

Incentivising Innovation and Technology Commercialisation in India

Igor Nikolic

Robert Schuman Centre for Advanced Studies, European University Institute, Florence, Italy

Email address:

Igor.nikolic@eui.eu

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Abstract: Intellectual property rights, in general, and patents, in particular, are associated with innovation, economic growth, jobs creation and higher wages. In fact, IPR-intensive companies amount to a much higher percentage of the GDP of a country than companies that do not own IPRs. Recognising the many pro-competitive effects of IPRs, in recent years, India has driven several initiatives to promote IP and, thus, innovation. However, some challenges remain. For instance, India faces low levels of R&D investment, insufficient domestic patenting, slow process to obtain and enforce patents, a too-small percentage of commercialised patents, and no national companies contributing to cellular standardisation, which is responsible for driving the digitalisation globally. This article examines several measures that would help India reach its full innovative potential: 1) further increasing the overall IP awareness in society by embarking on training judges, lawyers, and entrepreneurs on IP matters; 2) improving the efficiency of Indian patent system by focusing more on patent quality, which includes hiring more patent examiners at national patent office and providing them with more resources, as well as increasing the number of judges that would be specialised in IP matters; 3) providing direct financial support and tax incentives for domestic R&D and innovation; 4) introducing a centralised approach to support innovative MSMEs, start-ups and universities, especially when they choose to commercialise their IPRs and 5) the government could actively support domestic companies to participate in international technical standardisation and invest in the development of the next generation of standards in order to catch up with Chinese, US and European companies. Taken together, with the right policy measures, India would be one step near its goal of being one of the leading knowledge-based economies to the benefit of Indian society.

Keywords: Patents, Commercialisation, Technology Transfer, Standardisation, Intellectual Property, India

1. Introduction

Innovative ideas are indispensable to drive economic progress. However, groundbreaking inventions can be the result of significant investments in Research and Development (R&D). This is in particular the case in complex systems, such as when developing cellular standardised technology in the Information Communication Technology (ICT) field. Accordingly, these ideas are generally protected by intellectual property rights (IPRs). Several studies have shown that so-called IPR-intensive industries, i.e. “those having an above-average ownership of IPRs per employee, as compared with other IPR-using industries”, [1] are responsible for higher growth, exports and wages, heavily impacting the economy of a country. To achieve their full potential, IPRs also need strong protection. In this sense, IPR protection has led to drastic

improvements over the last century in all kinds of sectors, such as health, security, telecommunications and transportation, hence increasing consumer welfare. [2]

In recent years the government of India has recognised the crucial role of IPRs in protecting India’s creativity and innovation. Nevertheless, despite having undertaken relevant initiatives such as ‘National Intellectual Property Rights Policy’, ‘Accelerating Growth of New India’s Innovation’, ‘Make in India’ and ‘Start-up India’, [3] India still lags behind top economies in R&D spending and patenting with regard to the private sector, and even now faces insufficient domestic commercialisation of patented inventions. ¹ To date, most of

¹ A patent is an invention that is new, involves an inventive step and is susceptible to industrial application, see European Patent Convention, Article 52.

the patenting in India comes from foreign entities, while the majority of R&D spending is attributed to the government sector. [4] Consequently, India could benefit from a target-oriented strategy to overcome these challenges.

The aim of the article is to explore the difficulties that India is facing in improving its overall innovation climate and will suggest measures on how to further advance R&D and IPR activity by the domestic private sector and academia, contributing to economic growth, jobs, and the welfare of

citizens in India.

The structure of the article is the following: part 2 briefly analyses the benefits of IPRs and a strong patent system in general; part 3 describes the current state of the patent system, and the technology commercialisation in India; part 4 analyses the challenges that India needs to overcome to facilitate more patenting and commercialisation of innovation; part 5 suggests measures to improve the framework for innovation and entrepreneurship and part 6 concludes.

