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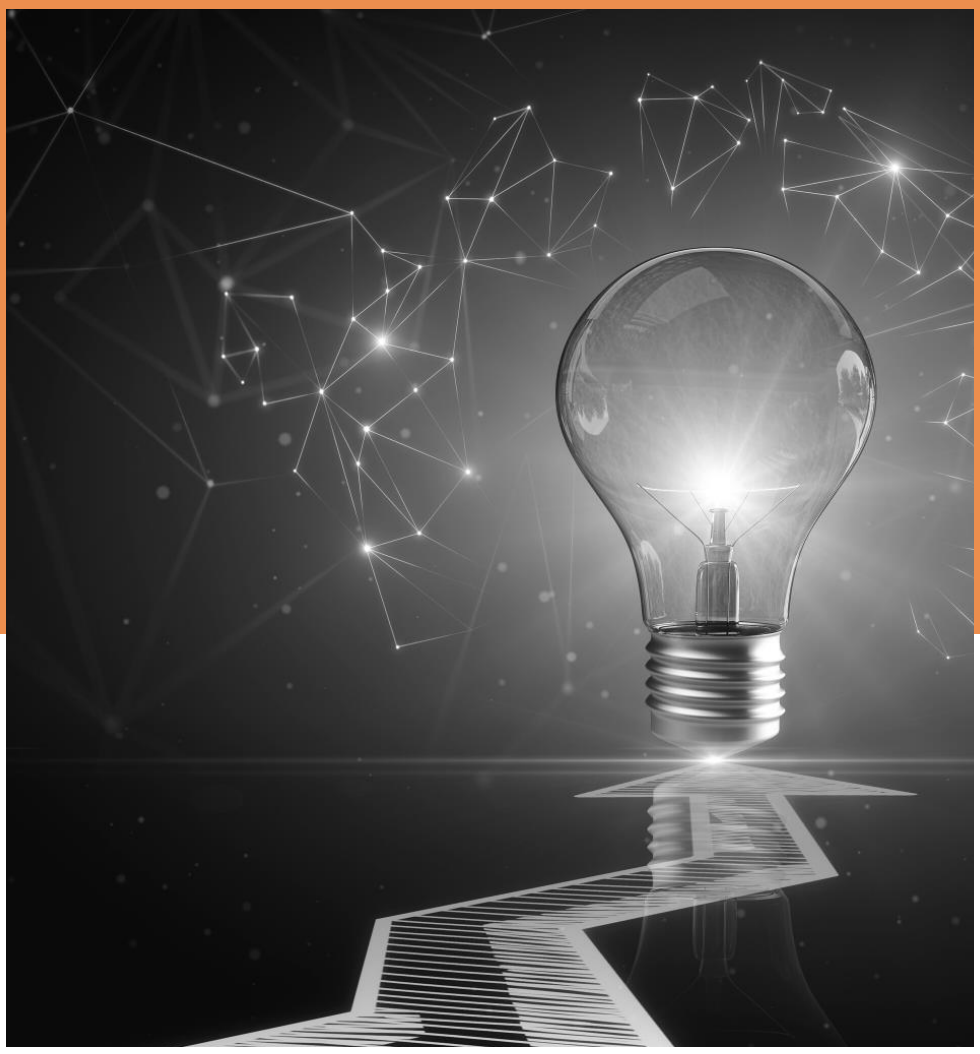
IP COMMERCIALIZATION IN AN INTERCONNECTED WORLD

LESSONS AND POLICY OPPORTUNITIES FOR INDIA AND DENMARK



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Sathguru has over three decades of experience in advancing technology to markets, enabling technology creation partnerships, down streaming innovation for public good and corporate competitiveness, valuation of IP, and monetizing IP through cross-border licensing. For any comments or discussions, please reach out to the authors at pushpa@sathguru.com or lifesciences@sathguru.com

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Introduction

Both India and Denmark are committed to green transition and focus on implementing the Paris Agreement and the United Nations (UN) Sustainable Development Goals (SDG). With the determined goals of Denmark for reducing carbon emissions up to 70% by 2030 and India's renewable energy goals of 500 GW by 2030, both the countries have partnered to create a mutually beneficial *Green Strategic Partnership*. One of the Green strategic partnership objectives is to focus on accelerating technology development and implementing new solutions. Both nations seek to promote and facilitate investments in science, technology, and innovation (STI) via solid public-private partnerships. Intellectual Property (IP) cooperation between India and Denmark covers the exchange of information and best practices on Intellectual Property Rights (IPR) to modernize and strengthen their science and innovation systems, the National Intellectual Property systems, and business promotion systems to strengthen innovation, application of science, creativity, and IP commercialization.

To accomplish the IP goals set by the partnership, it is essential to map the current IP ecosystem in both countries and assess means to strengthen further and accelerate IP commercialization outcomes. This report summarizes key trends around IP creation and commercialization in India and Denmark and presents recommendations based on stakeholder consultations and research.

This report incorporates three major chapters.

Chapter 1: Legal and IP framework for IP and Technology Transfer

Chapter 1 covers the legal and policy frameworks for the protection of IP and advancing IP through commercialization milestones. It includes a brief discussion on national legal frameworks and an overview of common policy frameworks across Indian and Danish institutions supporting IP protection and commercialization.

Chapter 2: Indian and Danish Ecosystems for IP commercialization: Evolving contextual considerations

Chapter 2 focuses on key trends in the evolving IP commercialization ecosystem in both countries. It touches upon the innovation funnel: research and development (R&D) investments and IP creation. It also covers trends across the most common approaches to commercialization – IP licensing, sponsored research and spin-out ventures.

Chapter 3: Recommendations

This chapter highlights recommendations based on extensive stakeholder consultations and secondary research. Recommendations cover the continuum of strengthening the IP creation funnel, strategically shaping the composition of the IP portfolio, and creating more robust enabling support for IP advancement and market shaping.

LEGAL AND POLICY FRAMEWORK FOR IP AND TECHNOLOGY TRANSFER

I. Legal and Policy Framework for IP and Technology Transfer

Fostering innovation is one of the sustainable development goals set by both countries. Both Denmark and India have implemented several initiatives to deepen innovation engagement and power IP-led growth. Both countries have introduced several policies to enhance IP creation and its deployment for economic and social development. This chapter provides an overview of key policies and legal frameworks implemented in both countries to support innovation and commercialization.

In the recent past, Patent offices in both countries have witnessed substantial growth in patent filings. India is well poised to accelerate R&D-led growth, and the culture of innovation is taking centre stage. Many changes have been introduced in the IPR regime to increase efficiency, which has substantially shrunk the time taken for the grant of patents. This is also reflected in the improved ranking on Global Innovation Index (GII) over the years. India produced more innovation outputs relative to its level of innovation investments. The focus on strengthening technology transfer capacity can accelerate value realization on this expanding base of innovation outputs. On the other hand, Denmark has a relatively more established yet evolving IP commercialization landscape. Denmark has a concentrated IP creation landscape that can be a significant enabler of the green transition. The country has a long-standing history of creating a highly international portfolio of patents and high conversion of institutional patents to licenses. As per the Global Innovation Index 2021, Denmark ranks ninth among 132 economies[1].

A. National Legal Frameworks – IP Protection

A robust IPR framework is foundational to nurturing innovation-powered economic and social goals. As outlined in Annexure D, both India and Denmark have a robust legal framework for various forms of IP. Both follow Trade-Related Aspects of Intellectual Property Rights (TRIPS) compliant, robust, equitable, and dynamic IPR regime. India and Denmark have also taken several policy measures to foster a more efficient and transparent process for grant of IP and broader engagement of start-ups and smaller companies. The legislative, administrative, and judicial framework is well-established to safeguard IPRs and meet international obligations while utilizing international regime's flexibility to address developmental concerns.

Under the aegis of The Minister for Industry, Business and Financial Affairs, the Danish Patent and Trademark Office (DKPTO) is responsible for implementing protection for different kinds of Intellectual Property generated (Annexure D), including Patents, Trademarks, Design, Plant Variety Protection, and Copyrights. In September 2021, the Danish Ministry of Industry, Business, and Financial Affairs launched the first National IP Action Plan with 16 initiatives for strengthening the IP ecosystem with better inclusion of (SMEs), supporting business competitiveness, export, and growth. The Action Plan focuses on four key areas:

a) Value creation via IP rights;

b) Fair, efficient, and well functional IPR system;

c) International commitment;

d) Knowledge of IP rights

[1] Global Innovation Index 2021 – WIPO (https://www.wipo.int/pressroom/en/articles/2021/article_0008.html)

A few of the key initiatives are highlighted in the box below.

The National IP Action Plan was developed with 16 initiatives for further strengthening the ecosystem for IP creation and business competitiveness. A few of the key initiatives are:

- Patent Vouchers: Monetary assistance to protect innovation for SMEs to cover the cost of patent filings and IP consultancy fees.
- Fast-track patent system to enable patent grant within 6-10 months, which is twice as fast as the standard patent grants time.
- Awareness programs and mentor programs that allow SMEs to engage in knowledge sharing with companies with IPR experience. The mentoring program will thus act as a bridge between IPR-experienced and inexperienced companies and create a learning partnership.
- Launch of a modernized "IP Marketplace" where companies can list their patents for sale, thereby increasing the probability of connecting patent creators with innovation seekers.

In addition to the initiatives mentioned above, DKPTO has introduced numerous services to support SMEs. Some of the essential services are:

- **PVSonline**: This service provides access to IPR professionals
- **IPsurvey™**: This service provides an ongoing commercial patent watch. It allows the companies to monitor competitors, identify potential business partners and keep up with the recent developments in their domain of interest.
- **IPscore®:** This online tool facilitates IP management, allowing the companies to progress through a thorough evaluation of their patent and technological development projects, with different sections identifying the relative strength of various strategic, technological, market, and financial factors.
- **Online searching:** The free tool provides access to a range of IPR databases relating to patents, utility models, trademarks, and designs and allows to collect information.
- **IP Evaluation**: A free tool that evaluates patents, trademarks, and designs when traded. The tool facilitates identifying the correct value for IP rights negotiations and creating IP strategies for business growth.

Similarly, the Indian IP system maintains a fine balance between private rights through IPRs on one hand and rights of the society as public interest on the other. The Department for Promotion of Industry and Internal Trade (DPIIT), at the Ministry of Commerce and Industry, India, is the nodal office for administering various laws related to IPRs (Annexure D).

The Government of India (GoI) introduced the National IPR policy in 2016 with the intent to foster creativity and innovation, thereby promoting its socio-economic development. The policy laid down seven objectives, including IPR awareness and IP commercialization, along with the other five objectives.

Since the introduction of the National IPR policy, the GoI has also taken several proactive steps to strengthen the IPR ecosystem and accelerate the pace of IP led value creation:

- **Modernisation of IP offices**: Steady switchover from manual to computerized system of processing IP applications, improved management of IP-related information, creating a stronger public interface, and revamping of the routine functioning of IP Offices.

- **Manpower Augmentation**: To remove the backlog and enable speedy examination/disposal of IP applications, the workforce in IP Offices has been augmented substantially. Examiners of Patents & Designs were recruited in 2016, and the recruitment of 220 new examiners of patents in different fields was made in 2019 to have sufficient strength.

- **Use of IT and Technology:** Initiatives such as paperless electronic processing, E-filing of applications; delivering in digital format certificates of grant/registration of patent, trademark, and designs; using video conferencing for hearing of IP applications, etc. are a few initiatives for the use of IT and technology to streamline and smoothen the process.

DPIIT and WIPO collaboration to support IP and innovation:

IP commercialization being one of the key objectives of IPR policy, DPIIT, through a service level agreement in collaboration with the World Intellectual Property Organisation (WIPO) has established 11 Technology and Innovation Support Centre (TISC) in India. These TISCs provide innovators with access to locally based, high-quality technology information and related services, helping them exploit their innovative potential and create, protect, and manage their Intellectual Property (IP) rights.

Scheme for facilitating 'Startups Intellectual Property Protection' (SIPP) has been extended to TISCs to support them in IP filing process further.

To support the ecosystem and encourage patent filings, other steps undertaken include:

- **Expedited Examination:** The facility of Expedited Examination has been provided for patent applications filed by start-ups and for applications where the Applicant has selected the Indian Patent Office as ISA/IPEA for their Patent Co-operation Treaty (PCT) application. By amending the Patents Rules, the Expedited Examination system (with effect from 17-09-2019) has been further extended for patent applications to 8 more categories of Applicants - SME, Female applicants, Government Departments, institutions established by a Central, Provincial or State Act, which is owned or controlled by the Government, Government Company, an institution wholly or substantially financed by the Government and applicants under Patent Prosecution Highway (PPH).

- **Initiatives for Micro, Small & Medium Enterprises (MSMEs)[2,3]:**
  - IP reimbursement Scheme by the Ministry of MSME
  - Ministry of MSME provides reimbursement for granted patents, trademarks, and geographical indications to lessen the financial burden of Innovators with good quality innovations. Establishment of Intellectual Property Facilitation Centres (IPFCs) across the country.
    With the support of the Ministry of MSME, various IPFCs have been established to assist the MSMEs in filing their IP, mentor them about their IP needs and guide them towards utilizing IP tools in leveraging IP for the sustainability of their businesses.

[2] http://dcmsme.gov.in/CLCS_TUS_Scheme/IPFC/Scheme_Guidelines.aspx
[3] https://my.msme.gov.in/MyMsme/Reg/COM_Ipgr.aspx

- **Initiatives for Start-ups:**
  - 80% fee concession is available for Patent applications filed by start-ups. A similar provision of enhanced fee concession for MSME has been proposed in the Draft (Second Amendment) Patent Rules, 2019.
  - SIPP was launched in 2016 (extended up to March 2023). It is implemented by the office of Controller General of Patents, Designs and TradeMarks (CGPDTM) and provides facilitators to start-ups for filing and processing their applications for patents, designs, and trademarks.
  - National Initiative for Developing and Harnessing Innovations (NIDHI) is an umbrella program conceived and developed by the DST-NSTEDB (Department of Science & Technology - National Science & Technology Entrepreneurship Development Board) for nurturing ideas and innovations (knowledge-based and technology-driven) into successful start-ups.

- **Initiatives for Academic Institutions:**
  - Department for Promotion of Industry and Internal Trade (DPIIT), vide its notification dated 21 September 2021, has released the Patents (Amendment) Rules, 2021, highlighting a rebate of up to 80% rebate on Patent fees for Educational institutions.
  - The *National Innovation and Startup Policy* (NISP) was adopted in 2019 by GoI is a guiding framework for all the Students and Faculty Members of Higher Education Institutions (HEIs) in India to promote innovation and entrepreneurship-related activities in HEIs. NISP has created a standard guideline that Universities can adopt to govern aspects of IP ownership, spin-out creation, and licensing.[4]

- **Awareness in IPR:** The Cell for IPR Promotion & Management (CIPAM) is regularly engaged in the dissemination of information and knowledge to IP stakeholders by way of conducting/participating in IPR awareness activities conducted for schools, universities, industries, legal and enforcement agencies, and other stakeholders.

Ministry of Education has launched a campaign, 'Kalam Program for Intellectual Property Literacy and Awareness Campaign (KAPILA)' for Intellectual Property Literacy and to create patent awareness. The scheme's objectives include creating IPR in HEIs, enabling IP protection of inventions originating from faculty and students of HEIs, development of Credit Course on IPR, training program on IPR for faculty and students of HEIs, and sensitization and development of a vibrant IP filing system.

Department of Science & Technology (DST) established Patent Facilitation Cell (PFC) in Technology Information Forecasting and Assessment Council (TIFAC) in the year 1995 and subsequently 24 Patent Information Centres (PICs) in various states under the Patent Facilitation Programme (PFP) of the Department to create awareness and extend assistance in protecting IPR at the state level.

[4] National Innovation and Startup Policy (NISP) (*https://mic.gov.in/assets/doc/startup_policy_2019.pdf)*

B. Legal and Policy Framework and Ecosystem - Technology Transfer and Commercialization

Technology Transfer Ecosystem in Denmark

Denmark is one of the few countries in the European Union (EU) that has reached Europe's 2020 target for R&D intensity of 3% of Gross Domestic Product (GDP). The European Innovation Scoreboard (EIS) ranks Denmark as one of the Innovation Leaders amongst the EU countries based on 27 parameters including R&D expenditure and an innovation-friendly environment[5]. This high output research landscape is concentrated. The research base includes eight Danish Universities and five university hospitals that receive 95% of the public expenditure on R&D[6]. The Universities and higher education institutions are state-funded autonomous institutions. The Danish Regions administer the hospitals. They are the second-largest R&D performers and account for 15 – 20% of the total public R&D expenditure.

