

CHAPTER 1: INTRODUCTION

Change is essential for all life processes and rightfully exclaimed, it is the only constant. It may seem to disrupt the routine temporarily and initially, but it inevitably comes along with all things, good and bad. Hence, the best way forward is adaptability towards the change. One such area which has been most prone to change and more so, in the times of the fourth industrial revolution, is technology. Companies like Google, Facebook, Amazon, Tesla and the like have changed the face of the global economy with hundreds of start-ups mushrooming almost every day. While it is difficult for people to make peace with how rapid and radical this change has been, it is essential to understand that it has continually been a part of our lives. Healthy growing technological advancements, even though difficult to adapt to at first, have had millions now perennially dependent on the same. The future with such a rapid pace of development can assure civilization advancements to the best possible.

Science and technology have been majorly responsible for having a great impact on the economic growth and paving the way for social development in India. The Indian Constitution under Part IV-A as one of the fundamental duties¹, promotes developing “scientific temper and the spirit of inquiry and reform”. Scientific temper connotes an individual’s capability of rational and critical thinking. The ability to reason things out scientifically or to apply a scientific method/reasoning in the decision making is immensely crucial to a scientific temperament.

The advancements that India as a nation has made in the area of science and technology in the contemporary times, cannot be discussed without having the mention of its history which dates back to Pt. Jawahar Lal Nehru’s ideas of a welfare State. In the transition from a *laissez faire* to a welfare state, the State not only found itself responsible to provide for the people but also answerable to them. Hence the government believing science and technology advancement to be an effective tool for the achievement of social and economic development, came up with a policy document in the year 1958, named *Scientific Policy Resolution* (SPR), which in a way laid the

¹ INDIA CONST. art. 51A(h)
“Fundamental Duties-It shall be the duty of every citizen of India-
(h) to develop the scientific temper, humanism and the spirit of inquiry and reform.”

foundation of the building of a scientific enterprise², eleven years after independence. The SPR proposed, “*to train enough science and technical manpower to fulfil the country's needs in science, education, agriculture, industry and defence.*” Pt. Jawahar Lal Nehru in his book, *Discovery of India*, expressed his belief in science being the answer to a lot of issues that the then India as a developing nation faced³. The execution of the policy⁴ also resulted in the establishment of many reputed organisations such as “Defence Research and Development Organisation (DRDO), Department of Electronics (DOE), Department of Science and Technology (DST) and Department of Space (DOS).”

A few decades later, realising the worth of scientific advancements for nation building and overall prosperity, India came up with *Technology Policy Statement* in the year 1983⁵, which laid focus on strengthening the agricultural and industrial base that India had already developed, and also on Research and Development. The policy aimed for “*attainment of technological self-reliance, a swift and tangible improvement in the conditions of weakest sections of the population and the speedy development of backward regions*”⁶. It was quite evident that India wanted to make science and technology a fundamental part of its development process. Relying on this viable method of acquiring knowledge, technology seemed to India as an ultimate solution to majority of its potential problems.

Shortly after, in 2003, the Science and Technology Policy extended the concepts introduced in earlier policies. Then-Prime Minister Shri Atal Bihari Vajpayee reiterated the economic and social importance of science and technology, emphasizing public awareness of these fields. Subsequently, with India designating the period from 2010 to 2020 as the decade for innovation, there arose a need to interconnect science, technology, and innovation. This gave rise to the Science, Technology, and Innovation Policy of 2013.

² Udgaonkar, B. M., *Implementation of the Scientific Policy Resolution*. Economic and Political Weekly 5, no. 52 (1970): 2091–95. Available at: <http://www.jstor.org/stable/4360884>.

³ Bhanu Pratap Singh, *Science Communication in India: Policy Framework*, Journal of Scientific Temper Vol. 2(1&2), Jan.-Apr. 2014, pp. 141-151.

⁴ “Government of India, Scientific Policy Resolution (GOI, 1958:1)”

⁵ “Government of India, Technology Policy Statement, January 1983 (GOI, 1983:1)”

⁶ *Id.*

Each of these policy documents plays a role in underscoring the necessity for advancements in science and technology, fostering innovation. In pursuit of these goals, it is not only government organizations but also private entities that are encouraged to step forward and collaborate, contributing to the scientific ethos of India as a nation. The policy is designed not only to promote but also to sustain scientific research across all facets. Consequently, it encourages substantial investments in research and development. The more a nation invests in R&D from its current resources, the more promising the future becomes in terms of scientific progress and innovation.

These changing phases of national policies have led to shaping of the technology infrastructure and creation of a national innovation system. In contemporary times, initiatives of the present government focusing on 'Make in India' is only attempting to make the country self-sufficient by having enough manufacturing capacity which also shall be made possible by advancements in science and technology.

COMPREHENDING THE EXPANSE OF TECHNOLOGY: TECHNO-NATIONALISM

As India was focussed more towards the attainment of socialism in the initial years of shaping of our democracy, foreign investments and capital with regard to technology were kept out from its access⁷. The economy, up until the late 1990's, continued to grow but with more impetus from the local companies. Since not much capital flowed in through foreign direct investments (FDI), the nation relied more on developing and prospering indigenous technology. Even in India, the developers of the technology knew that the technology should be such that it benefits all strata of the public and not just the people who may be able to afford it; otherwise their market of operation would be extremely limited. Hence making innovation and technology affordable to the general public was one major challenge that was faced. However, the fact that making all of this possible required a technical bent of mind, needs no assertion.

At that time, neither did India have the resources to purchase foreign technology, nor would such trading support the idea of self-sufficiency in manufacturing that India was struggling to achieve, something that later evolved as the concept of 'techno-

⁷ Trivedi, Anuradha, *Democratic Socialism in India*, The Indian Journal of Political Science, 26, no. 4 (1965): 118–23. <http://www.jstor.org/stable/41854096>.

nationalism⁸. Techno-nationalism is a concept which states that investments in technology and innovation are directly proportional to the growth, stability and prosperity of an economy. Through this idea, India could build whatever little it could in different sectors such as defence, space, electronics, nuclear energy, computer science and information technology; and it did well. As regards defence and nuclear energy both, the nation built varied missiles, rocket systems, satellites, orbiter projects, space aircrafts and other remotely piloted vehicles, all on a self-reliant basis⁹. From BrahMos to PSLV to Chandrayan-3, India's prowess in these areas developed quite a lot. This not only gave India an opportunity to enhance and hone these skills, but also gave a boost to techno-nationalism¹⁰. Techno-nationalism itself gave the nation a strong footing on technology advancement. It is said that strength respects strength. As much as a country gains ground on the technology front, its access to technology that is long due, also increases. The attitude of the developed nations concerning transfer or trade of technology also changed as India developed a strong technological foundation due to techno-nationalism.

India surely has done wonders in some sectors, the generic pharmaceutical industry being one such example, but the idea of technology transfer is an unrelenting process for the continuing growth of a country. Not only is the receiver country benefitted, but also the donor country as it gets something in return for the trade of technology. Many a times, the donor country may transfer technology to the other countries when it wants to expand its business and technology transfer helps the receiver country in areas that it can do better. Technology includes within its ambit, the knowledge and understanding of manufacturing a good or rendering a service.

