Indian Pharmaceutical Industry: Challenges & Prospects

Occasional Paper No. 176

एक्ज़िम बैंक
EXIM BANK
भारतीय निर्यात-आयात बैंक
EXPORT-IMPORT BANK OF INDIA

EXPORT-IMPORT BANK OF INDIA

OCCASIONAL PAPER NO. 176

INDIAN PHARMACEUTICAL INDUSTRY: CHALLENGES AND PROSPECTS

August 2016

CONTENTS

Project Team:

Ms. Sumana Sarkar, Assistant General Manager, Research & Analysis Group

Ms. Simaran Kaur, Manager, Research & Analysis Group

LIST OF EXHIBITS

LIST OF TABLES

LIST OF BOXES

LIST OF ANNEXURES

EXECUTIVE SUMMARY

OVERVIEW

Health is of paramount importance in the social and economic development of the world. It is in this regard, that the pharmaceutical industry is widely recognised as a predominant driver in the process of economic development. Players in the pharmaceutical industry include: branded drug manufacturers, generic drug manufacturers, firms developing biopharmaceutical products, non-prescription drug manufacturers, and firms undertaking contract research. In addition, there are also enablers of the industry such as universities, hospitals and research centers that play a role in R&D activities.

The Indian Pharmaceutical Industry has acquired a noteworthy position in the global pharma sector and has been achieving significant growth in the recent years. Indian pharmaceutical industry is one of the high performing knowledge based segments of the manufacturing sector. In addition to catering to the needs of the domestic demand, the pharmaceutical industry is also engaged in contract manufacturing, contract research, clinical trials, contract R&D, and direct exports to developed as well as developing country markets. The Indian pharmaceutical industry is one of the major vaccine producers, and is a global leader in end-to end drug manufacturing[1]. India, being amongst the fastest- growing pharmaceutical market worldwide, is emerging as a global manufacturing and research hub.

GLOBAL SCENARIO

Market Size

The global pharmaceutical market was estimated at US$ 1027.2 billion in 2014[2]. In 2014, the global pharmaceutical industry (including audited and unaudited markets) grew at a pace of 8.4 per cent y-o-y vis-a-vis a growth of 4.9 per cent in 2013. North America (mainly the USA), Europe and Japan are the dominant markets in the global pharmaceutical industry. The North American market

[1]Policy Landscape Reforms for Strengthening Indian Pharmaceutical Industry

[2]IMS Health

remained the single-largest market and accounted for more than a third of the total pharmaceutical sales in the year 2014, and exhibited a year-on-year growth rate of 11.8 per cent during the same period. The pharmaceutical sales in Europe during the year 2014 were worth US$ 228.8 billion and accounted for nearly 22.3 per cent of the global market share. Japan with pharmaceutical sales amounting to US$ 81.6 billion registered a nominal growth rate of 1.4 per cent during the year 2014. Pharmaceuticals sales in the Asian, African and Australian regions grew by 9.1 per cent during the year 2014 and Latin America registered a healthy growth of 11.7 per cent y-o-y, contributing US$ 72.1 billion to global sales during the year. With respect to therapy classes, oncology retained the top spot with the sales amounting to US$ 74.4 billion during the year 2014, and displaying 12.2 per cent year-on-year growth rate during the same period.

Trade

Global exports of pharmaceutical products (HS Code 30) registered a modest growth at a CAGR of 3.6 per cent between 2010 and 2014, from US$ 443.2 billion to US$ 510.3 billion. Germany was the leading exporter of pharmaceutical products (with a share of 15.6 per cent in global exports) during the year 2014, followed by Switzerland (12.3 per cent), Belgium (9.8 per cent), and the USA (8.6 per cent). In terms of growth, exports from India registered the highest growth at a CAGR of 17.6 per cent during the period 2010 to 2014, followed by Italy at a CAGR of 11.5 per cent and Denmark at a CAGR of 10.1 per cent.

Among the pharma-emerging markets, India's exports of pharmaceuticals have registered a significant growth at a CAGR of 17.6 per cent during the period 2010 to 2014 accounting for 2.3 per cent share in global exports of pharmaceuticals in 2014. China has emerged as a significant importer of pharmaceutical products growing at a CAGR of 25.2 per cent during the same period. In 2013, Brazil, Russia, India and China (BRIC) as a bloc accounted for 4.1 per cent of global exports and 7.9 per cent of global imports of pharmaceutical products.

KEY DEVELOPMENTS IN REGULATORY ENVIROMENT

Some of the recent developments and key trends in the regulatory environment that might significantly govern the global pharmaceutical sector are:

PIC/S

Pharmaceutical Inspection Co-operation Scheme (PIC/S) is an informal collaboration among member economies spearheaded by the EU seeking to improve the standards of

manufacturing requirements amongst its members. The EU has agreed Mutual Recognition Agreements on GMP with several third countries (Australia, Canada, Japan, New Zealand and Switzerland). India is not currently a member, although PIC/S has identified India as one of the 'key players' in terms of the pharmaceutical industry. Adhering to the new rules will entail Indian pharma companies to expand their mandate from the existing manufacturing standards to new fields, such as good clinical practices and good pharmaco vigilance practices.

EU Trademark

The European Parliament has formally adopted the EU Trademark Reform which is anticipated to have significant impact on the EU as well as on the global pharmaceutical industry. Under the law, the Community Trade Mark (CTM) in place since 1996 will become the 'European Union Trade Mark' and the Office for Harmonization in the Internal Market (OHIM) will become the 'European Union Intellectual Property Office'. The current law brings in considerable changes in the procedure of CTM filing as well as in the fees payable.

Base Erosion and Profit Shifting (BEPS)

On 5 October 2015, the Organisation for Economic Co-operation and Development (OECD) released the final action plan in relation to Base Erosion and Profit Shifting [BEPS]. BEPS refers to the complex structuring done by multinational businesses to artificially shift reduced profits to low tax countries and pay little or no corporate tax. Some of the key areas where the project is anticipated to impact are: on the status of Permanent Establishment (PE), tax treaties, IP, financial transactions and interest deductions on hybrid instruments, transfer pricing, contract research and manufacturing arrangements, and indirect taxes.

Impact of FDA and Court Rulings

Several decisions made by the Supreme Court of the USA in 2013 are anticipated to have a profound impact on the US as well as on the global pharmaceutical industry. For generic pharmaceuticals[3], the Court confronted the law governing a controversial pharmaceutical marketing practice known as reverse payment agreements (pay for delay) in which branded drug companies pay generic companies to delay the commercialization of their products. The verdict is anticipated to bring about increased competition in the branded drug segment at an earlier stage in its commercial lifecycle. Though this is envisaged to be good

[3]Federal Trade Commission v. Actavis

for consumers, it is disadvantageous for innovator companies.

Quality Risk Management

The International Committee of Harmonization (ICH) issued its ICH Q8, Q9 and Q10 guidances between 2005 and 2009. Validation guidance in 2011 formally began the agency's push to instill the concepts of scientific understanding and risk management as a basis for product design and quality. Despite these frameworks the industry has been slow to adopt these principles as part of its core drug development philosophy as the list of companies under warning letters or consent decrees continue to lengthen.

Drug serialization

Global pharmaceutical industry faces counterfeiting challenges as well as theft, diversion and false returns to manufacturers. In November 2013, the U.S. passed the Drug Quality and Security Act (H.R. 3204), which would preempt all state laws relating to drug pedigrees and track-and-trace systems, to assure the security and safety of drug supply chain. The rollout is anticipated to take place over the next decade with the goal of acheiving unit level traceability for all drugs manufactured in the USA.

Anti-Counterfeit Measures

On October 1, 2011, Anti-Counterfeiting Trade Agreement (ACTA) has been signed as a multilateral treaty by thirty-one countries (Australia, Canada, Japan, Morocco, New Zealand, Singapore, South Korea, USA, EU, and its member states), for the purpose of establishing international standards for intellectual property rights enforcement. The move has been largely detrimental for Indian generic pharmaceutical industry.

Licensing Agreements

The ensuing patent expiration of blockbuster drugs and apprehensions of resultant revenue loss have been prompting the large innovator companies, mostly multinationals, to reduce their focus on new drug discoveries. Instead, these companies tweak the existing compounds, and calling them new. The tweaked products are perceived as a threat to the generic drug industry, and viewed this practice hindering the achievement of affordable healthcare.

SSFC

A new initiative by the WHO has been constituted called Substandard/ Spurious/Falsely-labelled/Falsified/ Counterfeit medical products (SSFFC), to check the spread of counterfeit drugs. The goal of the SSFFC Mechanism is to promote international collaboration on strategies to address the falsification of medicines from the standpoint of public health, excluding trade and

intellectual property considerations. A major focus is on getting products registered and maintaining a two-way flow of information once the product is in use.

Current Good Manufacturing Practices (CGMP)

There has been enhanced scrutiny of pharma-units by the USFDA for Current Good Manufacturing Practices (CGMP). In case of deviations from ideal manufacturing practices, the FDA lists down the deviations in Form 483, and share the observations with the manufacturers, who then are expected to reply to the FDA with their corrective and preventive actions that will provide assurance of their adherence to the CGMP requirement.

Import Alerts

It has been observed that there has been an increased incidence of import alerts and ban on pharmaceutical units by the USFDA. India and China pharmaceutical companies feature among the maximum number of import alerts for good manufacturing practices. Since 2009, 160 countries have been issued import alerts for violation of good manufacturing practices. The top 30 countries in import alerts contribute to 58 percent of the total import alerts.

Generic Drug User Fee Amendment (GDUFA)

The US FDA has announced a new fee structure under the GDUFA programme for the period, October, 2014 to September, 2015. The latest order has reduced the dossier filing fees by about 8-15 per cent, and hiked the site registration fees by about 15-22 per cent.

SELECT KEY TRENDS IN THE INDUSTRY

Some of the key trends in the global pharmaceutical markets have been significantly defining the way forward for this sector. Mergers and Acquisitions have been dominating the global pharmaceutical industry and the number of deals increased from 371 in 2013 and 438 in 2014, to 494 in 2015. The cumulative deal values almost doubled from US$ 226 billion to US$ 415 billion, during the period. This is largely due to the announcement of the acquisition of Allergan by Pfizer.

Some of the large blockbluster drugs, such as Copaxone (Teva), Nexium (AZ), and Namenda (Forest Laboratories) is projected to be significantly impacted by the patent cliff. Pharma companies have been following unconventional means, such as legal protection, acquisition, corporate transformation, and regulatory shields to write-off patent cliff-related revenue losses.

Due to several patent expirations, the generic drug industry has experienced significant growth in the recent years.

The global market for generic drugs was worth US$ 225 billion in 2011, and is estimated to reach US$ 358 billion in 2016, growing at a 9.7 per cent CAGR between 2011 and 2016. Rising cost pressure on health care has resulted in an increase in generic pharmaceutical usage as generic drugs cost 30 to 80 per cent less than their patented equivalents.

R&D spending by the pharmaceutical industry continues to rise in the recent years. Between 2004 and 2015 the total industry expenditure on R&D rose from US$ 88 billion to US$ 166.3 billion, and is forecast to reach US$ 169.3 billion in 2016[4]. At the same time, the estimated cost of bringing a new chemical or biological product to market has more than trebled from US$ 451 million to US$ 1.5 billion[5].

INDIAN PHARMACEUTICAL INDUSTRY

Indian pharmaceutical industry can be broadly divided into two periods, the pre-patent regime and the post-patent regime. While the pre-patent or process patent regime helped the industry develop into world-class generics industry, the post-patent or product patent regime is aimed at encouraging new drug discoveries over the long term.

Over 100,000 drugs, across various therapeutic categories, are being produced in India. The domestic formulations industry is highly fragmented, in terms of both the number of manufacturers and variety of products. There are 300-400 organised players and about 15,000 unorganised players in the manufacturing of pharmaceuticals. However, organised players dominate the formulations market, in terms of sales.

Industry Performance

Globally, the Indian pharmaceuticals market is estimated to be the third largest in terms of volume and thirteenth largest in terms of value[6]. The value of the Indian pharmaceutical industry is estimated at US$36.8 billion as of 2014-15. Of this, the formulations market accounts for about US$12.2 billion (or Rs 746 billion) constituting around 1.1 per cent of the global market in value terms.

The exports of pharmaceutical products have displayed a moderate growth during this year, despite global trade slowdown. The exports of bulk drugs during the year 2015-16 were valued at US$ 3.6 billion; these exports have displayed a marginal

[4]2016 Global R&D Funding Forecast, Industrial Research Institute
[5]The R&D cost of a new medicine, J. Mestre-Ferrandiz, J. Sussex and A. Towse, Office of Health Economics, December 2012 (Hansen, 1979; Wiggins, 1987; DiMasi et al, 1991; OTA, 1993; DiMasi et al, 2003; Mestre-Ferrandiz et al, 2012)
[6]Equity Master

growth of approximately 0.8 per cent during this period. The exports of drug formulations have increased at a year-on-year growth rate of 12.8 percent and amounted to US$ 12.6 billion during 2015-16. The major export destinations for drug formulations during the year 2015-16 were: the USA (with a share of 39.5 per cent) followed by South Africa (4.1 per cent), the UK (3.6 per cent), Nigeria (3.0 per cent) and Russia (2.7 per cent).

The USA is the leading importer of bulk drugs from India and its share in the aggregate exports during the year 2015-16 was approximately 11.2 per cent. The other significant importers of bulk drugs from India are Germany (4.2 per cent), Turkey (3.4 per cent), Iran (3.3 per cent), Brazil (3.2 per cent), and Egypt (3.2 per cent).

Market Share in Select Regions

The EU (27) is the largest pharmaceutical market in the world. In the year 2014, EU imported pharmaceutical products worth US$ 260 billion. During 2015-16, the EU accounted for 11.5 per cent share in India's total export of drug formulations and biological. In 2015-16, among the European countries, the UK, with a share of 31.6 per cent, was the largest market for Indian drug formulations and biological, followed by the Netherlands (10.4 per cent), Germany (10.3 per cent) and France (10.3 per cent). The EU is also the largest market for India's bulk drugs exports. In 2015-16, bulk drugs exports from India to the EU amounted to US$ 923.8 million. With 16.1 per cent share in the total bulk drugs imported from India by the EU, Germany is the leading destination, followed by the UK (9.5 per cent).

The USA is the second largest pharmaceutical market in the world. In the year 2014, the USA imported pharmaceutical products worth US$ 73 billion. USA made up a share of 39.5 per cent in India's total exports of drug formulations and biologicals in the year 2015-16. USA is also a significant market for bulk drug exports from India. In 2015-16, bulk drug exports from India to the USA amounted to US$ 401.3 million which is around 70.4 per cent of total bulk drugs exported to North America.

Africa imported pharmaceutical products worth US$ 15.1 billion during 2014. India was the second largest source country for pharmaceutical products for Africa with a share of 17.7 per cent. Africa as a region accounted for 21.3 per cent in India's total exports of drug formulations and biological during the year 2015-16. In 2015-16, bulk drug exports from India to Africa amounted to around US$ 378.5 million.

Asia imported pharmaceutical products worth US$ 84.5 billion during

the year 2014. During 2015-16, Asia's share in India's total exports of drug formulations and biologicals stood at 7.8 per cent. During 2015-16, bulk drugs exports from India to Asian region amounted to around US$ 923.2 million, which is around 25.7 per cent of total bulk drugs exported from India.

Latin America imported pharmaceutical products worth US$ 26.6 billion during 2014. India's share in total imports of pharmaceutical products by Latin America stood at 3.2 per cent, during 2014. Latin America's share in India's total exports of drug formulations and biologicals stood at 5.2 per cent. Latin America accounts for 6.5 per cent (US$ 233.2 million) of total bulk drugs exported from India during the year 2015-16. Brazil was the third major export destination for bulk drugs exported from India.

Role of Exim Bank in Promoting Indian Pharmaceutical Sector

Exim Bank has been providing support to all segments in the pharmaceutical value chain. Exim Bank's exposure to pharmaceutical industry as on 31st March 2016 is Rs 4,921 crores, a share of 4.8 per cent in total credit exposure to all industries.

Exim Bank finances pharmaceutical or biopharma companies to fund the research and development, new product development and other related costs for obtaining Intellectual Property Rights/regulatory approvals in regulated overseas markets. Financing by Exim Bank is in the form of either term loan/equity participation or a hybrid product. Exim Bank's support to pharma companies for overseas investments as at the end of FY2015-16 was Rs. 2262.7 crores.

VACCINES AND BIOSIMILARS

India is a major vaccine producer and has 18 major vaccine manufacturing facilities. These vaccines are used for national and international markets (150 countries) which makes India a major vaccine supplier across the globe. More than 70 per cent of all measles vaccines used globally are produced in India.[7] The exports of Indian vaccines were valued at US$ 702.7 million during the year 2015-16. These exports have risen at a CAGR of 29.7 per cent during the period 2010-11 to 2015-16. During the year 2015-16, the exports of vaccine increased at a year-on-year growth rate of 22.9 per cent. Nigeria was the leading export destination of Indian human vaccines. The exports of animal vaccines from India during the year 2015-16 amounted to US$ 4.6 million.

The Indian biotechnology sector is one of the fastest growing knowledge

[7]WHO

based sectors. This sector had a turnover of $ 7 bn during the year 2015 and has been growing at 16.3%. India ranks among 12 biotech destinations in the world, with third position in Asia, after China and South Korea. Indian biosimilar guidelines (2012) are harmonized with the WHO, EMA and PICs principles.

CHALLENGES & PROSPECTS

Global pharmaceutical industry, in the recent years, is faced with four key challenges. These are as follows:

Steering Market Dynamics

Changing Demographics

Aging population, growing prevalence of chronic diseases, and rising consumer affordability are expected to continue to change and challenge the global health care and pharmaceutical industry in terms of demand and discovery. Diseases, such as obesity, cardiovascular diseases, hypertension, and diabetes are currently, persistent and widespread and challenging the public health systems which is struggling to meet the increasing demand for medical services at affordable prices.

Health Care Reforms

In the recent years, countries including the USA, China, Brazil, Germany, France, and the UK have introduced legislations that have been considerably accelerating the transformation of global health care from a volume-based to a value-based sector, significantly impacting the global pharmaceutical industry. While such increased coverage has resulted in marginal to considerable increase in revenues of pharmaceutical companies, in certain economies drug companies have seen revenues declining as the prescription drug usage have increased.

Pricing and Cost Pressure

Price Controls

Reform-driven shift in the pharma industry has resulted in emerging of new business environments which are outcome focused, value-based payment and reimbursement centric. As a result, drug manufacturers have been under constant pressure of justifying cost of their products based on innovation and comparative effectiveness against similar offerings.

Taxation

Pharmaceutical companies are increasingly exposed to challenges pertaining to tax planning compliance, execution, and tracking. Key challenging areas have been tax risk management, transfer pricing, business model optimization, international taxes, tax data

management and analytics, global mobility and skilled workforce management, and tax credit and incentives.

Operational Efficiency

Pharmaceutical companies, particularly in the developing countries have been facing challenges operationalizing and optimizing operations, resulting in expensive and duplication of functions, services, and facilities. Attaining compliance and safety and efficiency to address increasing supply chain risks is also becoming critical for cost overrun for the pharma industry, especially in the emerging markets.

Innovation and Value Addition

R&D and Product Development

The recent incidents of patent cliffs involving several branded drugs going off-patent have created downward pressure on the revenues of the large pharmaceutical companies, prompting them for undertaking R&D and new product development. This also implies increased cost on product development and positioning for the companies. In pharmaceutical R&D, productivity is a constant challenge.

Skilled Manpower

Lack of skilled man power and technology has also been plaguing the sector's pursuit for innovation and value addition. Retention of skilled manpower has been a constant challenge for the sector in the developing markets like India.

Outdated IT Infrastructure

Pharmaceutical firms, particularly in the emerging countries including India, are considerably spending to fix operational and compliance issues caused by an outdated digital infrastructure. Additionally, growing data explosion in the pharma industry stemming from digital devices and electronic patient records is increasingly contributing to a need for updated digital infrastructure in the industry.

Regulatory Compliance

Policies and Regulations

Policies and regulatory frameworks of the US-FDA and EU's EMA have strong implications on the global pharmaceutical industry. Drug safety standards, particularly those associated with quality systems implementation, data integrity, and validation of manufacturing and testing processes continue to tighten in many countries around the world. Other regulatory challenges faced by the pharmaceutical firms include long product registration and approval time, e.g., average two to three years in Southeast Asian markets.

Counterfeit Drugs

Weak or incomplete supply chain security, particularly with multiple supply chains expanding across the globe is exacerbating the spread of counterfeit drugs, particularly in emerging pharma-markets. While the counterfeit market is difficult to quantify, it is estimated to be increasing at 15 percent per year, which is double the expected rate for legitimate pharmaceutical market.

Digital Threat

The transforming global health care system is producing immense volume of information, which rides upon its availability, integrity, and confidentiality. The new health care models, health insurance models, electronic medical record (EMR) and other technologies, and permeable boundaries among industry stakeholders have increased the complexities of managing protected health information (PHI), and have compounded an already challenging issue in the pharmaceutical industry.

IPR

Ineffective intellectual property (IP) protection in the pharmaceutical industry is regarded as a frequent concern in many developing countries, which requires the pharmaceutical companies to adapt to local market conditions for product commercialization depending on the level of IP enforcement.

Indian Pharmaceutical Industry – Key Challenges

External

Trade Agreements

The Trans-Pacific Partnership Agreement (TPP) based on the principle of free market and free trade zone, initiated by the USA and signed by 12 countries is forecast to have serious implications on Indian pharmaceutical industry (India is not a party to this Agreement). The collective impact of the TPP on the pharmaceutical industry is anticipated to grant at least 10 years of additional monopoly to innovator companies in several ways, which is forecasted to reduce the pressure on innovators to research new drugs. It is also anticipated to slow down the development and commercialisation of generic drugs, impacting access to affordable medicines worldwide.

The Transatlantic Trade and Investment Partnership (TTIP), under negotiation between the world's two leading markets, the USA and the EU, envisages harmonizing regulatory environment in the two regions, besides enhancing provisions for IPR, data and investment protection. While

the pact is yet to be finalized, there are apprehensions that TTIP may prevent Indian pharma companies to come to market with the same products that they used to trade over the years using the window of preference treatment for the members.

PICS & EU-Trademark

Some of the challenging areas to be addressed in a given time frame for India to accede to the PICS include: developing and promoting harmonised GMP standards and guidance documents – given the numerous manufacturing units present in the country, this would require large scale revamping of the regulatory bodies in terms of skilled manpower with GMP competence, and technology; training competent authorities, in particular GMP inspectors; assessing (and reassessing) GMP Inspectorates; and facilitating the co-operation and networking for competent authorities and international organisations.

The EU Trademark legislation has raised considerable concern for the Indian drug manufacturers shipping items in Latin America or Africa using European ports and airports in transit. The industry also apprehends that the new law could be an attempt to create a trade barrier to check India's exports of low-cost generics to the markets in Latin America and Africa as large pharma companies, many of them based in the EU, feel threatened by India's low-cost but high-quality medicines.

Internal

Data Integrity

Data integrity practices followed in many FDA approved units of Indian pharmaceutical companies have emerged as a single largest challenge for the industry in the recent times. One of the major gaps leading to such data integrity lapses were reported to be the deficiency of skill set among the middle and lower levels staff of the units, in terms of language barrier and technical knowledge of FDA requirements. Shortage of skilled manpower in the regulatory agencies in India has emerged as another critical area encompassing data integrity. Combined regulatory staff, at federal and state levels, including inspectors is estimated to be around 1500, currently, which is far from sufficient, considering that India has over 10,000 drug manufacturing facilities. According to industry sources, this is in sharp contrast with the fact that the USA has 15000 regulatory staff for 3000 pharma manufacturing facilities.

Credibility of Clinical Trial Data

There has been a huge growth in the number of clinical trials undertaken in the country; however, capacity to regulate clinical trials has not kept

pace with this growth leading to a few reported unethical practices such as: limited patient compensation for adverse events; approval of drugs without clinical trials; and lapses in informed consent procedures. While the Government of India has enhanced the regulatory control measures, the delays in new drug approvals as a result of the new regulatory control regime has been also making some of the multinational pharma companies to rethink their clinical trial activities in India.

IPR

While Compulsory License (CL) has been viewed as a necessary evil, in a developing country, like India, they have also caused grave concerns in the industry due to the revenue loss that CLs tend to cause. In a recent order by the Controller of Patents, it has been held that granting a CL should be the last resort and efforts for obtaining a voluntary license should be made first. This order provides some comfort to the industry, as it clarifies the legal position that so long as the patentee does not meet the conditions for grant of CLs under the Patents Act, 1970, its patent rights would not be interfered with. Another observable trend in the IPR sphere is the stricter enforcement of trademark contraventions in India. In the pharma sphere, this trend is comforting as trademark contraventions may lead to use of wrong drugs.

Over Dependence on China for Bulk Drug and APIs

Indian pharma industry imports metformin, analgestics paracetamol, ranitidine, vitamin C and its intermediates from China in large quantities. India is largely dependent on China for almost all APIs by fermentation route, such as penicillin, cephalosporins and macrolides. The over dependence situation on China for important bulk drugs and API is of significant concern for Indian pharmaceutical industry as any shift in Chinese policies or eco-political conditions between the two countries may result in a significant setback for the Indian formulation industry.

R&D

In contract research, collaborative research projects, out-licensing and in-licensing partnerships, Indian firms have been partners of subordinate status who perform piecemeal projects in drug research and they are not exposed to the whole process of new drug development. In these collaborations, the scope for transfer of technology and joint ownership of technology is also very limited. The subordinate status of the Indian firms in the long run may result in a dependency relationship of Indian firms with the MNCs. The limited capacity of Indian firms in developing new drugs, both in terms of S&T skills and financial resources leave them

with no other option but to collaborate with MNCs as subordinates.

The liberalisation measures, on the other hand, have attracted foreign investment in pharmaceutical R&D in India. But it has been observed that bulk of foreign investment in R&D in the pharma sector has been in the clinical phase, especially in phase III trials and not much in the biology and chemistry research for new drug development.

Way Forward

Trade Agreements and Market Access Negotiations

Indian pharmaceutical industry's concerns arising due to the execution of upcoming trade pacts, such as TPP and TIPP may be addressed through diplomatic channels. One option for India may be to join the TPP to strengthen the dissenting voices in the TPP and make the TPP provisions more patient-friendly. Alternately, India should brace itself for the world post-TPP. It should pursue other Free Trade Agreements (FTAs) more diligently factoring the concerns of trade barriers. India is currently in negotiation for treaties with the European Union and the USA. It is also a part of the on-going Regional Comprehensive Economic Partnership (RCEP) deal among ASEAN Plus members. The concerns arising out of TPP and TIPP needs to be adequately circumvented in these proposed treaties.

Regulatory Compliance

In order to address GMP and data integrity issues, emphasis of Indian pharmaceutical companies should be on pursuing stronger compliance and risk management capabilities, rather than to merely satisfying the emerging legal requirements. Indian pharma companies are required to re-evaluate their organization's approach of managing compliance risks and adapt risk-based approach to compliance planning, execution, and monitoring and not depend overtly on contract testing and production operations.

Manufacturing of Bulk Drugs and Intermediaries

Increased production of essential drug intermediaries and APIs at competitive prices should be the current focus of the Indian pharmaceutical industry to ensure adequate supply of essential raw materials and attain self-sufficiency, and reduce the dependence on imports.

Research and Development

To promote novel research and development in the areas of neglected tropical diseases, there is a need for short/medium/long term policy to further incentivize the private sector for new drug development and

bringing down the commercialization barriers in these areas. Public-Private Partnerships (PPPs) need to be more commercially oriented and proactive in bringing innovations to the market. To commercialize new drugs developed for neglected tropical diseases, there is also a need to promote them by providing incentives to the private sector in the form of subsidies, or through drug assistance programmes, or by reviving public sector R&D for development of these drugs.