The Danish Researcher's Patent Act came into effect in 2000 and was modified in 2009. Modelled similar to the US Bayh Dole Act, it requires disclosure of inventions by academic researchers, accords IP ownership to institutions, and puts the onus of IP protection and commercialization on the institutions. It thus created a national legal framework covering ownership of institution-generated inventions and mandated the creation of technology transfer capacity across research institutions. At the end of 2014, the University Act was amended to give universities more autonomy in arranging their management structures[7]. This implies that in addition to a concentrated ecosystem, there is a relatively high level of structural homogeneity in the Danish technology transfer ecosystem across institutions/universities, with all universities having an embedded TTO.

The embedded TTO in each university is an integral part of the ecosystem. The TTOs play a critical role in engaging with researchers to create awareness, understand the IP being generated, identify innovation with commercial viability and manage the entire range of IP commercialization activities. The TTOs also nurture industry connectivity and focus on business development has expanded across Danish TTOs. Some of the university TTOs, such as Aarhus, University of Southern Denmark, etc., have also expanded their support to the hospitals in the region and manage commercialization activities for the hospitals. The TTOs are funded by the respective universities and are perceived as an extension of the research function and encompass the critical role of realizing the social and economic value of innovation investments. There are no special grants provided to the university to run the TTOs, and they are funded from the university budget. Revenue generated through licensing, equity, and other means covers part of the patenting costs for the TTOs. Over the last ten years, 2017 was the first year when Danish public research institutions generated a commercialization surplus (excluding wage expenditure)[8]. Danish Universities have, over the years developed a strong collaborative spirit, and the TTOs are organized in the Danish National Network for Technology Transfer, which is a committee

[5] European Innovation Scoreboard 2020 (https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_1150)
[6] Peer Review of the Danish R&I System, The European Commission, 2019
Other higher education and research institutions are university colleges, art and architecture schools, business academies, maritime education institutions, government research institutions and Research and Technology Organizations. These institutions that spend the remaining 5 % of the public expenditure on R&D.
[7] https://www.oecd-ilibrary.org/docserver/sti_in_outlook-2016-56-en.pdf?expires=1639232133&id=id&accname=guest&checksum=23B990EEEA529024DD668CD6366118B0
[8] Literature review and assessment of the Danish knowledge-based innovation support system, November 2018, Prepared for Danish MHER (https://irisgroup.dk/wp-content/uploads/2018/12/Literature-review-and-assessment-of-the-Danish-knowledge-based-innovation-support-system.pdf)

operates under the organization Danish Universities. In addition to focusing on more effective business development, the TTOs have also taken initiatives to make the overall process of licensing more efficient and transparent while embracing the widening role of technology maturity through spin-outs.

Most universities mandate that the faculty contribute to the research and innovation ecosystem. So, along with teaching, the faculty is also committed to research. This commitment and focus on research and development by academia has been one of the significant contributors to the thriving innovation economy in Denmark. Entrepreneurship in education has been introduced to motivate students towards entrepreneurship. There are also student-supporting incubators associated with all the universities that encourage active engagement of students in entrepreneurship. Each university has full or partial ownership of companies supporting commercialization activities, spin-out creation, and/ or investment consultation. These companies offer services to the university as well as to the institutions in the regions too. Universities can be co-owners of incubators or research parks through their subsidiaries and invest in them (up to 3% of their research turnover). Most universities are now investing in tech parks to boost the ecosystem. The TTOs in Denmark have established several incubators to support innovation (Annexure E).

Within the ambit of the national legal framework, universities have the flexibility to define their own policies and unique strategy to handle IP commercialization and revenue generated from them. In universities, knowledge exchange is mandated for publicly funded projects by the University Act, the Public Access to Information Act, and the Public Administration Act. For collaborative research with private entities, the implications of these Acts must be taken into consideration along with the budget guidelines set forth by the Ministry of Finance for the use of grants in the state. In addition, the universities may enter into agreements on licensing and sale of rights to private companies without an R&D collaboration. Similarly, companies and entrepreneurs offer an express license based on a pre-approved agreement template intended for uncomplicated license agreements.

> "***Standardization of licensing agreements and spinout models help in reducing the turnaround time and ensure more efficient licensing process. We have substantially reduced time and simplified the process with fast- track contracts***"
>
> Nis Kjær Weibel, Head of Business Development, Aarhus University Technology Transfer Office

To support spin-outs or start-ups from the university, the university may also offer funds to provide initial support to them in return for ownership of the company. Under the Tech-trans-Act (2004)[9], the Universities have been able to establish their own subsidiaries for commercialization work. The Tech-trans-Law enables the university/research institution to establish and own public limited companies to promote collaborations between research institutions and the business community, collaborate with foundations, rent infrastructure and be co-owners in research parks.

Inventor incentivisation and benefit-sharing: On benefit-sharing, the Researchers' Patent Act mandates sharing with inventors any profit made on commercialization. While individual universities have their own policies, it is often equally divided between three parties: Inventor, university/department, and/ or funding agency, and the TTOs.

[9] Tech-Transfer Act, 2004 (https://www.retsinformation.dk/eli/lta/2004/483)

Denmark has been focusing on strengthening the IP commercialization ecosystem. There have been several initiatives to create a stronger culture for entrepreneurship and increase competencies within entrepreneurship and the commercialization of research within Danish universities. The national law governing technology transfer creates relatively more structural homogeneity in a concentrated ecosystem.

Technology Transfer Ecosystem in India

India has released its 5th Draft of National Science, Technology, and Innovation Policy (STIP) for public consultation in 2020[10] after discussions with 40,000 stakeholders. Few of the key points the policy focuses on are: Open Science Framework & Inclusiveness; Collaboration & Ease of Doing Research, which will include setting up an STI Development Bank to facilitate a corpus fund for investing in direct long-term investments in select strategic areas; Increasing research in disruptive technology impacting defence, education, health, etc. Currently, the research landscape is expansive and includes networks of public research labs such as Council of Scientific and Industrial Research (CSIR), Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR), Department of Science & Technology (DBT) and Department of Science & Technology (DST) and universities under the GoI's Ministry of Education (MoE), (formerly Ministry of Human Resource Development (MHRD)) that could be either state-owned or private funded non-profit entities. In aggregate, there are about 150 research institutions and more than 1000 Universities (MoE and other GoI communication, Sathguru analysis).

The country has a relatively heterogeneous technology transfer policy framework landscape at an institutional level (Figure 1). Intramural funded research in public research networks such as CSIR, ICMR, ICAR, and DST are governed by respective institutions' IP and Technology Transfer Policy. Each research network has its own policy framework governing IP assignment to the institution, level of centralization of the IP protection and technology transfer process, inventor benefit-sharing, and technology transfer practices. For instance, while the CSIR currently follows centralized IP protection and prosecution, technology transfer and licensing are largely decentralized. The CSIR IP Policy governs all CSIR labs, but individual institutions lead their own industry engagement efforts and manage IP licensing. Benefit-sharing is also governed by the central CSIR IP and Technology Transfer Policy.

The IP policies define benefit-sharing ratio between the inventors, institutions, and funding organizations, and in majority of the publicly funded organizations, only non-exclusive licenses are preferred. CSIR was the first research funding national research network to publish its IP and TT policy in 1996 which was followed by ICMR in 2002 and ICAR in 2006.

On the other hand, universities under the Ministry of Human Resource Development (MHRD) currently have the flexibility to shape their policies around IP ownership and Technology Commercialization. If the national research networks fund specific research projects, respective grants could be governed by the funder's IP assignment policy. Notably MHRD governs more than 1000 universities, and this wide network is now emerging as a substantial IP-creating force. While there is no legal mandate to commercialize inventions, leading universities increasingly view research and commercialization as core institutional focus and expand support to inventors. Within universities, the top tier of about 25

[10] https://dst.gov.in/dst-releases-draft-5th-national-science-technology-and-innovation-policy-public-consultation

institutions have mature technology transfer offices with experienced professionals handling whole gamut of IP portfolio creation, sponsored research, licensing, and spin-out creation.

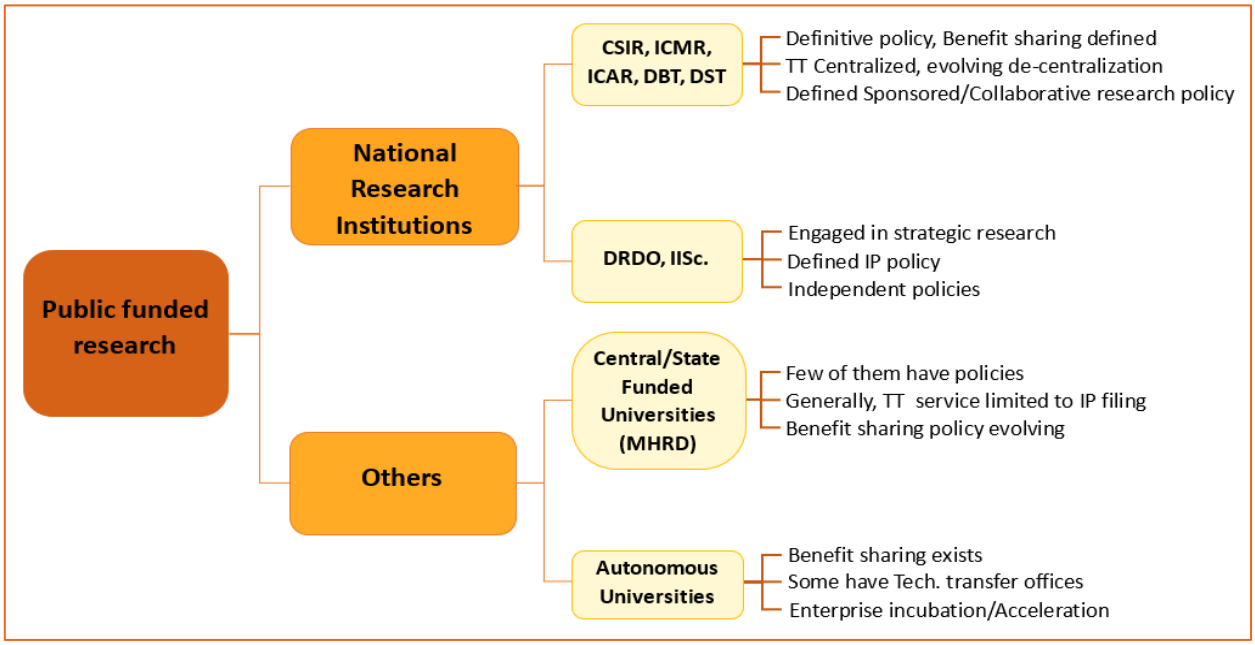


Figure 1: Heterogeneous Technology Transfer Framework in Public Sector in India (Source: Sathguru analysis)

As an example, IP filing and technology transfer activity of Foundation for Innovation & Technology Transfer (FITT) during FY 2020-21 is illustrated alongside (Table 1). FITT is Indian Institute of Technology (IIT) Delhi's technology transfer and incubation arm. Since its inception, FITT has supported IIT Delhi in filing more than 1000 patents and commercializing more than 130 technologies. FITT serves as the primary industry interface for IIT Delhi. The incubator associated with FITT has also played an active role in shaping the entrepreneurial and spin-out ecosystem. Beyond the top tier, the next tier of institutions have high focus on IP creation but don't have the depth of expertise in a full suite

Foundation for Innovation & Technology Transfer (FITT) – IP filing & technology transfer activity in FY 2020-2021	
No. of IPR applications	**No. of technology transfer deals executed**
155	25

Table 1: FITT IP filing and Technology Transfer activity for the year 2020-21 (Source: FITT Annual Report (https://fitt-iitd.in/media/)

Structural innovation – Addressing technology transfer capacity gaps through regional offices:

Under the aegis of the USD 250 million National Biopharma Mission (NBM) funded by Government of India's Department of Biotechnology and the World Bank, 7 regional TTOs have been created to support institutions and ventures within the respective geographic regions. The intensive capacity creation investment includes operational funding for the TTO teams nurtured under the program, qualified CE credits granting training and ongoing mentoring and handholding for a 3 to 5 year period, professionally developed tool kits, and practice aids for the TTOs. Close mentoring is provided by domestic and international mentors to shape operational models of the TTO, advise them on industry engagement and licensing models, intricate areas such as IP valuation and nurture professional skills in this multi-functional and applied practice area.

of technology transfer capabilities. However, they are now nurturing technology transfer capacity with IP or research management professionals gaining exposure to commercialization nuances.

Various national avenues are being explored to enable access to technology transfer expertise for the wider base tier of institutions where IP facilitation support exists but has no in-house technology transfer capacity. These include long-standing public and private sector technology transfer facilitators including, National Research Development Corporation (NRDC), TIFAC, Agrinnovate for ICAR institutions, Biotech Consortium India Limited (BCIL), Sathguru, etc., as well as more recent initiatives such as Regional Technology Transfer Offices (RTTOs) created under the National Biopharma Mission and AGNIi launched by Office of the Principal Scientific Adviser, Government of India. NRDC has initiated Technology Development, Validation and Commercialization (TDVC) program for the start-ups / MSMEs and the incubatees, to encourage them to bring their technologies to the commercial level. The TDVC Program provides a maximum of about USD 133,700 and facilitates academia-industry meet for technology transfer and commercialization. There are also 11 Technology and Innovation Support Centre (TISC) established in India through a collaboration of DPIIT and World Intellectual Property Organization (WIPO) to provide innovators support to create, protect, commercialize and manage their Intellectual Property (IP) rights.

Success story of TISC:

The technology-based on Punjab State Council for Science and Technology (PSCST) patent on "Hybrid Brick Kiln Technology" has been successfully implemented in more than 900 brick kilns, with the PSCST TISC earning revenues of USD 21.7 million, till date.

NRDC concluded more than 5000 technology licensing agreements and supported patent facilitation (more than 2000 patents) for various universities, MSMEs, and academia in the country. NRDC - TISC at Visakhapatnam is working aggressively towards IP commercialization. Recently, it received the best TISC Centre award from DPIIT, Government of India. More than 37 technologies have been transferred and commercialized. Over 300 IPR facilitations have been extended to MSMEs, universities, industries and start-ups in the last 3 years of operation. This TISC also collaborated with more than 45 universities and institutions of the region.

Focus on IP creation has pervasively expanded since it was first championed extensively by leaders in the national research system on introducing the product patent regime in 2005. As universities and research institutions transform into hubs of translational research, the role of leading TTOs has evolved and substantially widened. Within several institutions, the TTOs and incubation entity are converged with the same entity playing the role of venture incubation, acceleration, and consequently spin-out creation. The number of incubators in India has grown 15 times in the last 20 years. There are around 326 verified incubators. The incubators and TTOs are also emerging as de-centralized non-dilutive soft funding managers at the seed stage. This includes funding programs such as the Biotechnology Ignition Grant (BIG), a seed-stage grant offered by the DBT.

There have been several efforts towards creating a more structured framework for IP protection and commercialization. As a significant milestone, DPIIT released a vision document, "The National IPR Policy" in 2016. It is the responsibility of CIPAM, set up under the aegis of DPIIT, to ensure implementation of the Policy's objectives. CIPAM is working towards various initiatives to promote IP commercialization which include the establishment of 11 TISCs and the promotion of technologies listed on AGNIi portal. In 2019, with an objective to provide a framework for industry-academia collaboration and IP commercialization, "Model Guidelines on Implementation of IPR Policy for Academic Institutions" was also prepared by CIPAM. The overall convergence of translational research interfacing and venture acceleration in one entity results in a greater ability to connect with industry and create vibrant networks from which both institutions and ventures can benefit from.

> *"Trust needs to be built between Industry and academia. To nurture and build this relationship is must to have a TT professional. There should be TTO and one point of contact for industry interaction. Each university must have at least one technology transfer professional."*
>
> Dr. Shirshendu Mukherjee Mission Director Program Management Unit (DBT-BIRAC_BMGF_Wellcome Trust)

Inventor incentivisation and benefit-sharing: Benefit-sharing is often embedded in the respective national network's IP and Technology Transfer Policy. In India, while some of the institutions of national eminence, such as IITs, have inventor benefit-sharing as high as 70% to incentive inventors, other institutions include 20% to 30% benefit sharing for inventors, which is more aligned with wider global practices. In addition to explicit provision for sharing commercialization proceeds with inventors, similar to the Danish ecosystem, leading institutions are exploring other incentivization mechanisms such as inventors' awards and recognition programs as well as funding support for further research activities.

Skilling and Professional Capacity in India and Denmark

Technology transfer professional capacity is critical for achieving intended outcomes in advancing early-stage innovation to commercialization milestones and realizing the socio-economic impact. The non-profit national association of technology transfer professionals in India, Society for Technology Management (STEM), and the pan-European Association of European Science and Technology Transfer Professionals (ASTP) are both affiliated with Alliance of Technology Transfer Professionals (ATTP). They have been making concerted efforts to expand the pool of internally accredited technology professionals in India and Denmark. Currently, there are more than 650 Registered Technology Transfer Professionals (RTTPs) globally, and about 192 professionals have received qualifying CE credits through ATTP-recognized courses delivered by STEM and ASTP. The number of RTTPs in India has increased from a low single-digit to about 22 RTTPs practicing in India as of November 2021.