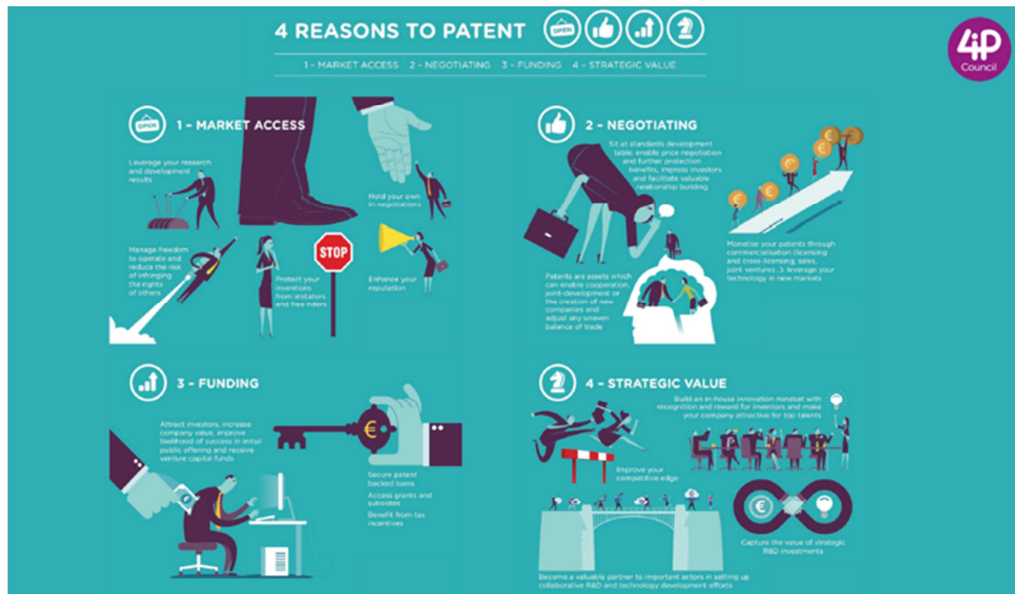


Figure 1. Reasons to patent. Source: 4iP Council at <https://www.4ipcouncil.com/4smes#why-should-i-care>.

2. The Benefits of a Strong Patent System

IPRs are generally recognised as a crucial tool to promote innovation and economic growth. [5] There are many forms of IPRs, the main ones being patents, copyrights, trademarks, and design rights. IPRs incentivise the creation or improvement of goods and services by conferring exclusive rights for a limited period of time, thus promoting dynamic efficiency. [6] For instance, by preventing others from using patented technology, the patent holder can (1) protect the invention from imitators and free-riders, (2) expand its business model, (3) use the patent defensively in licensing negotiations or litigation, (4) secure loans from banks, (5) attract investors, or public funding,² (6) increase the company value and its reputation, (7) potentially obtain revenues from licensing, and (8) improve his competitive edge, to name but a

few benefits of patents. [7] Copyrights, in turn, protect original artistic creations such as books, songs, movies, computer programs, photographs, plays and drawings,³ while trademarks are symbols or signs that distinguish one product or service from another.⁴ The main purpose of a trademark is to convey information about the character and reputation of the product or service, and companies use them to distinguish their offerings on the market. Similarly, design rights are exclusive rights that protect the appearance of a product. [8] Copyrights, trademarks and design rights are used by companies to guard against imitators and copycats, enhance the reputation for creativity and originality, obtain licensing revenues, help attract venture capital and improve the company's overall value to investors.

³ According to the Berne Convention for the Protection of Literary and Artistic Works (as amended on September 28, 1979) copyright is the exclusive right for the protection of the rights of authors in their literary and artistic works

⁴ A trademark may consist of any signs, in particular words, including personal names, or designs, letters, numeral, colours, the shape of goods or of the packaging of goods, or sounds, provided that such signs are capable of a) distinguishing the goods or services from one company to another and b) being represented on the register in a manner which enables the competent authorities and the public to determine the clear and precise subject matter of the protection see Article 3 of the Directive (EU) 2015/2436 of the European Parliament and of the Council of 16 December 2015 to Approximate the Laws of the Member States Related to Trade Marks OJ L 336. See also <https://euipo.europa.eu/ohimportal/en/trade-mark-definition>

² Patents are very important for start-ups in securing capital funding, with studies showing that venture capital investors consider start-up's patent ownership important in their funding decisions (Hsu, D and Ziedonis, H., (2013) Resources as Dual Sources of Advantage: Implications for Valuing Entrepreneurial-Firm Patents, Strategic Management Journal 34(7) 76; Graham, S. et al. (2009) High Technology Entrepreneurs and the Patents System: Results of the 2008 Berkeley Patent Survey Berkeley Technology Law Journal 24 1255; Hall, B. and Ziedonis, H. (2001) The Patent Paradox Revisited: An Empirical Study of Patenting in the US Semiconductor Industry, 1979-1995, RAND Journal of Economics 32, 101).