Appropriate deployment of technology is fundamental to all developmental processes. Owing to the difference in the availability of resources in a country and depending on how the country chooses to utilize its available resources, there arises a need for this give and take in order to enhance and fulfil one's developmental goals. In a situation like this, the developing countries look towards the developed countries for exchange of technology, related know-how and the means for advancing the technology for the

⁸ Prosenjit Datta, *The Promise of Techno-nationalism*, Business Standard, January 5, 2021, Available at: <https://mybs.in/2ZbDlkf>

⁹ MASHELKAR, RAGHUNATH A., *REINVENTING INDIA*, Sahyadri Prakashan, 2011.

¹⁰ *Id*, MASHELKAR.

furtherance of one's own technological needs. With agreeing to make oneself TRIPS¹¹ compliant, the developing countries held onto the hope of receiving what it had been promised when they were, in a way, lured into signing the agreement. Article 7¹² and 8¹³ of the TRIPS Agreement aims at setting up an international IP system as it identifies the goals of technological innovation and dissemination of knowledge, thus furthering greater public interest. It contains policy guidelines for establishment of a working International Intellectual Property protection. Although, having gained momentum during the Doha Declaration¹⁴ on TRIPS and Public Health, the idea behind both the articles can be seen as an extension to the multilateral trading system that was envisioned as back as 1948. Going beyond treaty and agreement boundaries, the articles have seem to cast influence on policy objectives of trade, more so in the matters of enforcement. By visualising an international IP forum, the perspectives behind Article 7¹⁵ and 8¹⁶ of TRIPS lay down the foundation of such IP regulations that are conducive to social and economic development in all member countries.

THE INTERNATIONAL TRADING STRUCTURE CONUNDRUM

The establishment of the World Trade Organization (WTO) on January 1, 1995, represented a significant transformation of the General Agreement on Trade and Tariffs (GATT)¹⁷, marking a pivotal reform in international trade post-World War II. Following the war, allied nations engaged in a series of trade negotiations to stabilize the international economy. During the Bretton Woods Conference in July 1944, which led to the creation of the IMF and World Bank, recommendations were made to regulate

¹¹ Trade Related Aspects of Intellectual Property Rights, 1995.

¹² "The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations."

¹³ "1. Members may, in formulating or amending their laws and regulations, adopt measures necessary to protect public health and nutrition, and to promote the public interest in sectors of vital importance to their socio-economic and technological development, provided that such measures are consistent with the provisions of this Agreement.

2. Appropriate measures, provided that they are consistent with the provisions of this Agreement, may be needed to prevent the abuse of intellectual property rights by right holders or the resort to practices which unreasonably restrain trade or adversely affect the international transfer of technology."

¹⁴ "Doha Ministerial Declaration on the TRIPS Agreement and Public Health", (hereinafter "the Doha Declaration"), WT/MIN(01)/DEC/W/2, 14 November 2001.

¹⁵ *Supra* Note 12, 5.

¹⁶ *Supra* Note 13, 5.

¹⁷ Irwin, Douglas A, *The GATT in Historical Perspective*, The American Economic Review, vol. 85, no. 2, 1995, pp. 323–28, <http://www.jstor.org/stable/2117941>.

trade between nations, urging participating governments to take substantial measures to reduce barriers to international trade.

In pursuit of this objective, there was a recognition of the need for an international institution, leading to the proposal of the Havana Charter. This charter aimed to establish the International Trade Organization (ITO)¹⁸. Unfortunately, it did not receive approval from the U.S. Congress. As an alternative, the GATT was adopted to promote international trade, emerging as a result of the failure to establish the ITO. Despite its institutional shortcomings, GATT persisted as an international organization managing and regulating rules of international trade until January 1, 1995, when the WTO was founded.

Even though the seeds of globalisation had been sown as back as the World Wars, the concept developed teeth with the growing need of free trade. Although free trade appeared more to be a misnomer as it did not exist in entirety, the concept of managed trade in place of free trade gained more footing where the former was a combination of free trade and trade with certain tariff or non-tariff barriers.

Much of the history of international trade took shape in Geneva, but the entire journey of development can be traced across continents. From Atlantic Charter to Havana via Ancey, Torquay, Tokyo, Uruguay and finally to Marrakesh in 1994, the GATT¹⁹ as an international agency was envisioned to establish a strong base for multilateral trading system, which it quite successfully did for almost half a century, becoming more and more flexible through the series of trade negotiations. Although the World Trade Organisation as an organisation providing for the enforcement mechanism of the provisions relating to international trade seemed to replace the international agency of GATT, it would be incorrect to say that GATT no longer exists. Majority of the WTO agreements came into existence as a result of the Uruguay Round²⁰, which were signed

¹⁸ William Diebold, Jr., *The End of the ITO*, Essays in International Finance, No. 16, International Finance Section, Department of Economics and Social Institutions, Princeton University (Oct. 1952) <https://ies.princeton.edu/pdf/E16.pdf>

¹⁹ The General Agreement on Tariffs and Trade, Geneva, July 1986, Available at: https://www.wto.org/english/docs_e/legal_e/gatt47_e.pdf

²⁰ Jesus Seade, *An Overview of the Uruguay Round*, Trade Policy Issues, International Monetary Fund, March 1995 (January 08, 2021), <https://www.elibrary.imf.org/view/books/071/07475-9781557756213-en/C10.xml?tabs=Related%20Documents>

at the Marrakesh Ministerial Conference in April 1994²¹. Thus, GATT 1994 which incorporates all major provisions of the GATT 1947²², the original agreement, still forms the heart of WTO that goes a step ahead to provide an effective dispute mechanism and enforcement machinery in addition to having the liberal ideas of relaxing the trade barriers embedded in it. It is the transformation of the GATT into the WTO that took place on January 1, 1995²³.

There were three core functions proposed of the GATT:

- a) providing a set of agreed rights and obligations that apply among countries in various forms,
- b) to provide for a juridical system that would allow the resolution of disputes related to the respect or otherwise of those rights and obligations, and
- c) to establish a negotiating forum to allow for the evolution and expansion of those rules and commitments²⁴

There were seven rounds of trade negotiations that were held prior to the Uruguay Round which led to a series of discussion on trade. The initial rounds were more specifically focused on tariff negotiations while the last three apart from tariffs also deliberated on non-tariff measures, anti-dumping measures, framework agreements, rules, services, textile, agriculture, dispute settlement, creation of WTO and most importantly, intellectual property. Needless to say, that in all this time the key objective of reduction of trade barriers to trade was never lost sight of and with the gradual passage of time the trading system became more liberalised keeping in mind the above aims and objectives that the system had to fulfil²⁵.

The Uruguay Round was considered as a round to end all the rounds of trade negotiations. From notably the reduction in tariff and the measures taken to enforce the same, the discussion had extended to new areas of trade namely, agriculture, textile, intellectual property and the like. In 1988, the ministers met at Montreal, Canada to

²¹ Marrakesh Agreement establishing the World Trade Organization, concluded at Marrakesh on 15 April 1994, <https://treaties.un.org/doc/Publication/UNTS/Volume%201867/volume-1867-A-31874-English.pdf>

²² Irwin, Douglas A., et al. *The Genesis of the GATT*, Cambridge University Press, 2008.

