

## Executive Summary

Technology and innovation are the two key factors in economic growth. Patents are the key motivators for innovators. With the coming of liberalized economies, World Trade Organization and Trade Related Intellectual Property Rights, patents have taken a more important place. Inculcating the habit of innovation and ownership of intellectual property is a challenge some of the newly industrialized countries, including India, are facing. In this background, the current study attempts a holistic analysis of patented technologies in Indian Patent Office (IPO). The existing analyses largely address specific sectors such as pharmaceuticals and chemistry related patents. The current study is more inclusive and provides a panoramic view of the patents in IPO.

Specific objectives of the study were the following:

1. Patenting trends of Indian and foreign entities as a whole in Indian Patent Office (IPO).
2. Country-wise / assignee-wise trends, based on the patents they have obtained in India.
3. Technology-wise comparisons and analysis of patents granted to Indian and foreign entities locally.
4. Patenting strategies of the major patenting countries based on technology schema adopted from the existing literature.
5. In depth analysis of a few specific technology areas to infer possible implications of foreign patents on local market.

The study adopted the following methodology:

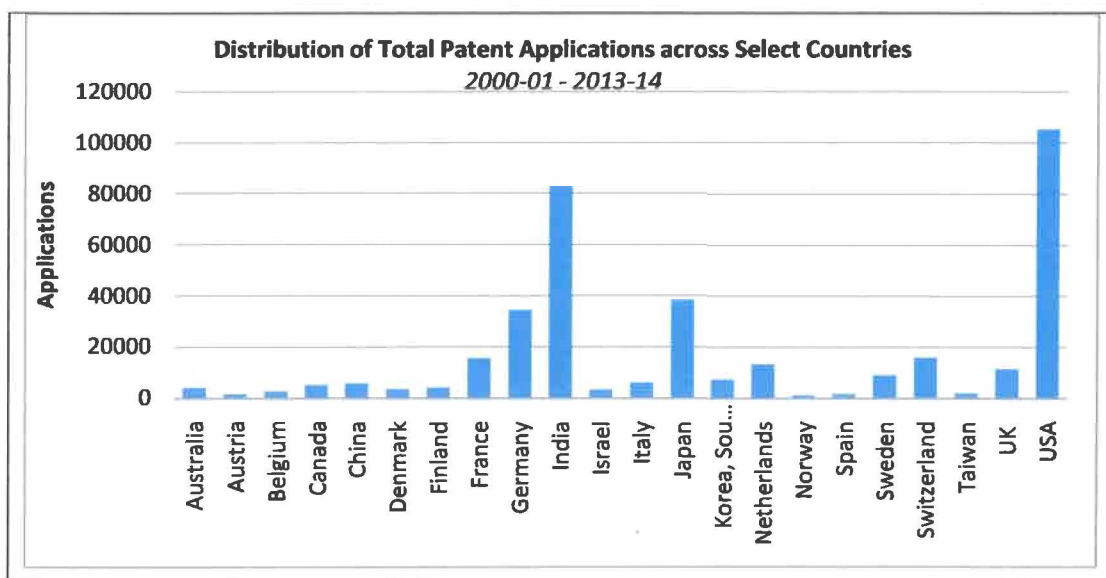
- Patents granted by the IPO during 2001-2014 period was obtained from the IPO database available in the public domain (<http://ipindiaonline.gov.in/patentsearch/search/index.aspx> )
- The records were recreated in a local database constructed for the purpose of analysis.
- The patents were grouped on IPC classes, sub-classes to understand the subject wise distribution of patents granted.
- The patents were grouped on the assignees to know who owns the patents, both on a country basis and on the firms.
- Patents were also grouped on the subject schema which facilitated comparison of the Indian and foreign patents in a set of technologies.
- Patent application data were obtained from Annual Reports of the Controller General of Patents, Designs, Trademarks, and Geographical Indications (CGOP).
- After discerning the patenting trends of different patenting countries, three case studies were done to understand the nature of patents under the technology, their impact on local market and the assignees who own the patents.
- Experts in the field were interviewed for reactions for possible policy lessons in our context.

The study presents three case studies namely, patents on transportation, telecommunication, and medical devices. The report also analyses the trend of technology dependence of Indian enterprises, by considering royalty, licence fee payments in different sectors.