> *"….RTTP certification training was very beneficial and this has contributed to the ecosystem. Strongly believe that the professional cohort should be expanded in the country. Exposure to global best practise, mentoring and knowledge sharing by international and domestic experts through STEM and the connect with network of Technology Transfer professionals has been very beneficial….."*
>
> Ravi Pandey, IPR & Technology Transfer Professional, Indian Institute of Technology (IIT), Kanpur

INDIAN AND DANISH ECOSYSTEM FOR IP COMMERCIALIZATION: EVOLVING CONTEXTUAL CONSIDERATIONS

II. Indian & Danish Ecosystem for IP Commercialization: Evolving Contextual Considerations

Innovation-led growth has been emphasized across both countries, India and Denmark. This brings focus on the entire continuum of closely interlinked activities: nurturing a robust portfolio of translational research, creating a strong IP funnel that embodies the potential of research results generated, and fostering effective mechanisms to steward IP to adoption and scale-up milestones to reap the socio-economic benefits. This section highlights key trends across R&D investments, resultant momentum around IP creation, and finally, the evolving focus on IP commercialization in both the countries.

A. R&D Investments: Denmark and India

Denmark has been recognized as a benchmark for Gross Domestic Expenditure on R&D (GERD). In 2015 Denmark crossed the milestone of 3% of GDP as R&D expenditure, the target set in the EU 2020 strategy. Spending on R&D has been consistent since 2007, between 2.91 % to 3.1% of the GDP.

The public sector contributes to a third of the R&D investments, and the remaining two-thirds of the investments are made by the private sector (Figure 2). The investment in R&D by both the public and private sectors has been constant. The universities and the university hospitals receive the largest share of funds - close to 95% of public funding. There has been an increase of 4.1% in R&D employees from 2018[11]. Private sector R&D spending is concentrated in a small set of large companies – about eight companies contributed to 39% of the total private R&D investments in 2016[12]. To encourage innovation from academia to transform into products from industry, the Danish government is funding the "Open Entrepreneurship," which will receive approximately USD 532,000 annually in 2022 and 2023[13] through Innovation Fund Denmark. This initiative was introduced to create a better framework for research in the field of health and is part of the government's forthcoming life science strategy.

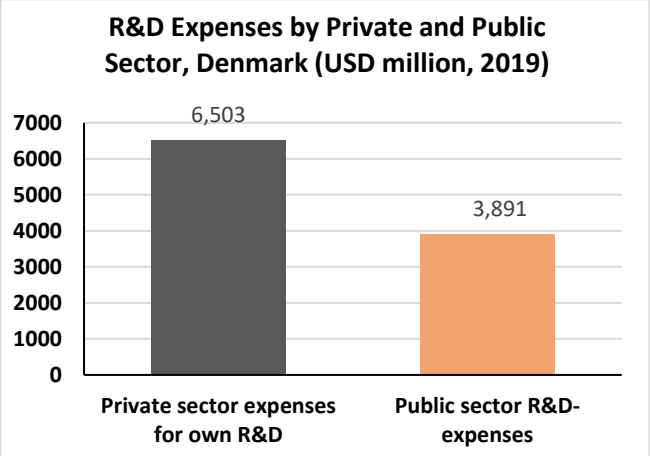


Figure 2: Comparative indication of R&D expenses in private and public sector in Denmark. The graph also indicates the difference in R&D expense contribution in the country.

In Denmark, within private funding, the non-profit foundations have been playing a significant role in research funding. As an example of expanding impact, one of the larger research funders - the Novo Nordisk Foundation, alone disbursed over DKK 1.7 billion in 2018 (~USD 262 million) to increase to DKK 5 billion (USD 760 million) by 2023[14].

[11] https://www.dst.dk/da/Statistik/nyt/NytHtml?cid=32056
[12] Peer Review of the Danish R&I System, The European Commission, 2019
[13] Press release 2021 (https://ufm.dk/aktuelt/pressemeddelelser/2021/regeringen-afsaetter-flere-midler-til-samarbejde-mellem-forskere-og-ivaerksaettere)
[14] Peer Review of the Danish R&I System, The European Commission, 2019

The larger share of R&D funding (two-thirds) in India is from the public sector. Private companies contributed to about 37% of the GERD in 2018 (Figure 3). Between 2012-13 and 2017-18, R&D expenditure grew at a Compound Annual Growth Rate (CAGR) of 9% at current prices and 5% at constant prices. While absolute R&D spending has expanded, the investment threshold as a % of GDP has remained constant at around 0.7% since 2014[15].

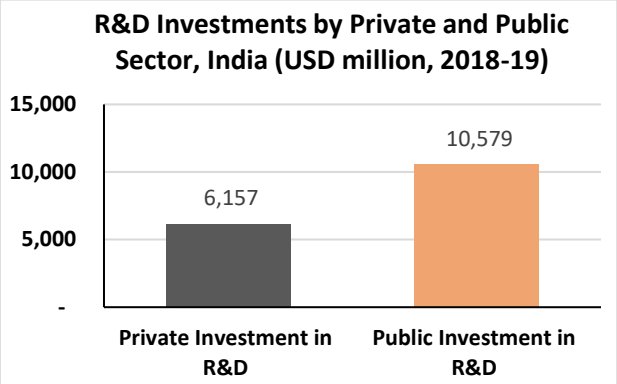


Figure 3: Comparative indication and contribution of R&D investments by private and public sector in India.

Over the last decade, India has expanded public funding for extramural research and mechanisms for R&D funding. Per the last reported data for 2016-17, DST and DBT together contributed to about 75% of the total extramural research funding in the country (with DST contributing 63% and DBT about 14%). The total share of extramural R&D expenditure in national R&D expenditure for 2016–17 was 2.4%[16].

The Indian government has created incentives for R&D investments in the form of co-funding for public-private partnerships and portfolio-based funding programs and the introduction of flexible tools for public procurement to improve ease of doing business in Science, Technology, and Innovation (STI) activities. Interactions with industry stakeholders point to strategic merit in re-introducing fiscal incentives for R&D investments, such as the weighted deduction that is now phased out. Overall, there is a substantial opportunity to incentivize higher contributions from private companies to India's GERD. The draft STI Policy released by the Department of Science and Technology in December 2020 also emphasized the vision of doubling private sector contribution to GERD every five years and enhancing fiscal and financial support to the private sector to achieve this[17].

> ***"The improvement in the IP filing and prosecution is remarkable, and the numbers have increased due to the various initiatives to support start-ups and MSMEs. However, to nurture the innovation ecosystem, a stronger technology transfer ecosystem and policy measures to provide tax breaks to industry and institutes based on the quality and volume of innovation rather than solely based on R&D expenditure may be considered."***
>
> Member, FICCI IP Committee

Finally, over the last few years, the government has also triggered funnelling of Corporate Social Responsibility (CSR) spending to research and development activities. The Companies Act mandates companies above a certain size threshold to contribute 2% of average net profits (over the last three

[15] Research and Development Statistics 2019-20 (DST, Government of India) – (https://dst.gov.in/sites/default/files/Research%20and%20Deveopment%20Statistics%202019-20_0.pdf)
[16] Research and Development Statistics 2019-20 (DST, Government of India) – (https://dst.gov.in/sites/default/files/Research%20and%20Deveopment%20Statistics%202019-20_0.pdf)
[17] Draft Science, Technology and Innovation Policy (V1.4) released by Department of Science & Technology (https://dst.gov.in/draft-5th-national-science-technology-and-innovation-policy-public-consultation)

years) to approved CSR activities. In Financial year 2021, CSR spending by Indian companies crossed INR 21,231 crores (USD 2.8 billion)[18]. CSR funding directed to research represents a substantial opportunity to energize R&D funding in India further. In 2019, the Government created a formal mechanism for this opportunity to be leveraged by allowing CSR spending on investments in technology business incubators and research carried out by institutions and national research labs[19].

B. IP Creation

India has been intently focused on fostering innovation-led growth, and IP creation impetus stems from both policy stimulus as well as organic growth momentum in industry.

As illustrated in (Figure 4), *the* number of patents filed has doubled over the last decade. In the latest World Intellectual Property Indicators 2021[20], globally, India ranked 8th in the number of patents filed, 4th in the number of Trademarks filed, and 12th in Design applications showcasing an improved ranking in comparison to IP filing rankings in 2010 (15th in Patents; 17th in Trademarks and 32nd in Design).

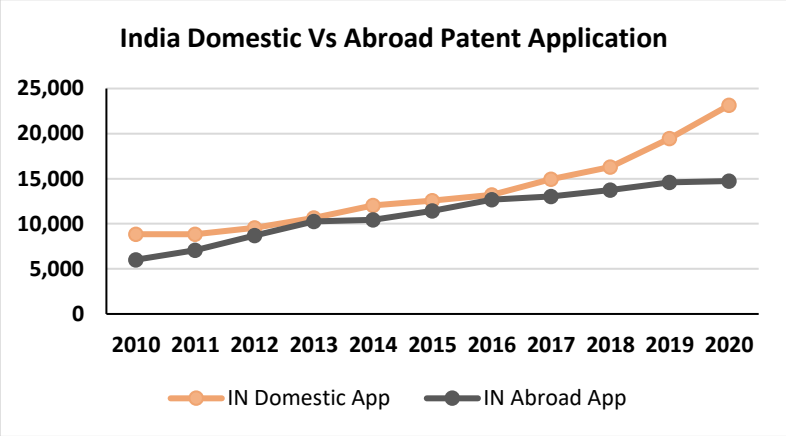


Figure 4: India Patent Application Filings in India and abroad. (Source WIPO)

The expanding portfolio of patent creation is driven by several propelling factors where momentum is expected to continue into the near future:

Expedited grant process and multiple supportive measures to promote patent filing by start-ups, MSMEs, and Institutions: Multiple measures have been taken to enhance ease of IP protection and create a more inclusive filing base – this includes enhancing overall capacity for patent examination, digitization of filing process, 80% reduction in filing fees for start-ups and MSMEs as well as substantially expediting patent grant and 50% rebate in Trademark filing fees. The patent grant timeline has reduced from an average of 72 months in

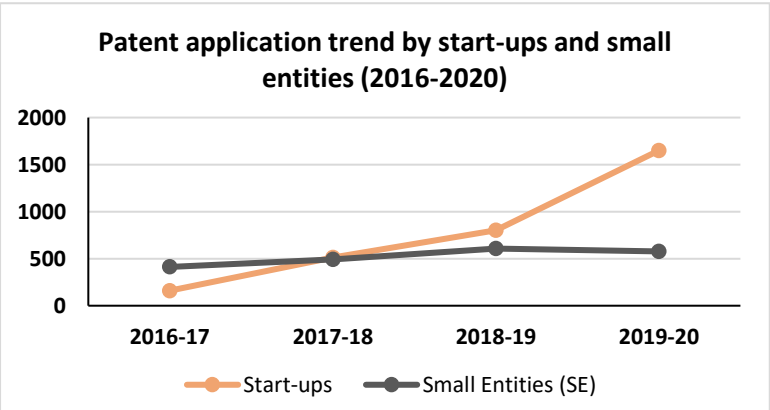


Figure 5: India Patent Application Filings by start-ups and small entities between 2016 - 2020. (Source Annual Report 2019-2020, The office of CGPDTDM)

[18] CRISIL CSR Yearbook 2021 (https://www.crisil.com/en/home/our-analysis/reports/2021/08/rs-100000-crore-crisil-csr-yearbook-2021.html)
[19] Ministry of Corporate Affairs Notification (G.S.R. 776 (E), 2019, (https://egazette.nic.in/WriteReadData/2019/213151.pdf)
[20] https://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2021.pdf

2015 to 12 to 30 months presently. These initiatives have had a tremendous impact on the patent filings by start-ups, and their filings have increased more than three-fold in the last five years (Figure 5).

As an example, according to the latest achievements by the office of CGPTDM under the expedited examination system, most applications regarding grant of patents have been decided within about one year of filing request for expedited examination as compared to the period of few years required in case of regular examination route. The fastest granted patent is the one granted in 41 days after filing such a request. Similarly, to promote patent filings in educational institutes, in the 2021 Amendment, the 80% reduction in filing fees has been extended to educational institutions as well. An expedited examination system has been introduced wherein an application for patent grant is decided within one year of filing.

GoI Initiatives to Support IP Creation and Protection for Start-ups and MSMEs

Patents Rules have been amended in 2016, 2017, 2019, 2020, and 2021. Various programs such as Schemes for facilitating SIPP (2016) have been implemented by the Indian Patent Office (CGPDTM) to encourage and facilitate IPR protection by start-ups. Under this scheme, facilitators are provided to start-ups for filing and processing of their IP applications, and professional charges of the facilitators are paid by the office of CGPDTM.

Through the 2019 Amendment, the facility of Expedited Examination system has been extended beyond start-ups to include eight more categories of Patent Applicants - SMEs, female applicants, Government Departments, Institutions established by a Central, Provincial or State Act, which is owned or controlled by the Government, Government Company, an institution wholly or substantially financed by the Government and applicants under Patents Prosecution Highway.

Ease of patent filing and prosecution: DPIIT, through the Start-up India program, offers the start-ups, fast-tracking of patent applications so that value of the IPRs can be realized at the earliest. They also offer a panel of facilitators to assist in filing of IP applications.

Expanded base of patent filings and teaching universities now assuming the research role as an extended function:

Since the introduction of the product patent regime in 2005 in India, the national research labs have since been the dominant partner for applied research, while most universities considered teaching to be primary mission. Over the last decade, substantial cultural transformation has been noted, with this large base of teaching universities now emerging as active IP creators. Most institutions now acknowledge research as an important mission, and both public and private universities are actively encouraging patent filings. CSIR is the top Indian applicant for patents from scientific research & development organizations with 1131 unique patents in force from its patent portfolio[21], and Indian Institute of Technology (IIT) collectively, with 621 patent filings in 2021 are also among the top applicants for patents from academic Institutes and universities[22].

A tacit lever that has substantially contributed to this trend is the inclusion of the "Research and Professional Practices – RP Score" as one of the three parameters to rank all educational institutions

[21] About CSIR (https://www.csir.res.in/about-us/about-csir#:~:text=CSIR%20has%20a%20patent%20portfolio,filing%20and%20securing%20patents%20worldwide)
[22] Council of Indian Institute of technology (https://www.iitsystem.ac.in/?q=patents/publicview)

under the National Institutional Ranking Framework (NIRF) introduced by the Ministry of Education. The RP Score explicitly considers patent filings, sponsored research, or services revenue as criteria for ranking institutions. Other ranking frameworks, such as the ATAL Ranking of Institutions on Innovation Achievements (ARIIA), rank all major institutions and universities on indicators related to "Innovation and Entrepreneurship Development. Along with collaboration and investment, ARIIA also takes into consideration innovations developed, start-ups established, IP generated and commercialized, infrastructure, etc. The Indian Innovation Index also examines India's innovation capabilities and the performance of different states and union territories.

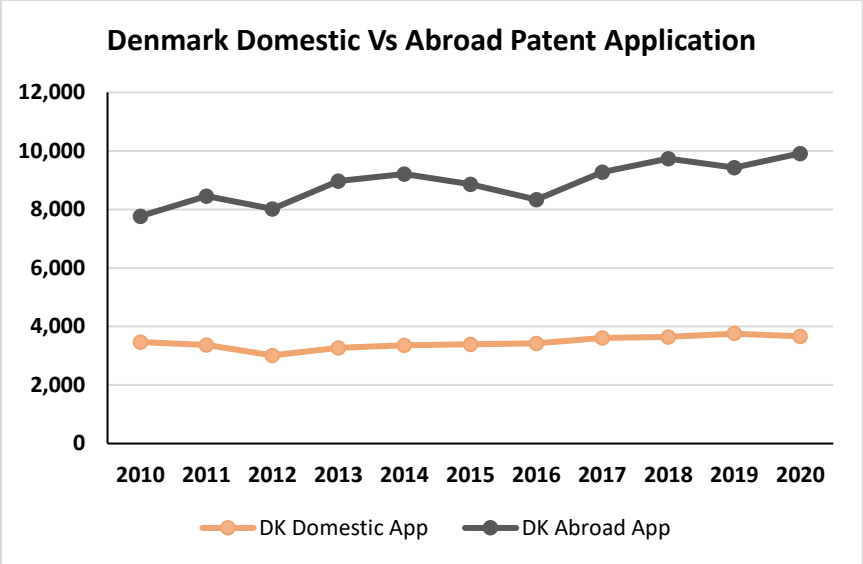


Figure 6: Denmark Patent Application Filings in India and abroad. (Source WIPO)

Denmark has been a consistent investor in research and innovation. Consequently, the country has been an active creator of a robust Intellectual Property portfolio. The level of applications filed abroad stands dominant in Denmark within the IP filing trends. Notably, several international applications are more than double domestic patent applications (Figure 6). Internationalization has been a long-standing focus for the Danish government. The impact of this on the innovation ecosystem is evident. Internationalization is on account of both factors – a well-networked research community, as well as business development focus being global. The former is evidenced by the number of international scientific co-publications being 182% of the EU average in 2021, the highest in the EU[23]. The international business development focus has been motivated by the limited size of the domestic economy and the strategic prioritization of exports and global competitiveness. The Danish TTOs also nurture globally focused business development capacity, including industry connectivity and regular participation in global industry forums and technology transfer convergences[24].