²³ The Uruguay Round (1987-1994), which culminated in the Marrakesh Agreement, established the World Trade Organisation (WTO) that came into being on January 1, 1995.

²⁴ *Supra* Note 20, 6.

²⁵ Kirmani, N., and Wong, C. (eds), *TRADE POLICY ISSUES, USA*: International Monetary Fund, 1997 (January 11, 2021), <https://doi.org/10.5089/9781557756213.071>

assess the progress of the round's agendas²⁶. Although not all issues could be resolved but the meeting helped streamline some of the ideas which were centred around helping developing countries including dispute settlement mechanism, 'trade policy review mechanism' which would help the GATT members review their trade practices and policies which they adopted.

Without a doubt, the WTO provided a coherent institutional framework to give effect to the agendas and principles of international trade²⁷. From facilitating trade to resolving trade disputes, the organisation took over as a permanent institution along with a secretariat. The aim laid down by the GATT to achieve a multilateral liberalized trading system, mutually advantageous, was largely achieved²⁸.

ENTRY INTO FORCE OF THE TRADE RELATED ASPECTS OF INTELLECTUAL PROPERTY RIGHTS

Following the conclusion of the Uruguay Round, the concept of TRIPS emerged. TRIPS resulted from prolonged and effective multilateral trade negotiations. These negotiations convened countries with varying economic power and development potential, aiming to find a middle ground between developed and developing nations for the creation of a global intellectual property policy²⁹. The negotiation process encompassed discussions on principles, submission of substantive proposals, identification of prevailing issues, and ultimately the approval of the substantive text of the agreement³⁰. The Agreement, along with the establishment of the World Trade Organization in 1995, marked a significant milestone in the history of the multilateral trading system. Its entry into force undeniably stood out as a noteworthy event, making substantial contributions to the shaping of laws, policy matters, and international relations governing intellectual property. Realising trade as one of the potential ways to strengthen international relations among nations, the idea of tapping the tradability of IP was given shape through the Agreement³¹. The period that followed after the entry

²⁶ Uruguay Round: Trade Negotiations Committee Meeting at Ministerial Level, GATT/AIR/2708 31 OCTOBER 1988, https://www.wto.org/gatt_docs/English/HTM/2708.RFT.HTM

²⁷ *Supra* Note 17, 5.

²⁸ Richard Baldwin, *The World Trade Organisation and the Future of Multilateralism*, Journal of Economic Perspectives, 30, 95-116, (2016), <https://www.jstor.org/stable/43710012>

²⁹ THE MAKING OF THE TRIPS AGREEMENT: PERSONAL INSIGHTS FROM THE URUGUAY ROUND NEGOTIATIONS (Jayashree Watal & Antony Taubman, eds., 2015)

³⁰ Trade Related Aspects of Intellectual Property Rights, 1995

³¹ *Id.*

into force of TRIPS has been extremely noteworthy for the protection to IP in the global sphere.

Not to say that IP wasn't given any recognition before TRIPS as the phases of initial economic integration during 1880's saw attempts of acknowledging legit protection to industrial property and copyright by virtue of the Paris Convention³² and the Berne Convention³³. One of the reasons for its recognition could be attributed to the fact that absence of an organised framework on IP policy could hamper trade relations among nations. Thus, making trade in IP a successful tool for economic integration. Though a substantial amount of time has passed since the coming into effect of these international agreements on protection to intellectual property, their contribution is valued even today as they continue to be the backbone of structural legal recognition to IP. Before the deliberations in the Uruguay Round which ultimately culminated into the inception of the Agreement, not much of IP existed in the texts and provisions of the GATT³⁴.

However, today the Agreement happens to be the most comprehensive treaty on IP covering almost all different kinds of intellectual property; providing for its recognition, administration, trading among nations and even dispute settlement. It is believed though, that, the global north-south divide was never as noticeable as before and the history of the making of the TRIPS Agreement sure had a part of its own to play³⁵. The demarcation on social, economic and political factors is what initially led to the divide between countries into two broad groups namely the global north and global south. The global north comprised of the northern countries on the world map which were relatively better and stronger economies than the global south, which comprised basically of the regions of Latin America, Asia and Africa. On the other hand, countries of the global south were on social, economic and political parameters considered marginalised and were not at par with the counter regions like Europe and North America.

The idea behind inclusion of intellectual property in the Uruguay Round which led to TRIPS primarily came from the United States. Being the largest superpower and

³² "Paris Convention for the Protection of Industrial Property, 1883."

³³ "Berne Convention for the Protection of Literary and Artistic Works, 1886."

³⁴ *Supra* Note 19, at 6.

³⁵ Tarun Kabiraj, *Intellectual Property Rights, TRIPs and Technology Transfer*, 29 *Economic and Political Weekly*, 2990–98 (1994), <http://www.jstor.org/stable/4402037>.

dominant in developed economies, US was much worried about the loss that it shall incur with respect to trade interests which could potentially lead to damaging the competitiveness of the US industry, due to ineffective recognition to intellectual property assets³⁶. Section 301 of the US Trade Act of 1974³⁷, which also happens to be the subject of broader international and congressional debate during both the Trump administration as well as the Biden administration, contained certain policies which firmly supported the protection of Intellectual Property³⁸. While the Trade Act of 1974 comprised of a legislation passed by the Congress to ensure enhanced participation of the United States in International Trade alongside removing trade barriers and settling trade disputes effectively, The Trade and Tariff Act of 1984³⁹, laid down the conditions under which the unfair trade cases under Section 301 of the Trade Act of 1974 could be pursued for the settlement of such disputes. The unresolved disputes could potentially disrupt US's international relations. In view of the same, the US Trade and Tariff Act of 1984⁴⁰ made actionable under Section 301 of the Trade Act, the inadequate or ineffective protection accorded to intellectual property. The aim was to conclude a more impacting far-reaching agreement on IP protection so as to push US trade and diligently mark IP and it's tradability on the global map.

In the initial years of the making of the Agreement, the Negotiating Group working in this regard, focused on certain issues of intellectual property namely, issues in connection with enforcement of intellectual property rights, issues in connection with the availability and scope of intellectual property rights, issues in connection with the use of intellectual property rights and issues in connection with the settlement of disputes between governments on intellectual property rights.

³⁶ *Supra* Note 29, 8.

³⁷ 19 U.S.C. Ch. 12: Trade Act of 1974, §§2411-2420, <https://www.govinfo.gov/content/pkg/STATUTE-88/pdf/STATUTE-88-Pg1978-2.pdf>

³⁸ Andres B. Schwarzenberg, *Section 301 of the Trade Act of 1974: Origin, Evolution and Use*, Congressional Research Service, December 14, 2020, Available at: <https://sgp.fas.org/crs/misc/R46604.pdf>

³⁹ Joseph H. Price, *The Trade and Tariff Act of 1984: An Analytical Overview*, 19 INT'L L. 321 (1985), <https://scholar.smu.edu/til/vol19/iss1/15>. In signing the legislation, President Ronald Reagan said that the Act was the most important trade law approved by the US Congress in a decade.