With the Amendment of Indian Patents Act to comply with TRIPS agreement coming into force in 2005, the applications received for award of patents have taken a giant leap. During the period of analysis (2000-01 - 2013-14) applications were received from 137 countries. Applications from the US topped the list with 105,215 of them. Other countries in the top bracket include India, Japan, Germany, France, Switzerland, Netherlands, and Sweden. The second cluster of countries include China, South Korea, Italy, Canada, Finland, Australia, Denmark, Israel, Belgium, Taiwan, Spain, Austria and Norway. Applications through PCT route (National Phase Applications) dominate the trend and have marginalized those thorough normal and convention mode. Preliminary analysis by the IPO shows that applications relating to innovations in mechanical engineering top of the list, followed by chemicals, computer / electronics, drug, electrical engineering technologies, biotechnology in that order. The US stands apart as a group of its own, with the host country, India, standing second. The trend indicates Indian market potential sensed by leading countries. The year 2005 is the year which marks a steep upward trend.

IPO has received patent applications from 137 countries from 2000-01 onwards. Twenty-five countries have filed more than 100 applications during the period covered. Of these, eight have filed more than 1,000 applications including all the three categories. These countries are France, Germany, India, Japan, Korea, Sweden, the U.K., the U.S.A.

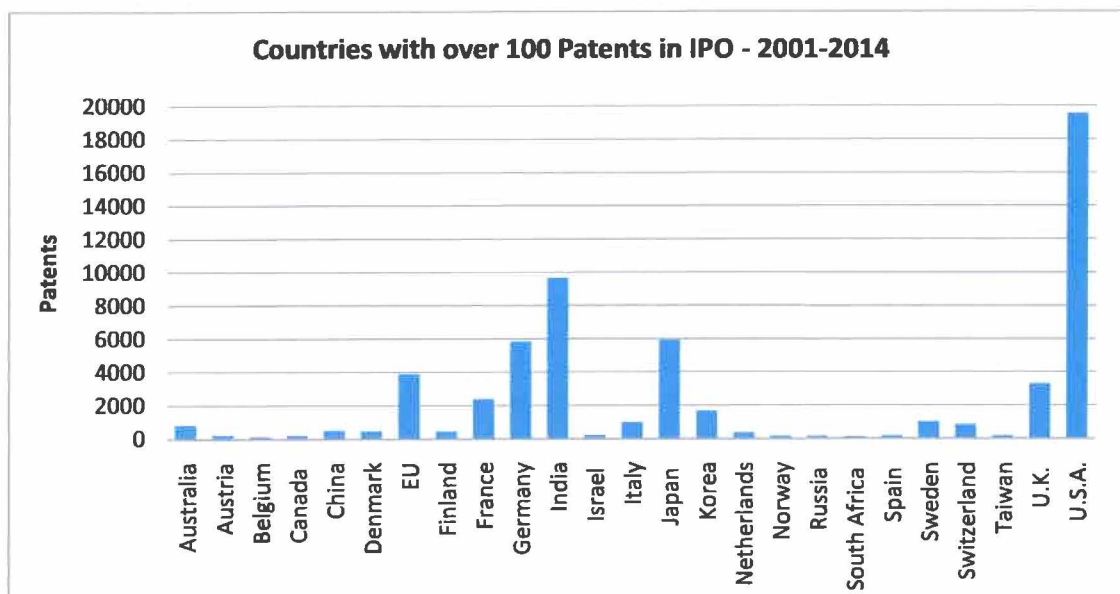
Twelve other countries make up the second cluster of applicants. These include Austria, Australia, Belgium, China, Canada, Denmark, Finland, Israel, Italy, South Korea, Spain, and Taiwan. The general trend, among most of these countries, is the rapid growth of PCT applications in the National Phase.



The figures indicate a rapid pace of examination and for the period as a whole the success rate has been 51.7% of the total. It was also noticed that a large number of applications are abandoned prior to examination. The success rate will be higher when we consider this factor.