Within the overall pool of patent filings, contribution by Danish universities has been relatively stable. Patent filings by academic institutions have been consistent in the last five years, which was observed to be between 100 – 150 patent applications per year. Although, on average, around 430 inventions have been disclosed by 14

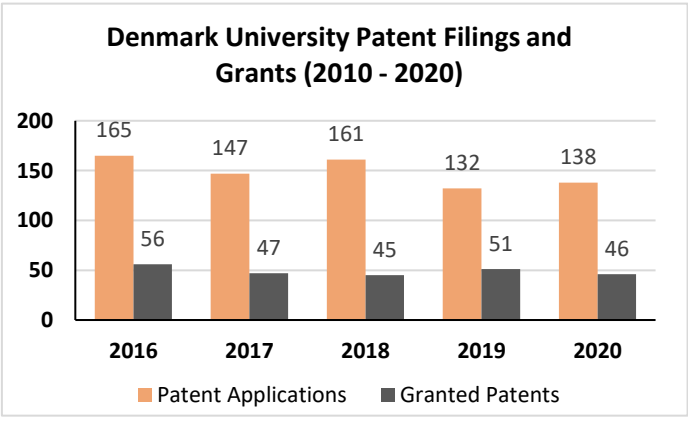


Figure 7: Denmark University Patent Application and grants (Source Danske Universiteter)

[23] European Innovation Scorecard 2021 (https://ec.europa.eu/docsroom/documents/45911)
[24] Workshop discussion with Danish TTOs

research entities (Universities, hospitals, etc.) reporting commercialization statistics[25], only a quarter of the disclosures made it to patent filings, where 26% were granted (Figure 7). The level of discretion on patent filings to rationalize costs and engage in more strategic technology transfer activity has been emphasized by the Danish TTOs. As per insights shared during the Technology Transfer workshop conducted as a precursor to this report, most Danish TTOs have developed a strong capability to review techno-commercial merit of invention disclosures and exercise a high level of judiciousness around patent filing decision making.

Emergence of non-profit foundations as active funders of R&D:

With non-profit foundations actively funding R&D, the overall R&D investment pool, as well as R&D output such as patent filings, are likely to expand in the near to mid-term horizon further. Many private foundations have set up joint ventures to promote and support the ecosystem. Examples include the Novo Nordisk Foundation's collaboration with the Danish Cancer Society to establish cancer research centres, the establishment of Biosustain by Novo-Nordisk Foundation in collaboration with Technical University of Denmark (DTU), funding for the Bio Innovation Institute (BII), which acts as an incubator to support early-stage life science start-ups.

With the foundations taking a more directed approach to funding translational innovation, the Danish patent portfolio is likely to be further strengthened within areas such as life sciences and enabling technologies for the green transition. The base of patent filings is likely to expand beyond government-funded Universities with the emergence of non-profit-funded centers such as the BII. SMEs are currently not a significant contributor to IP filings, and only 10% of Danish SMEs have patents filed[26] compared with 65% of the larger Danish companies that have registered IP. With the introduction of policy stimuli such as vouchers for SMEs to obtain financial support for patent filings, the base of patent filers can potentially get more inclusive in the future with greater participation of start-ups and SMEs. Per the 2019 EUIPO report, SMEs with IP protection bundles are 33% more likely to achieve higher turnover growth[27]. Hence fostering greater inclusion of SMEs in the IP creation and commercialization ecosystem can enhance their competitiveness and growth potential.

While relatively limited data is available on other forms of intellectual property (other than patents), a review of filing trends of trademarks and designs implies similar trends as patents. Across India and Denmark, the number of filings have expanded over the last decade. Compared with the number of filings in 2011, Danish trademark filings abroad have increased by 56%, while domestic filings remain constant. In India, domestic applications had increased by 117% during the same period while foreign applications have increased by 97%. A summary of trademarks and design filings is included in the Annexure F. Our interactions with industry, and institutional stakeholders' point to the trend of IP filings viewing merit in a stronger overall portfolio where design registrations and trademark filings

[25] Commercialization Statistics for 2020, Danske Universiteter (https://dkuni.dk/analyser-og-notater/kommercialiseringsstatistikken-for-2020/)
[26] EUIPO survey, 2021(https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/reports/IPContributionStudy/IPR_firm_performance_in_EU/2021_IP_Rights_and_firm_performance_in_the_EU_en.pdf)
[27] High-growth firms and intellectual property rights, 2019 (https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/reports/2019_High-growth_firms_and_intellectual_property_rights/2019_High-growth_firms_and_intellectual_property_rights.pdf)

complemented filings for stronger protection. However, since no commercialization data is available on trademarks and designs, this report primarily focuses on patents assessing commercialization trends.

Over the years, both countries have prioritized IP creation and have fostered an expanded pool of IP portfolio creation. This lays the critical foundation for commercialization activities and realizing the socio-economic impact of R&D investments. We have discussed below the evolving focus on IP commercialization and key trends across key mechanisms for knowledge transfer – licensing, sponsored research, and spin-out creation.

C. Evolving Focus on IP Commercialization

There are many pathways for IP commercialization for leveraging IP to power economic and social goals. Trends in India and Denmark across commonly pursued approaches of IP licensing, sponsored research, and creating spin-outs to advance IP are discussed in this section.

Both India and Denmark recognize the criticality of fuelling innovation-led growth. IP commercialization is critical for realizing the economic and social benefits of innovation investments. Stakeholder insights and published statistics point to a high level of current success in out-licensing by Danish TTOs and progressively expanding success in tapping into sponsored research by Indian institutions and intent focus on nurturing spin-outs across both countries.

1. IP Licensing

The process of IP licensing marries academia's foundation of research with the industry's commercial strength. It is one of the most common approaches for innovation advancement in markets. To facilitate the transfer of technologies, different IP licensing models have been adopted by both countries. In both countries, these models follow the same basic structures, including a combination of upfront, milestones, and royalty fees.

For India, as per the IP Management and Technology Transfer Survey published in 2016 by the Indian national association of technology transfer professionals, Society for Technology Management (STEM, www.stemglobal.org), public sector institutions have mostly pursued only non-exclusive licensing based on their policies. While private sector institutions are open to both exclusive and non-exclusive models of licensing, they prefer exclusive licensing.

Number of IP licensing deals		
CSIR (2019-20)	**Agrinnovate (ICAR) (2020-21)**	**NRDC (2020-21)**
140[28]	105[29]	24[29]

Table 2: Licensing by national research labs & national technology transfer organizations

Indicative success story – Industry licensing and co-development from a National Research Lab

CSIR-Indian Institute of Chemical Technology (IICT), Hyderabad, developed a bench-scale technology process to manufacture "Hydrazine Hydrate," mainly used for water treatment, Agrochemicals, and Pharmaceuticals. In 2015, as a part of agreement with Gujarat Alkalies & Chemicals Limited, Vadodara (GACL), it was successfully demonstrated on a pilot scale at GACL. In 2021, a patent was granted to both CSIR-IICT and GACL to co-develop Hydrazine Hydrate.

[28] https://www.csir.res.in/readbook?bid=MTQ5MDMz&submit=view
[29] Primary insights from Agrinnovate and NRDC

Collective technology transfer statistics are not currently reported as part of the DST Survey of R&D Statistics. But individual national research labs under organizations such as CSIR, ICAR (where affiliated technology transfer entity Agrinnovate now handles technology transfer), and leading academic institutions such as IITs, etc., often publish IP licensing success stories in their annual report (Table 2). In 2019-20, CSIR, the largest national research lab network, reported 50 licensing or commercialization of high-impact technologies[30]. In 2017-18, CSIR licensed 7% of its total patents and earned a total revenue of INR 960 crores (USD 148 million) [31] from contract R&D, consultancy, and licensing.

Interactions with institutions and technology transfer professionals' points to their focus on both sponsored research and licensing. Leading national research labs and academic institutions have taken proactive efforts to cultivate industry relationships and nurture high visibility for ongoing applied research programs and patents filed. For instance, IICT, a CSIR lab, emphasizes substantially strengthening business development efforts and actively conducting roadshows in addition to participating in seminars. Active efforts to pursue linkages with industry have led to expanding the base of licensing success stories in leading institutions.

Indicative Success Story – Industry knowhow licensing from a National Research Lab

Till 2021, International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) has implemented 41 technology transfers to start-ups and established companies. Additionally, more than 225 technological solutions have been provided to private and public sector organizations for a variety of applications. One of the recent success stories includes licensing of anti-reflective coating technology for solar photovoltaic glass to a leading solar glass manufacturing company in India. The technology transfer partnership, in this case, evolved from an initial Option Agreement to a full commercial license subsequent to successful validation of the technology by the licensee.

With a wider base of academic institutions expanding their focus on IP commercialization, IP licensing activity is expected to grow substantially in the near future. The culture of IP creation being nurtured in academic institutions spurs this expanded opportunity for commercialization activity. However, several of these institutions may not have internal technology transfer capacity or critical volume of IP filings per institution to trigger internal capacity. Initiatives such as the created under the National Biopharma Mission and AGNIi launched by Office of the Principal Scientific Adviser are empowering this long tail of academic institutions to engage with industry and pursue technology showcasing and licensing opportunities.

The Danish Technology Transfer ecosystem is more concentrated, structurally homogenous, and relatively more established. Given Denmark's legal framework mandate, all universities have a functional and dedicated TTO that is actively engaged in the triage of invention disclosures, exercising discretion on patent filings, engaging with industry for licensing, creating spin-outs, and post-license monitoring.

Alternative initiatives to support licensing activities include initiatives such as "Open Innovation Licensing" (OIL) initiative by Aarhus University, which allows the testing of new technologies before commercial licensing. Another initiative by Aarhus University and the Novo Nordisk Foundation, "Open Discovery Innovation Network (ODIN)," connects industry with researchers to co-develop selected

[30] https://www.csir.res.in/readbook?bid=MTQ5MDMz&submit=view
[31] https://apctt.org/sites/default/files/2020-07/VJS_HRDC_Technology_Commercializatiion_0.pdf

projects. This is the research precompetitive and early-stage where all parties work openly and share their results with the public until a certain threshold of technology readiness is reached. At that point, anyone can use the open results for commercial purposes – e.g., by pursuing specific applications through classical technology transfer mechanisms in closed, contracted research projects with IP filing and licensing, enabling further innovation advancement.

To achieve licensing success, marketing is one of the key aspects. An example of the marketing focus of the Danish TTOs is the Danish IP Fair: An initiative of the TTOs, the "The Danish IP fair" converges Danish Universities and research institutions along with the Danish Industry as an annual matchmaking event. It was launched in 2017 and is progressively expanding in size and momentum as a connectivity platform.

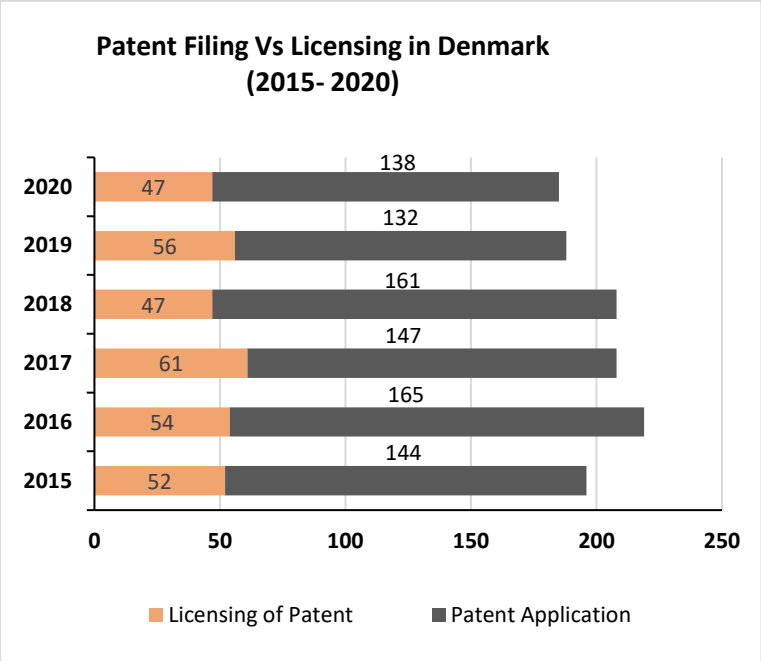


Figure 8: Patent Filing and Licensing in Denmark
(Source: Danske Universiteter)

While most Danish TTOs have not emerged as net cash generators for universities akin to global examples[32], they have established commendable metrics for converting patent filings to concluded IP licenses. As per Commercialization Statistics published[33], cumulatively during the 2015 to 2020 period, number of licenses concluded by Danish TTOs are about 38% of the number of patents filed during the same period (Figure 8) (with both statistics being filing and licensing activity for the period, and licenses concluded not being correlated to the year of filing).

This statistic is a sound indicator of judicious filing and active engagement in business development to achieve high conversion to license agreements. This is clearer when the statistic is considered in the context of peer benchmarks: In a study conducted by Innovation Union Commitment 21 on Knowledge Transfer (IU21KT)[34] in 2014, on knowledge and technology transfer by Public Research Institutions (PRIs) in Europe, it was identified that on an average individual institution held ~90 IP assets. Out of the total IP generated, 20% was exploited by the PRI, 30% licensed (or sold) to third parties, ~45% of the IP was dormant, and the remainder were exploited in other ways. A comparable statistic for the same period

[32] Commercial Revenue and patenting costs indicated in the Peer Review of the Danish R&I System, The European Commission, 2019, global benchmark referenced in the report of 87% of US TTOs not breaking even financially (https://www.brookings.edu/wp-content/uploads/2016/06/Valdivia_Tech-Transfer_v29_No-Embargo.pdf)
[33] Commercialization Statistics for 2020, Danske Universiteter (https://dkuni.dk/analyser-og-notater/kommercialiseringsstatistikken-for-2020/)
[34] First Report on the Knowledge Transfer Stakeholder Forum, 2014 (https://www.researchgate.net/publication/302636581_First_Report_on_the_Knowledge_Transfer_Stakeholder_Forum)

of 2015 to 2020 from the US association, Association of University Technology Managers (AUTM)[35] is about 52% (with both statistics being filing and licensing activity for the period, and licenses concluded not being correlated to the year of filing). The Danish statistic fares well when considered in the context of the US technology transfer ecosystem being relatively more evolved since the introduction of the Bayh-Dole Act in 1980 and the larger research base in the US.