IPR-intensive industries have a huge impact on the economy of a country. Only in the US, IPR-intensive industries were directly responsible for 27.9 million jobs, indirectly supporting an additional 17.6 million jobs in 2014. These industries also paid 47% higher wages than other industries in the same year. [9] Besides, they provided a total value of 38.2% of the US gross domestic product (GDP), i.e., USD 6.6 trillion, approximately 491 trillion Indian rupees. Moreover, merchandise exports of IPR-intensive industries made up 52% (USD 842 billion or around 62.7 trillion Indian rupees) of the total US merchandise exports. In the EU, IPR-intensive industries generated (directly and indirectly) 83.8 million jobs in 2014–2016 (representing 38.9% of all jobs) and paid 47% higher wages than other industries. [10] Over the same period, IPR-intensive industries generated almost 45% of the EU's GDP worth EUR 6.6 trillion (roughly 491 trillion Indian rupees) and accounted for EUR 182 billion (about 16 trillion Indian rupees) in trade surplus. Furthermore, IPRs are very beneficial for small and medium-sized enterprises (SMEs) in India are known as MSMEs). On average, SMEs that own IPRs are 21% more likely to experience growth and have 68% higher revenue per employee than SMEs that do not own any IPR. [11]

Patents, in particular, are becoming increasingly important in today's digital world. Cutting-edge technologies like the 5G standard that provides interconnectivity to smart objects in the Internet of Things (IoT) are highly complex. They are the result of years of R&D investment and are often protected by numerous patents. [12] These technologies will enable breakthrough innovation in modern economies, such as smart cities, smart agriculture, utility monitoring, smart homes, and the monitoring of physical infrastructure. [13] Therefore, a robust patent system that ensures smooth obtainment and enforcement of high-quality patents can protect and stimulate innovation in the digital markets, as it positively correlates with R&D investment and economic growth. [14] For example, in the EU, patent-intensive industries offered 72% higher wages than non-IPR-intensive industries and were responsible for EUR 130 billion (around 11 trillion Indian rupees) trade surplus. [15] Moreover, EU firms that own patents have on average 36% higher revenues and 53% higher salaries per employee than firms that do not have patents. [16] Having a patent is also very important for SMEs. In high-tech industries, the likelihood of growth is 110% higher for SMEs that have filed one or more patents than SMEs without patents. [17]

However, owning a patent alone is not sufficient to get a return on investment (RoI). With the commercialisation of their patents, companies can exploit their inventions by bringing them to the market. [18] Commercialisation may enable the division of labour between, on the one hand, companies that specialise in the production of new (patented) products or services and, on the other hand, innovators focused solely on R&D activities. In particular, licensing as a method for commercialisation of patents is associated with a number of pro-competitive benefits, such as “(i) allowing the innovator to maximise profits (...); (ii) allowing an innovator to promote one's intellectual property while limiting

free-riding by would-be IP infringers; (iii) facilitating risk management and reducing transaction costs in commercialising an innovation; (iv) protecting and maintaining goodwill, such as a reputation for quality; and (v) promoting productive efficiency by the licensee”. [5] Furthermore, licensing patents can be especially useful to MSMEs, universities and research institutions that lack the production capabilities to bring their inventions to the market. Instead, they can obtain revenues by selling their patents or by granting manufacturing companies the right to commercialise such inventions. In consequence, licensing is an efficient way to ensure that commercially relevant research is further used by the private sector to the benefit of the economy and the citizens of a country. Considering the above, a proper framework for obtainment and commercialisation of patents seems crucial to enable innovation, economic growth, and employment.

3. Initiatives to Strengthen the Indian Patent System

India has embarked on a series of reforms to improve its patent system. For example, the Department of Industrial Policy and Promotion (DIPP) developed a National IPR Policy in 2016 to improve the overall ‘innovation climate’ in India, hence creating an atmosphere that fosters and protects innovation. One year later, the Department embarked on a country-wide IP awareness campaign by sponsoring workshops and seminars for schools, universities, MSMEs and start-ups. The government continued to strengthen IP awareness by introducing the IPR subject knowledge in the course curriculum for 12th-grade students and the training for police officers, conducting awareness programs in rural areas via satellite programmes and focusing on the development of e-content and dissemination through online channels. [19] These projects were part of implementing the Department's vision of India as a place where “creativity and innovation are stimulated by Intellectual Property for the benefit of all; an India where intellectual property promotes advancement in science and technology, arts and culture, traditional knowledge and biodiversity resources; an India where knowledge is the main driver of development, and knowledge owned is transformed into knowledge shared.” [20].