⁴⁰ David Palmetier, *The Trade and Tariff Act of 1984: From the Customs Treatment of Manhole Covers to the Return of Goods from Outer Space*, 11(2) SYRACUSE JOURNAL OF INTERNATIONAL LAW AND COMMERCE 489-92 (1984); <https://surface.syr.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1191&context=jilc>.

However, in light of these roadblocks, the success that the TRIPS Agreement has had, with the negotiations culminating into a forceful document with the passage of time, is remarkable. Slowly and steadily working on the key components of the WIPO Convention, it ultimately provided for a framework that among other things laid down a dispute resolution system in the IP arena, for the very first time⁴¹. Owing to the possibility of divergent opinions and lack of consensus among different nations' governments over the world, it was felt important that unanimity be reached as regards the extent to which the governments can go in setting their IP policies, taking into account the trade relations they share with the other members.

Analysing its effectiveness, the TRIPS seems to have survived the test of over twenty five years relatively well and continuing, it shall guide domestic IP laws and policies with its minimum standards and more so, as it forms an important pillar of the new multilateral trading system.

GLOBALISATION AND ITS IMPACT WORLD OVER

Globalisation as a concept is extremely vast. It is also a widely discussed term which has been open to interpretations, leading to an understanding of its nuances. As a reality, by shrinking boundaries, it has achieved the cohesion of different nations and people to a great extent. Continuing the process, globalisation offers both opportunities and challenges⁴². Maximising the opportunities and making sure the challenges are minimized, is the need of the hour.

Major advancements in technology and communication have made possible the growth of transport and communications network possible. Globalisation pertains to the idea of global increase in the economic activities catering to global demand and supply in an effort to bring people closer. To accomplish this goal, many economic institutions mushroomed at the time like the World Trade Organization, World Bank and the International Monetary Fund, to aid the member countries to facilitate international trade⁴³.

⁴¹ Athreye, S., Piscitello, L. & Shadlen, K.C., *Twenty-five years since TRIPS: Patent policy and international business*, 3 JOURNAL OF INTERNATIONAL BUSINESS POLICY, 315–328 (2020). <https://doi.org/10.1057/s42214-020-00079-1>.

⁴² N. N. Mathur, *Globalisation and the Legal Profession*, 1.1 NLUJ LR (2012) 84, <http://www.scconline.com/DocumentLink/4GteFEIB>.

⁴³ *Id.*

With this growing concept of trade, an understanding of the other parts of the world also started building amongst people. Changes in ideology, cultures, general lifestyle happened with this understanding and global exchange of knowledge and trading opportunity. Countries which were a step ahead in developing technology, products and subsequently trading them with the other nations were the ones which ensured that their economies grew tremendously. Today's developed nations back in the 19th century, had huge amounts of income pouring in, as they strengthened their exports and its tradability therein⁴⁴. Seeing the powerful nations on the path of building their economies strong, other developing nations also followed suit and that also provided for a healthy competition in the market. For this reason, international trade is seen as an inevitable aspect of the process of economic globalisation for the integration among countries and people.

While it is believed that initially the ideology behind globalization rested more on moving goods across borders, the new globalization in addition, relies more on being driven by information technology⁴⁵, which made exchange of ideas and goods relatively easy and simpler. Where earlier a country depended on different companies within the home country itself for the manufacture of goods in the market which can be used by the people, globalisation and information technology has made possible for the competing companies in other countries to be able to sell their products across the globe. Hence people, for similar products have different options to choose from, which may even be available at lesser prices. Due to this active exchange of goods, more affordable products are available to more people and companies in order to sustain their products, have to withstand the competition⁴⁶. This is not only limited to products and goods but also extends to services, knowledge, languages and cultural exchanges.

Just as reduction in tariffs, removal of non-tariff barriers or reduction in travel costs have helped foster international trade⁴⁷, so have these advancements in information technology. Not only has information technology facilitated companies to trade goods across borders, they are also able to operate their businesses from different parts of the

⁴⁴ RICHARD BALDWIN, *THE GREAT CONVERGENCE: INFORMATION TECHNOLOGY AND THE NEW GLOBALIZATION*, 13 (2016).

⁴⁵ *Id.*

⁴⁶ JEFFERY JAMES, *Information Technology and Globalization*, in, *GLOBALIZATION, INFORMATION TECHNOLOGY AND DEVELOPMENT* 3-6 (1999).

⁴⁷ *Id.* at 12.

world by setting up the base of their companies in different nations⁴⁸. Once the businesses are set up in different parts of the world, they can be worked together by sharing of real time information networks that maintain such records; again courtesy information technology. Thus, information technology and economic globalisation go hand in glove, given that information technology is responsible for the processing, transmission and analysing information in all types be it video or audio⁴⁹.

The basis of development and growth of the economy rests on how well the government or the policy makers understand the impact of technology and utilise it for the same objective. This can help the nation form an integrated international production system better responsive to the needs of economic globalisation.

There have been many benefits along the path of introduction of information technology in the developing countries. The fact that the use of technology and computers has facilitated the spread of globalization even quickly cannot be denied. Without a doubt, it has encouraged the growth and development of new businesses, coming up with methods to reduce costs of production; all of which is leading to boost the nation's economy⁵⁰. Information Technology has brought with it new opportunities in the nature of creation of new industries involving processing of huge amounts of data which in turn is again fostering international trade. It has also contributed by means of creation of job opportunities for people in the developing countries. All of this sheds focus on how in order to prioritize a nation's overall growth, technological enhancement and innovation cannot be ignored. Such is the essence of technology, which takes responsibility for globalization as well.

The existing industry shows potential for tremendous progress by means of increased efficiency in allocation and management of resources which can lead to enhancing its

⁴⁸ Farhat, Seema, and Mir Annice Mahmood, *Globalisation, Information Technology, and Economic Development*, 35(4) THE PAKISTAN DEVELOPMENT REVIEW 1019–33 (1996), <http://www.jstor.org/stable/41260013>.

⁴⁹ "Information technology is defined as the acquisition, transmission, processing and presentation of information in all its forms; audio, video and graphics. Information technology includes semiconductors, computers, software including telecommunications and is different from other technologies in its ability to greatly reduce communication and transaction costs and in its degree of pervasiveness across all aspects of the economy and the society as well as geographically."

⁵⁰ See Press Release, The Borgen Project Blog, How technology is helping economies in developing countries (November 29, 2017), <https://borgenproject.org/how-technology-is-helping-economies/#:~:text=For%20developing%20countries%2C%20access%20to,new%20business%20and%20advancing%20communication>.

competitiveness in global markets. Technology can help bridge this gap. At present, one area that the developing countries need to pay a little attention to and up their game is improved management and utilization of their present resources to the maximum efficiency possible. The use of technology, if tapped strategically and judiciously, can bring with it advantages that one may not have imagined⁵¹.