2. Sponsored Research

Sponsored research projects serve as an optimal model of industry engagement for institutions to enhance the level of applied research that is commercially relevant. They are ripe opportunities to demonstrate research capability to industry partners and nurturing long-term research partnerships. Over the last decade, leading Indian institutions have nurtured robust engagement in sponsored research which is true for national research labs such as CSIR as well as leading public and private universities such as IITs, ICMR, ICAR, IISc, etc. This phenomenon clearly emphasizes a strong cultural shift in the Indian university system, where several institutions now consider research as an integral part of their mission in addition to teaching. While collective national statistics are not published for sponsored research revenue, within the NIRF ranking for teaching universities, data published for top 100 ranked universities includes specific information on sponsored research and consultancy revenue. While the top 100 institutions represent only about 10% of the number of institutions in the country, research capacity within universities is highly concentrated in this tier. Over the years, the number of consultancy projects has increased consistently to 15,567 (2019-20) in the public sector. As indicated in the graph below (Figure 9), **the total sponsored research and consultancy project earnings in 2019-2020 in the top 100 NIRF-ranked institutes aggregated to USD 724 million.**

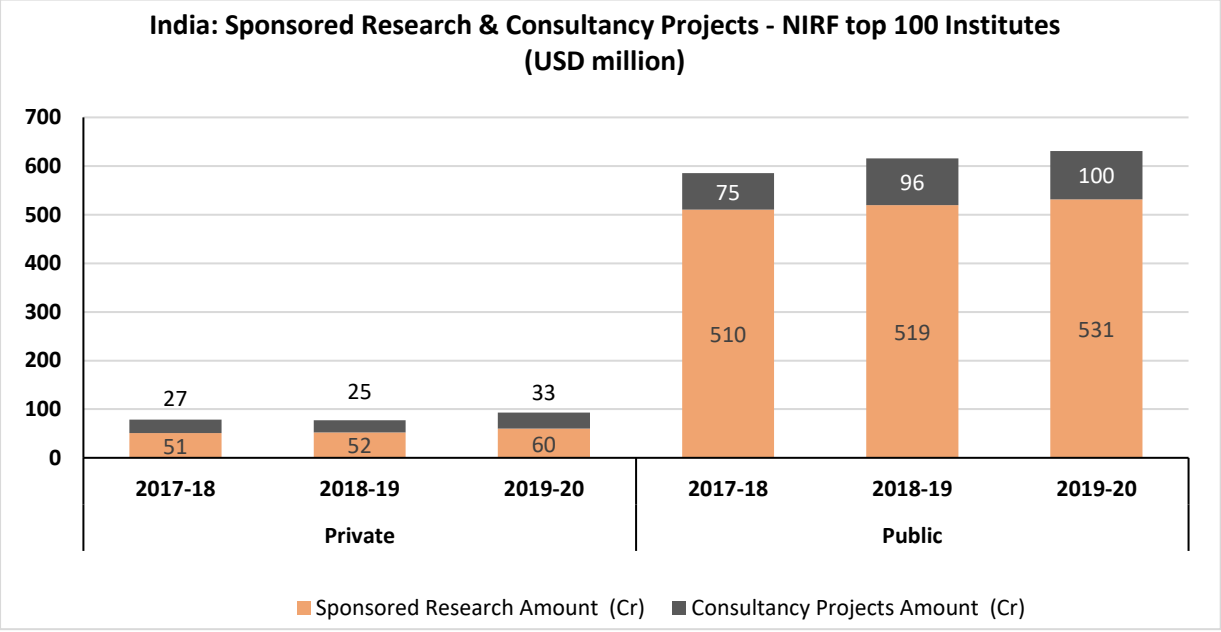


Figure 9: The increase in the revenue generated (USD million) through sponsored research & consultancy projects for the past three years is indicated in the above graph for both public and private institutions in the NIRF top 100 Institutes. Source: NIRF Overall India Ranking 2021

[35] AUTM 2020 Survey (https://autm.net/AUTM/media/SurveyReportsPDF/FY20-US-Licensing-Survey-FNL.pdf)

While the public universities capture a substantial share of sponsored research revenue, there is increasing participation from private universities as well. Private universities in the top 100 rankings secured, in aggregate, close to USD 100 million in sponsored research and consultancy revenue during 2019-2020. Private deemed universities such as Amity, Kalinga Institute of Industrial Technology (KIIT), Chitkara, Vellore Institute of Technology (VIT), and Satyabhama have significantly encouraged IP

> ***"Embedding experienced researchers in industry for short term projects and strong Alumni support has boosted orientation of research goals towards industry needs" strengthening and opening avenues for the academia – industry relations for licensing, collaborative and sponsored research projects"***
>
> Prof. Sunil Bhand, Dean (Institute wide) - Sponsored Research and Consultancy, Birla Institute of Technology and Science (BITS)

facilitation and technology transfers. DPIIT recently conferred Intellectual Property Award – 2020 on Amity University for "Top Indian Academic Institution for Patents & Commercialization." Birla Institute of Technology and Science (BITS) is also an exemplary example of strategically and proactively nurturing a stronger base of applied research through several initiatives – faculty incentivization, hiring of faculty with industry experience, embedding faculty in the industry for applied exposure, fostering a multi-fold increase in publications, pursuing industry / Government /philanthropically co-funded applied research centers, etc.[36]. The inclusion of the RP score in the NIRF ranking served as an initial trigger for the cultural expansion of institutional focus on research. The deep engagement is now supported by institutional commitment across leading public and private institutions and is only expected to expand in the future.

This entrenched engagement in sponsored research bears the potential to reshape the overall GERD composition in India. At a country level, nearly 60% of contribution to the GERD is made by the Government, with industry contribution being lower than benchmarks of high-income countries. However, in the case of top raking Indian Institutes of Technology (IITs) (Figure 10), the revenue generated from sponsored research and consultancy is at least 9% higher than the funds received for R&D from the Government of India. In three of the IITs, IIT Mumbai, IIT-Delhi, and IIT-Kanpur, in 2018-19, sponsored revenue and consultancy revenue outstrips Government funding by more than 20%[37].

In the case of the Danish institutions, interactions with TTOs point to more strategic leveraging of sponsored research for follow-on IP creation and licensing opportunities. For instance, inventors often build on sponsored research projects and develop new IP (also called foreground IP) that can be subsequently licensed to the sponsor. The current sponsored research model in most Indian institutions implies a

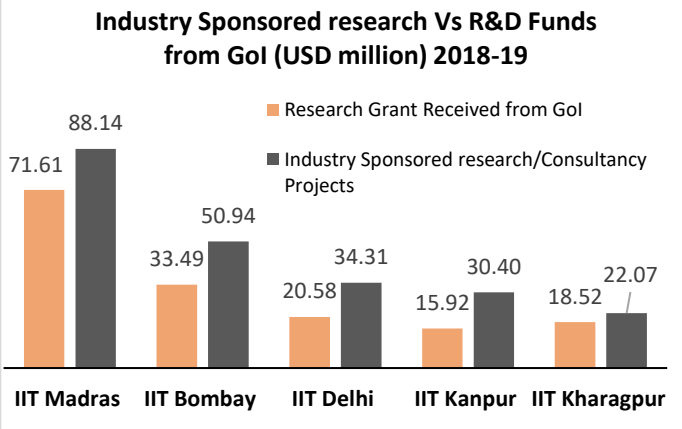


Figure 10: Compares the research grants received from GoI by different IITs with the revenue generated through sponsored research / consultancy projects.

[36] Workshop insights
[37] https://www.nirfindia.org/2021/OverallRanking.html

negligible level of IP capture on sponsored research. While this calls for the attention of institutional leadership and TTOs, the overall level of engagement in sponsored research and industry services revenue implies high evolution of capability in translational research that is relevant to the industry. Strategically, Indian institutions and TTOs can steward the relationships with industry and applied research capabilities to a higher level of commercially relevant IP generation and licensing success.

3. Spin-outs and Enhancing IP Readiness Through the Venture Mode

Expanding potential across India and Denmark for leveraging spin-outs to advance technology readiness:

Spin-out ventures (start-ups created to advance institutional IP) play a dual role in technology commercialization – of advancing technology readiness for absorption by large companies and emerging as entities stewarding technologies all the way through commercial scale-up. Spin-outs have emerged as an attractive pathway for commercializing IP in India and Denmark. The momentum around spin-outs is attributable to both countries expanding incubation capacity for start-ups, enabling ease of access to funding, and creating a supportive policy environment. Due to these drivers, the engagement of start-ups is increasing in absorbing IP from institutional research and advancing to commercialization milestones. During stakeholder interactions, both industry and institutional stakeholders envisioned start-ups playing a progressively wider role in IP commercialization over the coming decade across both countries.

Overall momentum in start-up and spin-out ecosystem in India: The current high momentum in the start-up ecosystem combined with expanded access to incubation capacity and seed-stage non-dilutive funding have created ripe ground for institutions to pursue spin-out ventures as a vehicle for IP commercialization. India is now among the top five start-up ecosystems globally. The number of seed-stage deals grew at ~13% in 2020[38]. To accelerate and nurture a strong ecosystem for innovations and start-ups driving sustainable economic growth, the GoI in 2016 launched the 'Start-up India' program (Annexure G). India has an active ecosystem of spin-outs and start-ups focusing on technology for climate change with venture funding support. It ranked ninth globally for climate tech investment, with an investment of USD 1 Billion[39]**.**

Creation of expansive incubation capacity: Over the last decade, there has been a substantial expansion of incubation capacity, including several private universities. This has substantially widened the net of institutionally anchored and stand-alone incubators that can evolve as innovation hubs in respective thematic areas. DBT's Biotechnology Industry Research Assistance Council (BIRAC) has funded about 60 incubators between 2011 and 2021 but intends to more than double the network by August 2022 as an ode to the 75th year of independence. Under the Atal Innovation Mission (AIM), 86 incubators across the country were identified and 68 of them have been provided grants worth USD 27 million[40]. While momentum around incubation capacity is encouraging, the current focus on expanding incubators' presence beyond Tier 1 cities is also likely to provide a broader national impetus for venture creation.

Access to funding and incubation: Within the government of India, DST and DBT are the most active funders of extramural grants, including funding for start-up ventures. A few examples include BIRAC's

[38] Bain- India Venture Capital Report 2021 (https://www.kalaari.com/wp-content/uploads/2021/09/bain_report_india_venture_capital_2021_compressed.pdf)
[39] https://dealroom.co/uploaded/2021/10/Dealroom-London-and-Partners-Climate-Tech.pdf
[40] https://www.startupindia.gov.in/content/dam/invest-india/SCO/Republic%20of%20India_Startup%20Ecosystem.pdf

BIG fund provides proof of concept ignition funding of about USD 60,000 per venture in multiple calls each year and operates through a de-centralized model where it is administered by incubator partners. The BIG grant has served as the first stepping-stone for entrepreneurs from multiple backgrounds – students, institutional researchers, and industry veterans taking the start-up challenge. Beyond the ignition grant, a series of other non-dilutive funding programs provide co-funding for technology de-risking as ventures advance IP through progressive stages of development and validation. The ease of access to funding fuel for take-off is quite high for IP-led ventures in India. DPIIT also offers financial assistance to start-ups for proof of concept, prototype development, product trials, market entry, and commercialization through their *Startup India Seed Fund Scheme* (SISFS), which started in 2021. The funding available at various stages is indicated in Annexure H.

Ease of patent filing and prosecution: DPIIT, through the Start-up India program, offers the start-ups fast-tracking of patent applications so that value of the IPRs can be realized at the earliest. They also offer a panel of facilitators to assist in the filing of IP applications.

Enabling policy framework for spin-outs: Department of Scientific and Industrial Research (DSIR) notification in 2009 provided sanctity to spin-out creation from national research labs and universities. These guidelines allowed Universities to accept equity in the spin-outs through incubators associated with the universities. It authorized spin-outs to utilize infrastructure at the university to advance technology further. CSIR institutions such as National Chemical Laboratory (NCL) have several examples of spin-out creation and serve as models that can be replicated. Several private universities have also created spin-outs and have expressed openness to allowing faculty to take positions in the spin-outs while the institution holds equity. However, most universities and institutions are currently shaping standard institutional guidelines for structured spin-out policies, which include conflict of interest between the university and the spin-out entity around technology transfer.

Spin-out example from an Indian public university

The Science & Technology Entrepreneurs Park (STEP), IIT Kharagpur incubate, Ecozen, is an agri-company focused on creating solutions to overcome problems in cold chain infrastructure. The company envisions to impact the value chain by empowering farmers, mandi owners, and mobile cold chain players with clean technology for a sustainable future. They have filed eight patents, and the product has won numerous awards such as the Dow Sustainability Innovation Challenge by California Institute of Technology, Pasadena, the Economic Times-Power of Ideas award from DST, Govt. of India organized by CIIE, IIMA, etc. Ecozen has also been listed in the 'Latest 50 to Watch' List as one of the Companies that have been actively working towards tackling the Climate Crisis. Using the innovative products offered by Ecozen, more than 71,905 farmers have benefited, 14,040 MT produce wastage was reduced, 674 Mn kWh clean energy was generated, and 6,74,000 tons of CO_2 emission abated.

Danish Landscape for Spin-outs: The Danish ecosystem also offers a ripe opportunity for spin-out creation with entrepreneurial momentum and non-dilutive funding avenues, which provides the initial fuel. Danish hospitals have been actively fostering spin-out companies, and their numbers have been consistently increasing. However, Danish universities are still by far the type of public research institution that has created the largest proportion of spin-out companies (Figure 11).

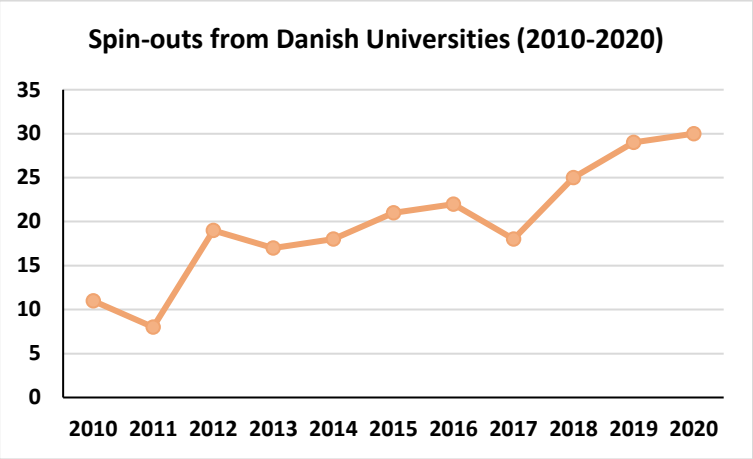


Figure 11: Rise in spin-outs creation by the Danish universities over the past decade is indicated.

Structured Spin-out Policies and Framework: The university spin-out ecosystem is quite mature and has a structured model. All universities have an established framework for spin-out creation[41] for licensing to spin-outs, equity ownership in spin-outs and managing conflict of interest.

> ***"Spinouts as a career avenue is gaining more importance, and more private sector people quit their jobs and are trying to run with their business ideas for spinouts."***
>
> Thomas Schmidt, Head of Technology Transfer, SDU

In accordance with the Researcher Patent Law, universities may license or sell their IP rights to the spin-outs in return for equity in the company. Some Universities, such as DTU, have created a handbook on the agreement between DTU and a spin-out company[42] to provide guidance and support sustainable spin-outs by maturing the innovation as much as possible within the university framework.

Access to Funding and Incubation: Start-ups in Denmark are rapidly growing, and there is active support for funding from International private investors, the public Innovation Fund Denmark ("Innovationsfonden" or IFD), which has different programs to support innovations at different stages, and the Danish state's fund, The Danish Growth Fund ("Vækstfonden") which offers investments, loans, and guarantees for both creation and growth of start-ups. The IFD stands out as a prominent source of soft funding for spin-outs to engage in technology, risking investments and primes the country's pipeline for Venture Capital (VC) and strategic investments. With IFD's International Strategy 2022 – 2025 published on 28 February 2022[43], opportunities are likely to

> **"Translating research into innovative solutions needs high risk investments at early stages, which is supported by Innovation Fund Denmark."**
>
> Michael Adsetts Edberg Hansen, PhD, Senior Investment Officer, Innovation Fund Denmark

[41] Lov om offentlige forskningsinstitutioners kommercielle aktiviteter og samarbejde med fonde (https://www.retsinformation.dk/eli/lta/2014/580)

[42] Establishing an IP agreement between DTU and a spinout company, Danmarks Tekniske Universitet, 2017, (https://tt.dtu.dk/-/media/Subsites/DTUTechTrans/12435_DTU_Handout_A4tvaer_8sider_15nov_low2.ashx?la=da&hash=66AE53CF86A30B748AD53E2B81C1E093BE1F283F)

[43] https://innovationsfonden.dk/da/programmer/internationalt-samarbejde#accordion2851

further expand for cocreating joint IP in bilaterally funded programs and pursuing more international opportunities for commercialization.

Finally, with the involvement of all non-profit foundations now keenly engaged in nurturing the spin-out ecosystem, access to funding and acceleration opportunities are likely to expand in the future. The largest investor is the Novo Nordisk Foundation, and a marque example of its catalytic efforts includes creating the BII. The BII was founded only in 2019 and has already incubated 79 start-ups in life sciences that have raised external capital of $ 112 million. The Villum Foundation granted USD 11.6 million project, "Spinouts Denmark," which reaffirms the commitment and engagement of private foundations and industry to strengthen the Danish commercialization ecosystem. "Copenhagen Spinouts" was one of the initial collaborations between the academia and industry in 2012, jointly funded by EU regional fund, Capital Regions Growth Forum, and its partners, focusing on innovation and commercialization of biotech research, which boosted the spin-out ecosystem[44]. This project aimed to create biotech spin-outs based on the research carried out by the Copenhagen University, Danish Technical University, and hospitals in the region. The focused targeted efforts for scouting mature research projects with the availability of funds and mentors boosted the spin-out creation. Such targeted efforts have resulted in boosting the spin-out ecosystem from only eight spin-outs in 2011 to 20 university spin-outs in 2020. Expanding funding is a significant driver of the start-up ecosystem and thus provides greater opportunity for spinning out IP from institutions to further advance through validation milestones. Funding available at various stages is indicated in Annexure I.