Moreover, to make the application and granting of patents more efficient, the Controller General of Patents, Designs and Trademark (CGPDT) introduced a fully online and video-conferencing procedure for patent examinations, provided for expedited examination process for start-ups, enabled the issuance of an electronic patent certificate, and recruited more personnel. [21]

Also, aiming to reduce the duration of commercial litigation and build specialised judges, the Government of India set up specialised Commercial Courts in 2015 (Act amended in 2018) to hear commercial disputes, including IPR disputes. [22] Just recently, the Delhi High Court established a separate IP division to deal with IP cases in order to provide better legal

certainty and more efficient protection for innovators. [23]

India is additionally facilitating the participation of its companies, academic and research institutions in international standardisation. Cellular standardisation is developed in a joint effort of many companies under a consortium of seven standard development organisations (SDOs) called 3GPP. The resulting technologies (2G to 5G standards) are typically accessible on fair, reasonable and non-discriminatory (FRAND) terms and conditions. FRAND ensures the widest possible access to companies wishing to use the standard as well as an adequate and fair reward to innovators. As the European Commission recognises, “[s] tandards help manufacturers reduce costs, anticipate technical requirements, and increase productive and innovative efficiency”. [24] For instance, 5G and other interoperability standards are estimated to represent 40% of the potential value of the Internet of Things projected to be up to \$11,1 trillion per year in 2025. [25] Already there are approximately 12,4 billion IoT devices in the world, with an expected rise to 26 billion by 2026. [26] Thus, Indian companies would benefit from becoming contributors to international cellular standards instead of purely implementers. In particular, MSMEs have a real chance to compete against larger companies under equal conditions, since SDOs typically adhere to the principles established by the World Trade Organisation (WTO): transparency, openness, impartiality and consensus, effectiveness and relevance, coherence, and protection of developing countries’ interests. [27] In fact, a study looking at contributions made to 3G and 4G standards, showed that the likelihood of acceptance of technologies from SMEs and start-ups for inclusion to 3G and 4G standards was higher (34.4%) than the contribution of larger companies (28.9%). [28] This proves that SMEs can successfully compete against large players in the development of international standards.

Measures related to international standardisation include the adoption of the Digital Communications Policy (DCP) in 2018, which envisages financial incentives for the development of standard essential patents (SEPs) in the field of digital communication technologies. In 2014, the Indian Telecommunications Standards Development Society (TSDSI) was formed consisting of network operators, manufacturers, academic and R&D organisations, providing Indian entities with the opportunity to contribute to the development of global ICT standards. [29] Moreover, Indian courts have addressed some SEP disputes, reaching well-founded decisions, condemning free-riding on inventions by awarding injunctions and anti-suit injunctions against infringers. [30] Indian courts are also ready to order interim injunctions if the implementer does not make interim royalty payments during the pendency of the litigation. [31]

Finally, the adoption and implementation of various government programmes have contributed to an improved framework for innovation and growth. For example, the ‘National Intellectual Property Rights Policy’ has an ambitious programme to foster the greater use and protection of IPRs, [32] while the ‘Accelerating Growth of New India’s Innovation’ [33] helps commercialisation of domestic

technologies by bringing together India’s start-ups and innovators with the users of technology, such as corporations, government entities and non-profit organisations. Further, ‘Make in India’ is a programme aimed at transforming India into a global design and manufacturing hub, [34] and the ‘Start-up India’ is an initiative to incentivise and support domestic start-ups. [35] Lastly, India operates a favourable tax regime by giving tax deductions for R&D, accelerated depreciation of the R&D assets, as well as having a special 10% tax rate on profits from patent commercialisation and a 100% tax deduction on the profits of innovative start-ups for the first three years. [36]

4. Status Quo and Challenges to Overcome

Mainly because of the above-mentioned initiatives, for the first time, India has entered the top 50 innovating countries in the World Intellectual Property Organization (WIPO)’s Global Innovation Index (GII), improving its rank from 81st in 2015 to 48th in 2020. India also ranks third in the lower-middle-income economies and first in the Central and Southern Asia region.