THE DEVELOPMENT AND GROWTH OF TECHNOLOGY

It is believed that technology is the key to achieving developmental goals of a nation. While a nation's demands or the path to progress may be different, they are all connected with technology. In simple words, technology has made human life simpler; to an extent that today for almost all of our daily needs and routine we are dependent on some technology or the other. Technology is the application of scientific knowledge for fulfilling practical aims of life and rightfully so, it has been. From mobile phones to television, watches, bulbs or other appliances; it is technology that has made the surrounding world 'smart'. In the wake of development, technology was what man was seeking from the very beginning. Surrounded by this technology zone, most of the things that people use in their everyday lives are technology. Contrary to its popular understanding, technology does not have to be very complex or require electricity to work. Technology includes within its ambit not only physical tangible objects like machines but also intangible objects such as software or a coded program which may make a machine work. From rubbing two stones together to create fire in ancient times to today controlling the lighting of the bulb by giving voice commands to the virtual assistant 'Alexa', the all-pervasive role of technology cannot be ignored.

Just as an invention is seen as a solution offered to a long felt and existing problem, technology must meet the challenges of a human need⁵². The mechanism of achieving these human needs and the needs themselves, changes with time. Hence, considering the scope of improvement, technology also changes with time to make even the most complex of machines work smoothly in order to make human life simpler. For example, food is one of the most basic of human needs. In earlier times, humans used earthen pots to cook food as they did not have proper utensils to use which took a considerable

⁵¹ Joe Cackler et. al, Technology in Developing Economies, (March 17, 2008), <https://cs.stanford.edu/people/eroberts/cs181/projects/2007-08/developing-economies/>.

⁵² See Press Release, Industry Today, The Growth of Technology (November 4, 2019), <https://industrytoday.com/the-growth-of-technology/>

amount of time; transition to today where even a cake can be baked in just thirty minutes in an oven or a microwave, which may easily be found in every household. Similarly long distance communication was never made this easy as a mail or a text message sent across to someone or a telephone call made to another. With globalization and the subsequent migration of people to the west, the need for reliable communication increased rapidly.

No matter what the technology, there are always risks that ride along with the benefits. A simple illustration would depict how advancements in transportation have resulted in personal vehicles such as cars that have given the freedom to human beings to cover distances in a short span of time and have the autonomy to go almost anywhere. However, vehicles use fuel to run, which is a non-renewable and a limited resource available to mankind and which also causes pollution to the environment. This can mean to conclude that even though man is aware of the risks that are coupled with technology, man continues to make use of the same, rather companies continue to cater to the demands of the technology realising that the benefits outweigh the risks. It shall not always be the case that a particular technology is continually used even after the awareness of the risks because the benefits outweigh the risks but sometimes those risks may not be urgent to address, even if extremely important. The same illustration can be used to elaborate further. Not the case that environmental pollution or depleting non-renewable resources is any less of a concern for the global world, but it doesn't occur to man to address this issue first before he chooses his personal convenience. This does not undermine in any way the fact that if technology is not used judiciously or made in a manner to fulfil the desired requirements, the risks may be extremely unwarranted.

As developments in technology rises, investments in the technology sector, consequently, start pouring in heavy. More than ever, technology has seeped into not just the telecommunications or transport sector, but diverse fields such as health, medicine, finance, real estate, research and development so to say any and every kind of invention or innovation today⁵³.

⁵³ *Supra* Note 52, 14.

Resultant being that technology is seen as playing the pivotal role in nurturing the economic growth of nations⁵⁴. It undoubtedly has been dominant in enhancing the efficient production of goods and services, which is a parameter to judge economic prosperity. The effect of this rapid increase in technological developments has had different impacts on different countries. While it is believed that technology is the key to transforming least developed nations, for developing nations, this economic prosperity is essentially required.

OPEN INNOVATION AND THE IMPACT OF TECHNOLOGY ON DEVELOPING NATIONS

The fourth industrial revolution, fuelled by technology has witnessed many extraordinary changes in the global economy fostering new processes of interaction amongst the world at large. It has brought about significant changes in the standard of living of the people as advancements in technology have been related with increased levels of income and a higher purchasing capacity of man; and has had unprecedented transformation of economies of nations.

The limited use and growth of technology in the least developed nations is the prime reason behind their inhibited structural transformation⁵⁵. The difference in the impact and utilization of technology to advance development between developed versus developing or least developed nations is strengthening technological capacity and making optimum use of the resources available to aid such structural transformation⁵⁶. This structural transformation not only includes the relocation of labour from lower productivity to higher productivity or skill-intensive sectors but also encompasses the ideal consumption and exploitation of all resources to meet human needs. Many of the developed countries may serve as good examples showcasing this structural

⁵⁴ See Press Release, Knowledge, Technology and Complexity in Economic Growth, Real Colegio Complutense, Harvard University, <https://rcc.harvard.edu/knowledge-technology-and-complexity-economic-growth>

⁵⁵ See, *Technology is the key to transforming least developed countries*, The Davos Agenda, World Economic Forum, (January 13, 2022), <https://www.weforum.org/agenda/2022/01/least-developed-countries-ldc-technology/>

⁵⁶ Ghose, A. K., Structural Change and Development in India, 15(1) INDIAN JOURNAL OF HUMAN DEVELOPMENT 7–29, (2021), <https://doi.org/10.1177/09737030211005496>

transformation. While on one hand, developing countries like India may currently be undergoing this transformation, the LDC's have been relatively slow in this regard⁵⁷.

The reason behind lacking on the structural transformation can reasonably be attributed to overdependence on other countries for the production and supply of commodities in addition to an undesirable technological base. This is common for both developing countries and LDC's with just there being a difference in the degree of dependence and extent of tapping technological creativity. The importance behind recognizing the reasons is immense as manufacturing and production of goods that are more technology oriented, technology friendly leading to a higher value of the goods, is more desirable for the economy and may have manifold positive implications for structural transformation. For least developed economies, this becomes a challenge as with limited resources, the countries have very little to put in as investments in the relevant sector to ensure the required level of technological sophistication⁵⁸.

In order to better manage the resources and enhance technological sophistication, skill development is required. Human Resources in the least developed countries well-trained in science, technology, engineering and mathematics (STEM), is a disappointing percentage. For the few who are actually trained, face other obstacles such as difficulty in finding well-paying jobs and securing fruitful employment opportunities⁵⁹.

Developed nations in this regard stand at a better and a more scaled up level. According to statistics, as back as 1995-1997 in United States, information technology accounted for thirty five percent of overall economic growth in the country⁶⁰. As impressive as it may seem, nations like United States and Canada also face certain challenges in maintaining these standards. Since there are resources to invest in research and development, the nations have to meet the ends of the continuing demands of high value and productivity goods and services. These nations have to continue to fuel innovation

⁵⁷ "According to the World Intellectual Property Organization (WIPO)'s Global Innovation Index 2021, which monitors the state of technological advancement in 132 countries, 21 out of the 32 countries in the bottom quartile are LDCs. Of the 22 LDCs ranked altogether, only one (Tanzania) is in the second quartile."

⁵⁸ *Supra* Note 55, 16.