IPR

To promote IPR activity in the Indian pharmaceuticals industry, the pharmaceutical companies need to be encouraged to undertake new drug discoveries, innovate new dosage forms, and new uses of existing drugs. This may be done through subsidizing the cost of filing and maintenance of patents, and supporting the cost of litigations and other legal formalities. There is an urgent need for the SMEs to develop collaborative research culture with the public and privately funded research organisations for their survival and increased participation in IPR activities.

Clinical Research & Trials

To address the unethical practices in clinical research and encourage clinical trials in India, the approval mechanisms for protocols need to be more transparent and time efficient. In addition, a policy promoting clinical research and innovation needs to be supported by action at various levels, which may include rationalizing regulations, capacity building, accreditation of investigators, establishing sites and ethics committees, supporting infrastructure development, creating public education and awareness,and ensuring transparency and openness.

Pharma-SME Development

To help pharma SMEs realize their potential to venture abroad, there is an urgent need to strengthen their access to national research laboratories, promoting pharmaceutical SME clusters, and continuous training and skill development programmes that help them venture abroad.

Cluster Development

Setting up of pharma specific clusters in SEZ formats may help the industry in addressing the regulatory requirements and resultant costs. Common facilities, including common patent libraries, effluent treatment plants, and low-cost power may be some of the constituents of the clusters.

Skill Development and Training

There is a need to focus on skill development and training

of personnel engaged in the pharmaceutical and life sciences industry in various areas, such as analytical ability, manufacturing and quality management, documentation skills, skills to comply with regulatory requirements and statistical techniques. Academic syllabus of pharmaceutical training institutions may include these areas.

Pricing of Formulations

According to the industry, a stable pricing policy or market based price control may continue to encourage the formulation industry to invest in R&D in NDDS and dosage forms. They also suggest that the prices of the patented products may be regulated on Purchasing Power Parity basis.

OUTLOOK

In the World

According to the IMS Health, the total use of medicines is expected to reach 4.5 trillion doses by the year 2020, registering an increase of 24 percent as compared to the 2015 levels. It has been anticipated that the global increase in the volume of medicines utilized till the period 2020, will majorly occur in India, China, Brazil, Indonesia and Africa.

In the Pharmerging markets, generics and non-original branded products form the majority of medicines, and are available often at a lower cost than original brands leading to increased access to medicines in these regions. Majority of the demand in branded drugs is anticipated to grow in the developed markets. The IMS Health also predicts a rise in demand in the speciality medicines in the developed markets.

As per the IMS Health, the global spending on medicines is expected to reach US$ 1.4 trillion by 2020, representing an increase of 29 percent to 32 percent from the 2015 levels. The developed markets are expected to account for nearly 63 percent of the global spending by the year 2020. The United States is predicted to be the leading region in terms of spending on medicines, followed by the European Union and Japan.

Oncology is the leading class of specialty medicines with over US$ 100 billion spending in major developed and pharmerging markets by 2020. Viral hepatitis, including recently introduced treatments for Hepatitis C, is forecast to reach about US$ 50 billion in 2020 for major markets.

In India

According to the Industry sources, the Indian Pharmaceutical industry is expected to grow at 12-14 percent CAGR during the period 2015-16 to 2020-21. A rapid increase in exports of formulations and bulk drugs to the regulated markets has also been

predicted. Regulated markets are predicted to be the leading export destinations of Indian pharmaceutical products in the future. Indian bulk drugs and formulations are highly demanded in the North American and European markets. This trend is expected to continue in the future as regulated markets are likely to limit their expenditure on healthcare, making low priced Indian drugs an attractive alternative. In the case of semi-regulated markets, the imports of Indian formulations by Russia and Brazil are anticipated to decline owing to currency fluctuations. Nevertheless, higher imports by Africa from India have been forecasted.

The exports of generic off-patent bulk drugs exports to the regulated markets are anticipated to rise in the future. An escalation in the demand for on-patent bulk drugs is predicted to be lesser relative to off patent bulk drugs, majorly because of sluggish growth in the branded medicines market as compared to the generic medicines in the US and in the Europe. Thus, the pharmaceutical industry is anticipated to display healthy growth over the next five years and exports are estimated to expand owing to the ageing population in India's major markets, and increasing incidence of chronic diseases in other developing country markets.

1. INTRODUCTION

Health is of paramount importance in the social and economic development of the world. It is in this regard, that the pharmaceutical industry is widely recognised as a predominant driver in the process of economic development. Amelioration of global health, particularly among the poor is of prime importance and is a priority in the process of development worldwide. The principal role of the pharmaceutical industry is to put in efficacious efforts in producing effective medicines and enabling provision of services which will lead to the welfare of patients. Moreover, the pharmaceutical industry contributes to provide considerable socio-economic benefits to the society in the way of creation of jobs, supply chains and also through community development. The pharmaceutical industry also involves the usage of technological innovation which reduces the cost of drugs which eventually is beneficial for members of the society along with providing a boost to the exports of the sector.

Players in the pharmaceutical industry include: branded drug manufacturers, generic drug manufacturers, firms developing biopharmaceutical products, non-prescription drug manufacturers, and firms undertaking contract research. In addition, there are also enablers of the industry such as universities, hospitals and research centers that play a role in R&D activities.

The Indian pharmaceutical industry has acquired a noteworthy position in the global pharma sector and has been achieving significant growth in the recent years.

Indian pharmaceutical industry is one of the high performing knowledge based segments of the manufacturing sector. In addition to catering to the needs of the domestic demand, the pharmaceutical industry is also engaged in contract manufacturing, contract research, clinical trials, contract R&D, and direct exports to developed and developing country markets. India is a major vaccine producer and also a global leader in end-to end drug manufacturing[8]. Indian pharmaceutical industry has been evolving over the years and

[8]Policy Landscape Reforms for Strengthening Indian Pharmaceutical Industry

is the leading provider of generic drugs globally. India, being amongst the fastest- growing pharmaceutical market worldwide, is recognised as a global manufacturing and research hub.

Table 1.1 : Evolution of the Indian Pharmaceutical Industry

1990-2010	• Liberalisation of market occurred • Indian companies increasingly launched operations in foreign countries • India emerged as a major destination for generic drug manufacturing • Approval of Patents (Amendment) Act 2005, led to the adoption of product patents in India
2010	• Leading pharmaceutical companies augmented their expenditure on research and development with the objective of manufacturing cost effective generics which would strengthen their presence across the global market • Increased patent filings by pharma players took place
2010-2015	• Patent Amendment Act 2015 followed, which included amendments to Patent Act 2002 • During the year 2014, 100% FDI was permitted for the medical device industry through the automatic route • Leading Pharma companies raised funds for the purpose of acquisition in domestic and international markets with the aim of increasing product portfolios • The National Health Policy Draft 2015 is expected to raise expenditure on the healthcare sector

Source: Ace Equity Database

As per ACE Analyser, the government expenditure in the pharmaceutical sector was US$ 23.9 billion during the year 2014. It was during the year 2015, that the government expenditure in the pharma sector increased by 27.2 per cent and was valued at US$ 30.4 billion. It is anticipated that by the end of 2016, the government expenditure in the pharma sector is likely to increase to US$ 53 billion as compared to US$ 30.4 billion during the year 2015.

Many Indian pharmaceutical companies have adopted the strategy

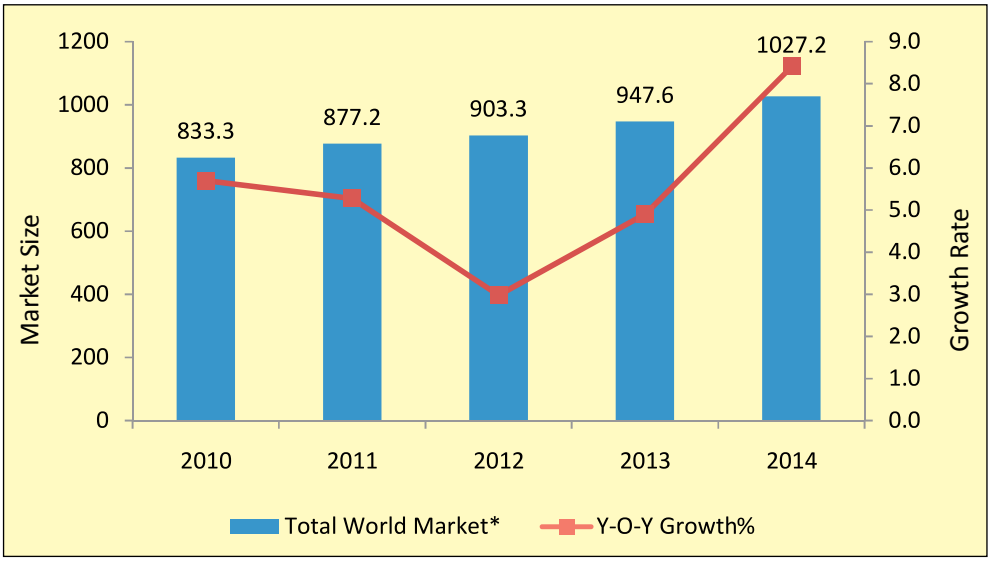
of mergers and acquisitions (M&As) with the objective of complimenting the strengths of two entities to get market access, new technologies as also new products. Indian pharmaceutical industry has also been increasing the R&D expenditure significantly in the recent years. Another noticeable trend in the Indian pharmaceutical industry is that, it has emerged as an attractive destination for sourcing contract research, particularly clinical trials, as also contract manufacturing by many large firms from the developed countries. A well-developed manufacturing base, low cost R&D, large pool of skilled man-power are some of the factors for the success of Indian pharmaceutical industry in these segments of business.

The Indian pharmaceutical industry has flourished over the years and it is anticipated that this growth trend will continue in the future. An expansion in Government spending, a rise in disposable income, the changing demographic trend and the higher incidence of chronic diseases will sustain the growth of this industry.

2. GLOBAL SCENARIO

The global pharmaceutical market was estimated at US$ 1027.2 billion in 2014. In 2014, the global pharmaceutical industry (including audited and unaudited markets) grew at a pace of 8.4 per cent y-o-y vis-a-vis a growth of 4.9 per cent in 2013. The launch of new and innovative drugs propelled the growth in the pharmaceutical market, which enabled overall growth of the regulated markets. An augmentation in the demand for generic drugs has led to rising growth momentum in the emerging markets.

Exhibit 2.1 : Global Sales in Pharmaceuticals



* Actual quarterly exchange rates have been used to compute global sales
Sales in constant US$ billions
** Growth in constant dollar terms
Source: IMS Health

North America (mainly the USA), Europe and Japan are the dominant markets in the global pharmaceutical industry. The North American market remained as the single-largest market and accounted for more than a third of the total pharmaceutical sales in the year 2014, and exhibited a year-on-year growth rate of 11.8 per cent during the same period.

The pharmaceutical sales in Europe during the year 2014 were worth US$ 228.8 billion and accounted for nearly 22.3 per cent of the global market share. Japan with pharmaceutical sales amounting to US$ 81.6 billion registered a nominal growth rate of 1.4 per cent during the year 2014.

Table 2.1 : Region-wise Sales in Pharmaceuticals (2014)

World Market*	Global Sales		% (Constant US$) Growth	
	US$ billion	Market Share (%)	y-o-y	CAGR (2009-14)
North America	405.6	39.5	11.8	4.5
Europe	228.8	22.3	4.1	1.9
Asia, Africa, Australia	199.2	19.4	9.1	12.4
Japan	81.6	7.9	1.4	2.0
Latin America	72.1	7.0	11.7	10.2
Total	1027.2	100.0	8.4	5.4

* - Includes both audited and unaudited markets.
Note : Sales cover direct and indirect pharmaceutical channel purchases in US dollars from pharmaceutical wholesalers and manufacturers. The figures above include prescription and certain over-the-counter data and represent manufacturer prices. Asia excluding Japan.Total may not add due to rounding.
Source: IMS Health

Pharmaceuticals sales in the Asian, African and Australian regions grew by 9.1 per cent during the year 2014, and jointly accounted for approximately 19.4 per cent of the world pharmaceutical market. Latin America registered a healthy growth of 11.7 per cent y-o-y, contributing US$ 72.1 billion to global sales, during the year.

With respect to therapy classes, oncology retained the top spot with the sales amounting to US$ 74.4 billion during the year 2014, and displaying 12.2 per cent year-on-year growth rate during the same period. The market for anti-diabetics and pain relievers grew by 18 per cent and 6.5 per cent respectively. The sale of anti-hypertensives was valued at US$ 47.5 billion, registering a decline in the growth by a meagre 1.2 per cent during the year 2014. The market for anti- bacterials worth US$ 40.3 billion grew by 0.8 per cent during the year 2014.

Global exports of pharmaceutical products (HS Code 30) registered a modest growth at a CAGR of 3.6 per cent between 2010 and 2014,

Table 2.2 : Therapy-wise Sales in Pharmaceuticals

Rank	Therapy Class	Global Sales (2014) US$ billion	Growth y-o-y (%)
1	Oncologics	74.4	12.2
2	Anti-diabetics	63.6	18.0
3	Pain Relievers	59.8	6.5
4	Anti-hypertensives	47.5	-1.2
5	Anti-bacterials	40.3	0.8
6	Respiratory Agents	39.6	5.6
7	Mental Health	39.1	0.6
8	Autoimmune Diseases	35.9	17.5
9	Lipid regulators	28.4	0.2
10	Dermatologics	28.2	9.5
	Total leading therapy classes	**456.8**	

Note:1) Sales cover direct and indirect pharmaceutical channel purchases in dollar from pharmaceutical wholesalers and manufacturers. The above figures include prescription and certain over-the-counter data and represent manufacturer prices. Totals may not add due to rounding. 2) Growth is calculated at constant US$ to normalise for exchange rate fluctuations.
Source: IMS Health

from US$ 443.2 billion to US$ 510.3 billion. As an aggregate, Europe accounts for about 80 per cent (US$ 406.6 billion) of total exports of pharmaceutical products. With a share of 15.6 per cent in total global exports of pharmaceutical products Germany was the leading exporter of pharmaceutical products during the year 2014, followed by Switzerland (12.3 per cent), Belgium (9.8 per cent), and the USA (8.6 per cent). In terms of growth, exports from India registered the highest growth at a CAGR of 17.6 per cent during the period 2010 to 2014, followed by Italy at a CAGR of 11.5 per cent and Denmark at a CAGR of 10.1 per cent.

With a share of 58 per cent (US$ 305.1 billion) in total global imports of pharmaceutical products, Europe was the largest importer of pharmaceutical products during the year 2014. As a country, the United States of America is the largest importer of pharmaceutical products globally with a share of 13.8 per cent in the worldwide imports. The imports of pharma products by the United States of America have increased by 4.2 per cent CAGR during the period 2010 to 2014.

Among the pharma-emerging markets, India's exports of pharmaceuticals have registered a significant growth at

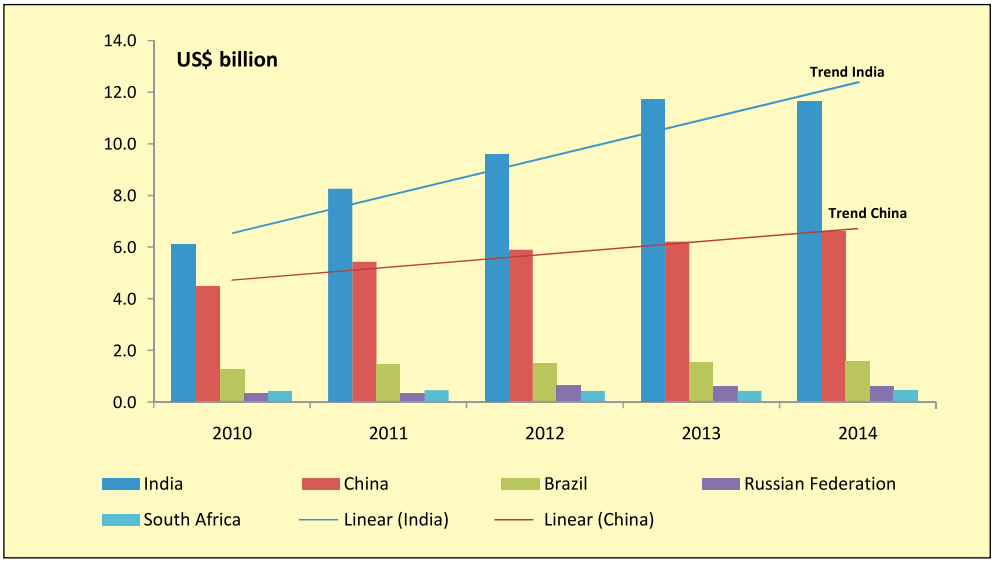
Table 2.3 : Major Exporters and Importers of Pharmaceutical Products (HS Code 30) in the World

Exporters	2014	Share in global exports	CAGR (2010-14)	Importers	2014	Share in global imports	CAGR (2010-14
	US$ billion	(%)	(%)		US$ billion	(%)	(%)
Germany	79.7	15.6	5.3	The USA	72.6	13.8	4.2
Switzerland	62.6	12.3	8.5	Germany	49.3	9.4	2.2
Belgium	49.8	9.8	0.4	Belgium	39.4	7.5	0.4
The USA	44.0	8.6	1.9	The UK	33.7	6.4	9.4
France	35.2	6.9	1.2	France	27.9	5.3	2.7
The UK	33.6	6.6	0.3	Switzerland	23.5	4.5	8.1
Ireland	27.2	5.3	-3.2	Italy	21.5	4.1	3.6
The Netherlands	25.7	5.0	-0.9	Japan	19.9	3.8	5.3
Italy	25.3	5.0	11.5	The Netherlands	19.3	3.7	-6.9
Spain	12.7	2.5	3.4	China	17.8	3.4	25.2
Denmark	12.2	2.4	10.1	Spain	15.2	2.9	0.9
India	11.7	2.3	17.6	Russia	12.8	2.4	3.6
World	**510.3**	**100.0**	**3.6**	**World**	**526.4**	**100.0**	**4.0**

Source: Trademap, ITC Geneva; Exim Bank Analysis

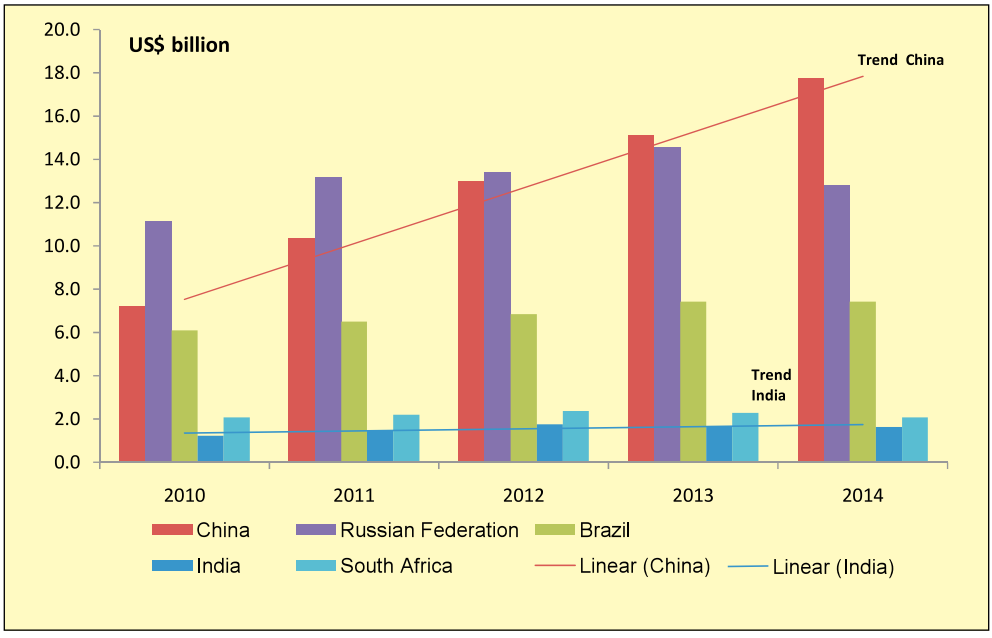
a CAGR of 17.6 per cent during the period 2010 to 2014 accounting for 2.3 per cent share in global exports of pharmaceuticals in 2014. China has emerged as a significant importer of pharmaceutical products growing at a CAGR of 25.2 per cent during the same period. In 2013, Brazil, Russia, India and China (BRIC) as a bloc accounted for 4.1 per cent of global exports and 7.9 per cent of global imports of pharmaceutical product.

Exhibit 2.2 : Exports of Pharmaceutical Products from BRICS



Source: Data derived from Trademap, ITC Geneva; Exim Bank Analysis

Exhibit 2.3 : Imports of Pharmaceutical Products by BRICS



Source: Data derived from Trademap, ITC Geneva; Exim Bank Analysis

3. REGULATORY ENVIRONMENT

The pharmaceutical industry is influenced by a host of practices, which may primarily relate to price regulations, patent laws, safety policies, promotion regulation, insurance, procurement regulation, etc. Hence, the regulatory mechanism plays a crucial role in the trade and development of the pharmaceutical industry. Some of the recent developments and key trends in the regulatory environment that might significantly govern the global pharmaceutical sector are briefly discussed in the current chapter.

PIC/S

Pharmaceutical Inspection Co-operation Scheme (PIC/S) is an informal collaboration among member economies spearheaded by the EU seeking to improve the standards of manufacturing requirements amongst its members. Going further, the EU has agreed Mutual Recognition Agreements on GMP with several third countries (Australia, Canada, Japan, New Zealand and Switzerland).

Forty-six government authorities, including the U.S. Food and Drug Administration (FDA), currently are Participating Authorities in PIC/S. India is not currently a member, although PIC/S has identified India as one of the 'key players' in terms of the pharmaceutical industry.

The main conditions for membership are to have a law on medicinal products, a GMP Guide equivalent to that of PIC/S, a GMP inspectorate that fulfils PIC/S quality system requirements, and experienced GMP inspectors. PIC/S entails membership candidates to bring their GMP systems up to international standards and the process of membership can be accomplished in two to three years.

Risk for disagreement about the application of GMP standards is currently greater than it might be if India were a PIC/S member. While PIC/S standards are not a requirement under the Technical Barrier to Trade (TBT), the application of GMPs without active international relationships contributes to the potential for the inconsistent interpretations and application of GMPs among India and its trading partners, thereby deterring exports from India to the member countries. According to the industry estimates, at

least 60 per cent of Indian exports are to the PIC/S member countries and that may be affected in the medium to long term if India doesn't become a member.

Adhering to the new rules will entail Indian pharma companies to expand their mandate from the existing manufacturing standards to new fields, such as good clinical practices and good pharmaco vigilance practices. For exporting companies, PIC/S will be one single regulatory body for procurement of drugs from any exporting country. However, for small and medium size drug companies, especially those that only cater to the domestic market, joining PIC/S will entail upgrading to global standards, which may result in an expenditure of Rs 5 crore to Rs 20 crore per unit, which according to industry estimates, may not be affordable to MSMEs.

EU Trademark

The European Parliament has formally adopted the EU Trade Mark Reform which is anticipated to have significant impact on the EU as well as on the pharmaceutical industry.Under the law, the Community Trade Mark (CTM) in place since 1996 will become the 'European Union Trade Mark' and the Office for Harmonization in the Internal Market (OHIM) will become the 'European Union Intellectual Property Office'. The current law brings in considerable changes in the procedure of CTM filing as well as in the fees payable. The most significant impact apprehended by the global pharmaceutical industry is the laws dealing with counterfeit goods. Under the new law, CTM registrants is envisaged to benefit from stronger protection against infringing goods in transit in the EU by the introduction of an express right to prevent goods from entering the EU when goods infringe. Though there is a defence where the importer can show that the trade mark registrant is not entitled to prevent sale in the country of final destination, there is an implying burden on the importer (infringer) to prove this. As a result, all trade mark owners having problems with counterfeits outside the EU shall have to consider obtaining EU trade mark registrations and EU customs registrations, even if they have no counterfeit problems (or even, arguably, no business) in the EU. Concerns have been already raised by the Indian pharmaceutical industry against the law, citing that the law may potentially confiscate shipments of Indian medicines to other destinations via European ports or airports, and termed it as another attempt to create trade barrier for Indian generics.

Base Erosion and Profit Shifting (BEPS)

On 5 October 2015, the Organisation for Economic Co-operation and Development (OECD) released the final action plan in relation to Base

Erosion and Profit Shifting [BEPS]. BEPS refers to the complex structuring done by multinational businesses to artificially shift reduced profits to low tax countries and pay little or no corporate tax. As a member of the G20 and an active participant in the BEPS project, India is committed to the BEPS project outcome and its implementation. The project is anticipated to impact the industry significantly. Impact on Indian pharmaceutical industry is however, subject to the proposed Indian tax law and positions adopted by India in the multilateral instruments or bilateral tax treaties. Some of the key areas where the project is anticipated to impact are: on the status of Permanent Establishment (PE), tax treaties, IP, financial transactions and interest deductions on hybrid instruments, transfer pricing, contract research and manufacturing arrangements, and indirect taxes.

Impact of FDA and Court Rulings

Several decisions made by the Supreme Court of the USA in 2013 are anticipated to have a profound impact on the US as well as on the global pharmaceutical industry. For generic pharmaceuticals, the Court confronted the law governing a controversial pharmaceutical marketing practice known as reverse payment agreements (pay for delay) in which branded drug companies pay generic companies to delay the commercialization of their products. The verdict is anticipated to bring about increased competition in the branded drug segment at an earlier stage in its commercial lifecycle. Though this is envisaged to be good for consumers, it is disadvantageous for innovator companies.

In another key decision the Court ruled that generics manufacturers are substantially immune from civil claims regarding injuries caused by their products. This decision basically eliminates the primary incentive for evaluating safety and design defects before marketing a generic product. This ruling is threatened by a proposed shift in FDA position on generic drug labeling. The FDA has submitted a proposed rule that would allow generic companies to change their labelling under appropriate circumstances, just like brand companies. FDA's Proposed Rule would allow generic manufacturers to independently update product labeling through the "changes being effected" (CBE-0) supplement process currently only available to branded drug manufacturers for product safety labeling. Under the Proposed Rule, generic manufacturers could unilaterally change their safety-related product labeling, and those changes could take effect simultaneously with the companies' notification to the FDA and of the branded drug manufacturer. No prior approval would be required; if this rule is adopted the regulatory and

liability landscape for the generic drug industry is envisaged to be completely transformed.

Quality Risk Management (QRM)

The International Committee of Harmonization (ICH) issued its ICH Q8, Q9 and Q10 guidances between 2005 and 2009. Validation guidance in 2011 formally began the agency's push to instill the concepts of scientific understanding and risk management as a basis for product design and quality. Despite these frameworks the industry has been slow to adopt these principles as part of its core drug development philosophy as the list of companies under warning letters or consent decrees continues to lengthen. However, several factors are driving the change at seemingly slow pace. First is the growing realization that the industry must get better at identifying and developing new drug therapies to remain competitive. This has prompted the industry to start looking at formalized decision-making tools as part of their risk management process. Second, in Asia, risk management is becoming a central component of any regulatory inspection and regulatory filing. While in the USA, the focus has been on clinical risk management via its REMS program, Asia is focusing on risk management tools for tactical components like facility design qualification, equipment selection, and commissioning and qualification. This is driving the integration of risk management tools as part of the overall project planning exercise rather than a checkbox activity. In the USA, many large multinationals are transforming their development programs to leverage knowledge management and utilized formal risk management tools. This trend is envisaged to help move the industry towards a more scientifically-based development philosophy.