Spin-out example from Danish university

Nanovi was set up as a spin-out company from Denmark Technical University (DTU). Founded in 2012, this spin-out manufactured a liquid fiducial marker based on a patent-protected technology platform to enhance target visibility during medical imaging for use in cancer therapy in 2015. In the latest round of Venture funding in 2020, Nanovi received USD 2.6 million from the Danish Growth Fund. Till date, Nanovi has been able to raise USD 9.7 million in funding over six rounds and has six patents to its credit. It has also developed a product PetXmark, to detect cancer in pets.

Creation of incubation capacity: Incubators and accelerators affiliated with institutions create ease of operation for spin-outs. Universities such as DTU and Aarhus have created robust innovation infrastructures and have science parks that support start-ups. DTU accounts for a large part of the spin-outs emerging from Danish research institutions over the past five years. In collaboration with Novo Nordisk Foundation, the DTU bio sustainability pilot facility has started to promote the formation of new ventures. All universities have defined spin-out models for different scenario.

Spin-off example from Indo-Danish ecosystem

Mash Makes is an Indo-Danish green tech spinoff company from Denmark Technical University (DTU) founded in 2015. It is advancing IP originally developed at DTU. They offer unique solutions to convert agricultural residues into fuel products, such as a thermochemical platform to create high-quality liquid fuels, cheap green hydrogen, convert waste into electricity and convert crop residue to Biochar through pyrolysis. In 2019, they received equity funding (24%) of USD 1.5 million by Det Forenede Dampskibs-Selskab (DFDS), which will be invested in three stages. The funding supports DFDS's CSR strategy. They have a unique model of operations with their headquarters in Denmark and processing in India and Tanzania.

[44] http://www.copenhagenspin-outs.dk/

IDENTIFIED POLICY OPPORTUNITIES

III. Opportunities: For Enhancing IP Commercialization Outcomes

Realizing the value of national R&D investments and national Intellectual Property rights will be fundamental for both India and Denmark to achieve goals of the green strategic partnership and actualize the vision of science-led fuelling of socio-economic growth. Based on the detailed secondary research, workshop findings, and interactions with several key innovation ecosystem stakeholders across India and Denmark, the following areas are identified as possible avenues for strengthening the overall IP commercialization ecosystems across both countries:

A. Shaping Composition of IP Filings to Enhance Commercialization Success & Address National Priorities

Context and Opportunity for Change:

Innovation commercialization is perceived as a key enabler for the green transition and the socio-economic development goals. To power the engine of applied science and innovation, India and Denmark have both taken several measures to enable ease of filing and registration of patents, reduce compliance burden and expand engagement of SMEs and institutions.

While the overall funnel of IP is expanding, IP filing trends and insights from the workshop and primary research with institutions and industry point to an opportunity to shape the composition of IP filings to enhance the potential for commercialization and value realization. Specifically, primary and secondary research findings point to the opportunity to trigger wider engagement in international filings and enhance the concentration of IP filings in areas that can support the national strategic priorities.

Implications and Current Initiatives:

Fostering a greater pace in the internationalization of IP filings from India will be important for value realization on investments in research and IP creation. With companies harbouring global business aspirations, patents filed only in India or Denmark may not be able to exploit the full potential of IP for powering global competitive advantage. As a business asset that embodies the value of science, it is imperative that the composition of the expanding IP portfolio dovetails with business aspirations. The cost of international IP filings and prosecution is currently a barrier for most Indian institutions and SMEs in both countries. While existing schemes such as the Ministry of Electronics and Information Technology's (MeitY) Support for International Patent Protection in Electronics & Information Technology (SIP-EIT) – II for MSME and Start-up Units and BIRAC – PATH (Patenting & Technology Transfer for Harnessing Innovations) in India and the Patent Vouchers in Denmark provide funding support in this direction, there may still be a demand from SMEs for further financial support for cost-prohibitive international filings.

While internationalization of IP filings can trigger greater alignment with business goals and greater potential for monetization of IP, creating stimulus for the same could provide an opportunity to more effectively leverage the expanding IP funnel for achieving national priorities such as green transition and life sciences innovation.

Identified Policy Opportunities:

Shaping composition of IP filings to enhance commercialization success

Support mechanisms could be considered to address concern of prohibitive cost levels that are currently a limitation for international filings, especially in institutions and SME companies:

1. Expansion of already existing schemes and creation of new soft funding avenues may be considered to support international IP filing and prosecution for start-ups and SMEs.
2. Additionally, directed patent filing support for international patents in areas of focus may be considered for both institutions and companies.

B. Market Shaping for Commercialization of Innovation

Context and Opportunity for Change:

In India and Denmark, institutions, industries, and ventures are spurring a pipeline of disruptive solutions that hold the substantial potential to address priorities of national significance. However, several emerging areas of transformative innovation such as, clean energy, markets, and consequent demand-pull, are still emerging. While both governments have triggered several levers of monetary stimulus such as grant funding programs to nurture innovation pipeline, industry stakeholders point to the opportunity for more intensive Government led market shaping. The tendering approach historically followed by the Indian Government has had limited scope for demonstrating innovations to Government buyers. This has been a limitation for procurement of IP-led products in public markets till recently. Additionally, in the absence of policy stimulus triggering adoption, industry stakeholders express concerns about the potential pace of market maturity for emerging technologies. This presents an opportunity at two ends – activating and paving ease of access for public markets where Government could be the buyer and pursuing enabling policy frameworks to cultivate demand in areas of priority for the green strategic transition.

Implications and Current Initiatives:

Leveraging public procurement as an engine for demand-pull and introducing policy levers for fostering innovation adoption could potentially catalyze accelerated market shaping. Both countries already have initiatives in this direction. For instance, Government e-Marketplace (GeM) Startup Runway provides opportunities for start-ups to introduce innovations to public sector buyers, and the waiver of prior experience and turnover requirements lower barriers to participating in public procurement. In Denmark, the strategy announced in October 2020[45] lays out several initiatives to leverage Government spending for demand-pull for the green transition – including mandatory use of eco-labeled products, reducing energy consumption in Government buildings, targeting public vehicles being emission-free by 2030, etc. Accelerated implementation and widening of such initiatives could substantially impact market-shaping, especially emerging transformative technologies.

Both countries also have several initiatives to trigger private market expansion for emerging technologies – such as tax incentives for electric vehicle purchases and adoption of other renewable energy sources. Stakeholder interactions have also emphasized the continued need for such policy stimulus to drive demand expansion in private markets for commercializing IP in these emerging areas.

[45] https://fm.dk/nyheder/nyhedsarkiv/2020/oktober/baeredygtighed-og-klima-skal-vaere-pejlemaerker-for-offentlige-indkoeb-for-trecifret-milliardbeloeb

Identified Policy Opportunities:

Market shaping for commercialization of innovation

1. **Ease of participation in public procurement** - There is strategic merit in considering measures to further enhance ease of market access for public procurement. To create stronger demand-pull for commercialization of the innovation pipeline, expanded avenues for innovation demonstration to public buyers and wider opportunity for uptake of IP-led novel solutions in public markets could be considered.

2. **Policy triggers for innovation adoption** - In the context of the green transition, industry stakeholders have emphasized continued potential for policy-led demand stimulus in private markets for commercializing innovations in emerging technology areas. It is recommended that specific policy imperatives for triggering innovation adoption and market-shaping be considered in consultation with research pioneers and companies.

C. Leveraging IP for SME Competitiveness

Context and Opportunity for Change:

Both India and Denmark are strategically nurturing competitiveness in the SME segment. However, the SME segment may not yet be fully integrated into the continuum of IP creation and IP absorption. While both countries have created incentives by lowering filing fees or introducing vouchers for patent filings (India and Denmark, respectively), the barriers to IP adoption continue to be high, with SMEs facing high exclusion from the innovation economy. This is relevant in the context of the concentration of private sector R&D in large companies. For instance, in Denmark, 50 largest R&D active companies contributed a significant 70% of the total private R&D investment in 2016[46]. The exclusion is also evident in IP filings - for instance, only 10% of Danish SMEs have IP rights in comparison to a steep benchmark of 68% amongst large Danish companies[47,48].

In this context, access to publicly funded institutional research outcomes could potentially empower SMEs with innovation-led competitiveness. Interactions with SMEs point to high level of difficulty in identifying technologies they can access and poor knowledge of IP licensing process. Several IP online portals are available for listings of innovations, ready-to-use technologies, etc., but the list is not too comprehensive. In the absence of visibility, network with scientists, and comfort with licensing process that larger companies enjoy, SMEs find it challenging to participate in IP absorption and commercialization.

Implications and Current Initiatives:

Impediments in SME participation in the IP commercialization ecosystem imply that the opportunity to nurture innovation-led competitiveness in this segment still is to be realized.

Both India and Denmark are engaged in educating SMEs on IP and creating ease of access to institutional, technical expertise. The IP Awareness Scheme from CIPAM in India has actively engaged in educating MSMEs on effectively utilizing IPR tools for enhancing competitiveness. In Denmark, DKPTO has dedicated efforts to creating awareness among the SMEs and technology support hubs, such as the fourteen national cluster organizations based on national positions of strength for science and business, regional business hubs, and seven Research and Technology Organizations that provide SMEs with an extended network that gives access to scientists, authorities, and other stakeholders as well as greater access to technical support and laboratories. Building on these foundational efforts, targeted efforts could be considered to integrate SMEs more effectively into the overall IP creation and commercialization ecosystem.

[46] Peer Review of the Danish R&I System, The European Commission, 2019
[47] https://dkpto.dk/Media/637714750846132139/IPH_uk_single.pdf
[48] Intellectual property rights and firm performance in the European Union (2021) (https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/reports/IPContributionStudy/IPR_firm_performance_in_EU/2021_IP_Rights_and_firm_performance_in_the_EU_en.pdf)

Identified Policy Opportunities:

Leveraging IP for SME competitiveness

1. **Discoverability** – It could be considered to explore how to ease SMEs access to scientific infrastructure, technical capability, and IP licensing opportunities from institutions to utilize untapped opportunities.

2. **Ease of access -** Simplifying IP licensing for publicly funded research with standardized and efficient processes could be one measure to enable greater participation of SME companies in IP commercialization. Improved technology documentation, demonstration at scale, and handholding through the licensing process are initiatives that could create a more SME friendly ecosystem.

3. **Soft funding for IP acquisition** - In addition to supporting mechanisms for IP filing, providing support for IP acquisition, such as monetary support, could most likely empower SMEs to engage in technology absorption more actively for business competitiveness. Since institutional innovations often require scale-up and validation prior to commercialization, technology risk co-exists with market risk, and deters SME investments. Hence, soft funding for IP acquisition and advancement could defray investment risk and foster innovation-led SME growth.

D. Enhancing Technology Transfer Capacity & Fostering Ease and Efficiency

Context and Opportunity for Change:

Over the last decade, in India, IP facilitation capacity has been substantially enhanced, and several universities and institutions now have access to in-house or outsourced IP expertise to enable IP filings. Several initiatives have also been championed to nurture technology transfer capacity. About 25 leading institutions in the country have full-fledged and mature TTOs. They have experienced professionals managing industry relationships and the entire ambit of sponsored research, licensing, and spin-out creation. While the next tier of universities and institutions have deeper capability of IP portfolio creation, they are now gaining applied exposure to commercialization nuances. Various national avenues are being explored to enable access to technology transfer expertise for the wider base tier that doesn't yet have in-house technology transfer capacity. These include long-standing public and private sector technology transfer facilitators (NRDC, BCIL, Sathguru Management Consultants, etc.) as well as more recent initiatives such as Regional Technology Transfer Offices (RTTOs) created under the National Biopharma Mission and AGNIi launched by the Office of the Principal Scientific Adviser, Government of India. There has also been an enhanced focus on nurturing professional capacity in technology transfer. Over the last two years, no. of RTTPs in India has increased from low single digits to close to 25 professionals in November 2021. Given the expanding IP funnel in the country, there is a need to further intensify efforts around technology transfer capacity creation. This will be an extremely important enabler for realizing value of IP portfolio created.

Denmark has a relatively close-knit research ecosystem, and all universities and institutions have functional TTOs. Stakeholder interactions point to substantial progress over the years in enhancing the ease of working with TTOs. However, start-ups and large companies alike believe there is further opportunity for standardizing and simplifying the technology licensing process. For instance, certain Danish TTOs have enhanced process efficiency by adopting standardized agreement templates that need minimal tweaks. Overall, strategic merit is perceived in exploring avenues for wider standardization of the technology transfer practices and simplifying the licensing process, especially for spin-outs and SMEs.

Implications and Current Initiatives:

Intensifying efforts to expand technology transfer capacity would be critical for realizing value in the robust IP pipeline being nurtured in India. Standardizing and simplifying the technology licensing process, to the extent possible, in Denmark could enable a more energized spin-out and commercialization ecosystem.

Identified Policy Opportunities:

Enhancing technology transfer capacity & fostering ease and efficiency

1. In India, more intensive investments in technology transfer capacity creation could enable more effective stewarding of IP to markets and unlocking of socio-economic value of IP generated. This could potentially include expanding existing models such as the Regional TTOs, creating thematic (focused on specific scientific area of innovation) specialized TTOs, or encouraging wider in-house capacity creation.

   Opportunities for process simplification and standardization could be considered by Danish TTOs to enhance ease of technology access.

   Overall momentum of technology transfer ecosystem could be energized through communication of success stories and highlighting impact of technologies transferred. This can result in better engagement of inventors, institutions, and research funders in the critical function of technology transfer.

2. Prioritization of investment in technology transfer professional development could create a much-needed pipeline of professionals (globally accredited RTTPs) to drive commercialization of India's rapidly expanding innovation funnel. Experiential learning opportunities and international exposure to diverse innovation ecosystems could substantially enrich professional development efforts in this applied practice area. Substantial opportunity is also perceived for bilateral collaboration and twinning arrangements between Indian and Danish TTOs for peer exchange and knowledge sharing.

E. Scale-up Infrastructure for Enhancing Commercialization Readiness

Context and Opportunity for Change:

Stakeholders across India and Denmark, including large companies and SMEs, point to a continued gap in scale-up infrastructure across different areas of innovation. One of the common commercialization challenges sighted at both ends is that technologies developed by academia are often not scaled-up to pilot scale or validated. Demonstration of technologies beyond lab scale could enhance technology readiness for industry adoption and thus improve IP commercialization outcomes.

Implications and Current Initiatives:

The dearth of pilot-scale infrastructure and validation networks impacts commercialization outcomes for institutional research results, and IP created. This challenge also severely impacts the SME segment's ability to absorb IP as they often lack in-house capability to advance lab scale-research to pilot and commercial scale.

> "*There is a change position, as there are many start-ups coming up with innovative ideas to address sustainability where they push the technology to industry to advance it to scale. The trends are moving towards commercialization. Pilot scale demonstration facilities will be required to bridge the gap so that technology readiness can be enhanced for industry to participate*"
>
> Mr. Rasmus L. Krogh-Meyer, Head of License & Partnering, Novozymes

There are initiatives across both countries in this direction. In Denmark, the DTU Biosustain is credited as a model where institutional research can be advanced to a pilot scale with higher industry receptiveness. Similarly, in India, the pilot-scale shared infrastructure created under the $250 million National Biopharma Mission (NBM), co-funded by DBT and World Bank, bridges this critical gap in scale-up for biological drugs, vaccines, and medical devices. There is substantial potential to expand the breadth of such initiatives and address the scale-up and validation infrastructure gap in a more accelerated manner.

Identified Policy Opportunities:

Scale-up infrastructure for enhancing commercialization readiness

1. There seems to be strategic merit in investing in pilot infrastructure anchored in academic institutions but also offering ease of access for SMEs. This could moreover help advance readiness of publicly funded research for industry uptake and thus enhance commercialization outcomes.

   DTU Biosustain and the NBM pilot-scale infrastructure for biological products are models with potential for replication. Creating more avenues for scale-up and validation could also enable spin-out ventures to leverage publicly funded shared infrastructure to advance innovation through preliminary scale-up phases.

   Wider investments may be then channelized for pilot infrastructure combined with ease of access for SMEs. Such models could enable spin-out ventures to leverage public research infrastructure for initial technology development and reach scale-up milestones.

F. Enhancing Pool of Risk Capital for IP Advancement

Context and Opportunities:

To nurture the innovation pipeline, both India and Denmark have created several programs that offer non-dilutive grant funding for early-stage technology development (such as under DST and DBT/ BIRAC in India and Innovation Fund Denmark). Additionally, international grants (including EU funds in Denmark), funding from non-profit foundations, etc., enable the creation of the IP funnel at early stages of innovation. Access to venture capital has also substantially expanded in both India and Denmark. However, risk capital for advancing IP through value realization milestones is still scarce in later stages of development that are more capital intensive (Annexure H & I). There is also currently limited late-stage risk capital accessible in life sciences and areas of national strategic priority.