⁵⁹ *Id.*

⁶⁰ See U.S. DEPT OF COMMERCE, THE EMERGING DIGITAL ECONOMY A1-5 (1998), <http://www.ecommerce.gov/emerging.htm>, See *generally* U.S. DEPT OF COMMERCE, THE EMERGING DIGITAL ECONOMY H (1999).

and diversify the talent-pool so as to remain a notch higher. In addition to the continuance of increasing technological transformation, it is expected that these nations help the developing as well as least developed nations to bridge this gap in the name of global economic harmony so that the other parts of the world are not left even further behind⁶¹.

The embracing of technology for developing nations has had a far-reaching impact on their economies⁶². It has generously led to reduction in the costs of production, helped in establishing quality standards for goods, reduced communication gaps and the like. This in turn has led to the increased awareness amongst people, alleviation of poverty and even cultural changes. In order to be one like the developed nations, the developing countries are risking losing their cultural identities to become part of the westernized part of the globe. In the process of keeping up, there is a lot of influence that the developed nations cast on the developing world. However, the problem still persists; one of influenced adoption of technology rather than innovation. An additional problem arises, when the developing nations find it difficult to measure appropriation of technology to meet the capabilities of the country and the people. This results in inefficient diffusion of technology and penetration within the country.

This influence and diffusion, although necessary, has to be carefully moderated, lest it shall cause more problems than it can solve. If a country wishes to provide world class education, but does not possess the necessary infrastructure, it fails to fulfil the idea behind establishing education as one of the strong pillars of a sound democracy. Not only equipping lecture rooms with smart boards or technological aids which today are capable of providing a better learning experience to the students, is required, but also ensuring well-staffed organisations, hiring people with technical expertise who are aware about the existing general problems. In this structural set-up, maximum parents should be in a position to send their children to these educational institutes and the institutes should be able to provide students with the promised learning experience and resources by taking appropriate help from the government. The government or the leaders of the nation should know how to use technologies to further policy goals⁶³.

⁶¹ Eric R. Biel, *The Impact of Technological Change on Developing Countries*, 25 Canada-United States Law Journal 257-266, (January 1999).

⁶² See *Supra* Note 51, 14.

⁶³ *Supra* Note 61, 18.

Developing countries require that they mobilize their growing population to work and put in their efforts to make the domestic industries so reliable that they achieve a sense of identity in the global markets. In the area of using information and making best use of technologies to advance development, the role of both governments and private sector companies is vital. In a developing country like India, which has established itself as a welfare state, the government sure plays an active role in furthering the welfare of the people⁶⁴, more than the private sector. Hence the private sector, even if may have more potential to develop technology remains relatively less organised.

Impact sourcing, another arm of business process outsourcing, making use of technology, is yet another approach which is helping the developing world not just emerge out from the clutches of poverty, but also provide employment opportunities to even the disadvantaged sector which otherwise has little or no means of employment. Impact sourcing has had positive implications in developing countries and is continuing to give a boost to the economies. Now, with the help of technology, affordable electronic gadgets are also being made available in the market so as to be reachable to all strata of the public, thereby lessening the digital divide⁶⁵.

Technology has made possible the economies to grow in many ways than one can imagine; and to say that human beings, as potential human resources, have explored these possibilities is no wonder. A small yet significant illustration of this could be using the Internet to market one's goods or offer services online. People from developing countries have gone one step ahead using the internet or platforms online to sell locally made products, handicrafts, selling vegetables and even offering services. Initially with the traditional method of selling of goods, there were many middlemen involved-offering for sale to a person who would take the goods to the local markets, thereafter the same would be given to a vendor who would then offer the goods to a dealer who would have more access to potential buyers. With internet as the selling market platform, these middlemen have been cut from the picture, which gives the seller

⁶⁴ Ajay Chhibber & Salman Anees Soz, *India is becoming a welfare state before developed state*, THE PRINT, (November 27, 2021), <https://theprint.in/pageturner/excerpt/india-is-becoming-welfare-state-before-developed-state-but-even-welfare-it-does-badly/772397/>

⁶⁵ Soomro, K.A., Kale, U., Curtis, R. et al, *Digital divide among higher education faculty*, 17 Int J Educ Technol High Educ 21 (2020). <https://doi.org/10.1186/s41239-020-00191-5>

exposure to a much higher percentage of buyers from all across the globe in addition to direct access to the buyers.

Now online trading of goods has given a direct competition to the traditional small scale businesses⁶⁶, however, what should be noted is that the technological revolution which has created a new digital marketplace has vast potential which surely needs to be tapped by the developing countries. One should try to be in a position to innovate so as to prosper. Thus the challenge for developing nations lies in putting their best foot forward to strengthen the knowledge base and build a nation with people possessing the required skills and knowledge who tomorrow can be the reason behind an effective technological structural transformation. Reversing the brain drain concept and the loss of educated and talented workers to migration abroad in search of better employment opportunities, these nations need to build and assimilate such talent pool.

Open innovation (OI): The shift towards open innovation has brought with itself increased exchanges of information in the technological age and has also resulted in meaningful collaborations of industry with educational institutions and many other research and business organisations. This helps in the knowledge transfer which is an essential aspect of transfer of technology also⁶⁷. Sometimes the knowledge might concern development of a technology or it might even concern the technical know-how of the working of the technology. In either case, the transfer and sharing of knowledge and information is equally important for technical structural transformation for developing countries.

Recognising this potential, today top research and development companies are ready to invest in all emerging technologies which will lead the world tomorrow. This can be made out by noticing the related technological fields in which these companies have been investing. This trend has been more active in the fields of artificial intelligence, big data, 3-D printing, automated driving systems and communication technology⁶⁸. As knowledge is essential in the development of technology, both codified and tacit knowledge have their role to play⁶⁹. Codified knowledge is all knowledge that exists in

⁶⁶ See *Supra* Note 61, 18.

⁶⁷ Mukherjee Srijit, Bhattacharjee Sudipta, *Technology Transfer and the Intellectual Property Issues Emerging from It – An Analysis from a Developing Country Perspective*, 9 *Journal of Intellectual Property Rights*, 260, 264-274 (May 2004).

⁶⁸ See *Supra* Note 54, 16 and accompanying text.

⁶⁹ *Id.*

a tangible form such as proven theories, patents, researches, protocols or manuals while tacit knowledge represents all that knowledge that exists in an intangible form or remains only as part of one's intellect and one which is equally difficult to state. It may include know how or even learning by experiences. Consequently, the codifiable component of this development of science and technology get recognition on paper and get registered.

Open innovation is beneficial to all, more so, the developing nations in the digital age. Open innovation is a progressive business practice which is being resorted to by almost all leading business entities. Contrary to the traditional secrecy and silo mentality culture portrayed by research and development (R&D) corporates, this focuses more on sharing of knowledge and information by sourcing ideas and solutions to drive innovation⁷⁰. This sharing happens from a vast pool of knowledge; from different individuals to organisations, thereby not just limiting research paths to internal sources, but also external sources. The implementation of different mechanisms or open innovation techniques happens by way of collaborations, industry alliances, research chairs in educational institutions and creating innovation ecosystems⁷¹.