Drug serialization

Anti-counterfeiting activities are rapidly becoming the central focus of many countries' regulatory landscape. Global pharmaceutical industry faces counterfeiting challenges as well as theft, diversion and false returns to manufacturers. The World Health Organization (WHO) estimates counterfeit drugs to constitute approximately 1 per cent of the supply in developed countries and 30 per cent to 40 per cent in developing countries. In November 2013, the U.S. passed the Drug Quality and Security Act (H.R. 3204), which would preempt all state laws relating to drug pedigrees and track-and-trace systems, to assure the security and safety of drug supply chain. The rollout is anticipated to take place over the next decade with the goal of acheiving unit level traceability for all drugs manufactured in the USA. Serialization regulations are also in place currently in Turkey, India, China, Brazil, Argentina and South Korea.

At the latest Global Track and Trace Roundtable, held in October 2013, almost every major pharmaceutical market stated their plans to formalize serialization by 2017.

Anti-Counterfeit Measures

On October 1, 2011, Anti-Counterfeiting Trade Agreement (ACTA) has been signed as a multilateral treaty by thirty-one countries (Australia, Canada, Japan, Morocco, New Zealand, Singapore, South Korea, USA, EU, and its member states), for the purpose of establishing international standards for intellectual property rights enforcement. The Agreement aims to establish an international legal framework for targeting counterfeit goods, generic medicines and copyright infringement, and propose to create a new governing body outside the existing regulatory framework, such as WTO, WIPO, and the United Nations. The move has been largely detrimental for Indian generic pharmaceutical industry. Though the World Health Organisation (WHO) has dropped its plan to include generic drugs in its definition of counterfeit goods, still generic manufacturers are facing the challenge of seizure by EU Custom Officials, even if the consignment is in trans-shipment stage. EU Regulation 1383/2003 allows for seizure or delay at Customs if the goods are suspected to be of patent infringement. Such challenges are reported even though the origin and destination does not have such anti-counterfeit measures in force.

Licensing Agreements

The ensuing patent expiration of blockbuster drugs and apprehensions of resultant revenue loss have been prompting the large innovator companies, mostly multinationals,to reduce their focus on new drug discoveries. Instead, these companies tweak the existing compounds, and call them new. This practice, increasingly followed by drug manufacturers in the developed countries, is being opposed by the national patent organizations in the developing countries, such as India and Egypt. The tweaked products are perceived as a threat to the generic drug industry, and viewed this practice hindering the achievement of affordable healthcare. Another approach adopted by the innovators is to sign licensing agreements with generic companies in the developing countries. While such moves are seen as favourable for the generic drug industry, they are perceived as creative business strategy of managing the competition by undermining the patent laws in the developing countries. This in turn threatens to reduce the competition needed to keep the medicine prices low and may ultimately shrink the global supply of affordable medicines.

SSFFC

The WHO has come up with another initiative, called Substandard / Spurious / Falsely-labelled / Falsified / Counterfeit medical products (SSFFC), which has excluded the originally inclusive IP Issues, such as patent infringement from its ambit. SSFFC has been making slow but steady progress through meetings in 2012, 2013, 2014 and the latest on November, 2015. The goal of the SSFFC Mechanism is to promote international collaboration on strategies to address the falsification of medicines from the standpoint of public health, excluding trade and intellectual property considerations. A major focus is on getting products registered and maintaining a two-way flow of information once the product is in use; e.g. the WHO will inform the national authority regarding any withdrawals, suspensions or delisting of prequalified medicines and the national authorities, in turn, will keep the WHO informed of any national deregistration or issues about the medicine's safety or efficacy. Through such mechanism, WHO also envisages strengthening of national and regional capacity by developing strategies to prevent SSFFC medical products reaching the patients.

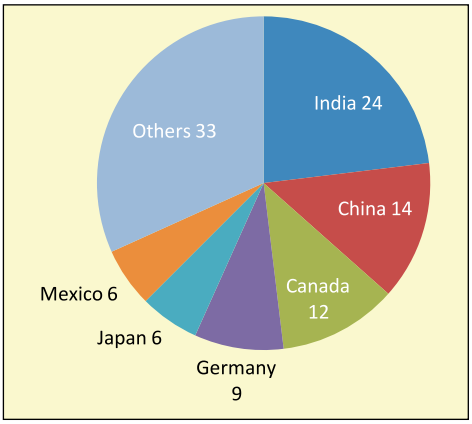
Current Good Manufacturing Practices (CGMP)

The US FDA inspects the manufacturing sites in order to check the adherence to the current good manufacturing practices. The manufacturing operations must comply with the current good manufacturing practices (CGMP) in order to have a site clearance. In case of deviations from ideal manufacturing practices, the FDA lists down the deviations in Form 483, and share the observations with the manufacturers, who then are expected to reply to the FDA with their corrective and preventive actions that will provide assurance of their adherence to the CGMP requirement. In case of further non-compliance or inadequacy of corrective and preventive actions, the FDA may issue a warning letter or an import alert. As a consequence of the increased focus of the US FDA on generic drug manufacturers, the number of warning letters issued to drug manufacturing sites has increased. On account of this, countries with a large manufacturing base have shown a rise in drug manufacturing warning letters and import alerts.

The warning letters are intended to enable defaulting firms to increase their compliance before further regulatory actions, such as import alerts and consent decrees, which altogether prohibits these firms from supplying to the US market.

Country-wise, India had a larger share of warning letters compared to other countries during 2014. However, on a per site basis, India's 332 approved

Exhibit 3.1 : Number of Warning Letters Issued in the year 2014



Source: US FDA

sites accounted for just about 24 drug manufacturing warning letters as compared to Canada's 25 sites which accounted for 12 warning letters. Thus, on a per site basis, India accounted for a lower number of warning letters as opposed to countries, such as Canada and Germany. This indicates that the FDA's focus has been more on company-specific actions as opposed to any country-specific actions.

According to a study by ICRA, around 40 per cent of the 50 warning letters issued by the US Food and Drug Administration (FDA) to the Indian pharmaceutical companies in the past seven years have been converted into import alerts. The study also finds that a third of the FDA warnings between 2008 and 2015 were resolved, the majority being resolved by the large drug companies.

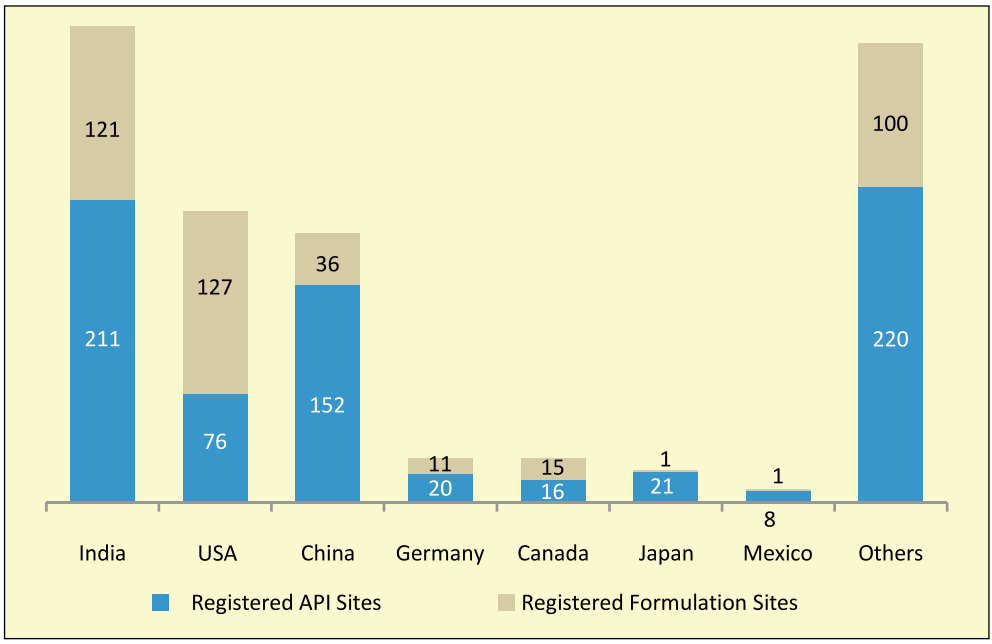
Import alerts are publicly available documents that enable the physical impounding of any drug substance produced at the affected plant site. The manufacturer has to stop all production from the factory site, until resolution of the issues. The FDA generally imposes an import alert against a drug manufacturing site in cases where the FDA deems that sufficient response to a warning letter is missing. Most import alerts have thus been issued against the firms which failed to comply even after receiving the warning letters. However, in certain instances, where the FDA deems them to be serious nature of violations during site inspections, they issue direct import alerts. Overall, country-wise, China, with its much smaller manufacturing base, has a higher number of firms under import alerts as compared to India and other countries.

Import alerts

India and China pharmaceutical companies feature among the maximum number of import alerts for good manufacturing practices. Since 2009, 160 countries have been issued import alerts for violation of good manufacturing practices. The top 30 countries in import alerts contribute to 58 percent of the total import alerts. India and China top the list of import alerts in the USFDA scanner.

The countries, which have the largest number of pharmaceutical

Exhibit 3.2 : Approved Manufacturing Base

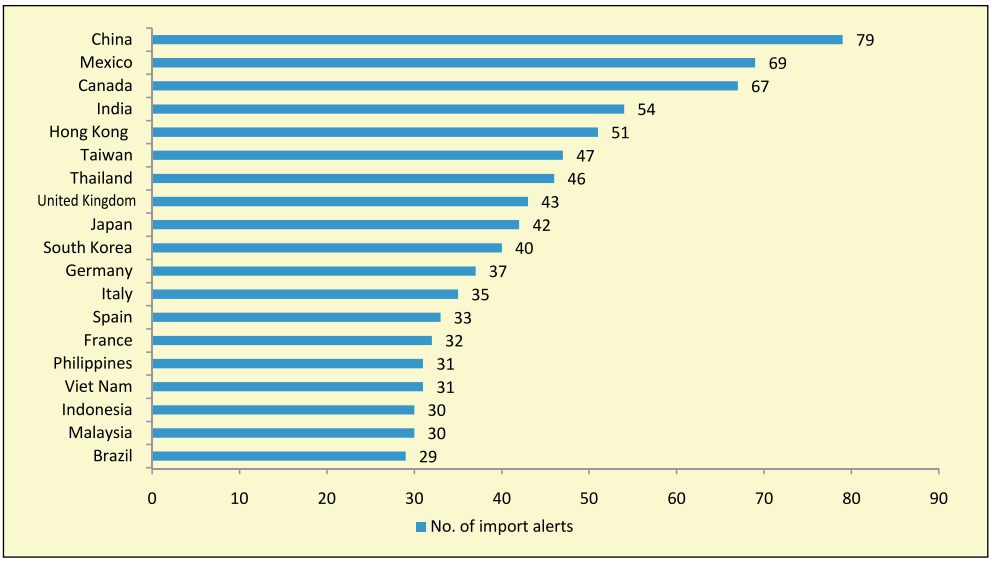


Source: US FDA

manufacturing plants and are the largest suppliers of medicines to the world, have been issued import alerts by the US FDA in the last five years. India ranks fourth in the list of warning letters and import alerts, and contributes nearly 3 percent of the total of US FDA import alerts till date. China tops the list contributing a little more than 4 percent, followed by Mexico and Canada which contribute 3.6 percent and 3.5 percent to the total import alerts. In the top 20 list of countries appearing in the import alerts issued by the USFDA, at least 10 countries are from the Asia pacific region.

The import alerts have been issued on account of several alleged violations by the Indian companies in the areas such as: quality control, hygiene, lack of reliability and accuracy of data and adulteration. An import alert effectively bans all exports of pharmaceutical products from such manufacturing plants into the USA, and renders all the stocks of the impacted production batches unsalable in the USA market. This has dented the prospective revenue streams of banned Indian manufacturers. Similarly, the R&D effort that went into the development of new molecules, for which approvals were planned to be obtained for manufacture in the banned facilities,

Exhibit 3.3 : Country-wise Number of Import Alerts by USFDA



Source: USFDA

cannot be commercialized / monetised for the duration of the import alert. However, the import alerts have so far not reduced the Indian pharmaceuticals exports to the US by a substantial volume. Nevertheless, Indian firms may face substantial opportunity loss on account of postponed product introductions and expenditure on corrective actions, besides the time and effort required to regain FDA approval (usually one to two years).

Further, if the US FDA continues its spree of issuing import alerts on the Indian manufacturing facilities, pharmaceutical producers will have to adhere to the US FDA's GMP guidelines on a more stringent level. This would mean more quality controls, more checks on the formulation manufacturing processes and rigorous-monitoring and documentation as well, resulting in incurring of additional investment in these areas, which would also add to the cost of manufacturing the medicines by Indian pharmaceutical companies. With the declining exports the additional cost may considerably affect their balance sheets.

Generic Drug User Fee Amendment (GDUFA)

The US FDA has announced a new fee structure under the GDUFA programme for the period, October, 2014 to September, 2015. The latest order has reduced the dossier filing fees by about 8-15 per cent, and hiked

Table 3.1 : New GDUFA Fee Structure

Application fees US$	**2015**	**2014**	**2013**
ANDA Fee	58,730	63,860	51,520
PAS Fee	29,370	31,930	25,769
DMF Fee	26,720	31,460	21,340
Facility Fees US$	**2015**	**2014**	**2013**
API Domestic	41,926	34,515	26,458
API Foreign	56,926	49,515	41,458
FDF Domestic	247,717	220,152	175,389
FDF Foreign	262,717	235,152	190,389

ANDA: Abbreviated new drug application; API: Active pharmaceutical ingredient
PAS: Prior approval supplement; DMF: Drug master file

the site registration fees by about 15-22 per cent.

According to the latest data (2015) on GDUFA I, FDA continues to seek more information or require companies to rectify what is known as an 'easily correctible deficiency' for the majority of ANDAs. The statistics also shows that rejection rate of ANDAs by FDA have been much more than approvals.

Exhibit 3.4 : Status of ANDA Approval by FDA-CY 2015

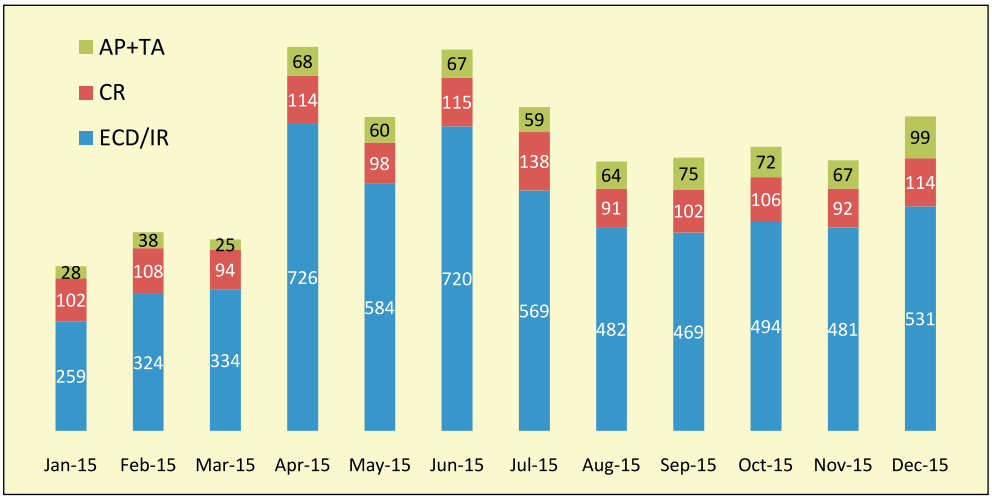


Figure Legend: AP+TA = approval + tentative approval; CR = complete response; ECD/IR = easily correctible deficiency/information request
Source: FDA

FDA prioritizes the review of ANDAs for “first generics,” which offer the first round of market competition for brand name drugs as patent and exclusivity barriers to approval have been lifted or will be lifted soon. US FDA also prioritizes ANDAs for products which are in shortage, and is related to public health emergencies and certain government purchasing programs, or is subject to statutory or other legal requirements. The US Congress is currently pushing FDA to also prioritize ANDAs for products seeing steep price increases, though this would be difficult for the agency as it currently does not track drug prices.

The statistics reveals that, as of January 2016, ANDA backlog with US FDA stands at 2,962; however, 2,170 have at least received one communication from the agency and only 211 are pending for review. According to US FDA, beginning February 2016 on pending approvals, it would take about 15 months to respond to a generic firm on their ANDA this year, and by October 2016, companies may expect to receive a response within 10 months.

The reauthorization of the next Generic Drug User Fee Act (GDUFA II) is scheduled for 2017. The GDUFA II is envisaged to also focus on the ANDA review time frame and review goal metrics, particularly around transparency, pre-ANDA processes, controlled correspondence, first generics and regulatory science.

4. KEY TRENDS IN PHARMACEUTICAL MARKET

Reducing cost of production, enhancing innovation and improving market access are the defining goals of the pharmaceutical sector in the recent years. Some of the key trends in the global pharmaceutical market that have been significantly defining the way forward for this sector are discussed in the current chapter.

Mergers and Acquisitions (M&A)

Mergers and Acquisitions have been dominating the global pharmaceutical industry after the global financial crisis. The number of deals increased from 371 in 2013 and 438 in 2014, to 494 in 2015. The cumulative deal values almost doubled from US$ 226 billion to US$ 415 billion, during the period. This is largely due to the announcement of the acquisition of Allergan by Pfizer. With a deal value which is in excess of US$ 183 billion, the Pfizer / Allergan merger makes up more than 40 per cent of the sum of all deal values, during 2015. However, even without this deal, deal activity in 2015 was reported at a considerably high level. Other large transactions in

Table 4.1 : Number of Deals in Top Locations of Global M&A in the Pharma Industry (2015)

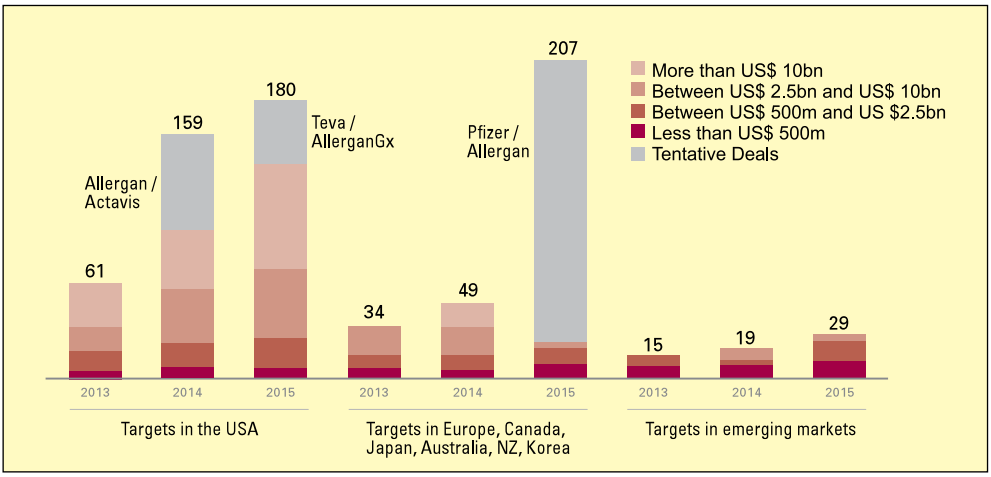
		Target Region, 2015				Target Region, 2014			
Buyer Region		USA	Western Europe & Canada	Other Developed Markets	Emerging Markets	USA	Western Europe & Canada	Other Developed Markets	Emerging Markets
	USA	8 (< US$ 25 bn)	39* (< US$ 25 bn)	4 (< US$ 25 bn)	6 (<US$ 25bn)	83 (= US$ 25bn)	35 (<US$ 25bn)	4 (<US$ 25bn)	11 (<US$ 25bn)
	Western Europe & Canada	48 (<US$ 25bn)	99 (<US$ 25 bn)	11 (< US$ 25 bn)	9 (< US$ 25 bn)	37*** (<US$ 25 bn)	92 (= US$ 25 bn)	1 (< US$ 25 bn)	13 (< US$ 25 bn)
	Other Developed Markets	9** (<US$ 25 bn)	4 (<US$ 25 bn)	16 (< US$ 25 bn)	5 (< US$ 25 bn)	9 (< US$ 25 bn)	4 (< US$ 25 bn)	13 (< US$ 25 bn)	4 (< US$ 25 bn)
	Emerging Markets	10 (<US$ 25 bn)	6 (<US$ 25 bn)	4 (< US$ 25 bn)	137 (< US$ 25 bn)	6 (< US$ 25 bn)	9 (< US$ 25 bn)	2 (< US$ 25 bn)	115 (< US$ 25 bn)

*Excluding Pfizer/ Allergan
**Excluding Teva/ Allergan
***Excluding Actavis/ Allergan
Units refer to the number of deals
Figures in parenthesis is the deal amount
Source: IMAP's Pharma & Biotech Industry Global Report — 2016; Exim Bank Analysis

2015 included generics consolidation deals (Endo / Par and Pfizer / Hospira), Baxter's split, and pipeline acquisitions by AbbVie, Alexion, Shire and AstraZeneca.

With regard to inter-regional transactions, (buyer and target in different regions), most of the deals, as in the previous years, were located in the USA and Western Europe. However, putting aside the Pfizer / Allergan deal, deal size in Western Europe has been lower in 2015 compared to 2014. This has been a consequence of the wave of tax inversion deals in 2013 and 2014. The main deal drivers have been access to new products,

Exhibit 4.1 : Cumulative M&A Deal Values by Target Regions



Source: IMAP's Pharma & Biotech Industry Global Report — 2016

tax savings and economies of scale.

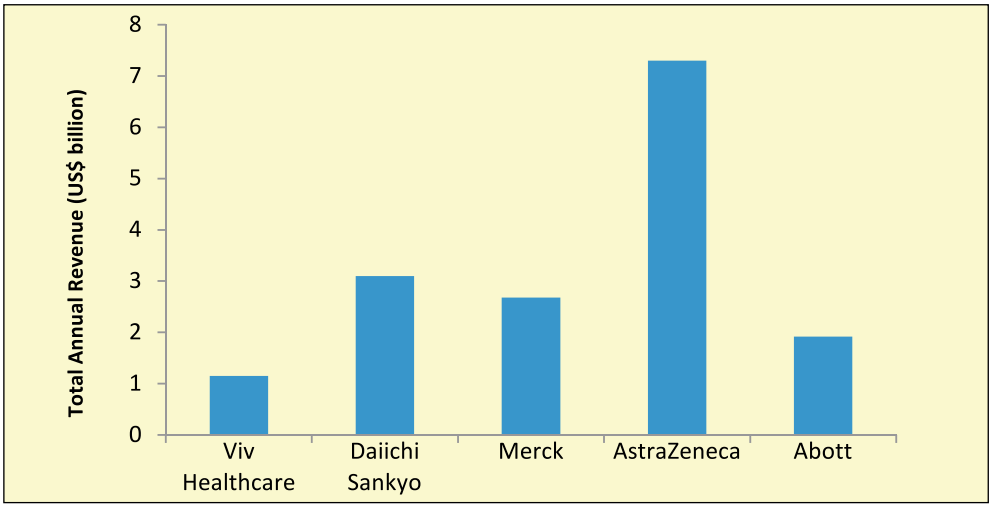
PATENT CLIFF

Over the past century, Loss of Exclusivity (LOE) or patent cliff has emerged as a major concern for the pharmaceutical industry. In 2014, about US$ 38.7 billion in pharma revenue was estimated to be "at risk" due to the LOE. By 2015, the figure was expected to reach US$ 47.5 billion (nearly matching the loss level of US$ 54.7 billion during the 2012 patent cliff). Some of the large blockbluster drugs, such as Copaxone (Teva), Nexium (AZ), and Namenda (Forest Laboratories) is projected to be significantly impacted by the patent cliff. Pharma companies have been following unconventional means, such as legal protection, acquisition, corporate transformation, and regulatory shields to write-off patent cliff-related revenue losses. For instance, Forest Laboratories' acquisition of Actavis is projected

to offset the losses from Namenda, the branded version of which was withdrawn from the market in August 2014. Novartis has drawn upon substantial benefits from the US ban on Ranbaxy. The latter holds the first-to-file status for Diovan, a drug from the house of Novartis. However, due to the ongoing ban, Ranbaxy has been unable to launch its generic version in the USA. Therefore, the entry of other US generics is also barricaded. Novartis continues to generate revenue from Diovan, despite the patent loss in 2012. Similarly, other companies, such as Novo Nordisk (Drug: NovoRapid; LOE: September 2013) and Allergen (Drug: Restasis; LOE: May 2014) continue to reap the benefits, even after the patent expiry.

Further, Symbicort (LOE: October 2014) and Advair (LOE: August 2014) will continue to enjoy exclusivity (after patent expiry) due to the difficulties faced by generic manufacturers to prove bioequivalence for their generic alternatives. Pfizer and Novartis are expected to recover from the revenue loss from LOE on their small molecules (Celebrex and Gleevac) through corporate transformation (Pfizer's three-way business split) and new molecule-discovery-based risk sharing (for Novartis). Biologics, such as Lantus and Neulasta will continue to enjoy their biologic status (even after patent expiry), with Lantus facing a delayed threat from biosimilars being developed by Eli Lilly and Boehringer Ingelheim, and Merck and Samsung.

Exhibit 4.2 : Patent Cliff - Top 5 in 2016

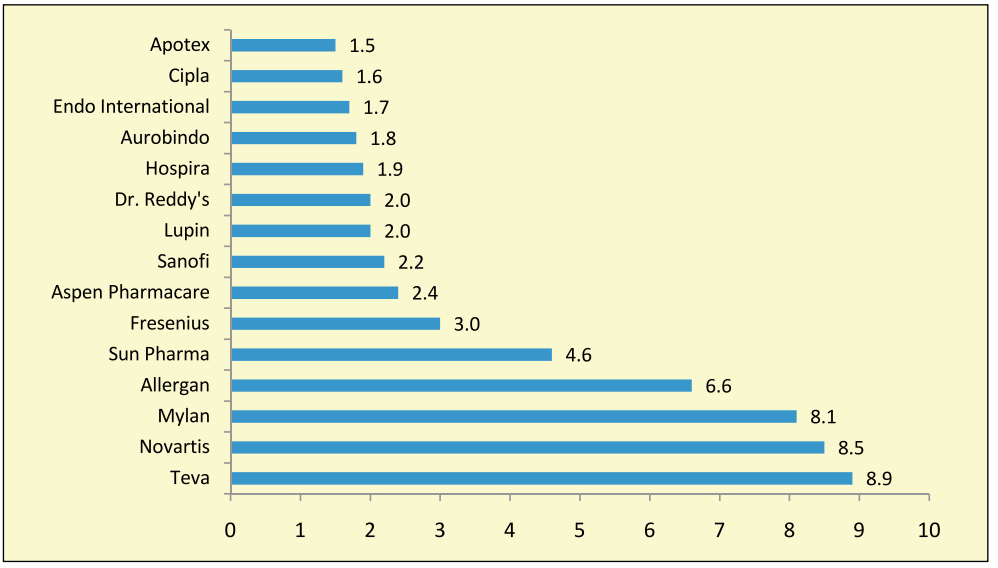


Source: Dickson Data

Growing Generic Industry

Due to several patent expirations, the generic drug industry has experienced significant growth during the recent years. The global market for generic drugs was worth US$ 225 billion in 2011, and is estimated to reach US$ 358 billion in 2016, growing at a 9.7 per cent CAGR between 2011 and 2016. Rising cost pressure on health care has resulted in an increase in generic pharmaceutical usage as generic drugs cost 30 to 80 per cent less than their patented equivalents. According to the estimates by the IMS, generics is projected to constitute 52 per cent of global pharmaceutical expenditure growth by 2018. Although there is still room for growth in generics, delivering is becoming more complex as: commoditization, combined with extensive reforms in both regulated and unregulated markets, are increasing the pressure on prices; product portfolio becoming increasingly complex; managing business while maintaining lean structure and striving for cost leadership has become more intricate; quality control in manufacturing is becoming a challenge; and new players intensifying the competition. As a result of these challenges the global generic market is projected to grow slow at 6 to 7 per cent per year until 2018.