However, beneath the surface, the use of India’s IPR system is not maximised yet and, thus, lags behind other top economies. Some possible reasons are described in the following:

First, the private sector does not adequately contribute to innovation. Most R&D in India is the result of government investment (56%), three times more than the average contributed by other countries. [4] To date, India’s gross expenditure on R&D is still 0.65% of its GDP, significantly lower than the 1.5-3% of GDP spent by other leading nations. [4] This figure seems to be caused by the low contribution of the business sector in India (about 37%) to gross R&D expenditure, almost half compared to the top ten economies for the same sector (68% on average). [4]

Second, most R&D investments (in particular from Indian companies) are not protected by patents in India. None of the Indian companies made it to the list of 50 patent filers globally. [37] In practice, the majority of patent applications in India come from non-residents. Indian residents in 2019 contributed only 36% of filed patents, compared to 62% of national companies on average in the top ten economies. [4] In other words, patenting and innovation is mostly driven by foreign companies. Furthermore, the numbers of patents filed in general are too low considering the market size of India. Data shows that in 2019 India received only some 53,000 patent applications, compared to 1,400,000 in China, 620,000 in the US, 300,000 in Japan and about 363,900 in Europe (181,000 of those were received by the European Patent Office). [38] Some of the reasons behind the lower patent applications may be that:

(1) When companies choose to protect their inventions, they face a much longer patent application process in India than in other leading countries. According to the latest

estimates by WIPO, an applicant requires on average 48 months to obtain a patent in India, compared to 22 months in China or the US and 28 months in Europe (the EPO). [38]

(2) The working conditions at the CGPDT casts doubt on the quality of Indian patents. According to one study of pharmaceutical patents in India, only 15% were subject to elaborate scrutiny, and in most cases the relevant patentability criteria have not been appropriately cited in the final written order. [39] A high patent quality requires more qualified, informed, and satisfied patent examiners. [40] However, Indian patent examiners reportedly have a higher workload than their foreign counterparts and lower salaries than the ones offered by the private sector. [41] While an EPO patent examiner handles, on average, seven patent applications and a USPTO examiner around eight applications per month, an Indian examiner has to deal with at least 40 applications a month. This workload can be explained by the still insufficient number of examiners, despite the recent hiring. For instance, the USPTO and the EPO in 2019 had 8,098 and 4,241 patent examiners, respectively, while India employed only 616 patent examiners in the same year. [38] Additionally, the average salary of Indian patent examiners is far less than what the private sector offers in India, which contributes to a high percentage of employees leaving the CGPDT. The average length of service of a patent examiner in India is only 4 years compared to 12.3 years in the US, and between 11 and 22 years for the majority of staff at the EPO. [42] As a result of the overwork of Indian patent examiners, there was a backlog of 115,750 patent applications as of January 2020. [43]

(3) The enforcement of patents is also a major challenge in India. It can take up to 10 years for a patent infringement case to be decided by Indian courts, [44] while the average length in Germany for a first instance decision is between 12-16 months, [45] a bit more than 1 year in the UK, [46] and about 2 and a half years in the US depending on the district court. [47] The recent reforms of commercial courts appear not to have produced the desired effect of reducing time to judgment. According to the study of the Vidhi Centre for Legal Policy, from the cases examined between December 2015 and December 2018 that went to trial, only 10% were resolved, while most were still pending with issues not yet being framed. The reasons for the still slow time to judgment have been attributed to the insufficient number of judges and the corresponding lack of specialisation; the absence of the use of new expedite instruments provided by the Commercial Courts Act such as case management proceedings and summary judgments; as well as the general inefficiencies related to frequent adjournments and delays in a summons. [48]

Third, India also ranks low on IP commercialisation. While there is no official data, some estimates are that as little as 3% of patents get commercialised in India. [49] In contrast, some comparative studies found that about 40% of examined Australian patents reach commercialisation stage, [50] 60% of surveyed US patents were monetised, [51] and 43.3% of sampled Canadian inventors received revenues from their inventions. [52] Not only the business sector but Indian universities are also minimally commercialising their

inventions, and their research appears to be far from the demands of the industry. [53] In contrast, 42% of patents by universities and public research organisations in the EU are being commercialised, with an additional 21% of patents planned to be commercialised. [54] In the US, Caviggioli et al. examined patents granted to the top 58 US universities and found that 37% of patents have been commercialised, primarily by licensing. [55]

