging innovation through active engagement with industry partners to assist in transferring technology and information. Universities can increase the likelihood of successful technology commercialisation by working with industries to ensure their research meets industry demands. University-business partnerships boost technology transfer's economic impact and speed it up.

Institutional mechanisms supporting technology transfer

Universities are important research centres for innovations and new technologies. Universities facilitate technology transfer through specialised centres called technology transfer offices (TTOs), direct research collaborations, and spin-offs creating startup companies, technology parks, and industry partnerships. They act as a catalyst for industry collaborations, encouraging entrepreneurial initiatives (Bulsara et al., 2010), developing skilled human resources, and translating research into practical applications⁵. Technology transfer from universities promotes economic growth and improves overall living standards.

5 <https://innovation-entrepreneurship.springeropen.com/articles/10.1186/s13731-024-00370-y>

The following are the mechanisms that universities use to transfer technology.

Formal licensing agreements: Formal licensing is the most prevalent and structured mechanism for university technology transfer. It involves the university, as the owner (licensor) of intellectual property, granting specific rights to a third party (licensee) to use and commercialise that IP. The primary objectives of such agreements are multifaceted: to ensure the diligent commercialisation of university technologies for public benefit, to comply with federal and institutional policies, and to generate a reasonable financial return for the university and its inventors.

University spin-off companies: Another important formal method for technology transfer is university spin-off businesses, sometimes called spin-outs. These are brand-new businesses established to market technology innovations created by university researchers, frequently by staff, teachers, or students. When a spin-off is formed, the university's intellectual property—mostly patents or copyrights—is usually transferred to the new business company or licensed.

Industry collaborations and research consortia: Universities work closely with industry partners and through research consortia in various ways in addition to direct IP licensing and spin-offs. These interactions include staff exchanges, collaborative R&D efforts, funded research, and university faculty consulting. These collaborations are advantageous to both parties. Exposing students to real-world applications and industry difficulties improves their learning experiences and frequently results in worthwhile internship and co-op opportunities.

Technology transfer offices: Technology Transfer Offices (TTOs), or Technology Licensing Offices (TLOs), are specialised intermediary bodies within universities that play a pivotal role in managing intellectual property assets and facilitating knowledge and technology movement from academic laboratories to commercial sectors. They are essential for bridging the gap between academic research and commercial applications.

When taken as a whole, these mechanisms demonstrate how important universities are in fostering industrial collaboration, entrepreneurship, and the creation of highly qualified human resources, all of which help turn research into useful applications that advance society.

Case Study 1: The Indian Institute of Technology Bombay

The Indian Institute of Technology (IIT) Bombay has long been an important centre for research, innovation, and entrepreneurship in India. A key enabler of this reputation is the institute's structured and proactive approach to intellectual property (IP) management through its Intellectual Property Rights (IPR) Cell. This Cell, operating under the Industrial Research and Consultancy Centre (IRCC), is instrumental in identifying, protecting, and commercialising the creative outputs of its faculty, researchers, and students (IIT Bombay, 2021). The IPR Cell is well-integrated into the larger innovation ecosystem at IIT Bombay, working closely with the Society for Innovation and Entrepreneurship (SINE) (Bulsara et al., 2009), the institute's business incubator (IIT Bombay, n.d.). Together, these entities have helped incubate several successful startups. Furthermore, the Cell collaborates with the Technology Transfer Office (TTO), which manages industry linkages, licensing agreements, and commercialisation strategies. In addition, regular workshops and awareness sessions are conducted to educate researchers and students on IP management, patent drafting, and valuation, thereby fostering an innovation-centric culture within the campus (IIT Bombay, 2021).

Seclore is a shining example of the success that can emerge from such a structured IP and entrepreneurship ecosystem. Founded in 2005 by IIT Bombay alumni Vishal Gupta and Abhijit Tannu, Seclore was born from a research project supervised by Prof. D. B. Phatak from the Department of Computer Science and Engineering (Nair, 2014). At a time when cybersecurity

solutions primarily focused on network and device-level protection, Seclore introduced a pioneering concept: securing the document itself, regardless of where it travelled. This innovation, later commercialised as Information Rights Management (IRM), embedded security policies directly into files, allowing persistent control over access, editing, and sharing, even outside the organisation's firewall (Seclore, n.d.).

Recognising the uniqueness of this solution, the IPR Cell at IIT Bombay helped the founders protect their core technology through early-stage patent filings. These patents became critical assets that offered legal defensibility and increased the startup's credibility in the eyes of investors and enterprise clients. Moreover, the startup received significant support from SINE, which provided seed funding, infrastructure, business mentoring, and access to industry networks (IIT Bombay, n.d.). The backing of IIT Bombay facilitated pilot projects with large organisations and enabled Seclore to establish a reputation as a serious enterprise security player (Nair, 2014). Seclore soon gained many licensing collaborations in sectors such as banking, financial services, manufacturing, and defence, and it has expanded its wings globally. Seclore's IRM technology managed to gain a valued position by integrating its services with platforms like Salesforce, SAP and Microsoft 365 (Seclore, 2023) and is able to manage its presence in more than 30 countries, working with more than 2000 clients. It attracted funding from notable venture capital firms and gained recognition in Gartner's Magic Quadrant for Information Rights Management (Gartner, 2022). Its clientele included leading firms such as ICICI Bank, Axis Bank, Saudi Telecom, and Infosys (Times of India, 2020).