Exihibit 4.3 : Worldwide Generic Sales (US$ billion) in 2015



Source: Evaluate Pharma, Company filings, Sun Pharma Investor Meet

R&D activities and Contract Research Organisations

Pharmaceutical industry is knowledge intensive and R&D investment plays a crucial role in the growth of the industry. R&D spending by the pharmaceutical industry continues to rise in the recent years. Between 2004 and 2015 the total industry expenditure on R&D rose from US$ 88 billion to US$ 166.3 billion, and is forecast to reach US$ 169.3 billion in 2016[9]. At the same time, the estimated cost of bringing a new chemical or biological product to market has more than trebled from US$ 451 million to US$ 1.5 billion[10]. Meanwhile, the average number of annual US Food and Drug Administration (FDA) approvals for new molecular entities (NMEs) that fell from 31.5 in 1990s to an average of 22.9 during the period 2001-2010[11] has been showing an upturn with the average annual NME figures for the years 2011-2013 rising to 32. One notable trend observed in R&D strategy in pharmaceutical industry, in the recent years, have been to forge stronger alliances with universities, with some companies moving their R&D bases closer to university sites to promote collaboration and enhance the scientific dialogue. In addition to partnerships, other prominent trend include asset swaps, carve outs, and transaction collaborations across the industry in an effort to spread risk and reduce R&D investment. There is also a rise in R&D licensing, as well as outsourcing to Contract Research Organizations (CROs). Although preclinical and clinical trial activity has been outsourced for some time, pharma companies are now starting to contract drug research and registration work. The global drug discovery outsourcing market (including early stage R&D) registered an annual rate of about 10 per cent between 2008 and 2013. The world market for drug discovery outsourcing is estimated to reach US$16.6 billion in 2015[12]. Currently, outsourcing accounts for close to 10 per cent of total global life sciences and pharmaceutical R&D spend of US$ 166.3 billion.This figure is forecast to double to US$ 25 billion by 2018[13]. The global biologic drug discovery outsourcing market is projected to grow at a CAGR of 23 per cent between 2015 and 2020, and

[9]2016 Global R&D Funding Forecast, Industrial Research Institute

[10]The R&D cost of a new medicine, J. Mestre-Ferrandiz, J. Sussex and A. Towse, Office of Health Economics, December 2012 (Hansen, 1979; Wiggins, 1987; DiMasi et al, 1991; OTA, 1993; DiMasi et al, 2003; Mestre-Ferrandiz et al, 2012)

[11]FDA official figures, March 2014

[12]Drug Discovery Outsourcing Market Forecast 2015-2025

[13]The New Trends of Global Drug Discovery Outsourcing 2013, Research and Markets report, September 2013; 2016 Global R&D Funding Forecast, Industrial Research Institute

may reach US$ 11.4 billion by 2020[14]. The global clinical trial service market is expected to reach more than US$64 billion by 2020, up from US$38.4 billion at present, representing a CAGR of 9 per cent between 2015 and 2020[15]. Around 63 per cent of global sponsors had outsourced their drug R&D to global CROs in emerging markets, recording a significant increase by 68 per cent during 2015, while in the year 2014, only 43 per cent reported outsourcing to these markets[16].

The rising cost of drug development is one of the key factors driving the movement of drug development to emerging markets. Biopharmaceutical companies are also challenged to improve productivity and efficiency, streamline clinical trials, and meet more rigorous regulatory and quality assurance requirements to sustain profitability at lesser cost. To that end, many are implementing strategies to boost profit margins while reducing fixed and variable costs and are looking at emerging market CROs to help them meet these challenges. Emerging markets such as China, Eastern Europe, Turkey, Argentina, India and Brazil have been playing a critical role in advancing medical sciences. These markets offer a number of attractive features, such as the potential for reduced R&D costs and development time and the availability of a large, affordable talent pool with nearly comparable technical capabilities and skills. Typically, these markets also have a larger, clinically naive patient population as potential trial subjects than established markets such as the United States and Western Europe, and offer means of streamlining trial costs.

[14]Outlook of Global Biologic Drug Discovery Outsourcing Market to 2020, Walstreet online

[15]JZ Med, Pharma Voice – June 2015

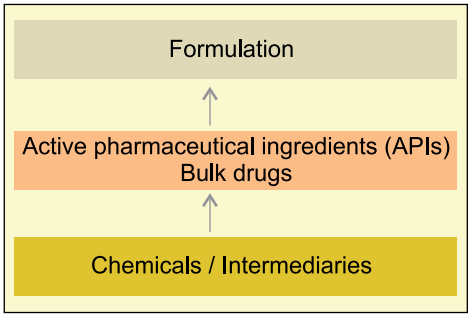
[16]Nice Insight's 2015 pharmaceutical and biotechnology outsourcing survey

5. INDIAN PHARMACEUTICAL INDUSTRY

Industry Characteristics

The evolution of the Indian pharmaceutical industry can be broadly divided into two periods, the pre-patent regime and the post-patent regime. In the pre-patent regime (before 2005), India recognised only process patents, which helped in building the basis of a strong and competitive domestic industry. In 2005, India entered the product patent regime which marked the end of a protected era, and signalled a new phase in the integration of Indian players into the global market. While the earlier process patent regime helped the Indian pharmaceutical industry develop into a world-class generics industry, the product patent regime is aimed at encouraging new drug discoveries over the long-term. However, the launch of patented products in India has been slow.

Exhibit 5.1 : Indian Pharmaceutical Industry Value Chain



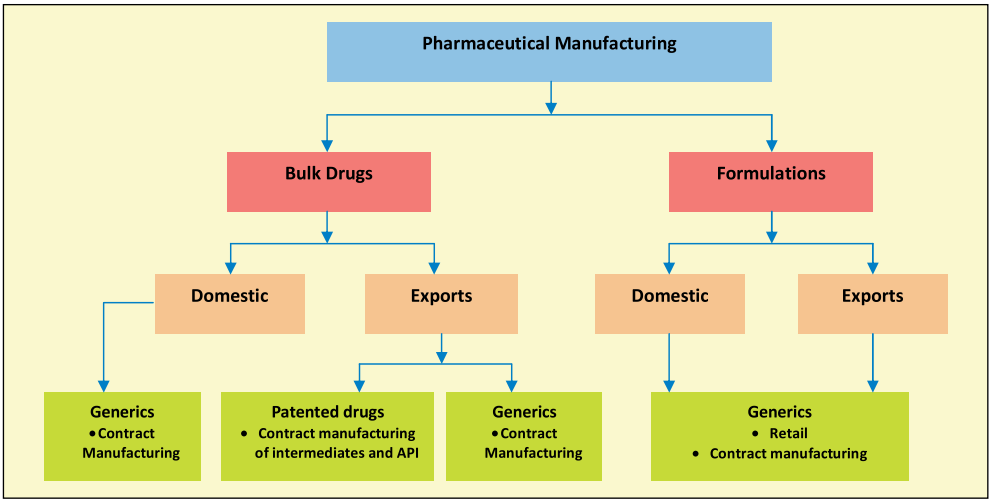
Source: CRISIL Research

India gained a foothold in the global arena, with reverse-engineered generic drugs and active pharmaceutical ingredients (API). India now seeks to become a major player in outsourced clinical research and in the contract research and manufacturing services (CRAMS) segments. India has the highest number of manufacturing facilities (332 sites) approved by the US Food and Drug Administration (US FDA). Further, in 2011, one-third of all Abbreviated New Drug Applications (ANDA) approved by the US FDA, belonged to Indian companies.

Indian pharmaceutical companies have manufacturing opportunities in two segments - formulations and bulk drugs. The formulations segment can be further categorised into domestic consumption and exports. Traditionally, the domestic segment accounts for 40-50 per cent of the total formulations production, with exports accounting for a larger share. In contrast, in the case of bulk drugs, domestic consumption accounts for only 10-20 per cent of the total production.

Hence, the Indian pharmaceuticals industry is dominated by exports (in both, bulk drugs and formulations), which contributed to a majority of the aggregate sales in 2015. Formulations are exported either through contracts (supply) or directly sold (retail) in the market. Similarly, bulk drugs are either supplied under a contract, in case of patented drugs, or are sold outright, in the case of off-patent drugs. In the coming years, Indian pharmaceutical manufacturers are poised to extend their presence in on-patent regulated markets, while maintaining a strong foothold in the generics (off-patent drugs) market as well.

Exhibit 5.2 : Manufacturing by Indian Pharmaceutical Players



Source: CRISIL Research

Over 100,000 drugs, across various therapeutic categories, are being produced in India. The domestic formulations industry is highly fragmented, in terms of both the number of manufacturers and variety of products. There are 300-400 organised players and about 15,000 unorganised players in the manufacturing of pharmaceuticals. However, organised players dominate the formulations market, in terms of sales. In 2014-15, the top 10 formulations companies accounted for 44.9 per cent of total formulation sales. Share of top 7 MNC pharmaceutical companies has reached close to 19.3 per cent as on March 2015.

Industry Performance

Globally, the Indian pharmaceuticals market is estimated to be the third largest in terms of volume and thirteenth largest in terms of value. The value of the Indian pharmaceutical industry is estimated at US$36.8 billion as of 2014-15. Of this, the formulations market accounts for about US$12.2 billion (or Rs 746

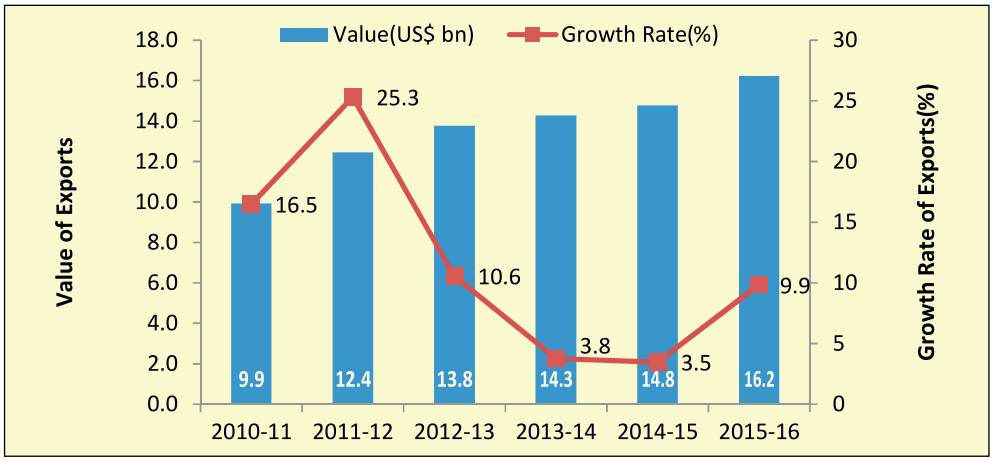
billion) constituting around 1.1 per cent of the global market in value terms. One of the reasons for the lower rank in terms of value, and higher rank in terms of volume is the low cost drugs manufacturing in India; the price differential is estimated to be ranging from 5 per cent to 50 per cent lower as compared to developed countries. The industry has attained self-reliance in the production of formulations, and produces almost 70 per cent of bulk drug requirements of the country. India is also one of the major producers of generic drugs in the world.

Exports

The exports of pharmaceutical products including bulk drugs and drug formulations during the year 2015-16 were valued at US$ 16.2 billion. The exports have displayed a moderate growth of nearly 9.9 per cent during this year despite global slowdown. The growth in exports of bulk drugs and drug formulations had been declining over the years; however, they displayed moderate growth in the year 2015-16. During the year 2010-11, the exports amounted to US$ 9.9 billion and registered growth rate of 16.5 per cent, which increased even further to a growth rate of 25.3 per cent in the following year. However, the growth rate fell in the consecutive year to 10.6 per cent and declined even further to 3.8 per cent in 2013-14. The exports of bulk drugs and drug formulations grew by 3.5 per cent during the period 2014-15, as compared to the previous year. Nevertheless, the exports of bulk drugs and formulations registered moderate growth rate of 9.9 per cent in 2015-16.

The major export destinations for drug formulations during the year 2015-16 were: the USA (with a share of

Exhibit 5.3 : Export of Bulk Drugs and Drug Formulations from India



Analysis based on classification of HS Code by DGCIS as bulk drugs, drug intermediates and drug formulations, biologicals, Sum of exports of both these products
Source: DGCIS (Data Source); Exim Bank Analysis

39.5 per cent) followed by South Africa (4.1 per cent), the UK (3.6 per cent), Nigeria (3.0 per cent) and Russia (2.7 per cent). As can be seen from the Table 5.1, the USA has retained its position as the leading export destination for drug formulations since 2010-11. South Africa has become the second largest export destination in 2015-16 as compared to the third largest in 2010-11. The UK has improved from the fourth largest to the third largest market for drug formulations exports from India during the six year period 2010-11 to 2015-16.Other markets which have emerged as major markets during the year 2015-16 are Brazil, Tanzania, Australia and Myanmar.

The USA is the leading importer of bulk drugs from India and its share in the aggregate exports during the year 2015-16 was approximately 11.2 per cent. The other significant importers of bulk drugs from India are Germany (4.2 per cent), Turkey (3.4 per cent), Iran (3.3 per cent),Brazil (3.2 per cent), and Egypt (3.2 per cent).

India's Market Share in Select Regions

India exports both bulk drugs, intermediates and drug formulations, biologicals. However, share of formulations (78 per cent) in total export of pharmaceuticals is higher than that of bulk drugs (22 per cent).

India's exports of pharmaceutical products (HS Code 30) has been increasing from US$ 1.0 billion in 2001 to US$ 11.7 billion in 2014 showing a

Table 5.1 : India's Major Export Destinations for Drug Formulations, Biologicals

2010-11			2015-16		
Importers	**US$ million**	**Share (%)**	**Importers**	**US$ million**	**Share (%)**
The USA	1775.8	28.2	The USA	4993.3	39.5
Russia	399.6	6.3	S Africa	519.4	4.1
S Africa	274.0	4.3	The UK	458.6	3.6
The UK	272.4	4.3	Nigeria	382.6	3.0
Nigeria	190.3	3.0	Russia	343.7	2.7
Kenya	156.9	2.5	Kenya	292.4	2.3
Germany	133.9	2.1	Brazil	201.5	1.6
The Netherland	129.6	2.1	Australia	200.1	1.6
Ghana	116.9	1.9	Sri Lanka	185.4	1.5
Sri Lanka	115.5	1.8	Tanzania	172.0	1.4
Total	**6306.8**	**100.0**	**Total**	**12646.6**	**100.0**

Source: DGCIS, Exim Bank Analysis

Table 5.2 : India's Major Export Destinations for Bulk Drugs, Intermediates (2015-16)

Importers	Value (US$ mn)	Share (%)
USA	401.3	11.2
Germany	149.1	4.2
Turkey	122.8	3.4
Iran	119.0	3.3
Brazil	115.0	3.2
Egypt	114.7	3.2
Mexico	112.5	3.1
Israel	111.1	3.1
China	110.7	3.1
Japan	106.6	3.0
Total	**3588.3**	**100.0**

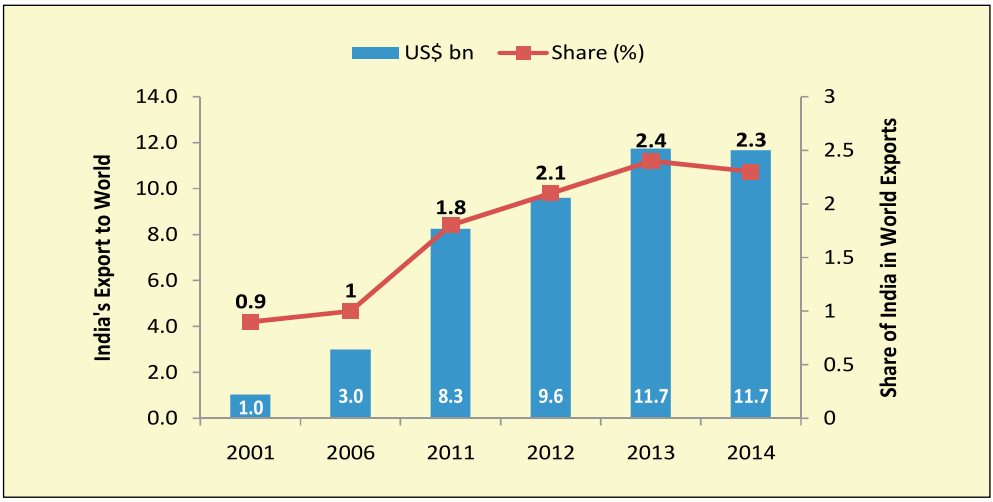
Source: DGCIS, Exim Bank Analysis

CAGR of 21 per cent. From being the fifteenth largest exporter in 2010, India has risen to the rank of being twelfth largest exporter in the world during 2014. The share of India's export of pharmaceutical products to world's exports has increased considerably from 1 per cent in 2006 to 2.3 per cent in 2014.

EU (27)

The EU (27) is the largest pharmaceutical market in the world. In the year 2014, EU imported pharmaceutical products worth US$ 260 billion. Germany with a share of 18.9 per cent in total imports was the largest importer, in the EU, followed by Belgium (15.1 per cent), the UK (12.9 per cent), and France (10.7 per cent). The EU imported 49.5 per cent worth of global pharma imports during the year 2014. The USA is the largest supplier of pharmaceutical products to the EU (27) and its share in the aggregate EU imports during

Exhibit 5.4 : India's Exports to the World and Share of India in World Exports



Source: Trademap, ITC Geneva, Exim Bank Analysis

the year 2014 was nearly 14.6 per cent. The other significant suppliers of pharmaceutical products to the EU are Switzerland (9.8 per cent), Ireland (6.8 per cent) and the United Kingdom (5.7 per cent). India accounted for a share of 0.7 per cent in the EU's imports of pharmaceutical products during the year 2014.

During 2015-16, EU accounted for 11.5 per cent share in India's total export of drug formulations and biological. In 2015-16, among the European countries, the UK, with a share of 31.6 per cent, was the largest market for Indian drug formulations and biological, followed by the Netherlands (10.4 per cent), Germany (10.3 per cent) and France (10.3 per cent). The EU is also the largest market for India's bulk drugs exports. In 2015-16, bulk drugs exports from India to the EU amounted to US$ 923.8 million. With 16.1 per cent share in the total bulk drugs imported from India by the EU, Germany is the leading destination, followed by Italy (9.5 per cent).

Table 5.3 : Region-wise Bulk Drug Exports from India (2015-16)

Region	Exported Value (US$ million)
EU	**923.8**
America	**803.6**
North America	570.4
Latin America	233.2
Asia	**923.2**
East Asia	17.7
West Asia GCC	91.6
West Asia Others	281.2
North East Asia	336.7
South Asia	195.9
Africa	**378.5**
West Africa	64.2
Southern Africa	79.1
Central Africa	19.8
East Africa	47.7
North Africa	167.6

Source: DGCIS, Exim Bank Analysis

North America

The USA is the second largest pharmaceutical market in the world. In the year 2014, the USA imported pharmaceutical products worth US$ 73 billion. Major source countries for the USA for pharmaceutical products include Germany (19.3 per cent), Ireland (14.2 per cent), Switzerland (13.2 per cent), India (6.6 per cent) and Israel (6.1 per cent).

USA made up a share of 39.5 per cent in India's total exports of drug formulations and biologicals in the year 2015-16. USA is also a significant market for bulk drug exports from India. In 2015-16, bulk drug exports from India to the USA amounted to US$ 401.3 million which is around 70.4 per cent of total bulk drugs exported to North America.

Africa

Africa imported pharmaceutical products worth US$ 15.1 billion during

2014. Among the African countries, Algeria with a share of 16.7 per cent in total imports was the largest importer followed by South Africa (13.7 per cent), Egypt (12.5 per cent), Morocco (3.9 per cent), Tunisia (3.8 per cent) and Kenya (3.5 per cent). India was the second largest source country for pharmaceutical products for Africa with a share of 17.7 per cent. The major source countries for Africa include France with a share of 18 per cent, Switzerland (6.4 per cent) and the USA (5.5 per cent).

Africa as a region accounted for 21.3 per cent in India's total exports of drug formulations and biological during the year 2015-16. In 2015-16, bulk drug exports from India to Africa amounted to around US$ 378.5 million.

Asia

Asia imported pharmaceutical products worth US$ 84.5 billion during the year 2014. Among Asian countries, Japan with a share of 23.6 per cent in total imports was the largest importer followed by China (21.0 per cent), South Korea (5.7 per cent), Turkey (5.2 per cent) and Saudi Arabia (5.2 per cent). The main source countries for Asia include: Germany (16.2 per cent), the USA (14.9 per cent), Switzerland (9.4 per cent), and France (8.8 per cent). India's share in Asia's import of pharmaceutical products was 2.3 per cent during 2014.

During 2015-16, Asia's share in India's total exports of drug formulations and biologicals stood at 7.8 per cent. During 2015-16, bulk drugs exports from India to Asian region amounted to around US$ 923.2 million, which is around 25.7 per cent of total bulk drugs exported from India.

Latin America

Latin America imported pharmaceutical products worth US$ 26.6 billion during 2014. Among Latin American countries, Brazil with a share of 27.9 per cent in total imports was the largest importer followed by Mexico (18.6 per cent), Colombia (9.0 per cent) and Venezuela (8.9 per cent). The main source countries for Latin American countries for pharmaceuticals imports include: USA (18.5 per cent), Germany (15.0 per cent), Switzerland (7.7 per cent) and France (7.5 per cent). India's share in total imports of pharmaceutical products by Latin America stood at 3.2 per cent, during 2014.

Latin America's share in India's total exports of drug formulations and biologicals stood at 5.2 per cent in 2015-16. Latin America accounts for 6.5 per cent (US$ 233.2 million) of total bulk drugs exported from India during the year 2015-16. Brazil was the third major export destination for bulk drugs exported from India.

Key Industry Trends

The overall exports to regulated market grew at 5 per cent in 2014-15. Sales to the regulated market were impacted by sales in some regulated European markets declining by 3.6 per cent. Moreover, Indian players were impacted by lacklustre business in some countries and adverse movement in the euro-dollar exchange rates. On the other hand, exports to the North American markets grew at a moderate 9 per cent, with exports to the US growing only by 9.4 per cent. Much of the growth came from the existing product portfolio of companies, with only few launches, amid slowdown in approvals from the US Food and Drug Administration (FDA). Exports to semi-regulated markets rose by 3 per cent in 2014-15, mainly affected by the Russian- Ukraine crisis, which led to significant currency depreciation in these countries. However, exports to Africa and Asia are expected to have grown in 2015-16. This growth is expected to be led by Africa, which is expected to continue to import large quantities of drugs such as anti-retroviral (ARV), anti-malarial, anti-infective from India. India's strong presence in the ARV, anti-malarial and anti-tubercular segments, which is majorly imported in Africa, is projected to remain the key driver. Further, many large Indian companies such as Ranbaxy are direct suppliers to large institutional buyers such as the United Nations Children's Fund, United Nations Development Programme and International Development Association, which is also forecast to further the industry's growth in near to medium term.

Key Segments

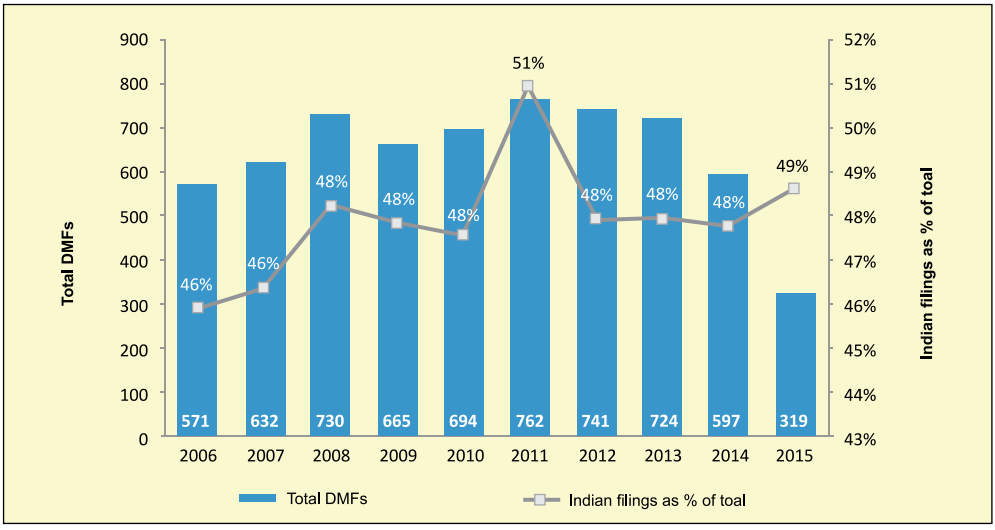
India's bulk drug exports have displayed lesser growth rates in 2014-15, due to decline in end-use formulations demand, as formulators had to contend with slowdown in dossier approvals and severe competition; primarily affected the off-patent generic active pharmaceutical ingredient (API) market. Generic off-patent bulk drug exports to regulated markets are projected to drive the growth. Significant patent expiries, coupled with pro-generic stance in the US and Europe, are expected to drive the demand for Indian generic drug formulations. Also, as many generic formulators look to improve profitability, greater outsourcing from Indian industry is likely. Hence, bulk drug exports of off-patent drugs are expected to rise. Comparatively, growth in demand for on-patent drugs is expected to be slower vis-a-vis off-patent API, mainly due to slower growth in the branded medicines market as compared to generics medicines market in Europe and the US. Of the total drug master filings (DMFs) sent to the US FDA in 2015, India's share has risen sharply to about 49 per cent, for the six months ending June 2015 from about 19% in 2001 indicating

the capability of Indian players to meet the required export quality standards for regulated markets. ADMF is an indicator of the bulk drug manufacturing capabilities of players (in terms of quality standards at their facilities for processing, packaging, storage of drugs), which is used by global pharmaceutical companies that are outsourcing production activities (innovator). India is considerably ahead of its competitors in terms of total number of DMFs. While India had over 2,183 DMFs from January 2009 to June 2015, its closest competitor, China, had only about 878.