Forth, the participation of Indian companies in international technological standardisation remains low. Currently, no Indian company appears in the list of owners of patents declared essential for the 5G standard [56] and Indian telecom handsets and equipment manufacturers, in general, have a small patent footprint and comparatively little investment in R&D. [57] Moreover, while the decisions of courts regarding SEPs, as seen, have been well-founded, the long time needed to secure protection may discourage companies, in particular those with little resources which depend on a return on investment in a timely manner to invest in innovation. For instance, the final judgment has been delivered in only one SEP case after a prolonged trial that took almost 9 years. [58]

In the following, this paper will provide some suggestions on how to address the above-mentioned challenges to the Indian patent system

5. Proposals to Strengthen the Indian Patent System

India could introduce certain measures to improve its overall innovation climate. The article suggests a combination of measures: 1) continue raising the general IP awareness; 2) financial support to innovation; 3) improve the efficiency of the obtainment and enforcement of patents; 4) support patent commercialisation and 5) facilitate and foster participation in international standardisation.

5.1. Continue Raising IP Awareness

While good initiatives have been taken by the government, India would benefit from a more intensive education regarding IPRs. This could particularly include training on IPR for judges and lawyers in order to make the IP enforcement system more effective and increase the dialogue between Indian judges and judges from experienced jurisdictions, such as the US, UK and Germany. Additionally, IPR education could be offered to entrepreneurs, start-ups and university students who directly contribute to patenting their innovative ideas.

5.2. Strengthen the Patent Quality and Enforcement

A prerequisite for a larger commitment of R&D efforts by the private sector is trust in the patent system, especially for the grant and protection of high-quality patents. Increasing the number of examiners and improving the working conditions by raising wages to at least match the ones offered by the private sector are crucial. This would allow the CGPDT to attract and retain talented staff and ensure the high quality of

its decision-making. The CGPDT could also increase their efforts towards the quality of its granted patents. For example, the EPO operates a quality management system that monitors the quality of all services provided to users from search and examination, oppositions, revocations, patent information and post-grant activities [59]. Similarly, the USPTO has a dedicated Office of Patent Quality Assurance that ensures the quality of patent examination and other services provided to users. The CGPDT could likewise implement certain quality control procedures.

The enforcement of patents before courts also needs to be strengthened. The definitive solution is hiring more judges to ease the workload and enable specialisation in patent matters. While the creation of IP division at the Delhi High Court is a welcome step, it must be ensured that more such measures are adopted by other High Courts so that there are more venues available for IP disputes. The increase in venues would create a better sense of accessibility among IP right holders, particularly start-ups and MSME. More venues would also ensure that one court is not overburdened, allow quick disposals of IP disputes and, eventually, strengthen IP and innovation ecosystem in India.

In the meantime, judges could use the new powers introduced by the Commercial Courts Acts in 2015 for faster resolution of cases, such as (1) scheduling case management hearings, which would prescribe strict deadlines for the rest of the proceedings, (2) granting summary judgments when warranted, and (3) insisting on an in-depth written procedure in terms of presentation of all facts and legal arguments and submission of expert opinions, which would contribute to shorter and more focused oral hearings [60].

5.3. Financial Support for R&D and Innovation

India may further support innovative activities by a combination of direct financing of original projects and indirect tax support to incentivise R&D.

Some countries have programmes that directly contribute to new and ground-breaking projects. For example, the EU operates a Horizon programme with a budget of €95.5 billion (almost 8.5 trillion Indian Rupee) to support research and innovation. Germany dedicated 3.094% of its GDP to R&D support in 2018, [61] while the German industry in the same year spent about 72.1 billion euros to R&D (about 6.36 trillion Indian rupees) [62]. Germany also has special programmes for start-ups and SMEs offering low-interest loans, venture capital and grants for growth [63]. The aim is to support all phases of starting up a business – from spin-offs from higher education and research establishments to support for expansion and growth of young companies already on the market.