The term open innovation was coined and promoted by Henry Chesbrough⁷², who attempted to define it originally in the following words-

“Open Innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology. Open innovation combines internal and external ideas into architectures and systems whose requirements are defined by a business model⁷³.”

This definition has been further improvised to state that open innovation is “a distributed innovation process based on purposively managed knowledge flows across

⁷⁰ See OPEN INNOVATION: ACCELERATING YOUR INNOVATION RESULTS, <https://www.ennomotive.com/open-innovation>, (last visited Nov. 22, 2021)

⁷¹ THE ELGAR COMPANION TO INNOVATION AND KNOWLEDGE CREATION (Harald Bathelt et al. eds., 2017)

⁷² An American organizational theorist, adjunct professor and the faculty director of the Garwood Centre for Open Innovation at the Haas School of Business at the University of California, Berkeley and Maire Tecnimont Chair of Open Innovation at Luiss, Rome.

⁷³ HENRY W. CHESBROUGH, OPEN INNOVATION: THE NEW IMPERATIVE FOR CREATING AND PROFITING FROM TECHNOLOGY 43 (2003).

organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model⁷⁴.”

These collaborations and alliances have made the boundaries that existed between different research companies or organisations more permeable, allowing easy inward and outward transfer of innovations and knowledge between different individuals and corporate bodies. Initially companies were reluctant in sharing with others the valuable assets of their firm and also because the commercial aspect of this was hardly recognised. Hence they used only internal sources for research and innovation. These were the closed innovation models. With closed innovation models, come certain limitations which were later noticed.

The knowledge that is generated internally with the help of R&D, usually takes too long to develop a certain technology. Sometimes, this knowledge that is generated after a long time is not fully complete to fetch the desired results. In acquiring knowledge for the development of technology over a significant period of time many a times may not be fruitful as either the technology changes or the business priorities. Thus, the help of external sources becomes essential and it is for the same reason that open innovation model has been viewed as the tool for building a new innovation model so that new ideas can take shape with the integration of different organisations. This open innovation paradigm can be interpreted to not only expand the horizon of research by bringing in external sources but also affect and benefit the employment of intellectual property as well.

Open innovation is rightfully touted as the successful approach to knowledge and research culminating into new product development⁷⁵. Success stories of open innovation strategy include big names likes Cisco, Procter & Gamble and Eli-Lilly. Cisco was one of the first companies to try the OI model strategy by acquisitions. Its main aim was to make the hardware compatible with software working in all new technological products⁷⁶. Procter & Gamble too, came with their agenda of *Connect and Develop* as part of the OI process. Consequently it has almost equal number of

⁷⁴ See also HENRY W. CHESBROUGH, WIM VANHAVERBEKE & JOEL WEST, NEW FRONTIERS IN OPEN INNOVATION, 17, 1st ed. (2014).

⁷⁵ Tang T. (Ya) et. al., *The effects of inbound open innovation, outbound open innovation, and team role diversity on open source software project performance*, 94 INDUSTRIAL MARKETING MANAGEMENT, 216-228 (2021).

⁷⁶ *Supra* Note 70, 21.

innovations from outside as it would itself generate, thereby giving its productivity a massive boost by 60%⁷⁷. The famous pharmaceutical company Eli Lilly also adopted the OI strategy to connect to the ‘global scientific knowledge’ and enhance innovation. Its spin-off⁷⁸ ‘Innocentive’ targeted reasons which accounted for the low innovation success rates in the pharma sector using combined knowledge and intelligence to improvise inventions.

THE DIFFERENT TYPES OF TECHNOLOGY

Though there may not be a well-defined category of the different types of technology, the same can still be studied under the heads discussed hereunder, for a better understanding. It may also sometimes be the case that a particular technology may overlap with different areas on which it is classified. Some of the groups under which types of technology may be classified to simplify understanding are as follows-

A) Emerging technology-

Emerging technologies, by their very literal interpretation denote technologies that are fast developing or ones that may have a huge potential as future technologies for tomorrow, but whose practical uses may still be largely unrealised. These can be technologies which themselves are new or may be known but have new applications. In either way, an element of novelty is recognised. They are usually understood as being a harbinger of positive change in the society and having the capability of changing the status quo for the better. While such good can be tapped from emerging technologies, there is still lack of consensus on what qualifies as ‘emergent’. Although there is difficulty in establishing what exactly constitutes an emerging technology, yet there have been efforts to define it and attribute certain characteristics to it⁷⁹.

“An emerging technology can be defined as a radically novel and relatively fast growing technology characterised by a certain degree of coherence persisting over time and with the potential to exert a considerable impact on the socio-economic domain(s) which is observed in terms of the composition of actors, institutions and

⁷⁷ *Supra* Note 70, 21.

⁷⁸ A spin-off is an independent company formed as a result of the parent company split. It marks a new creation from its parent. *Infra* Note 317, 132.

⁷⁹ Daniele Rotolo et. al, *What is an emerging technology*, 44(10) RESEARCH POLICY 1827-1843 (July 2015), http://sro.sussex.ac.uk/id/eprint/56071/1/2015RP_Rotolo_Hicks_Martin_Preprint.pdf.

patterns of interactions among those, along with the associated knowledge and production processes. It's most prominent impact, however, lies in the future and so in the emergence phase is still somewhat uncertain and ambiguous⁸⁰.”

“Certain fundamental aspects can be picked up from the above definition regarding an emerging technology-

- i) radical novelty
- ii) relatively fast growth
- iii) coherence
- iv) prominent impact; and
- v) uncertainty and ambiguity”

These key indicators have been analysed from trend analysis and researches and aren't determinative or universally applicable. It may so happen that a technology is adjudged as emergent on totally subjective grounds, like perspective⁸¹. Few examples of technologies which have been noted as emerging are artificial intelligence, nanotechnology, 3D printing, robotics and stem-cell therapy to name a few. As innovation is the key driver of economic growth of a nation and that a lot of resources go into developing these emerging technologies⁸², any nation which wishes for greater economic rewards will have to utilise resources judiciously and focus more on research and development.

B) Disruptive Technology-

Disruptive Technology comes from disruptive innovation, which was for the first time developed and discussed by Clayton Christensen⁸³. He describes the concept as a process by which a new innovation (product or service) takes its position at the root or bottom of an existing market and thereafter by value addition relentlessly moves up the market creating a niche for itself and eventually displacing the other already established technologies/business models in the market.

⁸⁰ *Supra* Note 79, 23.

⁸¹ Adner, R. & Levinthal, D., *The emergence of emerging technologies*, 45(1) CALIFORNIA MANAGEMENT REVIEW 50-66 (2002).

⁸² Arthur, W. B., *The structure of invention*, 36(2) RESEARCH POLICY 274-287 (2007).

⁸³ Harvard Business School Professor Clayton Magleby Christensen was an American academic and business consultant, who was the world's foremost authority on disruptive innovation. His theory of disruptive innovation has been considered the most influential business idea of the early 21st Century.