M&A[17]

During 2015, Indian pharmaceutical industry reported an increase of 340 per cent in total value of cross-border M&A transactions; however, the overall activity fell 30 per cent to US$ 3.7 billion. Out bound deals contributed around US$ 2 billion and in bound deals contributed around US$ 1 billion. The surge in out bound activity was mainly due to the consolidation in the US generics market. However, this was not enough to offset the effects of decreasing domestic consolidation. Some of the notable transactions in the year includes acquisition of US based Gavis Pharmaceuticals and Novel Laboratories by Indian pharma major Lupin for US$ 880 mn. This is reported as the largest buyout of a foreign pharma company by an Indian firm. Gavis specializes in niche dermatological and psychiatric segments. The acquisition offers a number of synergies: first US

Exhibit 5.5 : DMF Filings (Global vs India)



Note:*Active, Type II DMFs considered till June 2014
Source: US FDA, CRISIL Reserach

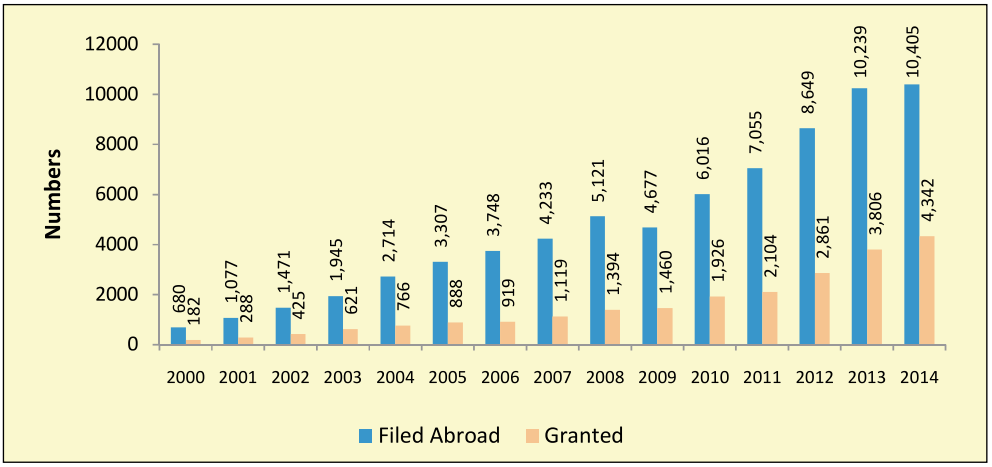
[17]IMAP's Pharma & Biotech Industry Global Report - 2016

manufacturing plant, controlled substances and derma capabilities. Lupin expects Gavis to contribute approximately US$ 300 mn in revenues by 2017-18 as based on estimated approvals of around 50 (66 pending ANDAs) in the next 3 years. Another notable acquisition include, acquisition of InvaGen and Exelan Pharmaceuticals, two US based generic manufacturers by large Indian generic drug manufacturer, Cipla Pharmaceuticals for US$ 550 mn. With the acquisition of InvaGen, Cipla envisages to gain scale in the US generics market and a complementary product portfolio in cardiovascular, anti-infective, anti inflammatory, antidiabetic and antidepressant therapeutic areas with various dosages. While InvaGen adds US-based manufacturing and a strong near-term revenue potential (given 40 approved / 30 pipeline ANDAs, with 5 FTFs), Exelanis forecast to provide Cipla with access to incremental business channels, including to the US government. The most prominent inbound deal of 2015 was the acquisition of FamyCare's female healthcare business by global generics company Mylan for over US$ 750 mn. As a result, Mylan is projected to gain access to a wide range of women's health products and a dedicated hormone manufacturing unit.

Patents

The patents filed by, and granted to Indian companies have been increasing significantly. Indian companies have filed large numbers of Drug Master Files and Abbreviated New Drug Applications (ANDA) with US-FDA.

Exhibit 5.6 : Patents Filed by India outside India (2000-2014)



Note: This data is not restricted to pharmaceutical; major share (19.9 per cent) of patent application for 2014 were for pharmaceuticals
Source: World Intellectual Property Organization (WIPO) 2016; Exim Bank Analysis

Table 5.4 : Patents Filed and Granted in the Pharmaceuticals Sector by the Indian Patent Office

Year	Patents in Pharmaceuticals			Total Patents	
	Filed	Granted	Share of patent granted to filed (%)	Filed	Granted
2008-09	3672	1207	32.9	36812	16061
2009-10	3070	530	17.3	34287	6168
2010-11	3526	596	16.9	39400	7509
2011-12	2762	282	10.2	43197	4381
2012-13	2954	452	15.3	43674	4126
2013-14	2507	256	10.2	42951	4226

Source: Office of the Controller General of Patents, Designs, Trademarks and Geographical Indicators, India; Exim Bank Analysis

According to the World Intellectual Property Organisation (WIPO), among the patents filed by India during 2014, pharmaceutical companies is reported to have the major share of 19.9 per cent. According to the Indian Patent Office (IPO), during 2013-14, a total of 42,951 patents were filed, of which only around 5.8 per cent were filed in the drug and pharmaceutical sector; and of the total 4,226 patents that were granted in the year, around 6.0 per cent share was for pharmaceuticals. A downward trend in patent application in the sector has been observed during 2013-14. Of the total of 4,226 patents granted by the IPO only 634 were granted to Indian applicants.

R&D

In the recent years, Indian pharmaceutical companies have significantly increased their R&D budgets in view of their growing focus both on regulated markets and complex molecules / therapy segments. In 2014-15, most of the leading pharma players spent anywhere between 5 billion to 12 billion on R&D, which represented an increase both in absolute terms as well as in proportion to net revenues (8-11 per cent of sales).

Table 5.5 : R&D Expenditure of Select Indian Pharmaceutical Companies

Company Name	2013-14			2014-15		
	₹ Million		R&D as % of sales	₹ Million		R&D as % of sales
	Sales	R&D Expenses		Sales	R&D Expenses	
Cipla Ltd.	95587.2	5119.3	5.4	102277.9	7140.4	7.0
Dr. Reddy'S Laboratories Ltd.	98100	9982	10.2	100939	11230	11.1
Lupin Ltd.	89775.7	9294.1	10.4	98323.2	10987.8	11.2
Sun Pharmaceutical Inds. Ltd.	29958.8	3752.3	12.5	82663.5	8302.9	10.0
Aurobindo Pharma Ltd.	72699.7	2550.5	3.5	82583.5	3182.4	3.9
Glenmark Pharmaceuticals Ltd.	24387.1	1213.6	5.0	52860.3	2773.1	5.2
Cadila Healthcare Ltd.	36916	4358	11.8	49721	5240	10.5
Torrent Pharmaceuticals Ltd.	33586	1454.7	4.3	34811.8	1658.7	4.8
Glaxosmithkline Pharmaceuticals Ltd.	26650.2	26.3	0.1	34520.3	21.9	0.1
Alkem Laboratories Ltd.	27815.2	1529.1	5.5	32552.7	1513.1	4.6
Ipca Laboratories Ltd.	32965.7	1243.7	3.8	31387.8	1200	3.8
Divi'S Laboratories Ltd.	25329.5	253.9	1.0	31115.1	276.6	0.9
Abbott India Ltd.	23036.2	16.2	0.1	23002.4	11.7	0.1
Biocon Ltd.	22393	705	3.1	22742	1011	4.4

Source: CMIE

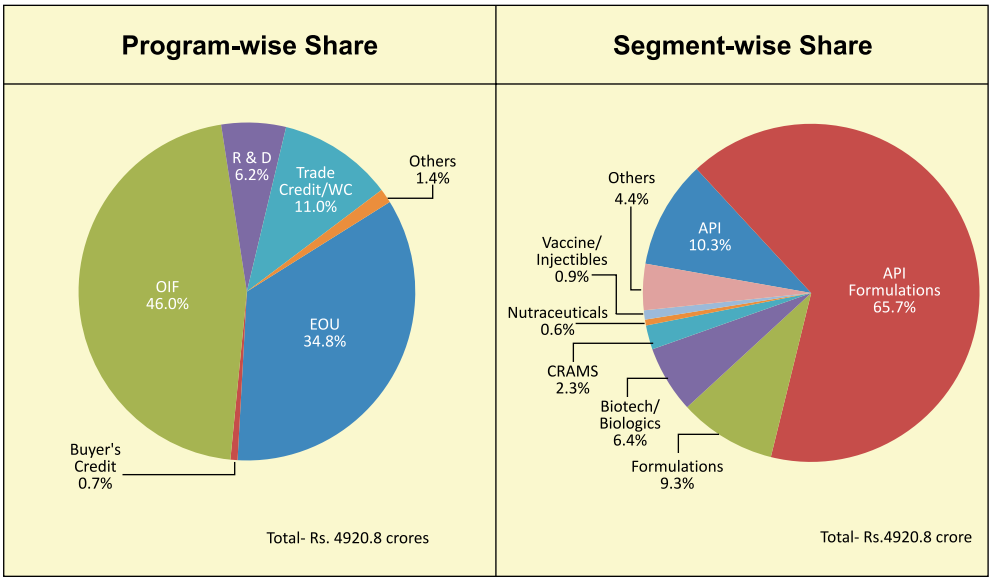
Role of Exim Bank in Promoting Indian Pharmaceutical Sector

Exim Bank has been closely associated with the export efforts of Indian pharmaceutical industry, in its entire value chain. Exim Bank has been providing support to all segments in the pharmaceutical value chain. A schematic segment wise and program-wise representation of the companies supported by the Bank in this sector is provided in Exhibit 5.7.

Pharmaceutical sector is one of the focus sectors of the Bank. On the whole, Exim Bank's exposure to pharmaceutical industry as on 31st March 2016 is Rs 4,921 crores, a share of 4.8 per cent in total credit exposure to all industries.

The Bank has been largely supporting the Indian pharmaceutical companies by providing term loans for domestic expansion projects and term loans for overseas acquisitions, besides loans for research and development.

Exhibit 5.7 : Exim Bank Supported Companies in Pharmaceutical Industry



Source: Exim Bank Analysis

Table 5.6 : Credit Flow to Pharmaceutical Industry

Year	Credit flow to Pharmaceutical Industry (outstanding as at end March)		Exim Bank's Exposure to Pharmaceutical Sector (as at end March)	
	Value (Rs. Bn)	Share in Total Gross Bank Credit to Industry (%)	Value (Rs. Bn)	Share in Total (%)
2010-11	405	2.53	37.33	8.68
2011-12	460	2.38	35.87	6.61
2012-13	495	2.22	38.54	6.28
2013-14	487	1.93	38.28	6.24
2014-15	493	1.85	41.06	4.72
2015-16	535	1.96	49.21	4.80

Source: RBI; Exim Bank Analysis

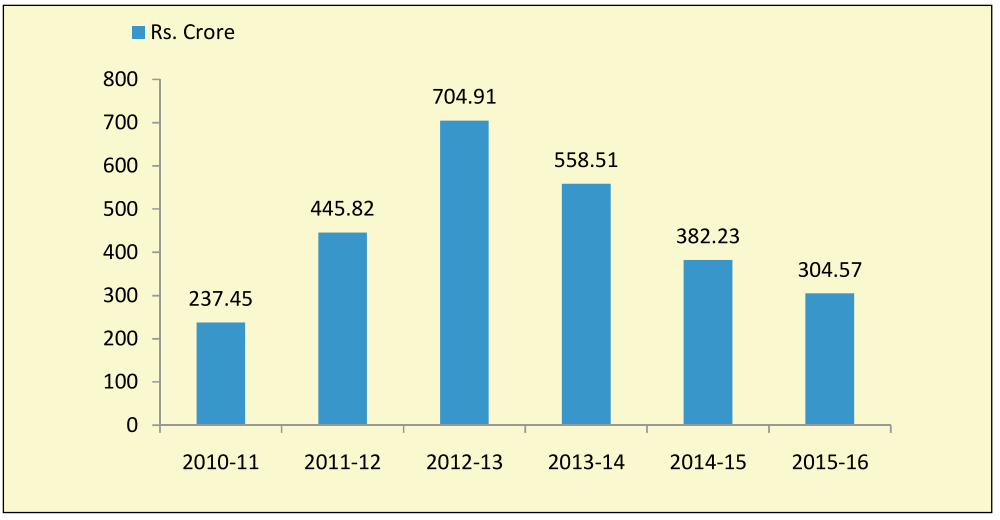
Finance for R&D of Pharmaceutical / Biopharma companies

In view of several of the drugs going off-patent and high cost of R&D investment, financial assistance is required by pharma and biopharma companies from banks/financial institutions with longer moratorium period. The need and nature of funding differs for medium and large pharmaceutical companies. Medium-sized companies generally have a pure debt financing requirement to finance research and development costs for obtaining IPRs/regulatory approvals. However, large companies need finance, both by way of debt and equity through special purpose vehicles being set-up which are focused on the activity of developing products, and for basic research work including clinical trials with the objective of obtaining IPRs/product approvals from overseas regulatory authorities. Accordingly, Exim Bank finance pharmaceutical or biopharma companies to fund the research and development, new product development and other related costs for obtaining Intellectual Property Rights/ regulatory approvals in regulated overseas markets. Financing by Exim Bank is in the form of either term loan/equity participation or a hybrid product.

Finance for Overseas Investment of Pharmaceutical / Biopharma Companies

The pharmaceutical industry is continuing its progress in fundamental restructuring. In this environment, acquisitions and divestments are essential means to achieve strategic

Exhibit 5.8 : Exim Bank Support to Pharma Sector for R&D

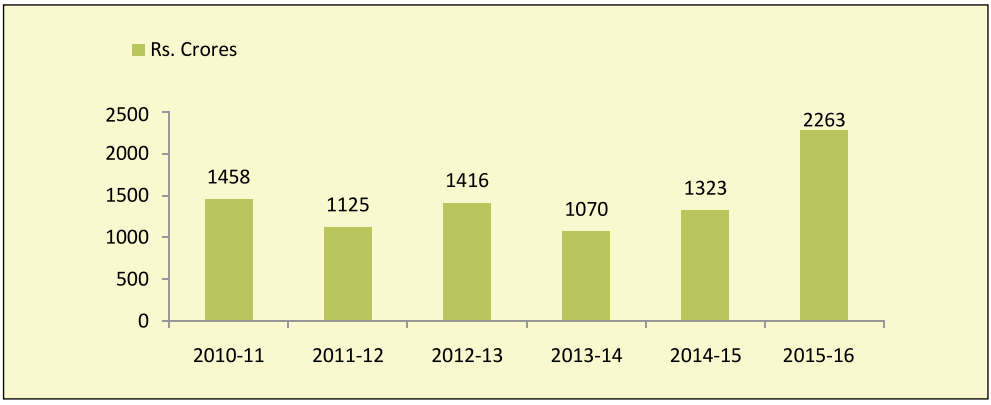


Source: Exim Bank Analysis

objectives. The Bank supports the pharmaceutical companies in their strategic investments abroad for, inter alia, setting up manufacturing units and for acquiring overseas companies to get access to the foreign market, technology, raw material, brand, and IPR.

Exim Bank's support to pharma companies for overseas investments as on end of FY 2015-16 was Rs. 2262.7 crores. Schematic presentation of Exim Bank's support to the Pharma sector for their overseas investment is given in Exhibit 5.9.

Exhibit 5.9 : Exim Bank Support to Pharma Sector for Overseas Investment



Source: Exim Bank Analysis

6. VACCINES AND BIOSIMILARS

The market for vaccines in India is characterised by tremendous potential. In the case of vaccines, India is able to fulfil its domestic needs and has also been ranked among the major global exporters of vaccines in the world. The commencement of the vaccine market in India was done by state-owned manufacturers which were involved in the provision of fundamental childhood vaccines to the immunization programme. In the recent years, the emergence of private manufacturers in the segment has enhanced focus on the sector with a changed industry landscape. There exists increasing opportunity for the development of biosimilar industry in India due to augmentation in patent expiries for biologic drugs. Furthermore, India has the edge in biosimilar products over other competing countries due to lower development cost. Thus, Indian firms are developing their manufacturing abilities and are collaborating with multinational companies for clinical trials.

VACCINES

Vaccines Market

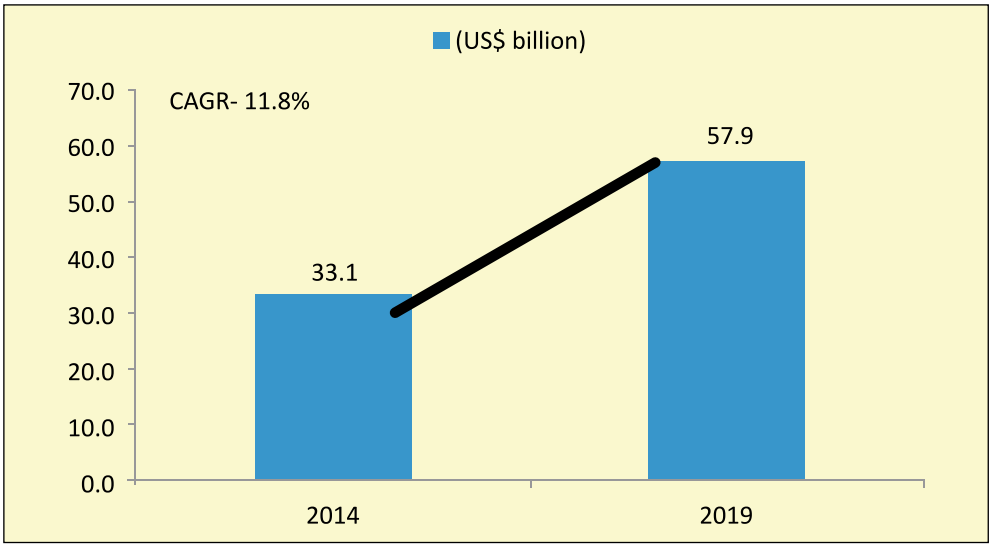
As per the WHO, a vaccine is a biological preparation that improves immunity to a particular disease. The Pediatric Vaccines segment includes vaccines for many diseases, such as pneumococcal, polio, varicella, meningococcal, rotavirus, DTP, measles, mumps and rubella (MMR), and tuberculosis. The Therapeutic Vaccines segments include vaccines for diseases such as hepatitis B, malaria, yellow fever, rabies, Japanese encephalitis, typhoid, West Nile, HIV, cancer, and influenza.

Global Scenario

In the Pharmaceutical and Healthcare Industry vaccines have been one of the most rapidly growing segments. The global vaccine market was valued at US$ 33.1 billion during the year 2014, and is expected to increase at a CAGR of 11.8 per cent and reach an estimated value of US$ 57.9 billion during the year 2019. The global vaccine technology market includes various human vaccines, which enable the prevention and treatment of diseases, such as cholera, typhoid and influenza. There are various factors which are propelling the growth of this industry,which include high prevalence of diseases, an

augmentation in the expenditure on vaccine developments, rise in Government initiatives worldwide for extending greater immunization along with the increasing efforts taken by non-governmental organisations for expanding vaccination. Consequently, an expansion in the vaccines market is expected in the future. However, certain challenges, such as lesser accessibility of vaccines in remote areas and stringent regulatory procedures act as impediments to the growth of this industry.

Exhibit 6.1 : Global Vaccines Market (Forecast)



Source:Vaccines Market by Technology, Type, End User, Disease Indication - Forecasts to 2019; Markets and Markets

About 80 per cent of global vaccine sales come from five large multi-national corporations (MNC) that are the product of various mergers and acquisitions of pharmaceutical companies over the past decades. While maintaining a strong focus on vaccines for industrialized country markets, MNCs also sell their products in developing countries and emerging markets and participate in Global Health Initiatives. To compete in these markets, MNCs often outsource and participate in joint-development activities and technological transfers. Research based manufacturers are represented by the International Federation of Pharmaceutical Manufacturers and Associations. The market for vaccines involves Governments of industrialized and developing countries, pooled procurement agencies, the private sector, various regulatory and advisory bodies overseeing vaccine quality and safety[18].

[18]WHO

Table 6.1 : Major Exporters and Importers of Human Vaccines (HS Code 300220) in the World

Exporters	2014	Share in global exports	Importers	2014	Share in global imports
	US$ bn	%		US$ bn	%
Belgium	10.5	36.5	Belgium	7.6	25.8
France	5.1	17.7	France	3.9	13.4
Ireland	2.7	9.5	The USA	3.6	12.2
The United Kingdom	2.5	8.7	Germany	1.8	6.0
The USA	2.4	8.5	The Netherlands	1.5	5.2
Germany	1.1	3.8	The United Kingdom	1.4	4.9
The Netherlands	0.9	3.2	Brazil	0.9	3.1
Italy	0.7	2.6	Italy	0.5	1.9
India	0.6	2.0	Japan	0.5	1.8
Canada	0.5	1.8	Mexico	0.4	1.5
World	**28.8**	**100.0**	**World**	**29.2**	**100.0**

Source: Trademap, ITC Geneva, Exim Bank Analysis

The exports of human vaccines have increased at a CAGR of 11.2 per cent during the period 2011 to 2014. With a share of 36.5 per cent in the global exports, Belgium is the leading exporter of human vaccines during the year 2014. France is the second largest exporter of this product and the value of exports amounted to US$ 5.1 billion in the same period. The other significant exporters of human vaccines are Ireland, the United Kingdom, the United States of America and Germany, with shares of 9.5 per cent, 8.7 per cent, 8.5 per cent and 3.8 per cent respectively.The imports of human vaccines have increased at a CAGR of 18.9 per cent during the period 2011 to 2014 with the aggregate imports in 2014 amounting to US$ 29.2 billion. Belgium is the leading importer of human vaccines and constituted nearly 25.8 per cent of the aggregate imports. The other major importers of human vaccines are France, the United States of America, Germany and the Netherlands.

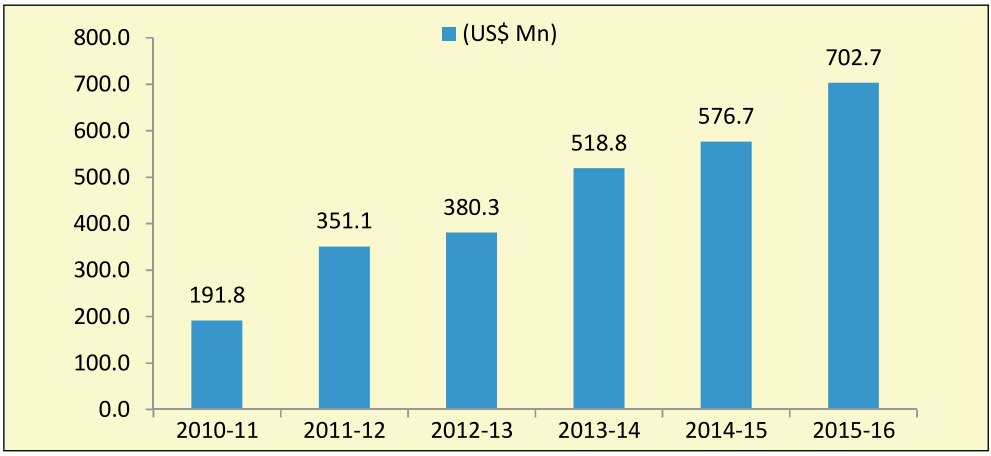
The exports of veterinary vaccines increased at a CAGR of 12.3 per cent during the period 2011 to 2014 with the value of exports in the year 2014 amounting to US$ 125.8 billion. The significant exporters of animal vaccines are Switzerland, Germany, Belgium, the United States of America and the United Kingdom.The imports

of vaccines for veterinary uses have increased at a CAGR of 6.9 per cent during the period 2011 to 2014. China is the largest importer of veterinary vaccines and its share in total imports were 6 per cent. China is followed by the United Kingdom (5.1 per cent), Brazil (4.0 per cent), France 4.0 per cent), Germany (3.9 per cent) and Spain (3.9 per cent).

Indian Scenario

India is a major vaccine producer and has 18 major vaccine manufacturing facilities. These vaccines are used for national and international markets (150 countries) which makes India a major vaccine supplier across the globe. More than 70 per cent of all measles vaccines used globally are produced in India[19].

Exhibit 6.2: Exports of Indian Human Vaccines



Source: DGCIS, Exim Bank Analysis

The exports of Indian vaccines were valued at US$ 702.7 million during the year 2015-16. These exports have risen at a CAGR of 29.7 per cent during the period 2010-11 to 2015-16. During the year 2015-16, the exports of vaccine increased at a year-on-year growth rate of 22.9 per cent. Nigeria was the leading export destination of Indian human vaccines and its share in the aggregate exports was nearly 12.2 per cent during this period. There are various African countries which are among the significant importers of human vaccines from India. Kenya, Congo D Republic, Ethiopia and Egypt, had shares of 5.6 per cent, 5.1 per cent, 4.8 per cent and 4.6 per respectively, during the year 2015-16.

The exports of animal vaccines from India during the year 2015-16 amounted to US$ 4.6 million. The exports of animal vaccines have

[19]WHO

Table 6.2 : Export Destinations of India's Human Vaccines

Export Destination	2014-15	2015-16
Nigeria	59.1	85.9
Kenya	19.4	39.6
Congo D Republic	17.1	35.5
Ethiopia	23.4	33.7
Egypt	19.9	32.2
Brazil	70.8	28.3
Philippines	22.6	20.3
Sudan	9.2	18.3
Mexico	3.2	17.3
Cameroon	8.1	17.0
Total	576.6	702.7

Source: DGCIS, Exim Bank Analysis

declined by nearly 14.8 per cent during the year 2015-16. Animal vaccines exported from India have decreased at a CAGR of 0.3 per cent, as the value of exports fell from US$ 4.7 million in 2010-11 to approximately US$ 4.6 million in 2015-16 .

Regulatory Procedure

India has shown a commitment and a strong political will to strengthen and build capacity of the National Regulatory Authorities (NRA). There is provision of large funds for strengthening drug regulatory authority and drug testing laboratories in the 12th Five Year Plan of the GOI and funds have been allocated appropriately. In the WHO NRA Assessment of the National Regulatory Authority, conducted in December 2012, India has been declared as 'functional' against the indicators. The effective regulatory oversight of vaccines is especially crucial for India, which is one of the major vaccine producers and also suppliers across the globe. The WHO had scaled up its technical support to the Indian NRA over the past several months in the context of this assessment. The recent success is a culmination of intensive efforts by the Central Drugs Standard Control Organization (CDSCO), in collaboration with the WHO, to implement the roadmap to strengthen capacity for regulation of vaccines. With a regulatory system for vaccines assessed as functional by the WHO, vaccine manufacturers in India continue to remain eligible to apply for prequalification of specific products[20].

UNICEF, GAVI and PAHO Markets

The Indian firms that have achieved WHO prequalification have participated in two major international pooled procurement schemes- The United Nation's Children's Emergency Fund (UNICEF) Supply Division and The Pan American Health Organization (PAHO) Revolving Fund. PAHOS's Revolving Fund for Vaccine Procurement is a mechanism developed by the Pan American Health

[20]Policy Landscape Reforms for Strengthening Indian Pharmaceutical Industry, 2015

Organization in 1979 for the purchase of vaccines, syringes/needles, and cold chain equipment for countries in Latin America and the Caribbean. Through a system of bulk purchasing, the Fund has secured for the past 20 years a supply of high quality vaccines for national immunization programs at affordable prices, and it has also allowed for the orderly planning of immunization activities. In these schemes vaccines are bought from developing countries in order to ensure continued supply of basic vaccines at affordable prices by the UNICEF with financing from the Global Alliance for Vaccines and Immunization (GAVI)[21]. During the year 2013, among the supplier countries to UNICEF, India was leading with procurement worth US$ 676 million[22].

BIOSIMILARS

Biosimilars Market

Biosimilar medicines are follow-on versions of original biological medicines. These products can be developed during the period in which the originator product is protected by patent exclusivity, but they can be marketed only after the patent protecting the original product has expired. Biosimilar medicines are independently developed to have similar mechanism of actions as the original biological medicine, and are designed to treat the same disease as the innovators product. As defined by the FDA “Biosimilars are a type of biological product that are licensed (approved) by FDA because they are similar to an already approved

Table 6.3 : Differences between Biosimilars and Generics

Biosimilars	Generics
Similar to, and not identical to reference product	Bioequivalent and identical to reference product
20-30% discount over reference product	80-90% discount over reference product
US$ 100 mn - US$ 200 mn in development costs	US$1 mn - US$ 5 mn in development costs
8 - 10 year development timeline	3 - 5 year development timeline
No interchangeability or automatic substitution*	Interchangeable with reference product

*France allows automatic substitution for biosimilars under certain conditions
Source: Winning with biosimilars: Opportunities in global markets

[21]The GAVI Alliance is a Geneva-based public-private partnership aimed at improving health in the world’s poorest countries. The Alliance brings together developing country and donor governments, the World Health Organization, UNICEF, the World Bank, the vaccine industry in both industrialised and developing countries, research and technical agencies, NGOs, the Bill & Melinda Gates Foundation and other private philanthropists

[22]UNICEF Supply Annual Report 2013

biological product, known as biological reference product and have been shown to have no clinically meaningful difference from the reference product."

The global biosimilars market is expected to reach US$ 25 billion- US$ 35 billion by the year 2020. Ever since the approval of the first biosimilar in the European Union in 2006, there are more than 700 biosimilars approved or in the pipeline globally.

Developed Markets

The developed markets of the United States, the European Union and Japan give access to near- term growth opportunities for the biosimilars market. However, long term growth prospects are subject to clarity in the regulatory compliances and the acceptability by patients and physicians with regard to the safety and the effectiveness of biosimilar products.