India can therefore introduce more target-oriented programmes to support innovative projects by start-ups, universities and research institutions. The University Grant Commission of India can be used to select the most innovative projects and steer the research into priority areas, while the state-level support schemes can be enhanced in order to reach the majority of institutions.

Tax framework is also important for innovation. Economists have found that tax incentives lead to more R&D spending, which then translates to valuable innovations [64]. Tax incentives can be in the form of 1) special deductions for R&D expenses; 2) an R&D tax credit based on the amount of R&D costs used to reduce a company's tax liability, 3) and patent boxes, a reduced corporate tax rate to profits from patents and other IPRs [65]. Countries are competing to provide the most favourable tax regime for attracting investment and innovation. Among OECD countries, 20 countries have special deduction rules for R&D costs, 18 countries have a tax credit for R&D, and 19 countries operate a patent box regime. Measures are not mutually exclusive, and some countries (Belgium, Ireland and the UK) have versions of all three policies in their tax systems. For example, the UK grants R&D deduction of up to 24.7% of qualified spending, a tax credit of up to 33%, and a patent box providing a reduction of the corporate tax rate to 10% on the profits earned from patented innovations [66]. Similarly, Ireland offers R&D deductions of 25% for qualified expenditure, a patent box of a reduced corporate tax rate of 6.25% for income earned from technology developed in Ireland, as well as a tax credit to royalty payments by Irish companies to non-residents.

As seen, India already has in place a favourable tax credit and deductions but could benefit from a more targeted patent box regime. Currently, a reduced tax rate applies only for the commercialisation of Indian patents (i.e. only domestic commercialisation). However, valuable inventions are usually patented around the world and can then be licensed out for commercialisation in third-country markets. In order to make Indian companies more internationally competitive and encourage technology transfer outside India, a favourable tax regime could be extended to the commercialisation of all patents (domestic and foreign) held by Indian companies.

5.4. Promote Patent Commercialization

India would profit from encouraging innovative start-ups, universities, and mature domestic companies to commercialise their inventions.

One measure could be to set up a centralised institution that would assist MSMEs and start-ups from inception until commercialisation. Specialised government agencies that support SMEs and start-up in patent commercialisation already exists in many countries. For instance, the EU established the European Innovation Council to support breakthrough innovation throughout the lifecycle from the early-stage research, technology transfer, financing and scale-up of start-ups and SMEs. Germany operates a German Accelerator programme to help start-ups to scale globally and successfully enter the US and Asian markets by providing mentoring from dedicated experts and access to a vast global network of business partners and investors. Similarly, the Innovate UK offers favourable loans and funding to SMEs and start-ups and helps them connects with businesses and investors to commercialise their ideas [67]. Ireland operates a special National Technology Transfer System where Technology

Transfer Offices are set up at universities and research institutes to help researchers decide the best route to the marketplace for their technology. As a result, there has been an increase in the number of technologies licensed to the industry from universities and company spinouts. According to government data, Ireland is generating 20% more licences and 2–4 times as many spinouts for the amount of R&D expenditure compared to more mature technology transfer systems worldwide [68]. Israel also has a special Innovation Authority that supports start-ups and mature companies to develop new products and enter new markets abroad, as well as academic groups seeking to transfer their technology to the market.

Furthermore, in line with the positive experiences of other countries, India could consider setting up a centralised agency to support start-ups through all stages of the commercial lifecycle. Currently, such support is scattered among different programmes such as Start-up India, which assist with formation and growth of start-ups, and AGNII – Accelerating Growth of New India's Innovation associated with commercialisation of ready-made technologies. Therefore, India may benefit from the synergies of having one centralised approach for MSMEs and start-up innovation.

Moreover, the government could actively facilitate the collaboration between the industry and academia to produce more commercially relevant research. For example, EIT Digital is an organisation co-founded by the EU which brings together large corporations, SMEs, start-ups, universities and research institutions and supports the market uptake and scaling of research-based digital technologies. Other EITs have been created for other sectors, such as EIT Health, EIT InnoEnergy, EIT Manufacturing, EIT Raw Materials, etc. Similarly, the UK Knowledge Transfer Partnership encourages collaboration between businesses and universities. It connects a company with a university or a research institution in order to facilitate the transfer of knowledge and technology to the company, on the one hand, and stimulate business-relevant research of a university or a research institution, on the other hand. Likewise, India could take measures to connect academia with the industry via a centralised organisation.