IPO has granted patents to assignees from 110 countries during the 2001-2014 period. Top 10 countries - UK, France, Korea, Sweden, Switzerland, US, India, Japan, Germany, convention patents from EU make up 90% of the

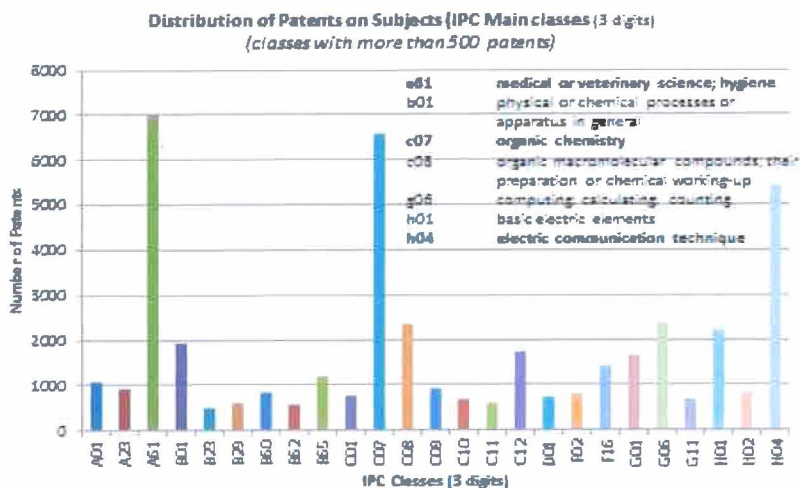
patents granted. Only 25 countries have more than a total of 100 patents during 2001-2014 period. Most of the other countries are minor players in Indian innovation space. There is a considerable foreign domination among the patents granted.



Mechanical and chemical engineering patents figure on the top followed by electronics, drugs, electrical engineering, biotechnology and others.

A Closer look at the subject-wise trend reveals that IPO granted patents fall in all the eight main divisions of International Patent Classification, 122 out of 130 IPC classes, and 625 out of 654 sub-classes. However, in most of these subjects the patent presence is very small. At the IPC class level, three classes make up top 25% of the patents - A61 (Medical or veterinary science; hygiene ...), C07 (Organic chemistry), H04 (Electric communication technique ...). Second quartile includes patents on G06 (Computing; calculating ...), C08 (Organic macromolecular compounds; their preparation or chemical working-up; compositions based thereon, H01 (Basic electric elements ...), B01 (Physical or chemical processes or apparatus in general), C12 (Biochemistry; microbiology; enzymology; mutation or genetic engineering). Third quartile consists of 15 broad subjects. The patent distribution is highly skewed at the level of broad subject categories.

At the IPC sub-class level six relatively narrower subjects make up the first quartile - A61K (Preparations for medical, dental, or toilet purposes), C07D (Heterocyclic compounds), C07C (Acyclic or carbocyclic compounds (macromolecular compounds) C08; production of organic compounds by electrolysis or electrophoresis), G06F (Electric digital data processing), H04L (Transmission of digital information), C12N (Micro-organisms or enzymes; compositions thereof) - followed by 22 in the second quartile, and 69 in the third. Even at the sub-class level the patent availability is much skewed. A few subjects dominate the innovation scene in the country.



More elaborate analysis of the data, taking into account 201 sub-classes with 50 or more patents in them, show that the US dominate 60% of these technologies, followed by India in 14.5% of the sub-classes. Germany, Japan and Korea are the most patent holders in the rest of the sub-classes. Indian technology space in its various components is dominated by the US entities. Yet, we get only a select set of patents filed / granted by IPO, on overlapping subjects.

India’s comparative technology strength in IPO viewed from ISI-OST- INPI classification indicate that we are relatively better in chemicals related technologies with 19% of the total patent ownership, followed by mechanical engineering (16.1%) and instrumentation (15.5%). We own only 7.7% of the patents that come under the broad head electrical engineering, which includes telecom, IT methods, semiconductors, etc. On the whole nearly 84% of the patents, making up major technologies, are owned by foreigners. The analysis shows that we have not carved any niche technology strength in domestic front. We tend to compete where other countries have dominated the technology scene.

There is a skewed distribution of patents among the assignees, through 12,830 enterprises, 365 universities, and 429 research institutes, along with nearly 3000 inventor assigned patents figure in our database.