For example, in 2019, Venture capital investments in the top 100 start-ups in Denmark aggregated about € 540 million (USD 611 million)[49]. Of this, 55% of the investments were across fintech, software, and e-commerce (€ 297 million) and 24% in life sciences (€ 540 million). However, the most mature cohort (29 Start-ups in top 100 that are 7 to 10 years old) only attracted 11% of this total funding (€ 58 million). In India, VC investments in 2020 aggregated USD 10 billion[50]. However, this was largely concentrated in technology investments, with consumer tech, SAAS, fintech, and B2B tech contributing to 83% of total investments and life sciences a meagre 3%. This indicates that there could be strategic merit in catalyzing improved access to equity capital for late-stage technology development. Both countries also do not have a provision for innovation-led ventures that are yet to generate revenues to access capital markets for funding (such as NASDAQ in USA, Hong Kong Stock[51] exchange in Asia, and proposed changes in South Korea[52]).

Implications and Current Status:

Paucity of risk capital for advancing IP becomes prominent as the level of capital required progressively expands through stages of validation. The relatively lower access to risk capital post initial take-off is likely to impact the probability of IP funnel translating to socio-economic impact on commercialization. The absence of a wider equity capital pool for late-stage development could also potentially result in a fleet of high potential ventures in countries with ease of access to late-stage venture capital.

[49] Venture capital and start-ups in Denmark, March 2020
[50] Bain IVCA India Venture Capital Report 2021
[51] https://www.hkex.com.hk/News/Media-Centre/Special/HKEX-Celebrates-Third-Anniversary-of-New-Listing-Regime?sc_lang=en
[52] https://www.fsc.go.kr/eng/pr010101/22230

Identified Policy Opportunities:

Enhancing pool of risk capital for IP

1. Catalytic measures for triggering larger pools of venture capital funding for late-stage IP-backed ventures could be considered. This is especially relevant for more capital-intensive segments or where technology de-risking takes longer. Current initiatives such as Government of India's Fund of Funds for start-ups could potentially be leveraged through sectoral allocation for life sciences, green transition, and other areas of national strategic priority.

2. Currently, technology-led ventures that are yet to advance their innovations to commercial milestones cannot use an Initial Public Offering (IPO) to raise capital as per listing norms as they are not yet revenue generating. Exploring the possibility for pre-revenue IP-backed companies to list on capital markets could also be a measure to create another avenue for late-stage funding.

G. Incentive Structures to Encourage Deeper Industry Engagement in IP Creation, IP Absorption, and IP Commercialization

Context and Opportunity for Change:

Several countries have introduced innovative fiscal and monetary mechanisms to encourage deeper industry engagement in R&D investments, IP absorption and IP commercialization, including weighted R&D tax deductions, lower tax rates on IP licensing or sale, monetary soft funding support for IP acquisition, etc. Interactions with companies in both India and Denmark point to an opportunity for further leveraging fiscal incentives to strengthen industry participation in IP-led value creation.

Implications and Current Initiatives:

India has a patent box regime[53] where a 10% tax rate is applicable on income from the worldwide exploitation of patents developed and registered in India. However, industry feedback points to the potential to expand the scope of benefit by including non-patent IP assets, patents not registered in India, not invented by the out-licensor, and transacted as IP sales instead of IP licensing. India earlier had weighted tax deductions of 200% on in-house R&D expenditure that was reduced to 150% for 2017-2020 and phased out now. On the other hand, Denmark has a weighted R&D tax deduction that gradually increases over a period of eight years from 100 % to 110 %. In response to the COVID crisis, tax deduction on R&D was increased to 130% for 2020 till 2022[54]. A political agreement was established in January 2022, aiming to make the tax deduction of 130% on R&D permanent[55]. Both countries do not have any fiscal incentives for IP acquisition. Industry stakeholders have opined that there is merit in considering opportunity for a more encouraging fiscal stimulus. This is especially so in the context of Indian cost arbitrage gradually eroding and countries with weighted tax deductions for R&D encouraging Indian companies to locate R&D onshore.

Identified Policy Opportunities:

Fiscal incentives to encourage deeper industry engagement in IP creation, IP absorption and IP commercialization

Denmark and India could consider opportunities to expand incentive structures across the following continuum:

1. **Incentives for In-house R&D and IP creation –** An agreement to make the super deductions on in-house R&D investments permanent has now been established in Denmark and could be re-introduced in India (as also recommended in the Draft 5th National Science, Technology, and Innovation Policy released for public comments).
2. **Incentives for IP acquisition and advancement -** fiscal and monetary incentives to catalyze industry investments in IP acquisition, technology de-risking, and deployment for commercial competitiveness.

   Incentives for IP monetization and commercialization – In addition to powering in-house business operations, IP created could be monetised by either selling or out-licensing the IP rights for certain applications or geographies. A comprehensive patent box regime covering revenue from monetization of in-house developed or acquired IP assets may be considered for enhanced incentives of IP commercialization.

inventor to benefit through tax concessions on the royalty income.

[54] OECD R&D tax incentives: Denmark, 2021 (https://www.oecd.org/sti/rd-tax-stats-denmark.pdf)

[55] https://www.regeringen.dk/media/11007/aftaletekst_en-ny-reformpakke-for-dansk-oekonomi.pdf

ANNEXURE

IV. Annexure

A. Approach & Methodology

Detailed secondary research on the IP commercialization ecosystem in both India and Denmark was conducted. The desk research encompassed literature review, analysis, and evaluation of patent filing trends, reviewing institutional annual reports, NIRF ranking data, TTO communications, to name a few. Sathguru leveraged its depth of incumbent knowledge and embedded presence in the ecosystem to derive more qualitative insights from secondary and primary research. Incumbent knowledge included insights from the STEM Survey, STEM Technology Transfer Impact awards, prior landscaping done by Sathguru for a national policy initiative, and insights from the ongoing role of handholding and mentoring TTOs created under the National Biopharma Mission.

B. Stakeholder Interactions – Acknowledgements

This report is developed based on insights from both secondary domain and qualitative and pragmatic perspectives from stakeholders across the Indian and Danish ecosystems. We acknowledge the time and contribution of the following stakeholders who consented to have a conversation with the authors of the report:

INDIA	
Organization	**Individual Name and Designation**
Department for Promotion of Industry and Internal Trade (DPIIT)	Ms. Pearl Sobti, Assistant Vice President, CIPAM
Department of Biotechnology (DBT)	Dr. Shirshendu Mukherjee, Mission Director Program Management Unit (DBT-BIRAC_BMGF_Wellcome Trust)
TISC, Hyderabad – ICRISAT	Dr. SuryaMani Tripathi, Legal Counsel
Gandhi Institute of Technology & Management (GITAM) University	Dr. Sreedhara Voleti, Dean – Entrepreneurship & Professor of Chemistry
Indian Institute of Technology, Kanpur (IIT)	Mr. Ravi Pandey, IPR & Tech. Transfer Professional
BITS Pilani	Mr. Rajneesh Kumar, Technology Transfer Officer (Institute Wide) Prof Sunil Bhand, Dean (university wide), Sponsored Research and Consultancy Professor, Department of Chemistry
Hester Biosciences	Mr. Rajiv Gandhi, CEO & Managing Director
National Biopharma Mission – Regional Technology Transfer Office (NBM-RTTO)	Ms. Pooja Bhatia Vasaikar, Chief Manager, Ms. Reema Sahni Mediratta, Senior Project, Manager, Innovation- Technology Transfer Office (i-TTO)

Indian Institute of Chemical Technology (IICT)	Dr. Shailaja, Chief Scientist & Head, Business Development and Research Management
International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI)	Dr. Sanjay Bhardwaj, Scientist F and Head, Centre for Technology Acquisition and Transfer (CTAT)
Accurex	Mr. Abhinav Thakur, Managing Director, Accurex; Secretary, Association of Diagnostics Manufacturers of India (ADMI)
FICCI	Mr. Dipankar Barkakati, Director and members of the FICCI IP Committee who have responded to a questionnaire circulated
Novozymes India	Dr. Avaronnan Harish Chandran, Head of Intellectual Property, India

DENMARK	
Organization	**Individual Name and Designation**
Ministry of Industry, Business, and Financial Affairs	Mr. Rune Lorentzen, Head of Department, Policy & Analysis. Ms. Sannah Plenaa Thorngreen, Special Advisor – Policy & Analysis
Ministry of Higher Education and Science, Danish Agency for Science, Technology and Innovation	Dr. Jakob Williams Ørberg, Counsellor, Innovation, Research and Higher Education
Innovation Fund Denmark (Innovationsfonden)	Dr. Michael Adsetts Edberg Hansen, PhD, Senior Investment Officer
Accelerace	Mr. Mads Løntoft, Head of Acceleration
Novo Nordisk Fonden	Mr. Mikkel Bülow Skovborg, Senior Vice President-Innovation
University of Southern Denmark	Mr. Thomas Schmidt, Head of Technology Transfer
Aarhus University	Mr. Nis Kjær Weibel, Head of Business Development
Novozymes	Mr. Rasmus L. Krogh-Meyer, Head of License & Partnering
Haldor Topsøe	Ms. Sanne Bang Olsen, Senior Director – Intellectual Property, Global Legal Affairs
Akademiet for de Tekniske Videnskaber (ATV)	Ms. Vibeke Schrøder, Chefkonsulent, cand. Scientist Dr. Martin Beck, Chefkonsulent
The Think Tank DEA	Dr. Maria Theresa Norn, Head of Analysis
DTU Entrepreneurship	Dr. Jes Broeng, Professor and Director
ODIN (Open Science at Aarhus University)	Dr. Marie Louise Conradsen, Head

C. Abbreviations

AGNIi	Accelerating Growth of New India's Innovations
AIM	Atal Innovation Mission
AIR	Academic Innovation Research
ARCI	International Advanced Research Centre for Powder Metallurgy and New Materials
ARIIA	ATAL Ranking of Institutions on Innovation Achievements
ASTP	Association of European Science and Technology Transfer Professionals
ATTP	Alliance of Technology Transfer Professionals
AUTM	Association of University Technology Managers
BCIL	Biotech Consortium India Limited
BIG	Biotechnology Ignition Grant
BII	Bio Innovation Institute
BIRAC	Biotechnology Industry Research Assistance Council
BITS	Birla Institute of Technology and Science
CAGR	Compound Annual Growth Rate
CGPDTM	Controller General of Patents, Designs and TradeMarks (Indian Patent Office)
CIPAM	Cell for IPR Promotion & Management
CSIR	Council of Scientific and Industrial Research
CSR	Corporate Social Responsibility
DBT	Department of Biotechnology
DFDS	Det Forenede Dampskibs-Selskab
DKPTO	Danish Patent and Trademark Office
DPIIT	Department for Promotion of Industry and Internal Trade
DSIR	Department of Scientific and Industrial
DSIR – PRISM	Department of Scientific and Industrial Research – Promoting Innovations in Individuals, Start-ups and MSMEs
DST	Department of Science & Technology
DTU	Technical University of Denmark
EIS	European Innovation Scoreboard
EU	European Union
FCCI	Federation of Indian Chambers of Commerce and Industry
FIST	Fund for Improvement of S&T Infrastructure
FITT	Foundation for Innovation & Technology Transfer
GACL	Gujarat Alkalies & Chemicals Limited
GDP	Gross Domestic Product
GeM	Government e-Marketplace
GERD	Gross Expenditure on R&D
GII	Global Innovation Index
GoI	Government of India

HEIs	Higher Education Institutions
ICAR	Indian Council of Agricultural Research
ICMR	Indian Council of Medical Research
IFD	Innovation Fund Denmark
IICT	Indian Institute of Chemical Technology
IIT	Indian Institute of Technology
IP	Intellectual Property
IPR	Intellectual Property Right
IPFCs	Intellectual Property Facilitation Centres
IT	Information technology
i-TTO	Innovation- Technology Transfer Office
IU21KT	Innovation Union Commitment 21 on Knowledge Transfer
KAPILA	Kalam Program for Intellectual Property Literacy and Awareness Campaign
KIIT	Kalinga Institute of Industrial Technology
LEAP	Launching Entrepreneurial Driven Affordable Products
MoE	Ministry of Education
MeitY	Ministry of Electronics and Information Technology
MHRD	Ministry of Human Resource Development
MSME	Micro, Small & Medium Enterprises
NBM	National Biopharma Mission
NCL	National Chemical Laboratory
NIDHI	National Initiative for Developing and Harnessing Innovation
NIRF	National Institutional Ranking Framework introduced by Ministry of Education
NISP	National Innovation and Startup Policy
NRDC	National Research Development Corporation
NSTEDB	National Science & Technology Entrepreneurship Development Board
ODIN	Open Discovery Innovation Network
OIL	Open Innovation Licensing
PATH	Patenting & Technology Transfer for Harnessing Innovations
PCT	Patent Co-operation Treaty
PFC	Patent Facilitation Cell
PIC	Patent Information Centres
PFP	Patent Facilitation Programme
PPH	Patent Prosecution Highway
PRI	Public Research Institution
PSCST	Punjab State Council for Science and Technology
PURSE	Promotion of University Research and Scientific Excellence
R&D	Research and Development
RTTO	Regional Technology Transfer Offices
RTTP	Registered Technology Transfer Professionals
SATHI	Sophisticated Analytical & Technical Help Institutes

SDU	University of Southern Denmark
SIP-EIT	Support for International Patent Protection in Electronics & Information Technology
SIPP	Start-ups Intellectual Property Protection
SISFS	Startup India Seed Fund Scheme
SMEs	Small and Medium Enterprises
SPARSH	Social innovation programme for Products
SBIRI	Small Business Innovation Research Initiative
STEM	Society for Technology Management
STEP	Science & Technology Entrepreneurs Park
STI	Science, Technology, and Innovation
STIP	Science, Technology, and Innovation Policy
TDVC	Technology Development, Validation and Commercialization
TIFAC	Technology Information Forecasting and Assessment Council
TISC	Technology and Innovation Support Centre
TRIPS	Trade Related Aspects of Intellectual Property Rights
TTO	Technology Transfer office
USD	U.S dollar
VC	Venture Capital
VIT	Vellore Institute of Technology
WIPO	World Intellectual Property Organization

D. National Regulations and International Agreements

Type of Right	Details	Denmark	India
Patent	Law	The Consolidate Patents Act; Publication of the Patents Act, cf. Consolidated Act No. 366 of June 9, 1998 as amended by Act No. 412 of May 31, 2000 (Latest amendment: The Consolidate Patents Act No. 90 of January 29, 2019)	The Patents Act, 1970 (Latest Amendment Rules 2021)
	Validity	20 years	20 years
	International Agreements	Patent Co-operation Treaty (PCT) Paris Convention Industrial property Budapest Treaty Deposit of Microorganisms for the Purposes of Patent Procedure Patent Law Treaty harmonizing patent application, WIPO Convention Strasbourg Agreement International Patent Classification	Patent Co-operation Treaty (PCT) Paris Convention Industrial property Budapest Treaty Deposit of Microorganisms for the Purposes of Patent Procedure
Utility Model	Law	The Consolidate Utility Models Act (Consolidate Act No. 91 of January 29, 2019)	NA
	Validity	10 years	NA
Trademark	Law	The Consolidate Trade Marks Act (Consolidate Act No. 88 of January 29, 2019)	TRADE MARKS ACT, 1999 (Amendments in 2017)
	Validity	10 years (renewable)	10 years (renewable)
	International Agreements	Madrid Protocol Concerning the International Registration of Marks Vienna Agreement Marks Nice Agreement classification of goods and services for registering trademarks and service marks Singapore Treaty harmonization of trademark registration Trademark Law Treaty (TLT) standardizes national and regional trademark registration process	Madrid Protocol Concerning the International Registration of Marks Vienna Agreement Marks Nice Agreement classification of goods and services for registering trademarks and service marks Nairobi Treaty Protection of the Olympic Symbol

Type of Right	Details	Denmark	India
Design	Law	The Consolidate Designs Act (Consolidate Act No. 89 of January 29, 2019)	The Designs Act 2000
	Validity	Maximum 25 years (renewable every 5 years)	10 years renewable once for 5 years
	International Agreements	Locarno Agreement industrial designs Hague Agreement protection of industrial designs Geneva Act (1999)	Locarno Agreement industrial designs
Copyright	Law	Consolidated Act No. 763 of June 30, 2006 on Copyright	The Copyright Act, 1957 The Copyright Act, 1957 (Amended in 2012)
	Validity	70 years after the year of the author's death	60 years after the year of the author's death
	International Agreements	Berne convention For the Protection of Literary and Artistic Works Phonograms Convention Against Unauthorized Duplication of Their Phonograms Rome Convention For the Protection of Performers, Producers of Phonograms and Broadcasting Organizations WIPO Copyright Treaty WIPO Performances and Phonograms Treaty Marrakesh VIP Treaty transfer of specially-adapted books Beijing Treaty on Audiovisual Performances	Berne convention For the Protection of Literary and Artistic Works Phonograms Convention Against Unauthorized Duplication of Their Phonograms Rome Convention For the Protection of Performers, Producers of Phonograms and Broadcasting Organizations WIPO Copyright Treaty WIPO Performances and Phonograms Treaty Marrakesh VIP Treaty transfer of specially-adapted books