Some other initiatives to support commercially relevant research by academia and its market uptake could also be envisaged. Mutual collaboration between research organisations should be encouraged and simplified to ensure that academia has the capacity to engage in the most demanding and complex R&D. Also, regular dialogue between businesses and research institutions should be institutionalised so that the industry can present its business requirements for certain products and R&D. Businesses should also be allowed to take an active interest in institution's research work and help with technology commercialisation. Additionally, technology fairs in every state could be established, encouraging academia to come up with relevant innovations and present them to the public. Finally, experienced people from the industry should be allowed to work as professors. By having established solid business backgrounds, they can successfully guide the research institutions in the market for technologies.

Lastly, China is an interesting example of how to support patent commercialisation directly. After becoming the world leader in patent applications, Chinese policymakers expressed scepticism about the quality of many patents and very low levels of commercialisation. Thus, the government decided to start focusing on the quality (instead of the quantity) of patents and moved to strongly foster patent commercialisation [69]. As a result, it introduced measures to reimburse up to 50% of expenses for the obtainment of patents only when such patent is licensed, [70] and a reduced income tax rate of 15% (instead of 25%) to companies that transfer their technology [71]. Measures are intended to incentivise companies, in particular MSMEs and start-ups, to focus on the commercialisation of their innovations instead of merely filing patent applications. India likewise may consider reimbursing expenses of commercialised patents.

5.5. Facilitate Participation in International Standardisation

As one of the world's largest markets, India can play a key role in promoting standardisation. For example, it could actively encourage its companies to participate in international standardisation by (1) financing part of the travel and accommodation costs to attend 3GPP meetings, or (2) commissioning experts that could (a) represent Indian companies in these meetings or (b) assist them in the preparation of technical contributions and, if adopted in the standard, (c) draft with them the claim charts, matching the standard with the technical specification to be used in licensing negotiations [72]. A good example is China which provides funding for the participation of Chinese companies in the standardisation activities of international and regional SDOs and the development of standards, and as a result, Chinese companies are increasingly contributing their technologies to the latest 5G standard [73]. Indian courts could also closely follow international best practices in resolving SEP disputes, such as the CJEU's *Huawei v ZTE* framework for granting injunctions, [74] the UK Supreme Court's *Unwired Planet v Huawei* case on the global portfolio licensing, [75] and the German Federal Court of Justice's *Sisvel v Haier* on the obligation of infringers to pro-actively negotiate FRAND licences in a target-oriented manner. [76] A similar practice could provide legal certainty to innovators and uniform solutions to global SEP licensing disputes. Finally, compliance with adopted international standards is also important. The TSDSI appears to have required changes to the 3GPP's technical specifications for the 5G standard, [77] making Indian handsets and telecommunication equipment potentially incompatible with the rest of the world and risking the standard not being available on FRAND terms. Thus, India should ensure that it remains compatible with international technological standardisation.

6. Conclusion

In recent years, India has launched several initiatives related to IP to make its industry more innovative, providing

more jobs and higher wages, leading to economic growth. However, some challenges remain. For instance, India faces low levels of R&D investment, insufficient domestic patenting, slow process to obtain and enforce patents, a too-small percentage of commercialised patents, and no national companies contributing to cellular standardisation, which is responsible for driving the digitalisation globally.

This article examines several measures that would help India reach its full innovative potential. For example, the Indian government could continue with measures to further increase IP awareness in society by embarking on training judges, lawyers, and entrepreneurs on IP matters. Furthermore, to improve the overall patent quality, the CGPDT could hire more patent examiners offering at least market-based salaries. Moreover, increasing the number of judges and eventually reducing the rotation system would allow for a greater specialisation in IP matters, ensuring that innovators can adequately rely on it and safeguard their rights. Next, providing direct financial support to innovative projects and reduced tax rates would incentivise domestic R&D. Patent commercialisation could be encouraged by the creation of a centralised agency that would support MSMEs and start-ups from the early stages of project development to commercialisation, and initiatives could be taken to connect academia with the industry in order to produce commercially relevant research. Finally, the government could actively support domestic companies to participate in international technical standardisation and invest in the development of the next generation of standards in order to catch up with Chinese, US and European companies.

Taken together, with the right policy measures, India would be one step near its goal of being one of the leading knowledge-based economies to the benefit of Indian society.

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