Emerging Markets

There is untapped demand for biosimilars in the emerging markets and there is huge potential for growth of this product category in the developing economies. Mass consumers in the emerging economies have low affordability for high priced biologics, owing to restricted financial prowess. The Governments in such countries have been increasing their focus on limiting cost and augmenting access to medicines. Although the emerging market countries each have different healthcare systems in place, studies have shown that the cost is the key barrier to the use of biologics in all of these markets[23]. Nonetheless, biosimilar approval pathways are in place for a majority of these countries.

Challenges faced by the Industry

Regulatory Uncertainty

The regulatory policies adhering to biosimilars are mercurial and lack consistency. The guidelines and policies in significant markets like China are inconsistent and unclear. During the year 2010, the Biologics Price Competition and Innovation Act (Biosimilars Act) was enacted as a part of the Affordable Care Act to set a standard for an abbreviated approval process for biosimilars. The Biosimilars Act outlined the approval pathway and timeline for biosimilar and designated the task of implementation to the FDA. The FDA subsequently released six Guidance documents to clarify some of the ambiguous provisions of the Biosimilars Act, added new restrictions and tightened the standards for some restrictions. Despite these attempts, both the Biosimilars Act and the FDA Guidance Documents remain unclear on several fronts[24].

[23]Winning with biosimilars: Opportunities in global markets
[24]Biosimilar Regulation: Bringing the UnitedStates Up To Speed with Other Markets

Reluctance in Prescribing

Biopharmaceutical drugs are produced using a living system, or a genetically modified organism. Compared to traditional chemical drugs, even a minor change in the conditions, formulation, or processes can change the final product drastically. Slight changes in the manufacture of biopharmaceutical drugs and biosimilar medicinal products can, to a very great extent, affect the efficacy of therapeutic molecules. Biopharmaceuticals drugs are developed using a living system, or genetics dramatically affect the safety and efficacy of the therapeutic molecules. Physicians have been hesitant to adopt biosimilars unless these agents demonstrate useful clinical data. Gastro enterologists and rheumatologists in the US and in the Europe have a low or medium-low likelihood of prescribing a biosimilar for an indication for which biosimilars have not been clinically tested. Thus, many healthcare providers are reluctant to prescribe biosimilar products, which pose a major challenge to the growth of the market[25].

Complexities in Production

Unlike generics, the cost, time and risk of biological production are higher, and these are typically passed on to the consumer in terms of higher prices. While generics cost between US$ 1 million and US $ 5 million to develop, biosimilars cost between US$ 100 million and US$ 200 million[26]. The production of biosimilars is complicated due to the complexity in exactly emulating the structure or manufacturing of the original biologic.

Competition

Biosimilars are anticipated to engage primarily in 'brand-on-brand" competition with their reference therapies. Also unlike generics, which are heavily discounted, biosimilar discounts can be offset by rebates and service agreements for branded biologics, thereby making biosimilars less attractive. With more sophisticated and long term biologic treatments and the associated treatment chronicity, it could take longer to demonstrate and convince stakeholders of the benefits of switching[27].

Indian Biosimilar Industry

The Indian biotechnology sector is one of the fastest growing knowledge based sectors. This sector had a turnover of US$ 7 bn during the year 2015 and has been growing at 16.3%. India ranks among 12 biotech

[25]Global Biosimilars Market; TechNavio Analysis
[26]United States. Federal Trade Commission. "Emerging Health Care Issues: Follow-on Biologic Drug Competition," June 2009
[27]Winning with biosimilars: Opportunities in global markets

destinations in the world, with third position in Asia, after China and South Korea. Indian biosimilar guidelines (2012) are harmonized with the WHO, EMA and PICs principles.

The manufacturing capabilities of Indian companies for developing biosimilars are augmenting as the patent expiries for biological drugs are rising. The firms are increasing their prowess in biosimilar manufacturing by either forming coalition with R&D intensive firms or by way of outsourcing tasks to rapidly developing Indian contract research organizations. India has an edge over its competing countries due to the cost advantage of lower manufacturing cost.

The Indian biosimilar market includes product segments such as insulin, erythropoietin, GCSF, hormones, interferon alpha, thrombolytic, plasma proteins, vaccines, and others. Among these, insulin is the largest segment of the biosimilar market followed by erythropoietin and GCSF. In 2011, there were about 15 epoetin, 8 G-CSF and 4 insulin biosimilars available in the Indian market. The acceptability of biosimilars is higher in the domestic market. Biosimilar substitution is automatic and can take place as soon as a biosimilar is launched[28].

India's Regulatory Framework for Biosimilars

The "Guidelines on Similar Biologics", prepared by the Central Drugs Standard Control Organization (CDSCO) and the Department of Biotechnology (DBT), lay down the regulatory pathway for a similar biologic claiming to be similar to an already authorized reference biologic. The guidelines address the regulatory pathway regarding manufacturing process and quality aspects for similar biologics. These guidelines also address the pre-market regulatory requirements including comparability exercise for quality, preclinical and clinical studies and post market regulatory requirements for similar biologics.

The similar biologics are regulated as per the Drugs and Cosmetics Act, 1940, the Drugs and Cosmetics Rules, 1945 (as amended from time to time) and Rules for the manufacture, use, import, export and storage of hazardous microorganisms/ genetically engineered organisms

[28]India Biosimilar Market Analysis; Research and Markets

or cells, 1989 (Rules, 1989) notified under the Environment (Protection) Act, 1986. Various applicable guidelines are as follows:

- Recombinant DNA Safety Guidelines, 1990
- Guidelines for generating preclinical and clinical data for DNA vaccines, diagnostics and other biologicals, 1999
- CDSCO guidance for industry, 2008:
  - Submission of Clinical Trial Application for Evaluating Safety and Efficacy
  - Requirements for permission of New Drugs Approval
  - Post approval changes in biological products: Quality, Safety and Efficacy Documents
  - Preparation of the Quality Information for Drug Submission for New Drug Approval: Biotechnological / Biological Products
- Guidelines and Handbook for Institutional Biosafety Committees (IBSCs), 2011

7. CHALLENGES AND PROSPECTS

Globally, fluctuating economic conditions continues to be a challenge for the pharmaceutical industry as in the case of other industries. Despite recovery in the US economy, pharma's leading market, the industry is still vulnerable to economic issues, such as sanctions and falling oil prices, stagnating economies, rising debt levels, currency devaluations, recession and inflation, and changing political regimes. In addition, the pharmaceutical industry, in the recent years, is faced with five key challenges. These are mainly with respect to steering market dynamics, pricing and cost pressures, delivering innovation and value, complying with regulatory changes, and operating in a liberalized connected trade environment.

STEERING MARKET DYNAMICS

Changing Demographics

Aging population, growing prevalence of chronic diseases, and rising consumer affordability are expected to continue to change and challenge the global health care and pharmaceutical industry in terms of demand and discovery.

While aging population is foreseen as the long-term growth driver for the pharma industry across economies, such as in the developed economies of Western Europe and Japan, and in emerging economies, such as China, Thailand and Argentina, proliferation of chronic diseases as a consequence of increased life expectancy has been exposing the public health systems to serious challenges in these economies. Diseases, such as obesity, cardiovascular diseases, hypertension, and diabetes are currently, persistent and widespread and challenging the public health systems wihich is struggling to meet the increasing demand for medical services at affordable prices.

Health Care Reforms

In the recent years, countries including the USA, China, Brazil, Germany, France, and the UK have introduced legislations that have been considerably accelerating the transformation of global health care from a volume-based to a value-based sector, significantly impacting the global pharmaceutical industry. Among the key developments,

universal coverage, reducing costs, enhancing innovation and improving market access are the defining goals of healthcare reform. Specific elements of reform vary by country, requiring pharmaceutical companies adopting national approaches. For example, the United States' Affordable Care Act ACA, Britain's Health and Social Care Act, and the laws arising from China's Guidelines on Deepening the Reform of the Health Care System, have many elements that are unique to the countries' national systems.

The principal of universal coverage has been the foundation of healthcare reforms in many countries; in the recent years, for example, the Government of Ireland instituting extensive reforms to replace the current two-tier public/ private health care system with one universal fund; the Government of India setting a target of raising public health expenditure from 1.2 per cent to 2.5 per cent of GDP within five years; and Brazil instituting mandatory pharmaceutical benefits in the private sector, under which over 40 oral oncological drugs have been subsidized. While such increased coverage has resulted in marginal to considerable increase in revenues of pharmaceutical companies, in certain economies drug companies have seen revenues declining as the prescription drug usage have increased. For example, OTC drug companies reported a decrease in revenue in Indonesia under the universal health insurance, instituted in 2014.

Cost containment is a common reform objective in both developed and developing pharmaceutical markets. Most national health care systems have been encouraging the use of generic drugs. For example, in the USA, the proportion of prescriptions with generics has risen from 50 per cent to 80 percent over the last decade. Brazil is in the process of making branded generics and proprietary drugs of greater interest to pharmaceutical companies, and in China, recent reforms have put intense pressure on the prices of all drugs, including generic and over-the-counter (OTC) medicines. In Germany and several other European countries, value-based pricing for new drugs have been introduced, which allows a priced differential from existing offerings, including generics, based on a new product's demonstrated superiority. Developing countries, such as India, Brazil and China, have national lists of essential drugs with set prices.

Another emerging health care reform is spurring product innovation, via value based pricing and other methods. For example, China has identified biotechnology as one of seven strategic industries in its latest five-year reform plan; the Brazilian government is in the midst of a ten-year

biotechnology development program; and UK has been incentivizing pharmaceutical companies by way of tax reduction for carrying out R&D activities in the country.

Third major goal of reform is improving health care access, which involves expansion of insurance coverage, and increasing governments' direct purchase of pharmaceutical products. For example, the Congressional Budget Office(CBO) of the USA has estimated that, by 2020, approximately 24 million people will be covered through the new health insurance exchanges.

While many pharmaceutical companies are addressing these challenges arising out of health care reforms with a reactive approach, many others are considering health care reforms as prominent challenge in the next few years in terms of developing products that meet the goals of reformed systems, such as more patient-focused care. One of the challenging areas for the companies is coping with many regulatory environments, which involves interacting with government agencies (which are created following economic reforms) in various countries, which are in their naïve state of operations.

PRICING AND COST PRESSURE

Price Controls

Reform-driven shift in the pharma industry has resulted in emerging of new business environments which are outcome focused, value-based payment and reimbursement centric. As a result, drug manufacturers have been under constant pressure of justifying cost of their products based on innovation and comparative effectiveness against similar offerings. In the recent years, numerous countries have been instituting reform-driven drug price controls. For example, healthcare plans in the USA envisage controlling drug costs through reference pricing, formularies, and co-payments. Similarly, the Government of China mandates all pharmaceutical procurements in the public hospitals through provincial, centralized bidding system. Reform based governmental control of drug pricing is also seen in UK, Japan and India.

Taxation

With the rise in the number of regulations and stringency, enforcement and penalties also have been rising in highly regulated pharmaceutical markets. Pharmaceutical companies are increasingly exposed to challenges pertaining to tax planning compliance, execution, and tracking. Key challenging areas have been tax risk management, transfer pricing, business model optimization, international taxes, tax data management and analytics, global mobility and skilled workforce management, and tax credit and incentives.

While strategic alliances, such as mergers and acquisitions (M&A) are still considered to be a strategy for growth in the pharmaceutical sector, the recent regulatory crackdown have receded the tax inversion M&A deals. Until 2014, pharmaceutical companies had been taking advantage of the tax regimes of certain countries using acquisitions to shift business to a lower tax location, a practice referred to Base Erosion Profit Sharing (BEPS). The recent G20-OECD Action Plan on BEPS is forecast to result in fundamental changes of the international taxation based on three core concepts: coherence, restoring the principles of the international frameworks, and transparency, which is slated for implementation in 44 countries beginning in 2016. The evolving development as a result of the action plan is projected to slowdown the M&A deals in the sector considerably.

Operational Efficiency

Pharmaceutical companies, particularly in the developing countries have been facing challenges operationalizing and optimizing operations, resulting in expensive and duplication of functions, services, and facilities. Attaining compliance and safety efficiency to address increasing and supply chain risks is also becoming critical for cost overrun for the pharma industry, especially in the emerging markets. Optimizing outsourcing strategies, such as for drug development with CROs and Functional Service Providers (FSPs) are also an area of concern to contain operational and cost benefits.

INNOVATION AND VALUE ADDITION

R&D and Product Development

Product innovation and value addition has become one of the compelling challenges for the global pharmaceutical industry. The recent incidents of patent cliffs involving several branded drugs going off-patent have created downward pressure on the revenues of the large pharmaceutical companies, prompting them for undertaking R&D and new product development. This also implies increased cost on product development and positioning for the companies. In pharmaceutical R&D, productivity is a constant challenge. Main challenges to productivity are managing risk without restricting innovation. Price of failure places increased risk leading the companies to adopt conservative research choices limiting the prospects of discovering genuine ‘breakthrough’ compounds. Consequently, there is considerable multi-disciplinary activity occurring around in today’s pharmaceutical R&D sphere, which requires collaboration and cooperation, both characteristics of new risk-sharing business models, such as joint ventures, partnerships,

and acquisitions. This transition of pharmaceutical R&D from its traditional vertically integrated scientific R&D model to the one focused more on asset management has been throwing newer challenges for pharmaceutical companies in human resources management and operations.

The ongoing patent cliff has also opened up opportunities for generic drugs. In addition, several countries, such as the USA and the Europe through various legislations have been encouraging use and manufacturing of generic drugs. While this has resulted in increased opportunity and competition in the generic industry, increased regulatory pressure on the generic industry introduced by FDA and similar national agencies is also envisaged to slow down the growth of the industry in the medium to long term.

Skilled Manpower

Lack of skilled man power and technology has also been plaguing the sector's pursuit for innovation and value addition, not only in India but also in other emerging markets. Retention of skilled manpower has been a constant challenge for the sector in the developing markets like India. In the recent years, the increasing trend of employing skilled manpower on a contingent, part-time or contract basis has also given rise to depletion of talent pool in the sector. Tightening of work-visas, particularly in the emerging markets, such as in the Southeast Asia also has emerged as considerable challenge for the industry in its innovation objectives.

Outdated IT Infrastructure

Pharmaceutical firms, particularly in the emerging countries including India, are considerably spending to fix operational and compliance issues caused by an outdated digital infrastructure. Additionally, growing data explosion in the pharma industry stemming from digital devices and electronic patient records is increasingly contributing to a need for updated digital infrastructure in the industry. This is challenged by cost and competence of implementation. According to Gartner, IT spending in the healthcare and pharmaceutical sector is projected to grow at an annual average of 5 per cent from 2015 to 2019 to reach US$ 54 billion by 2019. Customer analytics, R&D informatics, social media analytics and mobility are some of the key focus areas of digital technology for the industry to remain competitive and innovative.

REGULATORY COMPLIANCE

Regulatory compliance has emerged as a critical challenge for the pharmaceutical industry, particularly in emerging markets in Southeast Asia, India, China and Latin America.

Noncompliance is cost intensive, and may expose the companies to revenue losses, reputational risks, patient safety issues, criminal sanctions, and can jeopardize the future of the entire business unit. Compliance issues facing the pharmaceutical industry include government policies, drug safety, counterfeiting, information security and privacy, intellectual property protection, corruption and adulteration, and M&A/joint venture (JV) and other third-party risks.

Policies and Regulations

Policies and regulatory frameworks of the US-FDA and EU's EMA have strong implications on the global pharmaceutical industry. While each country develops and enforces its own regulations,increasing numbers of countries are enhancing cross-border agency collaboration to strengthen regulatory decision making and enforcement actions. Drug safety standards, particularly those associated with quality systems implementation, data integrity, and validation of manufacturing and testing processes continue to tighten in many countries around the world. The new and stricter Good pharmaco Vigilance Practice (GVP) module introduced by EMA is proposed to be implemented throughout the EU; increased inspections by US-FDA on India's FDA approved manufacturing units are some examples to cite.

Among recent developments with implications for current and subsequent years is an upward trend in the issuance of Form 483, and warning letters related to unreported adverse events found within third parties and non-safety-related departments at pharmaceutical companies. EU legislation mandating the implementation of new data standards called Identification of Medicinal Products (IDMP), allowing for the unique identification of medicinal products on an international level, by developing a method and process for generating global product identifiers that can then be used for product reconciliation and linkage across the entire product supply chain. Compliance for IDMP is expected to begin in the EU in July 2016 and continue to evolve throughout 2017 and 2018 via iterative rollouts addressing additional scope. Globally, IDMP is envisaged to enhance data transparency and support a variety of product-related activities and events including manufacturing, distributing, and use throughout the global health care marketplace; validating and monitoring correct product usage (based upon a product's labeling information); and tracking adverse events; however, implementation and operationalization of these standards requires significant investment, as this would require to bring key product data into alignment, spanning a wide set of functions covering

R&D, manufacturing and supply chain. While current EU legislations affects all global healthcare and pharma companies that manage investigational and marketed products in the EU markets, it is expected that the other major regulatory agencies, such as FDA and PMDA to also follow suit and adopt and mandate these standards in the coming years.

Other regulatory challenges faced by the pharmaceutical firms include long product registration and approval time, e.g., average two to three years in Southeast Asian markets. For example, China requires local patient trials for product registration while a simple approval of clinical trial application in the country can take approximately 17 to 26 months.

Counterfeit Drugs

Weak or incomplete supply chain security, particularly with multiple supply chains expanding across the globe is exacerbating the spread of counterfeit drugs, particularly in emerging pharma-markets. While the counterfeit market is difficult to quantify, it is estimated to be increasing at 15 percent per year, which is double the expected rate for legitimate pharmaceutical market.

Digital Threat

The transforming global health care system is producing immense volume of information, which rides upon its availability, integrity, and confidentiality. The new health care models, health insurance models, electronic medical record (EMR) and other technologies, and permeable boundaries among industry stakeholders have increased the complexities of managing protected health information (PHI), and have compounded an already challenging issue in the pharmaceutical industry.

Among emerging threats prompting pharma companies to implement enterprise-wide cybersecurity programs include : Cloud-based computing attacks, which expose the companies to challenges from distributed denial of service (DDoS), and related types of cyberattacks causing substantial downtime, affecting productivity throughout the product development process-from clinical trials to manufacturing, to sales and distribution. Such security breaches may lie undetected for several hours or even days, driving damages and high cost overrun; regulatory implications of cloud usage (in the absence of formal regulatory guidance on the appropriate controls to consider for cloud usage, health authorities have been focusing their attention on risks related to unauthorized changes made to public cloud platforms that could inadvertently impact functionality encompassing patient safety or product quality); issues related to management of large data (increased

access to company-owned data has been helping pharma companies better understand research and clinical trial results and more effectively target patient populations; however, safeguarding sensitive intellectual property, personally identifiable information (PII), and protected health information (PHI), throughout the product life cycle remains a constant challenge); and issues related to third-party, and privilege access (reliance on third-party data has been helping improving formulary management and driving the effectiveness of treatment protocols; however, third-party involvement have also greatly increased the risks of data breaches and IP leakages). On similar note, protection of privileged accounts with access to the most sensitive information continues to remain a critical challenge for the industry.

IPR

Ineffective intellectual property (IP) protection in the pharmaceutical industry is regarded as a frequent concern in many developing countries, which requires the pharmaceutical companies to adapt to local market conditions for product commercialization depending on the level of IP enforcement. Increasingly, pharmaceutical companies are entering into M&A and JV transactions or have key third-party contractual relationships in emerging markets. This has raised considerable cultural and geographical complexities creating operational challenge.

The challenge of operating in a liberalized and connected world involves addressing the demographic trends in the spread of chronic diseases and technological advancements.

INDIAN PHARMACEUTICAL INDUSTRY – KEY CHALLENGES

At present, India accounts for about 40 percent of generic drugs, over-the-counter products, and 10 percent of finished dosages used in the USA. The ongoing and ensuing patent cliff is projected to offer more opportunities for Indian pharmaceutical industry, particularly in generic and biosimilars. The generic market is projected to grow at the rate of 9.5 per cent to US$ 432 billion by 2018. However, recently the Indian drug industry has been facing increasing challenges both from external and internal constituents. Key challenges include:

External

Trade Agreements

The Trans Pacific Partnership Agreement (TPP) based on the principle of free market and free trade zone, initiated by the USA and signed by 12 countries is forecast to have serious implications on Indian pharmaceutical industry (India is not a party to this Agreement). The trade pact is envisaged to benefit

the branded medicines industry and the big pharma companies by evergreening patents, while the generic industry gets affected. The data exclusivity window provided in the TPP makes it possible for a drug company to block its competitors. The collective impact of the TPP on the pharmaceutical industry is anticipated to grant at least 10 years of additional monopoly to innovator companies in several ways, which is forecasted to reduce the pressure on innovators to research new drugs. It is also anticipated to slow down the development and commercialisation of generic drugs, impacting access to affordable medicines worldwide.

TPP mandates that any new use of a known substance, or of a new process, would help make it eligible for a patent. So, a drug molecule that has been patent protected for 20 years becomes a viable patentable subject for the next 20 years if a new use is found. Sustained release forms of existing molecules and fixed dose combinations also gets eligible for repeat patent protection under the pact. TPP also mandates countries to provide data exclusivity for five years for pharma, which can be extended by three years if new clinical information is submitted, and eight years for biologics.

The Transatlantic Trade and Investment Partnership (TTIP) under negotiation between the world's two leading markets, the USA and the EU, envisages harmonizing regulatory environment in the two regions, besides enhancing provisions for IPR, data and investment protection. While the pact is yet to be finalized, there are apprehensions that TTIP may prevent Indian pharma companies to come to market with the same products that they used to trade over the years using the window of preference treatment for the members. Anticipation is also ripe, that the Indian pharma industry would need to pass through several rounds of additional tests, resulting in drug prices moving up significantly.

These pacts are projected to largely affect the Indian generic industry. According to the industry sources, the decline in generics is forecast to be discernible from the end of 2017 and a greater impact of these mega trade deals is envisaged to be felt by 2020.

PICS & EU-Trademark

Joining Pharmaceutical Inspection Co-operation Scheme (PIC/S) will endorse Indian pharma companies as reliable exporters of quality medicines. However, meeting PIC/S' regulatory requirements is envisaged to be a vital challenge for the Indian pharma industry especially for companies in the MSME pharma segment, who will have to invest significantly to upgrade their facilities to be at par with the harmonized GMP framework of the PICS. PICS entails membership of

the pharmaceutical regulatory bodies in the country. While attaining the membership is challenging, the industry is also of the consensus that not joining PICS may be more detrimental for the industry particularly in terms of losing market access in the PICS member countries, which is rising in numbers. Some of the challenging areas to be addressed in a given time frame for India to accede to the PICS include: developing and promoting harmonised GMP standards and guidance documents – given the numerous manufacturing units present in the country, this would require large scale revamping of the regulatory bodies in terms of skilled manpower with GMP competence, and technology; training competent authorities, in particular GMP inspectors; assessing (and reassessing) GMP Inspectorates; and facilitating the co-operation and networking for competent authorities and international organisations.

The European Union's (EU) new trademark legislation that stipulates stricter enforcement measures on goods in transit through its territories not only blocks trading of goods within the bloc with logos found similar to the ones registered in the EU, but also permits the seizure of such consignments at EU ports and airports even if they are meant for a third country. The legislation has raised considerable concern for the Indian drug manufacturers shipping items in Latin America or Africa using European ports and airports in transit. The industry also apprehends that the new law could be an attempt to create a trade barrier to check India's exports of low-cost generics to the markets in Latin America and Africa as large pharma companies, many of them based in the EU, feel threatened by India's low-cost but high-quality medicines.

Internal

Data Integrity

Data integrity practices followed in many FDA approved units of Indian pharmaceutical companies have emerged as a single largest challenge for the industry in the recent times. According to the US-FDA, data integrity does matter, because properly recorded information is the basis for manufacturers to assure product identity, strength, purity, and safety. Evidences of misrepresented data or problems with batch records found during preapproval inspections has been the prime factor leading to delays in market approval, and the audits have led to warning letters and black listing of the units.

One of the major gaps leading to such data integrity lapses were reported to be the deficiency of skill set among the middle and lower levels staff of the units, in terms of language barrier and technical knowledge

of FDA requirements. Of late, the trend of foreign regulatory inspectors interacting with shop level staff during inspections, instead of talking to the management, have further aggravated the gap.

Shortage of skilled manpower in the regulatory agencies in India has emerged as another critical area encompassing data integrity. Combined regulatory staff, at federal and state levels, including inspectors is estimated to be around 1500, currently, which is far from sufficient, considering that India has over 10,000 drug manufacturing facilities. According to industry sources this is in sharp contrast with the fact that the USA has 15000 regulatory staff for 3000 pharma manufacturing facilities.

According to the industry leaders, though data integrity issues have always existed, new mandates by the US-FDA to attain parity in inspection of foreign and domestic facilities have further complicated the picture by expanding oversight of US-FDA to many firms that are less familiar with US standards. However, according to the sources, quality of finished drugs have not been under the US-FDA scanner; scanning have been mostly with regard to certain CGMP requirements, and collection and documentation of data, that are raised against the black listed units during the audits. Multiple data integrity issues reported by the investigators include failure to record activities contemporaneously; document back-dating; copying existing data as new information; re-running samples to obtain better results; and fabricating or discarding data. Further, according to the industry sources, in addition to India, data integrity issues have surfaced in other regions as well. In India the incidence of warning letters have been more due to more number of US-FDA approved units. India has the largest number of US-FDA approved drug manufacturing units outside the USA.

Whatsoever, the growth of the Indian pharmaceutical industry, which is one of the largest suppliers of pharmaceutical products to the world, would get affected by such measures arising due to data integrity issues.

Credibility of Clinical Trial Data

Credibility of 'Clinical Trial Data' generated by the Indian pharmaceutical industry has also become a cause of great concern. In many ways India is the ideal location to conduct clinical trials given its diverse pool of patients with diverse treatment needs, and access to a large, scientifically skilled, workforce. This has caused huge growth in the number of clinical trials undertaken in the country; however, capacity to regulate clinical trials has not kept pace with this growth leading to a few reported unethical practices such as: limited patient compensation for adverse events;

Table 7.1 : Summary of Top 11 Most Frequently Cited Categories of GMP Deficiencies

Rank	Area	Citations
1	Documentation - manufacturing	24
2	Design and maintenance of premises	22
3	Documentation – quality systems elements/procedures	20
4	Personnel issues - training	19
5	Design and maintenance of equipment	18
6	Cleaning validation	14
7	Process validation	14
8	Product quality review	14
9	Supplier and contractor audit	13
10	Calibration of measuring + test equipment	12
11	Equipment validation	11

Source: Industry Sources

approval of drugs without clinical trials; and lapses in informed consent procedures. While the Government of India has enhanced the regulatory control measures, in the form of mandatory trial registration, and the creation of numerous committees tasked with overseeing trial approval, trial execution, and ethical treatment of patients, the delays in new drug approvals as a result of the new regulatory control regime has been also making some of the multinational pharma companies to rethink their clinical trial activities in India.

IPR

Intellectual property rights (IPR) in the pharma sphere have been a contentious issue globally. The (Indian) Patents Act was enacted in 1970 and inter alia contains provisions relating to pharmaceutical patents. A major change in the patent laws in India was the enactment of the Patent (Amendment) Act, 2005, which made patent laws in India compliant with the TRIPS. Though there was an overall improvement in patent protection in India, recent issues such as granting of compulsory licenses (CLs) have been contentious. Under the Indian Patent Law, CLs can be awarded, inter alia, if:

- The reasonable requirements of the public with respect to the patented invention have not been met; or
- The patented invention is not available to the public at a reasonably affordable price; or

- The patented invention is not worked in the territory of India.