IIT Bombay model emerges as a benchmark for technology transfer from an academic institute. IIT Bombay can create pathways for successful startups and entrepreneur opportunities with strategic IP support, collaboration with industry, and transparent policies. Seclore's journey from academic research project to global cybersecurity leader represents the strong integration of academic research, IPRs pro-

tection, and successful technology transfer as an enterprise.

Case study 2: Sardar Vallabhbhai National Institute of Technology

The Association for Harnessing Innovation and Entrepreneurship (ASHINE) at the Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat operates as a Section 8 not-for-profit company under the institute's Research Park, established in 2017 with the Department of Science and Technology - National Science and Technology Entrepreneurship Development Board's (NSTEDB) National Initiative for Developing and Harnessing Innovations (NIDHI) - Technology Business Incubator (TBI) program funding. ASHINE's core mission is to foster interdisciplinary innovation and entrepreneurship across engineering domains such as materials, manufacturing, energy, and environment, as well as to promote the commercialisation of research outputs by providing infrastructure, funding, mentoring, and IPR support (SVNIT, 2025). It manages both pre-incubation and incubation activities, extending co-working spaces, laboratories, and a FabLab, and it supports startups through funding stages like Ignition, Catalyst, Energise, Leap, and Trigger under Gujarat's Student Startup and Innovation Policy (SSIP) and Scheme for Assistance for Startups (SAS) policies. Its official recognition as the nodal institute for South Gujarat under Gujarat's Scheme for Assistance for Startups Innovation empowers it to offer seed grants of up to ₹30 lakh (plus ₹10 lakh for social-impact), sustenance allowances, fees for training programs, and facilitation of connections to Gujarat Venture Finance Limited (GVFL) for pre-Series A funding (Times of India, 2021; ASHINE, 2024). To date, ASHINE has funded over 67 projects, incubated 57 startups, and disbursed more than ₹2 crore to innovators, including support for 12 IP filings (SVNIT, 2025). Additionally, its Student Associateship and Startup India Learning Programs train students in entrepreneurial skills, while events like UNICEF's Innovation Festival and

SVNIT Startup Expo engage over 2,000 participants and facilitate networking with industry experts (ASHINE, 2023; SVNIT, 2025). By integrating national schemes, institute policies, and industry partnerships, ASHINE exemplifies a robust ecosystem that transforms academic research into viable startups.

Recommendations for strengthening IP-driven transfer

The academic institute must adopt a multifaceted approach to develop strong IP-driven technology transfer. This involves building national and institutional frameworks, incentives for academic partners, operational capacity, and international collaboration. These strategies can develop a strong innovation ecosystem to boost technology transfer and create social impact (Thape, 2023; National Law School of India University [NLSIU], 2023). The following points can be considered as recommendations for developing effective IP-driven transfer.

The fundamental requirement is to establish specific and detailed IP policies at a national and academic level. These policies should cover aspects such as ownership rights, licensing terms, models for revenue sharing, and resolution of disputes. Countries with well-articulated IP policies tend to exhibit more streamlined and effective commercialisation processes. Such policies reduce ambiguity and build trust between universities, researchers, and industry stakeholders (DKPTO, 2022).

The capacity of Technology Transfer Offices (TTOs) and IP professionals must be significantly strengthened. TTOs require dedicated staff with legal, technical, and commercial expertise to manage the complex intellectual property lifecycle—from invention disclosure to patent filing, licensing, and startup creation. Targeted training and exposure to international best practices can enhance the effectiveness of these offices (World Intellectual Property Organization [WIPO], 2002; Law Office Sung, n.d.; Thakur, 2023).

Academic faculty should be encouraged and rewarded for participating in IP creation and commercialisation. This could include financial incentives such as royalty-sharing mechanisms, commercialisation bonuses, equity options, and non-monetary recognition such as awards and career advancement (WIPO, 2002; India Today, 2020; Singh & Patel, 2024). Universities that have embraced such incentives have reported higher patenting and licensing activity (LinkedIn, 2023a).

International partnerships between academic institutions and industry can promote knowledge exchange and accelerate technology transfer through collaborative research and development projects, global startups, international licensing, partnerships, funding sources, and expertise. These are crucial for scaling innovation (WIPO, 2023; LinkedIn, 2023b).

In addition to the four primary recommendations, several supporting actions should be considered. Adequate funding and institutional support are crucial for research, IP protection, and commercialisation efforts. Institutions should allocate dedicated budgets for patenting and proof-of-concept development (Goyal & Mehta, 2022; PowerPatent, 2023). Public-private partnerships can further leverage government funding and industry capabilities to scale research outcomes (Thape, 2023).

Another important strategy is awareness and education. Institutions should conduct regular workshops and awareness campaigns to educate students, faculty, and research staff about the importance of IP and technology transfer (Goyal & Mehta, 2021; AIMT, 2025).

Finally, it is important to establish evaluation mechanisms to measure the effectiveness of IP-driven technology transfer practices by considering key performance indicators such as the number of patents, collaborations, revenue from licensing, and the number of successful startups (WIPO, 2023; Sustainability Directory, 2024).

If addressed comprehensively by the academic institutes, these areas can significantly improve the innovation ecosystem and efficiency of the IP-driven technology transfer. This will contribute to national development.

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