Type of Right	Details	Denmark	India
Other Legislations	National Treaties	The Consolidate Act on the Protection of the Topographies of Semiconductor Products (Consolidate Act No. 92 of January 29, 2019) The Trade Secrets Act (Act No. 309 of April 25, 2018) Plant variety protection: The Consolidate Act on Plant Variety Protection (Consolidate Act No. 1131 of July 3, 2020)	Semiconductor Integrated Circuits Layout Design Act 2000 governs the layout designs of these semiconductor integrated circuits Plant Variety Protection and Farmers Rights (PPVFR) Act, 2001
	International Treaties	UPOV Convention Protection of Plant Variety	

E. Danish University's Offerings to Boost the Start-up & Technology Development Ecosystem

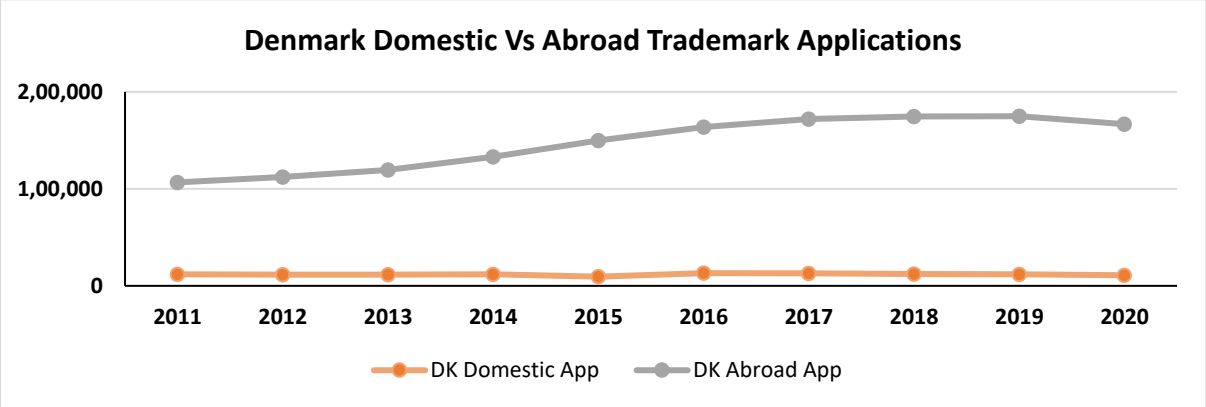
The table below indicates a few key offerings by various universities in Denmark to support the technology development ecosystem.

AALBORG UNIVERSITET Students at Aalborg University have access to ▪ **Entrepreneurship knowledge centre SEA** ▪ **AAU Incubator**	IT-UNIVERSITETET I KØBENHAVN Entrepreneurial activities at the IT University in Copenhagen take place at **ITU Business Development A/S** and **ITU Innovators**	CBS COPENHAGEN BUSINESS SCHOOL HANDELSHØJSKOLEN Copenhagen Business School has open activities for all students and special programmes for selected student entrepreneurs. ▪ **CSE - Copenhagen School of Entrepreneurship** ▪ **Bitlab**
AARHUS UNIVERSITET Students at Aarhus University have access to incubators within different professional areas. ▪ **Studentervæksthus Aarhus (SVAA)** ▪ **Food eHub** ▪ **Business Factory** ▪ **Startup Factory** ▪ **COMET (Commercializing and Entrepreneurship)** ▪ **HatchIT Lab** ▪ **Orbit Lab**	KØBENHAVNS UNIVERSITET Students at Copenhagen University (KU) can use the services of UCPH Innovation Hub. ▪ **SUND Hub** ▪ **DANSIC** ▪ **SCIENCE Innovation Hub** ▪ **Medical Business Association** ▪ **T57** ▪ **KU PLUS** ▪ **Synapse**	SDU At University of Southern Denmark (SDU), the different student incubators and labs are gathered in SDU RIO: ▪ **SDU Cortex Lab – Odense** ▪ **SDU MakerLab – Kolding** ▪ **Startup Alsion – Sønderborg** Danmarks Tekniske Universitet DTU Technical University of Denmark (DTU) Innovation hub **DTU Skylab** and **Stardust DTU**

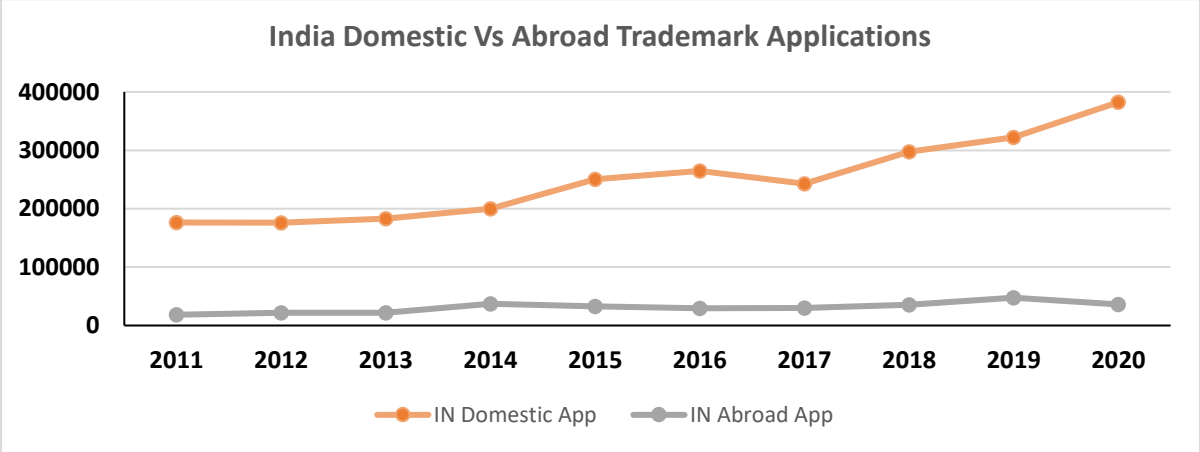
F. Trademark Filing and Design Filing Trends

The trademark and design filing trends are similar to the patent filing trends in the respective countries.

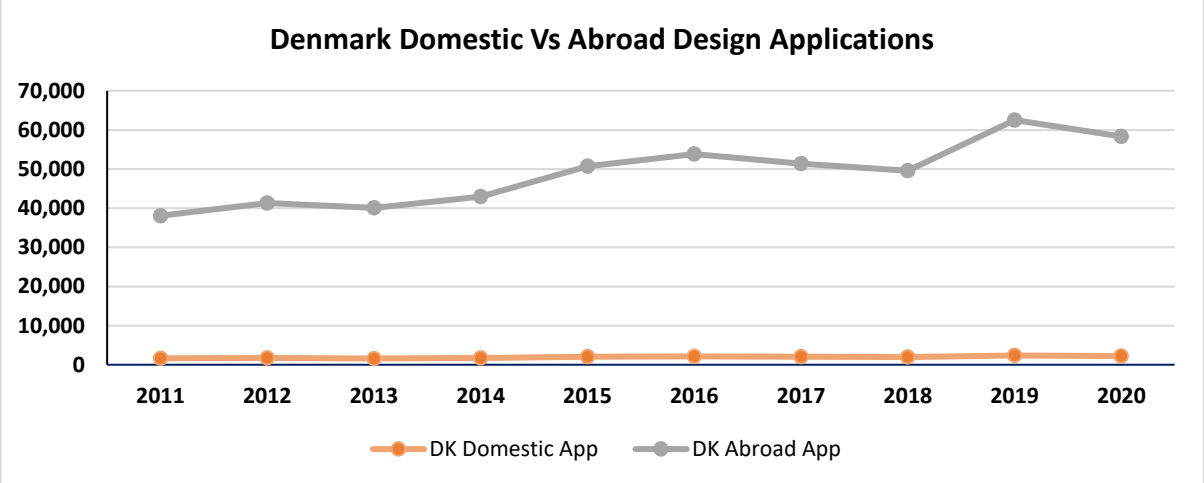
a) Denmark Trademark filing trends



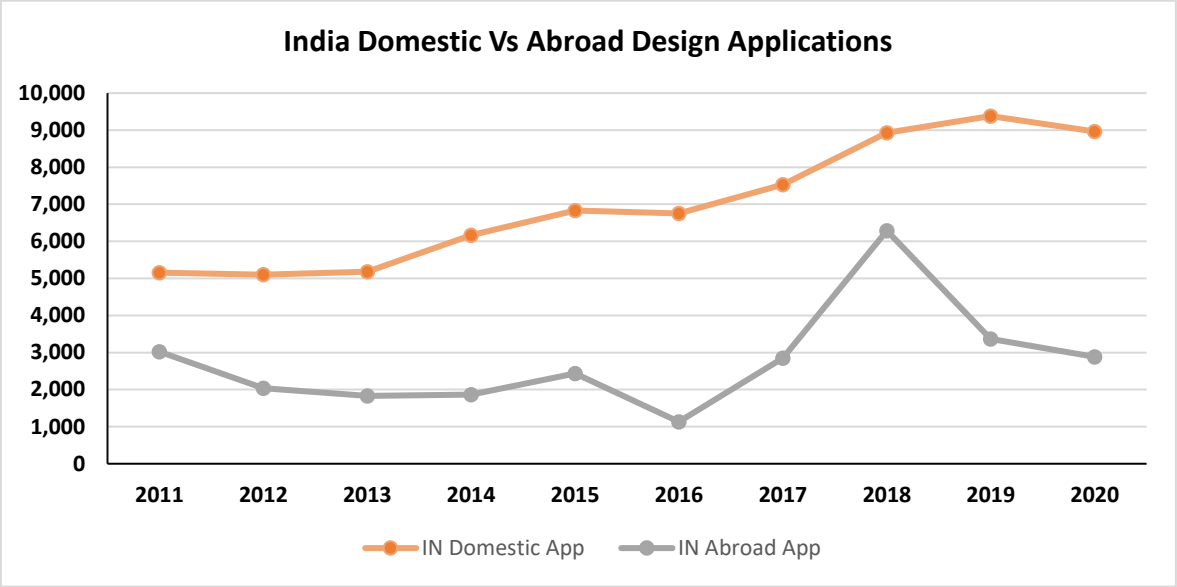
b) India Trademark Filing Trends



c) Denmark Design Filing Trends

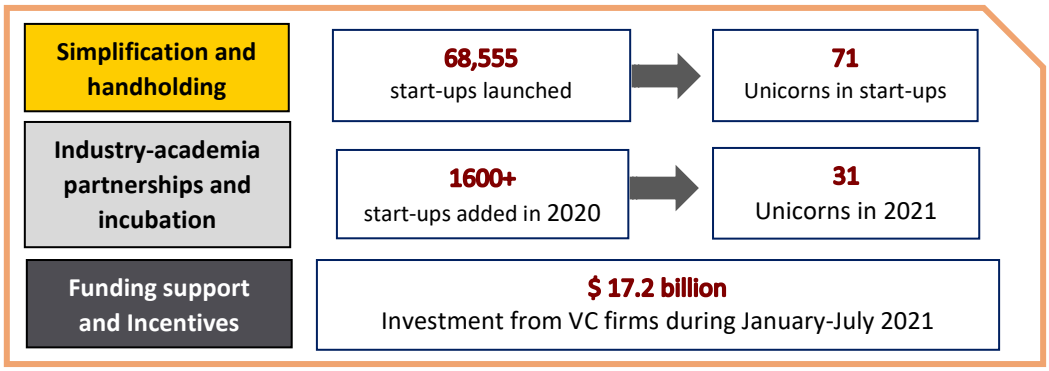


d) India Design Filing Trends



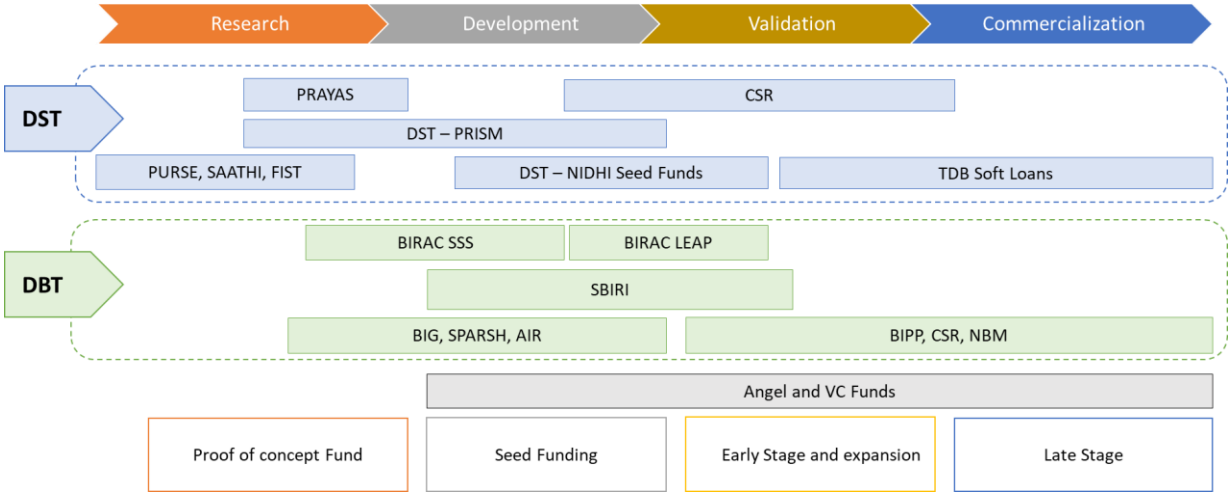
G. 'Start-up India' Program and Its Impact

The GoI launched the Start-up India program in 2016 that emphasizes on three key pillars to facilitate the creation of 70 incubators and research parks to collaborate with the private sector. The three pillars include Pillar 1, focusing on handholding, including initiatives such as relaxed norms for public procurement, legal support, fast-tracking patent examination at lower costs, faster exits, etc. Pillar 2 focuses on tax exemption on capital gains and allows a tax exemption for three years for start-ups, while Pillar 3 is a fund of funds corpus of USD 1,323 million[56]. Owing to this, 26 states in India now have their own start-up policies, which has led to a significant leap in the ease of doing a Business index for India from 130 in 2016 to 63 in 2020[57].

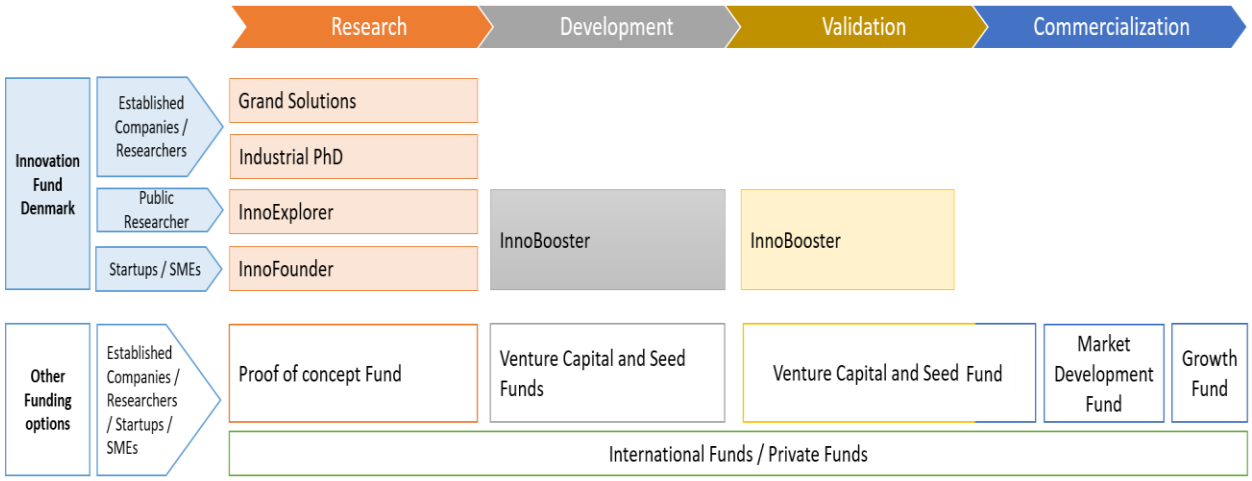


[56] Startup India Action plan (https://www.startupindia.gov.in/content/dam/invest-india/Templates/public/Action Plan.pdf)
[57] WIPO GII index

H. Funding Programs Offered at Different Stages of Innovation Commercialization, India



I. Funding Programs Offered at Different Stages of Innovation Commercialization, Denmark



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