In the context of the pharmaceuticals, the conditions for grant of a CL are aimed at preventing a situation where the public health is prejudiced by the exclusivity granted to the patented product. Recently, the Supreme Court of India dismissed a Special Leave Petition for reversing the CL awarded to an Indian company, since all the grounds for granting a CL under the (Indian) Patents Act, 1970 had been met.

While CLs have been viewed as a necessary evil, in a developing country, like India, they have also caused grave concerns in the industry due to the revenue loss that CLs tend to cause. In a recent order by the Controller of Patents, it has been held that granting a CL should be the last resort and efforts for obtaining a voluntary license should be made first. This order provides some comfort to the industry, as it clarifies the legal position that so long as the patentee does not meet the conditions for grant of CLs under the Patents Act, 1970, its patent rights would not be interfered with.

Another observable trend in the IPR sphere is the stricter enforcement of trademark contraventions in India. In the pharma sphere, this trend is comforting as trademark contraventions may lead to use of wrong drugs.

Over Dependence on China for Bulk Drug and APIs

India is heavily dependent on China for bulk drug intermediates and APIs. Indian pharma industry imports metformin, analgestics paracetamol, ranitidine, vitamin C and its intermediates from China in large quantities. India is largely dependent on China for almost all APIs by fermentation route, such as penicillin, cephalosporins and macrolides. The large scale imports have led to shutting down of several API units (Annexure 1). A similar trend is also evident in the case of many large volume imports of chemical synthesis-based API's or intermediates, such as

Table 7.2 : Size of API / Intermediate Imports from China by Value in 2015

API/ Intermediates	Value in US$ million
Paracetamol	116
Metformin	63
Ranitidine	12
Amoxicillin	104
Ciprofloxacin	59
Cefixime	16
Acetyl salicylic acid	5
Ascorbic acid	13
Ofloxacin	23
Ibuprofen	16
Metronidazole	14
Ampicillin	92
Levofloxacin	23

Source: Indian Drug Manufacturer Association (IDMA)

paracetamol, metaformin, ibuprofen, and quinolones. Imports of these APIs have grown at a CAGR of 18 per cent over the last decade. Currently, China contributes 58 per cent of all such imports by value and almost 80 per cent by volume.

The over dependence situation on China for important bulk drugs and API is of significant concern for Indian pharmaceutical industry as any shift in Chinese policies or eco-political conditions between the two countries may result in a significant setback for the Indian formulation industry, which are heavily dependent on the API imports as raw materials.

R&D

The R&D profile of Indian pharmaceutical industry includes development of generics, new drug delivery systems and new drug development. The data on patents granted to leading Indian pharma companies by Patent & Trademark Office (PTO) shows that patents on new products account for only 5 per cent and the rest has been on new processes, new dosage forms and drug delivery systems. It appears that the growth in R&D intensity of Indian pharma companies has been the outcome of the fear of shrinking market opportunities, as they will no longer be able to reverse engineer and produce new drugs, rather than induced by the incentives of the new patent regime. In the R&D for new drugs, the analysis of new drug pipeline of leading Indian pharma companies shows that the new patent regime has not been able to become the driving force; there are also complaints that the R&D activities of Indian firms are increasingly getting concentrated on life style diseases of global nature and they find little opportunity in addressing the drug delivery requirements of local diseases such as TB and malaria.

The policy reforms, however, paved the way for the "globalisation" of Indian pharmaceutical industry; it has now become a part of the global production and development network of MNCs. Participation of Indian firms in the global network has come more of an income generation opportunity than a means for competence building.

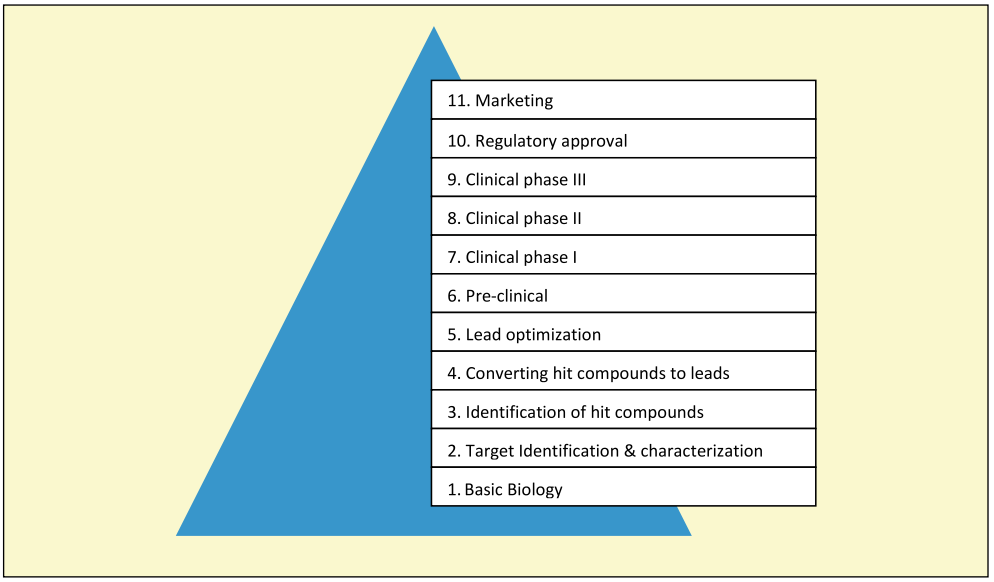
In contract research, collaborative research projects, out-licensing and in-licensing partnerships, Indian firms have been partners of subordinate status who perform piecemeal projects in drug research and they are not exposed to the whole process of new drug development. In these collaborations, the scope for transfer of technology and joint ownership of technology is also very limited. The subordinate status of the Indian firms in the long run may result in a dependency relationship of Indian firms with the MNCs. This may have deleterious consequences to the

industry in many ways. Being trusted allies in the global strategy of MNCs, Indian companies may lose interest in those therapeutic areas which do not have global presence (for example, tropical country diseases). These allies might also withhold themselves from: exercising compulsory licensing provisions, the TRIPS instrument to counter abuse of patent monopoly rights as well as to address national health emergencies.

The limited capacity of Indian firms in developing new drugs, both in terms of S&T skills and financial resources leave them with no other option but to collaborate with MNCs as subordinates. In the earlier policy regime, the public sector companies and public sector laboratories had played a major role in augmenting the S&T skills of the private sector industry. Under the new policy regimes, the public sector companies have been relegated and a few of them have already been closed down. The aversion to indigenous innovations at the regulatory approval stages and at promotional stages further encourages Indian firms to develop new drugs in collaboration with MNCs.

The liberalisation measures, on the other hand, have attracted foreign investment in pharmaceutical R&D in India. But it has been observed that bulk of foreign investment in R&D in the pharma sector has been in the clinical phase, especially in phase III trials and not much in the biology

Exhibit 7.1 : R&D Process for Developing New Drugs



Source: Kettler, White and Jordan

and chemistry research for new drug development. Phase III requires a large number of human subjects in the trials. MNCs are attracted because India provides a large size of population which is ethnically diverse and suffering from various ailments. The English speaking human power and a well-developed communication network with information technology capabilities are also advantageous for India in undertaking clinical trials.

In addition, the Indian pharmaceutical industry is also witnessing regulatory challenges with respect to, uncertainties over the FDI policy, the new pharmaceutical pricing policy, a uniform code for sales and marketing practices and compulsory licensing. These challenges have been slowing down the growth of the industry. The recent developments in domestic regulatory framework and their implications on the pharmaceutical industry are provided in Annexure-2.

WAY FORWARD

Trade Agreements and Market Access Negotiations

Indian pharmaceutical industry's concerns arising due to the execution of upcoming trade pacts, such as TPP and TIPP may be addressed through diplomatic channels. One option for India may be to join the TPP to strengthen the dissenting voices in the TPP and make the TPP provisions more patient-friendly. Alternately, India should brace itself for the world post-TPP. It should pursue other Free Trade Agreements (FTAs) more diligently factoring the concerns of trade barriers. India is currently in negotiation for treaties with the European Union and the USA. It is also a part of the on-going Regional Comprehensive Economic Partnership (RCEP) deal among ASEAN plus members. The concerns arising out of TPP and TIPP needs to be adequately circumvented in these proposed treaties.

In the developing country scenario, like that of India, chasing the state of 'zero error' in pharmaceutical manufacturing and attain PIC/S membership involves questionable investment. Further, acquiring the membership with large scale investment in all three stakeholders, viz., regulator, government and industry, may not ensure acceptance of India's dossier in other PIC/S member countries as they may decide to apply their own national laws. Hence, the need is for the developing countries to reach a mutual understanding considering healthcare as national priority and have another convention achieving similar quality with different processes and methods at reduced cost, and negotiate for its acceptability. In the current scenario, however, India may hold an observer status in PIC/S until it decides on the membership issue.

Further, India may also consider forming a Strategic Committee for

countering and erecting technical barriers to trade including IPR for better negotiations.

For market access, in addition to relying on traditional information sources, companies may consider participating in local projects and partnering with local firms. Partnering with local firms on R&D could be a strategy to shorten the approval times and reduce development and marketing costs.

Regulatory Compliance

CGMP and data integrity are other key focus areas for Indian pharmaceutical industry. In order to address GMP and data integrity issues, emphasis of Indian pharmaceutical companies should be on pursuing stronger compliance and risk management capabilities, rather than to merely satisfying the emerging legal requirements. Indian pharma companies are required to re-evaluate their organization's approach of managing compliance risks; applying methodologies used for financial reporting to compliance issues, such as putting formal governance and organizational structures in place; forming freestanding compliance and risk committees at the board level; and such others. Taking a risk-based approach to compliance planning, execution, and monitoring may help in a heightened regulatory environment. It may enable companies to focus on critical risk areas that need attention while reducing emphasis and effort on less critical ones.

To document that manufacturing processes comply with GMPs, pharmaceutical companies are required to retain complete and accurate production information and make them available to agency inspectors and auditors. It has been often pointed out by the agency inspectors that pharma companies regard contract testing and production operations as one way to alleviate their involvement in inspections and dealings with regulatory authorities. However, they have emphasized that licensed manufacturer remains responsible for products meeting all GMP standards. Thus, drug manufacturers should not totally look at contract manufacturers to reduce their responsibility for data accuracy and reliability. Using interpreters during inspections as practiced in China may help overcome language barriers.

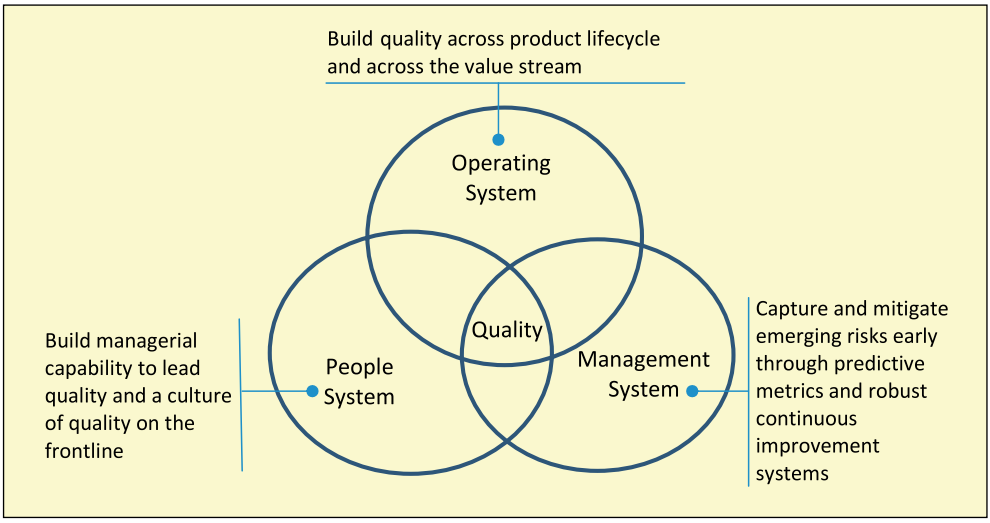
Preparedness and skill development on documentation, statistical techniques as per regulatory requirements are other important areas where Indian pharma companies need to invest.

Diverse and non-uniform structure of the pharmaceutical industry has emerged as a considerable constraint for the Indian regulatory mechanism. In order to bring in uniformity in the regulatory mechanism there is a need for extensive revamp or restructuring

of the Drug and Cosmetics Act (1940) and the departments implementing it. This may also help in addressing the increasing concern of counterfeit drugs reportedly produced in this country.

On the similar lines, the central drug testing laboratories need to be considerably revamped both in terms of technology and skilled manpower to be equipped to address compliance issues.

Exhibit 7.2 : Approach to Effective Quality Management System (QMS)



Source: McKinsey

Pricing and cost pressures

To improve the chances for product approval at favorable pricing, pharma companies may consider transitioning to a strategy of developing new drugs or drug delivery mechanisms that target complex disease areas that are high in value but low in competition. Furthermore, they should take the necessary steps to ensure that the effectiveness of these new drugs or drug delivery mechanisms is not easily replicable. Also, development of biosimilars may provide new avenues of cost-effective growth outside the innovative-generic dichotomy.

To address intensifying pricing pressure in developed countries, Indian pharma companies may intensify focus on entering or expanding in emerging markets. A well-defined expansion strategy with cost-effective operational reforms may help the industry to capitalize on the growth opportunities.

Manufacturing of Bulk Drugs and Intermediaries

Increased production of essential drug intermediaries and APIs at competitive prices should be the current focus of the Indian pharmaceutical industry to ensure adequate supply of essential raw materials and attain self-sufficiency and reduce dependence on imports. These primarily include:

- First-line antibiotics (e.g. SSPs, SSCs, Fluoroquinolones)
- Analgesics (e.g. Paracetamol, Ibuprofen)
- First-line cardiovascular drugs (e.g. ARBs, Ace Inhibitors)
- First-line anti diabetes drugs (e.g. metformin)
- Anti-cholesterol drugs (e.g. statins)

Bulk drug or API industry is capital-intensive with environmental implications. Towards this, there is need to have in place a long-term policy for sustaining the growth of the bulk drug industry. This may include encouraging PPP model in pharma manufacturing or establishing JVs with overseas manufacturers. This may also require dismantling sick bulk drug units and setting up of modern plants with higher capacity. Industry sources suggest the following capacity requirement of essential raw materials in short to medium term for the India's pharma industry:

- Penicillin plants with minimum capacity of 10,000 MT per annum
- Macrolides plants with minimum capacity of 2000 MT to 3000 MT per plant per annum
- Cephalosporin with minimum capacity of 2000 to 3000 MT per annum.

Research and Development

The present R&D efforts of the Indian pharmaceutical industry are mainly targeted towards therapeutic areas of global interest like diabetes, cardiovascular diseases, central nervous system disorders and oncology. However, diseases local to India and other tropical countries, for example tuberculosis and malaria, are getting less attention due to economic reasons. To promote the novel research and development in these areas, there is a need for short / medium / long term policy to further incentivize the private sector for new drug development and bringing down the commercialization barriers in these areas.

Presently, apart from strengthening intellectual property protection system, the Government of India is providing soft loans, grants and tax benefits to promote R&D activities. Public-Private Partnerships (PPPs) initiated by the Department of Science & Technology (DST) and the Council of Scientific and Industrial Research (CSIR) are providing avenues for risk sharing and better collaboration between public research facilities

and private sector for development of National College of Engineering NCEs. These partnerships need to be more commercially oriented and proactive in bringing innovations to the market. To commercialize new drugs developed for neglected tropical diseases, there is also a need to promote them by providing incentives to the private sector in the form of subsidies or drug assistance programmes, or by reviving public sector manufacturing for these drugs.

IPR

There has been a growth in patent activities in India after TRIPS came into existence. Most of the patent activities in the Indian pharma industry are carried out by large pharmaceutical companies in India and MNCs, and further, a greater number of applications are related to new or improved processes for products rather than products themselves. The products related to applications are concerned with intermediaries and formulations with maximum contribution in modified-release dosage forms. Further, R&D intensity of SME pharmaceutical companies is too insignificant in comparison to large companies; because of lack of technology support and resources for upgradation and expansion of their internal R&D facilities, SME firms have low to nil participation in IPR activity.

To promote IPR activity in the Indian pharmaceuticals industry, the pharmaceutical companies need to be encouraged to undertake new drug discoveries, innovate new dosage forms, and new uses of existing drugs. This may be done through subsidizing the cost of filing and maintenance of patents, and supporting the cost of litigations and other legal formalities. Towards this, the Nikko Denko Committee on IPR has been able to introduce expedited / out of turn examination under the Indian Patent Law recently. There is an urgent need for SMEs to develop collaborative research culture with the public and privately funded research organisations for their survival and increased participation in IPR activities.

Clinical Research &Trials

To address the unethical practices in clinical research and encourage clinical trials in India, the approval mechanisms for protocols need to be more transparent and time efficient. There is a need for a designated government agency dealing with clinical research and trial with a transparent and permanent mechanism involving experts, investigators, clinicians, operators, and recruiters. In addition, a policy promoting clinical research and innovation needs to be supported by action at various levels:

- Rational regulations: Regulations and guidelines developed through a multi stakeholder consultative approach that are based on science and highlight a commitment to patient safety, ethics and confidentiality, in line with globally accepted practices are the need of the hour. There are situations unique to India, like literacy, socio economic considerations and social cultural norms, which must also be taken into cognizance in the development of guidelines so that no one is denied the right to participate in research because of these challenges.
- Capacity building: There is a need for more trained resources within Central Drugs Standard Control Organization (CDSCO) to ensure the smooth roll out and governance of clinical research in the country.
- Accreditation: To address the concerns that have been raised about the conduct of clinical research in India, there is a need of an objective system to accredit investigators, sites and ethics committees. The accreditation should be provided by an independent third party and reviewed at periodic intervals.
- Infrastructure development: For sustained growth of clinical research in the country and to ensure a healthy balance of research across geographies, the investments are needed in bettering infrastructure particularly at government run hospitals and institutions. Many patients do not have the option of participating in clinical research in many areas of India because of majority of these sites being ill equipped and most of the investigators are not trained in clinical research.
- Public education and awareness: Misreporting and sensationalism of clinical research in India has created fear and suspicion amongst the public at large. A key requirement is public education and awareness not just about clinical research in general but also about the rights and responsibilities of those who participate in a clinical trial. There is a need to create an environment where patients have the confidence and trust that their participation in a trial is not only beneficial to them, but also to other patients in the world.
- Transparency and Openness: Greater transparency and openness by the regulators will go a long way in restoring trust amongst various stakeholders.

Pharma-SME Development

There are over 9000 pharma SMEs in India, which include manufacturers of formulations, APIs, and nutraceuticals. Pharma SMEs are cost-effective vital resources of skill, knowledge

Box 1 : New IPR Policy of the Government of India

The Government approved a new National Intellectual Property Rights (IPR) Policy which was announced by the Department of Industrial Policy and Promotion (DIPP) on 13th May 2016. It is a vision document that aims to create and exploit synergies between all forms of intellectual property and concerned agencies. It sets in place an institutional mechanism for implementation, monitoring and review of property rights. The policy envisages amalgamating India's expertise and competence in the field of research and development, education and also the proficiency of Indian entities including corporates, MSME's, start-ups and other stake holders in the creation of an innovative and conducive environment, and also facilitate a transparent and service-oriented IPR administration in the country. The policy recognizes that India has a well-established TRIPS-compliant legislative, administrative and judicial framework to safeguard IPRs, which meets its international obligations while utilizing the flexibilities provided in the international regime to address its developmental concerns. It reiterates India's commitment to the Doha Development Agenda and the TRIPS Agreement.

The broad contours of the National IPR Policy are as follows:

Vision Statement:

The IPR Policy has been framed with the perspective of stimulating creativity and innovation in the country. The policy intends to promote advancement in science and technology, arts and culture, traditional knowledge and biodiversity resources. The Policy envisages to create a developmental scenario in the country, where in knowledge is the driver of the developmental process and knowledge owned is eventually transformed into knowledge shared.

Mission Statement:

Stimulate a dynamic, vibrant and balanced intellectual property rights system in India to:

- foster creativity and innovation and thereby, promote entrepreneurship and enhance socio-economic and cultural development, and
- focus on enhancing access to healthcare, food security and environmental protection, among other sectors of vital social, economic and technological importance.

Objectives:

- IPR Awareness: To create public awareness about the economic, social and cultural benefits of IPRs among all sections of society.
- Generation of IPRs: To stimulate the generation of IPRs.
- Legal and Legislative Framework: To have strong and effective IPR laws, which balance the interests of right owners with larger public interest.
- Administration and Management: To modernize and strengthen service oriented IPR administration.
- Commercialization of IPRs: To get the value of IPRs through commercialization.
- Enforcement and Adjudication: To strengthen the enforcement and adjudicatory mechanisms for combating IPR infringements.
- Human Capital Development: To strengthen and expand human resources, institutions and capacities for teaching, training, research and skill building in IPRs.

Source : Press Information Bureau, Government of India

and employment and have been instrumental in reducing prices of drug manufacturing and in increasing rural penetration. Indian pharmaceutical SMEs have a great potential for venturing abroad through exports and outward FDI but are constrained by limited financial, technological capabilities and inadequate policy support. There is an urgent need for provision of sufficient low cost finance, strengthening access to national research laboratories, promoting pharmaceutical SME clusters, and continuous training and skill development programmes that help them venture abroad.

As per Pharma Vision 2020 of the Department of Pharmaceuticals, following goals have been set for the 12th Plan Period with respect to SMEs:

- Upgradation of SMEs to WHO-GMP and training of professionals therein; and
- Establishment of Pharma Growth Clusters.

To achieve these goals, there is a need for expedited approach.

Cluster Development

Setting up of pharma specific clusters in SEZ formats may help the industry in addressing the regulatory requirements and resultant costs. Common facilities, including common patent libraries, International Pharmacopoeias may be provided in identified clusters; establishing quality control labs that are cost intensive; and help developing world class quality control labs in the clusters will provide support for primary characterization and testing in a cost effective manner.

Utilities are the single largest contributor to the running costs of a plant in India, which include power and pollution control measures. Cluster development may address the need for reducing the cost of utilities by subsidizing power and by way of creation of Common Effluent Treatment Plant (CETP).

Skill Development and Training

There is an urgent need to focus on skill development and training of personnel for the pharmaceutical and healthcare industry. Skill development is required in various functional disciplines in the industry, such as analytical ability, manufacturing and quality management, and clinical trials. There is an acute dearth of qualified personnel in regulatory agencies governing the pharmaceutical industry, e.g. filing of New Drug Application (NDA), negotiation skills, documentation skills, skills to comply with regulatory requirements and statistical techniques. Hence, it is important that these disciplines may be introduced in academic syllabus of pharmaceutical training institutions. In addition, National Institute of Pharmaceutical Research and

Education (NIPER) and the National Skill Development Council (NSDC) may develop training centres and modules particularly catering to the pharmaceutical industry.

Pricing of Formulations

Industry is of the opinion that frequent changes in pricing policy may be counter productive and restrict long-term growth of the formulation sector. Also New Drug Delivery Systems (NDDS) for already marketed formulations need encouragement through proper fiscal measures. A stable pricing policy or market based price control may continue to encourage the formulation industry to invest in R&D in NDDS and dosage forms. Industry is further of the view that prices of patented products may be regulated on Purchasing Power Parity basis.

Combination products (Fixed Dose Combinations-FDC) are India's indigenous contribution to the world, with considerable approvals by regulators in the overseas markets. However, FDCs faces stringent regulations in the domestic market. FDCs contribute substantially to the pharma companies' turnover. Having a rigid stand on this issue may diminish the chances to attract FDI. Thus, depending on efficacy testing and patient compliance, FDCs may be supported and encouraged.

8. OUTLOOK

GLOBAL OUTLOOK

The growth of the pharmaceutical industry depends considerably on the prevailing economic scenario and the health care expenditure incurred by the people. Pricing pressures in the United States and unstable economic conditions in Brazil, Russia, and China, which collectively drive 50 percent of global pharma revenue, have led to a slowdown in the pharma segment. Moreover, contraction in the Government spending and cut back on the out of pocket expenditure has also been a major hindrance in the progress of pharmaceutical industry worldwide.

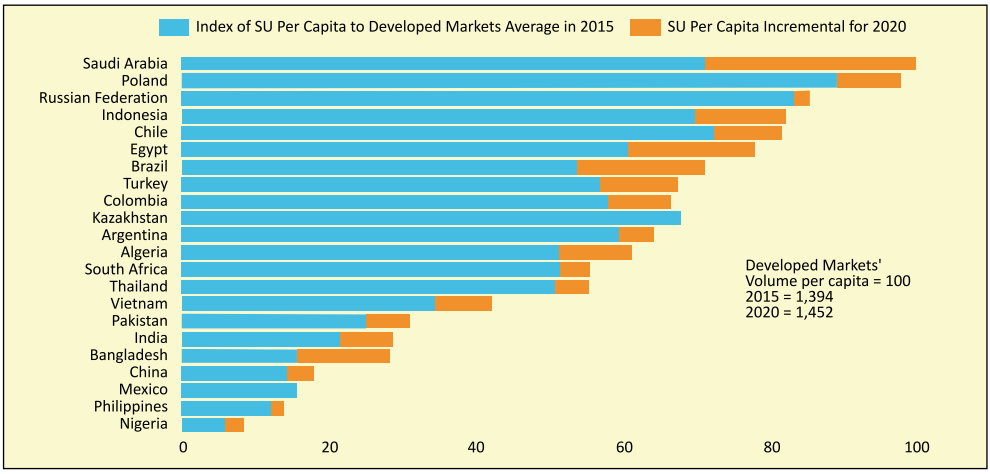
However, an increase in the ageing population is considered to be a major driver of growth for the pharmaceutical industry in the future. Advancement in the pharmaceutical sector, because of growing number of old people as part of the population, is anticipated largely in Western Europe and Japan. Additionally, countries such as Argentina, Thailand and China are also predicted to experience a development in the pharma sector for the similar reason.

Developed as well as developing countries in the world are facing the menace of chronic diseases. Immense transition in lifestyle and diet, massive urbanization and problem of obesity has led to multiplication of chronic diseases worldwide. China and India now have the largest number of diabetes sufferers in the world, at more than 98 million and 65 million, respectively[29]. As per the forecast by the International Diabetes Federation, the number of people suffering from diabetes globally is anticipated to escalate from 387 million to 592 million by 2035. Consequently, the burden of chronic diseases is likely to expand the advancement in the pharmaceutical sector globally.