Only 65 entities own more than 100 patents for the 2001-2014 period. The top assignees are Council of Scientific and Industrial Research, Qualcomm, Hindustan Unilever Ltd, Phillips, Samsung, Honda, Ericsson, Siemens, BASF, P&G and GM Global. Nearly 70% of the patent owners in IPO own only one patent, and nearly 90% of assignees own three or less patents. Patent ownership is diffused and most of them may not make much impact on the technology scene of the country.

Eight per cent of the assignees own 50% of the patents, 14% of the assignees own 50% of the patents at sub-class level. 75% of the patents fall under 8 IPC classes.

CSIR	IBM	Astrazeneca		Aloys Wobben
Qualcomm	BHEL	IITS	CIBA	Praxair
Hindustan Unilever	Motorola	Silverbrook	Akzo Nobel	DRDO
Philips	LG	Maschinenfabrik	Sanofi Aventis	Panasonic
Samsung	Shell		Syngenta	Aventis
Honda	F Hoffmann Roche	Dow Global	Sumitomo	Canon
Ericsson	Sony	Du Pont	LG Chem Ltd	Mitsubishi
Siemens	Matsushita	Blackberry	Exxonmobil	Schneider Electric
BASF	Intel	Tata Steel	Institut Francais Du Petrole	

P&G	<b>Samsung India</b>	Bosch	Eli Lilly	<b>TVS</b>
GM	Nokia	Bayer	Janssen Pharmaceutica	Colgate
	Novartis	3M	Hewett-Packard	Outokumpu
	General Electric	<b>SAIL</b>	UOP	Johnson & Johnson

The study also attempted three case studies. It could be noticed that medical device sector is dominated by the entities from the USA, with India following. Most of the patents taken are in the low or low moderate risk levels.

There has been a spurt in medical device manufacturing in India. From 2001-01 to 2012-13 it has grown more than six-fold. Yet, the imports have also grown more or less in the same measure. Most of the patents in low risk level are the consumer goods like pads, absorbents etc. We see a trend where the patents occupy the technologies with high volume trade. Imports still seem to dominate the high risk device end.

Patents in telecom reflect a more sordid story. Despite telecom industry being a high growth sector with teledensity growing from 3.58% in 2001 to 78.16% in 2015 and mobile economy itself contributing US \$ 400 billion to Indian GDP, our technology strength as reflected in patent ownership seems to be low. Internet and mobile telephony have brought a whole host of technology requirements both at hardware and software ends. Two sub-classes - H04Q (Selecting (the network) methods, circuits, or apparatus for establishing selectively a connection between a desired number of stations ) and H04B (Transmission of information-carrying signals ) dominate the patented technologies in IPO among the 3000 patents on telecom. Qualcomm, Ericsson, Samsung Electronics, Motorola, Nokia, LG, Matsushita, Huawei are the dominant players in this innovation space, with Qualcomm being the ahead in the bunch. There are nearly 500 patent owners holding only one or two patents each. Qualcomm dominates the scene both on network selection and transmission technologies. Indian presence in the telecom patent scene is negligible. There has been a steep rise in the payment towards royalty, IT enabled service charges pertaining to backend operations of the mobile telephone economy in the country.

In transportation sector, land vehicles have attracted most of the patents during the post 2001 period in IPO. Japanese enterprises stand first in the list of countries owning them, followed by India, the USA, Germany and others. Analysis of this data indicates a diffused patent ownership in the technology with Honda figuring prominently. More detailed look at the patents show that Honda ownership is in IPC sub-classes B62J which are more in the nature of accessories to the land vehicles. Yet, with patents which distinguish the vehicles of this class and innovation to suit the local needs, the company has been able to dominate the market. This has also come at a time when the demand for such vehicles has risen dramatically. These patents in IPO have added to the company strategy of moving away from joint venture with Hero Motors. Indian competition in this innovation space has come from TVS and to a small extent from Bajaj, Tata Motors and others.

The analysis also goes into the royalty and licence fees payment by Indian enterprises in different sectors. The data reinforces our dependence on the foreign technologies, particularly in consumer goods and high growth sectors like cosmetics, automobile, telecom among others.

The analysis shows that there is an urgent need to spread awareness of innovation in technology and ownership of this intellectual property. This is required more to get a firm grip on the local market to start with. In most of the countries' domestic patent holdings are dominated by the host country. It is essential to aim for that in IPO as well. New IPR Policy of 2015 seems to take this need earnestly and sets out to make a new beginning.