According to the IMS Health, the total use of medicines is expected to reach 4.5 trillion doses by the year 2020, registering an increase of 24 percent as compared to the 2015 levels. It has been anticipated that the global increase in the volume of medicines utilized till the period 2020, will majorly occur in India, China, Brazil, Indonesia and Africa. This increase

[29]National Bureau of Statistics of China. Cited in Fortune favours the bold: Unlocking the future of China's pharmaceutical market, Deloitte Development LLC, 2014

Exhibit 8.1 : Pharmerging Market Standard Units Per Capita 2015 and 2020



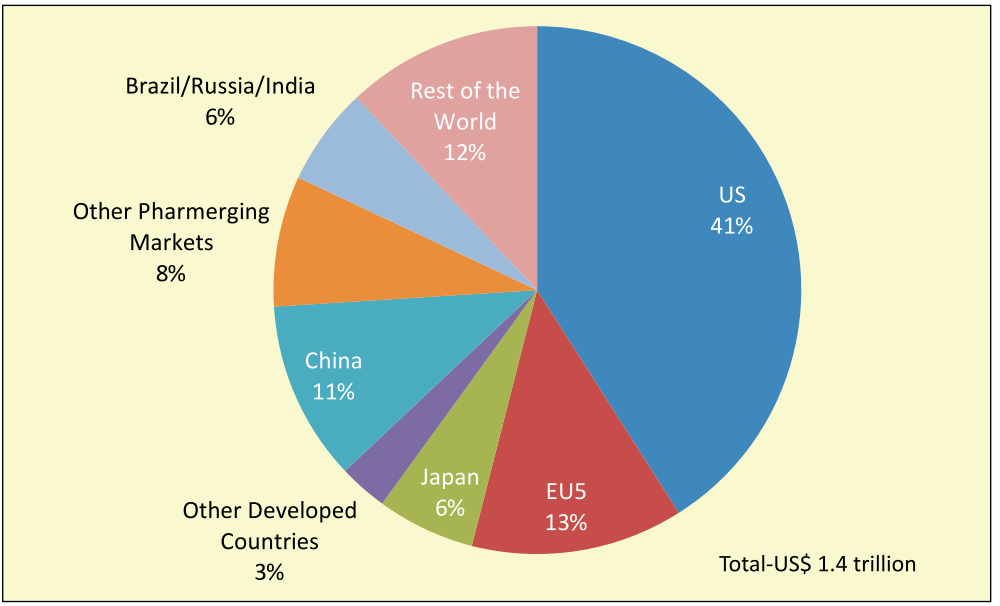
Source: IMS Health, Market Prognosis, September 2015: IMS Institute for Healthcare Informatics, October 2015
Note: Developed markets are known for more modern healthcare systems and wider adoption of newer therapies whose clinical importance is often under stated in Standard Units.
Pharmerging markets are known for historically less well resourced health systems and often use oral and older medicines to a greater extent. The index may overstate the gains being made by Pharmerging markets relative to more clinical or health outcomes based measures.

in medicines is forecasted in regions which are undergoing rapid process of development and also in areas where medicine usage was previously very low. Medicine usage in Africa and Middle-Eastern countries is foretold to increase from 300 billion standard units to 500 billion standard units in 2020. Apart from China and India, Indonesia is expected to experience massive increase in medicine usage in the Asia-Pacific region. As per the IMS Health, in the European region, a modest increase in medicine usage is expected, with majority of this rise occurring in central and eastern European countries, such as Poland.

According to the IMS Health, the global population is expected to stand at 7.6 billion in 2020, and the per capita usage of medicine is projected to reach nearly 1.6 standard units per person per day. The combined population of China, India, Brazil and Indonesia which is forecasted at 3.23 billion by 2020, up from 3.11 billion in 2015, is projected to account for approximately half of the increased volume of medicine usage worldwide.

In the Pharmerging markets, generics and non-original branded products form the majority of medicines, and are available often at a lower cost than original brands leading to increased access to medicines in these regions. Majority of the demand in branded drugs is anticipated in the developed markets. The IMS Health also predicts a rise in demand in the speciality medicines in the developed markets.

Exhibit 8.2 : Region-wise Medicine Spending in 2020



Source : IMS Health

The difference in average medicine usage between the developed markets and pharmerging markets has been declining. Safety nets by the Government are augmenting and the fortification in the form of private insurance has been leading to an increase in the usage of medicines in the pharmerging markets.

Global Spending

As per the IMS Health, the global spending on medicines is expected to reach US$ 1.4 trillion by 2020, representing an increase of 29 percent to 32 percent from the 2015 levels. The developed markets are expected to account for nearly 63 percent of the global spending by the year 2020. The United States is predicted to be the leading region in terms of spending on medicines, followed by the European Union and Japan.

It is anticipated that in 2020, approximately 28 percent of the global spending to be on speciality medicines. In the Pharmerging markets, approximately 12 percent of the aggregate spending on medicines is projected to be incurred on speciality medicines. Speciality medicines account for nearly 36 percent of the total spending on medicines during 2020, in the case of developed markets.

Oncology is the leading class of specialty medicines with over US$ 100 billion spending in major developed and pharmerging markets

Table 8.1 : Specialty Medicines and Leading Therapy Areas in 2020

Leading Speciality Therapy Areas	Sales in 2020	CAGR (2016-2020)
Oncology	100-120	9-12
Autoimmune	55-65	11-14
Viral Hepatitis	45-55	7-10
Immunosuppressants	20-30	11-14
HIV Antivirals	20-30	1-4
Immunostimulants	15-18	2-5
Interferons	7-9	1-4
Erythropoietins	7-9	0-3
Macular Degeneration	6-8	6-9

Source: IMS Health

by 2020. Viral hepatitis, including recently introduced treatments for Hepatitis C, is forecast to reach about US$ 50 billion in 2020 in major markets. By 2020, a substantial amount of the volume of treatment for Hepatitis C is expected outside major markets, as millions of people in other developed and pharmerging countries are anticipated to receive access to these treatments[30].

Traditional[31] medicines also form a substantial portion of the global spending on medical usage on medicines. Medicines for diabetes, cardiovascular system, respiratory system, dermatology including antibiotics and vaccines are anticipated to be highly in demand.

Pharmerging markets spending on medicines

The increased spending on medicine in these markets is chiefly caused by the larger use of medicines. The Governments in pharmerging markets are actively participating in making available health related facilities to the citizens. Furthermore, an expansion in private insurers in these markets is enhancing this trend further.

INDIAN OUTLOOK

The augmentation in the demand for pharmaceuticals globally is expected to provide impetus to the Indian pharmaceutical companies over the years. Several factors inducing the growth of Indian pharma sector include patent expiry of drugs and sluggish introduction of new molecules by innovators globally. It has been anticipated that pharmaceutical exports from India will surge caused by the rise in ageing population worldwide and the proliferation of chronic diseases globally. Moreover, in the developed economies Governments are implementing curb on healthcare spending, and increasing their reliance on lesser priced options.

According to the Crisil Research, the Indian Pharmaceutical industry is expected to grow at 12-14 per cent CAGR during the period 2015-16 to 2020-21. According to industry sources a rapid increase in exports of formulations and bulk drugs to the regulated markets has been estimated.

[30]Global Medicines Use in 2020; IMS
[31]Traditional Medicines- Those medicines which are not speciality medicines

Table 8.2 : Traditional Medicines Spending in 2020, (US$ Bn)

Category of Treatment	Spending	Category of Treatment	Spending
Diabetes	96-101	Traditional Medicines	23-24
Pain	63-65	Cardiovascular	23-24
Cardiovascular	50-52	Antibiotics & Vaccines	20-21
Respiratory	42-44	Pain	19-20
Blood disorders, coagulation	35-37	Respiratory	11-12
Antibiotics & Vaccines	35-37	Diabetes	11-12
Mental Health	30-32	Blood disorders, coagulation	8-9
Dermatology	25-27	Dermatology	8.5-9.5
Other CNS	23-24	Mental Health	4-5
Traditional Medicines	0.9-1.3	Other CNS	2.5-3.5

Source: IMS Health, Therapy Prognosis, September 2015; IMS Institute for Healthcare Informatics, October 2015
Note: Traditional therapy areas are defined as all therapies other than Specialty medicines.

Regulated markets are predicted to be the leading export destinations of Indian pharmaceutical products in the future. Indian bulk drugs and formulations are highly demanded in the North American and European markets. This trend is expected to continue in the future as regulated markets are likely to limit their expenditure on healthcare, making low priced Indian drugs an attractive alternative. Moreover, the patent period of many drugs in the regulated markets is anticipated to expire in the coming period and India is anticipated to benefit from this opportunity. The principal advantages of India's pharmaceutical sector namely low manufacturing cost and large numbers of approved manufacturing facility are expected to drive the growth of the bulk drugs exports from India.

Formulation exports to the US are expected to rise in the future. As per Crisil Research, ANDA approvals by the US FDA have picked up for Indian companies in the year 2015-16. However, formulation exports to the Europeans countries are estimated to be stagnant.

In the case of semi-regulated markets, the imports of Indian formulations by Russia and Brazil are anticipated to decline owing to currency fluctuations. Nevertheless, higher imports by Africa from India have been forecasted. As the African continent continues to face perennial healthcare challenges, its imports of drugs majorly anti-retroviral, anti-malarial and anti-tubercular drugs from India is projected to augment incessantly.

The exports of generic off-patent bulk drugs exports to regulated markets are anticipated to rise in the future. An escalation in the demand for on-patent bulk drugs is predicted to be lesser relative to off patent bulk drugs, majorly because of sluggish growth in the branded medicines market as compared to the generic medicines in the US and in the Europe.

The Indian bulk drug exporters have to deal with challenges posed by increased competition and pricing pressures. India has been facing stiff competition from industry players of various countries who want to tap the remunerative opportunities in the generic segment of regulated markets in the US and in the Europe. As per industry sources, the number of companies seeking ANDA approvals have doubled in the last eight years. This extension in competition among companies is likely to incur substantial pricing pressure on the Indian bulk drug manufacturers.

The domestic pharmaceutical industry is anticipated to be boosted by the chronic care drugs. The Drug Price Control Order passed during the year 2013 capped the prices of approximately 348 molecules and mandated the price cut majorly on acute care drugs. Similar price interventions were applied by the Government during the year 2014 on anti-diabetic and cardiovascular drug segments. On the similar lines, the Government released another order leading to decline in the prices of 57 medicines including insulin.

Notwithstanding these price controls, increased volume growth, particularly in the chronic care therapies, neutralized the losses caused due to DPCO- impacted drugs. Escalation in the demand for chronic care drugs have been anticipated majorly in the gastrointestinal and dermatological segments. Thus, the pharmaceutical industry is anticipated to display healthy growth over the next five years and exports are estimated to expand owing to the ageing population in India's major markets and increasing incidence of chronic diseases in other developing country markets.

ANNEXURE-1: NON- FUNCTIONAL API/BULK DRUG MANUFACTURING PLANTS IN INDIA

Name of Bulk Drug	Producers	Commencement of Production	Present Status
Penicillin G/V	Alembic, Sarabhai, IDPL, JK Torrent, Ranbaxy, Standard	In early 60's	Plant Stopped
Streptomycin	Alembic, Sarabhai, IDPL	In early 60's	Plant Stopped
Tetracycline	Sarabhai, IDPL, Pfizer	In early 80's	Plant Stopped
Oxytetracycline	Sarabhai, IDPL, Pfizer	In early 80's	Plant Stopped
Kanamycin	Alembic	In early 70's	Plant Stopped
Erythromycin	Alembic, Themis, IDPL, Standard	In early 80's	Partially in operation for captive production for safety
Rifamycin	Themis, Lupin, Sandoz	Late 80's	Protection, captive
Gentamycin	HAL, Themis	Late 80's	Closed
Sisomycin	Themis	Late 80's	Closed
Vitamin B12	Themis, Alembic, MSD	Early 70's	Closed
Cephalosporin 'C'	Alembic	Early 90's	Closed
Lovastatin	Themis, Biocon, Kreb	Early 90's	In operation
Pravastatin	Themis, Biocon, Mylan	Late 90's	Closed
Griseofulvin	Glaxo	Late 80's	Closed
Cyclosporin A	Biocon, Mylan	Late 90's	Closed
Bleomycin	Themis	Early 90's	Closed
Mitomycin 'C' T	Themis	Early 90's	Closed
Citric Acid	Citurgia, Citric India, Themis	Early 80's	Closed
Ephedrine	Malladi	Early 80's	In operation
Ascorbic acid	Sarabhai, Jayant Vitamin	Early 80's	Closed

Source: IHS, 2014

ANNEXURE -2: KEY DEVELOPMENTS IN REGULATORY ENVIROMENT AND ITS IMPLICATIONS ON INDIAN PHARMACEUTICAL INDUSTRY

National Pharmaceutical Pricing Policy (NPPP) 2012	• The Indian Government introduced NPPP in 2012 to regulate the prices of 348 essential drugs, based on their strengths and dosages. • Manufacturers are allowed to sell these drugs at or below the ceiling price fixed by the government. • The policy is applicable to imported drugs as well.	• Implication of NPPP resulted in decline of profit margins for products under regulation from 20% to 16% and 10% to 8% for retailers and stockists, respectively, during 2012-13. • The policy has resulted in significant uncertainty among stockists on whether to continue with the business amid low profit and margin reduction.
Foreign Direct Investment (FDI) Policy	• The FDI Policy in the pharmaceutical sector allows 100% FDI under the automatic route for Greenfield investments and 100% FDI are allowed for brownfield investment under the government approval route. • Further with a view to protecting the domestic pharmaceutical sector, including the production of generics, the Government has decided that 'non-complete' clause would not be allowed except in special circumstances with the approval of Foreign Investment Promotion Board	• As per the Department of Industrial Policy & Promotion (DIPP), the pharma sector attracted cumulative FDI inflow of approximately US$ 13.8 billion during the period April 2000 to March 2016.

Medical Council of India (MCI) guidelines on sales and marketing practices	• MCI guidelines were issued to ensure transparency in sales and prevent unethical practices of some doctors. • MCI aimed to stop medical professionals from prescribing drugs in exchange of enticement from drug manufacturers.	• Tax authorities use the Central Board of Direct Taxes (CBDT) circular based on MCI guidelines to decide on permissible sales and marketing expenses.
Department of Pharmaceuticals (DoP) uniform code on sales and marketing	• In 2011, DoP laid down a code of marketing practices for the pharma sector to streamline marketing efforts. • The DoP code lays down guidelines for exaggerated claims; audiovisual promotions; activities of medical representatives; and provision of samples, gifts, hospitality and sponsorships by pharma companies.	• The adoption of DoP code is voluntary. However, in recent times, the pharma sector has agreed to enforce the code. • DoP review its implementation and after a set interval of time it is discovered that the code has not been implemented by pharma associations or companies, it would consider making it a statutory code.
Compulsory Licensing	• India has adopted compulsory licensing on the following grounds under Section 84 of the Indian Patent Act: (1) The drug did not mean reasonable requirements of the citizens, (2) the drug was not reasonably priced and (3) the patent was not locally manufactured.	• The imposition of this regulation paved the way for production of low-cost generic medicines of the branded patent drugs. Thus, costly branded lifesaving drugs is available at cheaper rates to the Indian population. • The regulation affects the brand value of branded drugs manufactured by MNCs and thus has been opposed by them.
Clinical Trial Regulations	• As per new regulations introduced in 2013, all clinical trials need to be approved by a government committee and at least half of each trial needs to be run in government–run hospitals. • Pharma companies need to have the videotaped consent of each test subject.	• Stringent regulations increase the duration of the approval process; hence, the number of clinical trials has dropped to 19 in 2013 from 500 in 2011. • It also projects India as a less favourable option to conduct clinical trials

Bio similar Guideline	• The 'Guidelines on Similar Biologics' prepared by the Central Drugs Standard Control Organisation and Department of Bio technology in 2012 laid down the regulatory pathway for a biological claiming to be similar to an already authorized reference biological. • The guidelines address the regulatory pathway regarding manufacturing process and quality aspects for similar biologics. • These guidelines also address the pre-market regulatory requirements including comparability exercise for quality, preclinical studies, and post-market regulatory requirements for similar biologics.	• The new guidelines create a pathway for local and international companies to invest in bio similar development with manufacturing in India. • The introduction of a similar biologic or bio similar into the market would result in significant reduction in cost. • The introduction would also help address local patient's access to expensive drugs.

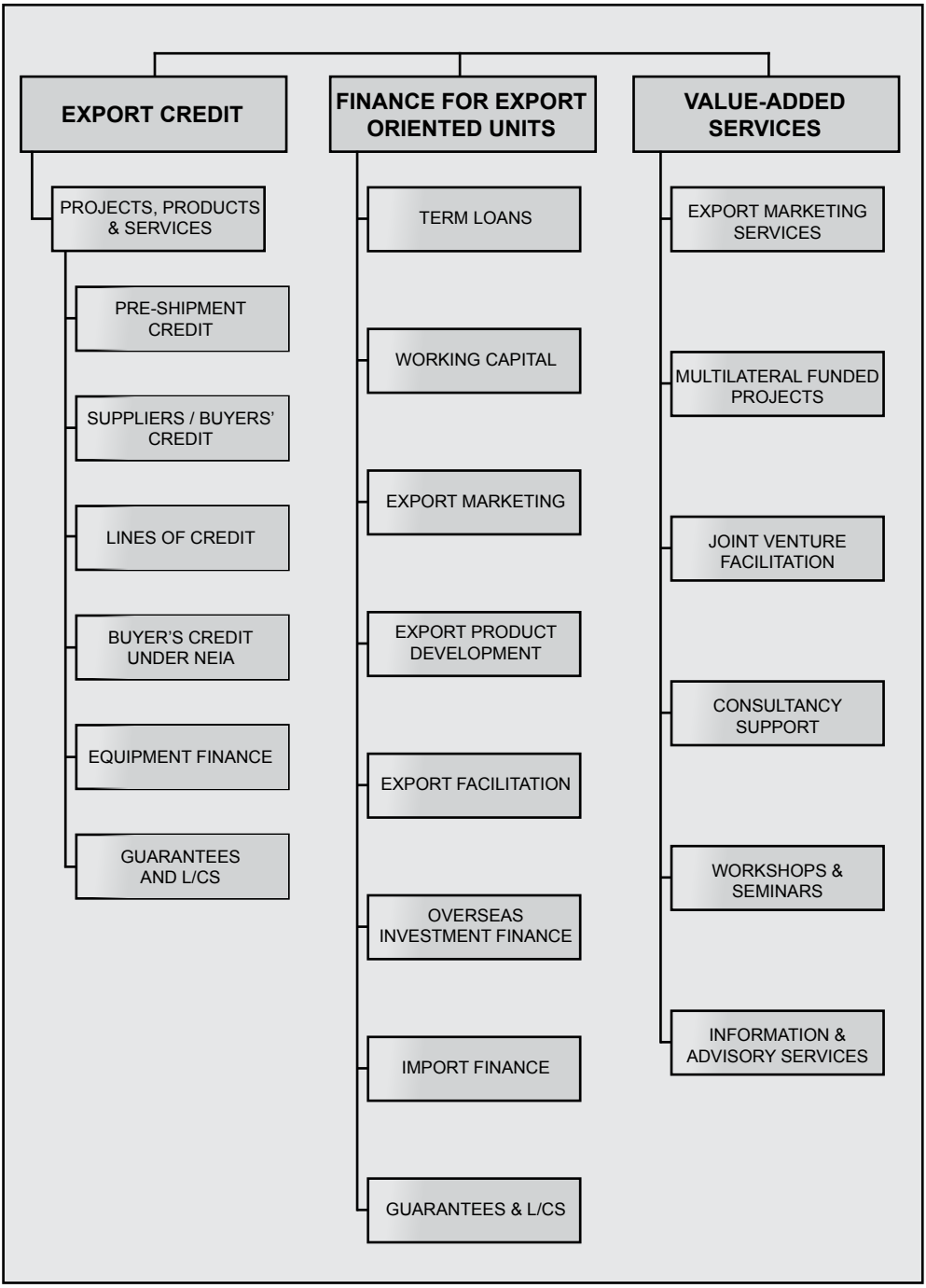
Source: Sun Pharma Annual Report; PWC

RECENT OCCASIONAL PAPERS	
OP No.	**Title**
110.	GCC Countries: A Study of India's Trade and Export Potential
111.	Indian Petroleum Products Industry : Opportunities and Challenges
112.	Floriculture : A Sector Study
113.	Japanese & U.S. Foreign Direct Investments in Indian Manufacturing: An Analysis
114.	Maghreb Region: A Study of India's Trade and Investment Potential
115.	Strengthening R & D Capabilities in India
116.	CIS Region: A Study of India's Trade and Investment Potential
117.	Indian Chemical Industry: A Sector Study
118.	Trade and Environment: A Theoretical and Empirical Analysis
119.	Indian Pharmaceutical Industry : Surging Globally
120.	Regional Trade Agreements: Gateway to Global Trade
121.	Knowledge Process Outsourcing: Emerging Opportunities for India
122.	Indian Mineral Sector and its Export Potential
123.	SAARC: An Emerging Trade Bloc
124.	Indian Capital Goods Industry - A Sector Study
125.	Financial Liberalization and Its Distributional Consequences
126.	ECOWAS: A Study of India's Trade and Investment Potential
127.	Indian Textile and Clothing Industry in Global Context: Salient Features and Issues
128.	Fair Trade : Fair Way of Enhancing Export Value
129.	Indian Automotive Industry: At The Crossroads
130.	CARICOM : A Gateway to the America
131.	IBSA : Enhancing Economic Cooperation Across Continents
132.	MSMEs and Globalisation: Analysis of Institutional Support System in India and In Select Countries
133.	International Trade, Finance and Money: Essays in Uneven Development
134.	Sikkim: Export Potential and Prospects
135.	Mizoram: Export Potential and Prospects
136.	Floriculture: A Sector Study
137.	Biotechnology Industry in India: Opportunities for Growth
138.	Indian Gems and Jewellery: A Sector Study
139.	SADC: A Study of India's Trade and Investment Potential
140.	Innovation, Imitation and North South Trade: Economic Theory and Policy
141.	Comesa (Common Market for Eastern and Southern Africa): A Study of India's Trade and Investment Potential
142.	Indian Shipping Industry: A Catalyst for Growth
143.	New Renewable Energy in India: Harnessing the Potential

144. Caribbean Community (Caricom): A Study of India's Trade and Investment Potential
145. West African Region: A Study of India's Trade and Investment Potential
146. India's Trade and Investment Relations with LDCs (Least Developed Countries): Harnessing Synergies
147. Indian Electronic Industry : Perspectives and Strategies
148. Export Potential of Indian Plantation Sector: Prospects and Challenges
149. Mercosur : A Study of India's Trade and Investment Potential
150. Openness and Growth of the Indian Economy: An Empirical Analysis
151. The Commonwealth: Promoting a Shared Vision on Trade and Investment
152. Southern African Development Community (SADC): A Study of India's Trade and Investment Potential
153. Strategic Development of MSMEs: Comparison of Policy Framework and Institutional Support Systems in India and Select Countries
154. Indian Chemical Industry : Exploring Global Demand
155. Technological Interventions In Indian Agriculture for Enhancement of Crop Productivity
156. Exports of Services and Offshore Outsourcing: An Empirical Investigation in the Indian Context
157. Indian Ocean Rim Association for Regional Co-operation (IOR-ARC): A Study of India's Trade and Investment Potential
158. West Africa: A Study of India's Trade and Investment Potential
159. The Effects of Financial Openness: An Assessment of the Indian Experience
160. Comparison of Labour Laws: Select Countries
161. India's Trade and Investment Relations with Cambodia, Lao PDR, Myanmar, Vietnam (CLMV): Enhancing Economic Cooperation
162. Indian Horticulture-Imperatives to Enhance Trade from India
163. India's Trade and Investment Relations with Gulf Cooperation Council (GCC): Strengthening Economic Ties
164. India's Hi-Tech Exports: Potential Markets and Key Policy Interventions
165. Outward Direct Investment from India: Trends, Objectives and Policy Perspectives
166. East African Community (EAC): A Study of India's Trade and Investment Potential
167. Trade Liberalization, Product Variety and Growth
168. Research & Development in BRICS: An Insight
169. Indian Capital Goods Industry: A Sector Study
170. Bangladesh: A Study of India's Trade and Investment Potential
171. Indian Electronic Goods Industry: Neutralizing Trade Deficit with China
172. Indian Steel Industry: Export Prospects
173. Value Addition Chains and Trade in Manufactured Commodities in South-East Asia
174. Potential for Trade of Organic Products from India
175. Multilateral Development Bank- Funded Project: Trends and Opportunities for Indian Exports

EXIM BANK'S MAJOR PROGRAMMES

Bank's Major Programmes



EXPORT-IMPORT BANK OF INDIA

HEAD OFFICE

Centre One Building, 21st Floor, World Trade Centre Complex, Cuffe Parade, Mumbai 400 005.
Phone: (91 22) 22172600 Fax : (91 22) 22182572 E-mail : ccg@eximbankindia.in
Website: www.eximbankindia.in

LONDON BRANCH

5th Floor, 35 King Street, London EC2V 8BB United Kingdom
Phone : (0044) 20 77969040 Fax : (0044) 20 76000936 E-Mail :eximlondon@eximbankindia.in

DOMESTIC OFFICES

Ahmedabad
Sakar II, 1st Floor,
Next to Ellisbridge Shopping Centre, Ellisbridge P. O.,
Ahmedabad 380 006
Phone : (91 79) 26576852/26576843
Fax : (91 79) 26577696
E-mail : eximahro@eximbankindia.in

Bangalore
Ramanashree Arcade, 4th Floor,
18, M. G. Road,
Bangalore 560 001
Phone : (91 80) 25585755/25589101-04
Fax : (91 80) 25589107
E-mail : eximbro@eximbankindia.in

Chandigarh
C- 213, Elante offices, Industrial Area phase 1,
Chandigarh 160 031
Phone : (91 172) 4629171-73
Fax : (91 172) 4629175
E-mail : eximcro@eximbankindia.in

Chennai
Overseas Towers,
4th and 5th Floor, 756-L, Anna Salai,
Chennai 600 002
Phone : (91 44) 28522830/31
Fax : (91 44) 28522832
E-mail : eximchro@eximbankindia.in

Guwahati
NEDFi House, 4th Floor, GS Road,
Dispur, Guwahati 781 006
Phone : (91 361) 2237607/609
Fax : (91 361) 2237701
E-mail : eximgro@eximbankindia.in

Hyderabad
Golden Edifice, 2nd Floor, 6-3-639/640,
Raj Bhavan Road, Khairatabad Circle,
Hyderabad 500 004
Phone : (91 40) 23307816-21
Fax : (91 40) 23317843
E-mail : eximhro@eximbankindia.in

Kolkata
Vanijya Bhawan, 4th Floor,
(International Trade Facilitation Centre),
1/1 Wood Street, Kolkata 700 016
Phone : (91 33) 22833419/20
Fax : (91 33) 22891727
E-mail : eximkro@eximbankindia.in

New Delhi
Statesman House, Ground Floor,
148, Barakhamba Road,
New Delhi 110 001.
Phone : (91 11) 23474800
Fax : (91 11) 23322758/23321719
E-mail : eximndro@eximbankindia.in

Pune
44, Shankarseth Road, Pune 411 037.
Phone : (91 20) 26403000
Fax : (91 20) 26458846
E-mail : eximpro@eximbankindia.in

OVERSEAS OFFICES

Abidjan
5th Floor, Azur Building,
18-Docteur Crozet Road, Plateau,
Abidjan, Côte d'Ivoire
Phone : (225) 20 24 29 51
Mobile : (225) 79707149
Fax : (225) 20 24 29 50
Email : eximabidjan@eximbankindia.in

Addis Ababa
Bole Kifle Ketema, Kebele - 19, (03/05),
House No. 015-B,
Addis Ababa, Ethiopia.
Phone : (251 116) 630079
Fax : (251 116) 610170
E-mail : aaro@eximbankindia.in

Dubai
Level 5, Tenancy 1B,
Gate Precinct Building No. 3,
Dubai International Financial Centre,
PO Box No. 506541,
Dubai, UAE.
Phone : (971 4) 3637462
Fax : (971 4) 3637461
E-mail : eximdubai@eximbankindia.in

Johannesburg
2nd Floor, Sandton City Twin Towers East,
Sandhurst Ext. 3, Sandton 2196,
Johannesburg,
South Africa.
Phone : (27 11) 3265103/13
Fax : (27 11) 7844511
E-mail : eximjro@eximbankindia.in

Singapore
20, Collyer Quay, #10-02, Singapore 049319.
Phone : (65) 65326464
Fax : (65) 65352131
E-mail : eximsingapore@eximbankindia.in

Washington D.C.
1750 Pennsylvania Avenue NW,
Suite 1202, Washington D.C. 20006,
United States of America.
Phone : (1 202) 223 3238
Fax : (1 202) 785 8487
E-mail : eximwashington@eximbankindia.in

Yangon
House No. 54/A, Ground Floor, Boyarnyunt Street,
Dagon Township, Yangon, Myanmar
Phone : (95) 1389520
Mobile : (95) 1389520
Email : eximyangon@eximbankindia.in