For attracting customers, a disruptive innovation basically opens access of the particular product or service to a whole new segment of the population, which the population initially could not procure because of financial or skill limitations. However, because now the segment of the public can access or afford that which it could not before, it must have disrupted the market of something which the public resorted to, when they could not have access to the disruptive innovation. Some characteristics that may be attributable to disruptive technology are-

- i) small target markets
- ii) lower gross margins; and
- iii) simple goods that may seem unattractive to other competitors relative to other existing solutions⁸⁴

Due to lack of threat of competition, owing to the lower gross margins that these technologies offer, other competitors often find them unattractive and not worthy of replacement, thereby creating space for them at the bottom of the market tier from where these new disruptive innovations emerge. As the name suggests, disruptive technologies disrupt other businesses in the market creating a new area or space for themselves, open for exploration. Some examples could be cellular mobile phones disrupting the fixed line telephones, laptops in place of mainframe or mini computers, automobiles for animal driven carts, 5G technology for 4G technology and cloud services, amongst others.

Difference between emerging and disruptive: What is noteworthy here is that from the examples in the name of disruptive technology mentioned above, quite a few may be emerging ones. Hence drawing a distinction between emerging and disruptive technology becomes necessary. While both the kinds of technologies are one of a kind, where emerging as discussed represents the future of tomorrow, while disruptive, replaces the traditional or existing, the common element here can be ‘emerging to the level of disruption’.

According to popular beliefs, a technology which is recognised as emerging, would disrupt some past technology or innovation eventually. A minor difference can be realised at the stage of establishment of the technology or innovation. For example, a

⁸⁴ See DISRUPTIVE INNOVATION, <https://claytonchristensen.com/key-concepts/>, (last visited Jan. 05, 2022).

novel technology with a new application which has just come into view and whose potential is yet to be realised, can be seen as emerging. However, with the gradual passage of time, it is seen to have acquired an inevitable role where it has also made the use of past technologies redundant. It is then that it may be seen as disruptive. This establishes the fact that tapping the potential of the emerging technology would be essential to validate its disruptive aspects else what might seem as shining and glowing from a distance may not be the same on nearing.

Disruption may be interpreted to mean either to cause chaos and discord in an existing system or to completely ruin one. The other competitors in the market sometimes face either kinds of disruption or may face even both (one leading to another). A business in order to survive must up its game the moment disruption by means of any chaos is caused to it because of another innovation or technology so that the disruption does not result into totally ruining or destroying other businesses. It may also be the case that an emerging technology's newly discovered application may prove disruptive to other business models. Such disruptions may not be the immediate repercussions of an emerging technology and may be quite a substantial time ahead when more research has led to unveiling the unknown.

Evaluation of an emerging technology becomes essential in today's time with abundance, intensity and potential of such technologies. Organised innovation involves chasing the emerging technology that shows signs of disruption and letting go of technology which does not take calculated risks instrumental in generating revenue⁸⁵. The development of developing countries is significantly influenced by the substantial socio-economic impact of these technologies as well and hence have assumed such importance⁸⁶.

C) Innovative Technology-

As the term suggests, an innovative technology entails a new and an original element. Similar to emerging technologies in many aspects, innovative technology is an

⁸⁵ See, Chris Curran, *Emerging Technology and Disruptive Technology: What's the Difference*, ARCHITECTURE AND GOVERNANCE MAGAZINE, (Feb. 15, 2014), <https://www.architectureandgovernance.com/digital-transformation/emerging-technology-disruptive-technology-whats-difference/>

⁸⁶ New and Emerging Technologies: What Impact on Developing Countries? 19(4) FOREIGN TRADE REVIEW 587-594 (1985).

experimental or an unproven technology procedure developed or recognised at a nascent stage. It is a proposed idea which is yet to establish its operational and technical validity. Its operation may have been tested to show positive results in certain circumstances, but the technology unlike emerging technology may not have seen growth or have information about its known full scale use, its effectiveness or cost. It may also not have any related documents or research studies analysis to support or establish prediction of its performance. Hence, the technology is tested and installed and then research is conducted to assess the performance, cost, efficiency and design objectives prior to its industry use.

As innovation may denote an improvisation to or a step ahead of invention, innovative technology may denote technology that has improved characteristics. It may have properties which may be an addition to the previous technology or have properties which differ significantly from what was already known. Innovation is not necessarily driven only by technology but technology might be crucial to innovation. If technology is being used in the process of improvising the viability and in turn the commercialisation of a product or service according to the demand and needs of the consumer, then it refers to technological innovation. Innovative technology in this sense overlaps with emerging technology to quite an extent.

D) Converging Technology-

Converging technologies are the resultant of two or more different kinds of technology, all instrumental in pursuing similar goals. These technologies existing as separate technologies may produce different results and efficiencies when put together. Their convergence may hail new applications of the technology producing the desired result. The most basic of an illustration of converging technology would be the mobile/laptop and the internet. The mobile or laptop as an individual electronic device may showcase its own uses and advantages but combining with internet as a technology, amplifies its efficiency and brings its utility to the maximum potential.

Contrary to emerging or innovative technologies, converging technologies need not always involve the combining of two or more new, breakthrough technologies. Rather, it may involve converging existing technologies, the idea of combination of the existing ones being the novel element. The combination of different technologies can help

achieve new levels of performance or cater to complex technical issues which arise as technology progresses.

E) Established Technology-

Established technologies are those which are current and running in the present world. Technologies which are in operation, made use of and widely accepted by people, generally fall under this category. Going by the literal interpretation of the term, an established technology is one which holds its ground firm and has been tried and tested, thus, established. Since it is in operation, it implies that it has been proven successful in its commercial application. While emerging or innovative technology may also be called as developing technology, established technology implies technology which is generally developed.

A generic example of established technology would be the internet, as a means of connecting people globally.

F) Sustaining technology-

A sustaining technology, as totally opposed to disruptive technology, is a technology which is instrumental in making an existing established technology better. It is dependent on incremental improvements or small innovations to a technology already in existence resulting in a better functioning of some previously established technology. Technologies can also be categorised in a hierarchy. For example, a motor car is a technology in the transportation system. The car consists of multiple small technologies like internet inside the car, air conditioning, heavier engine, automatic transmission and many more. These small technologies eventually add value to the motor car, a technology in itself.

The major difference between sustaining technology and disruptive technology is that while disruptive technology disrupts an existing market creating a new market for itself, a sustaining technology does not create new markets but only evolves the existing ones. A sustaining innovation may be discontinuous resulting in a transformation of a technology or continuous where it continues to evolve a process, thus evolutionary in nature.

CONCLUSION

In any domain, technology plays a remarkable role in augmenting growth and development. Having discussed the importance of technology as pivotal to development and the significance of trade between countries (how it started and how it continues to grow) with the advent of globalisation, the utilisation of different measures of technology by different countries in order to advance growth, is further highlighted. In such a scenario, keeping the global economic progress in mind, recognising the potential of technology transfer becomes imperative. To achieve this potential of global integration, it is crucial that developed nations indulge in ways to help other nations come at par with them or if not, progress continually towards development. In doing so, the stronger nations would consequently be strengthening trade relations with the other nations. Hence not only is the process advantageous to the wealthier nations as regards trade, it does offer a viable solution for global co-operation and overall development of all beings.

Technology transfer is a procedure wherein knowledge or technology created by one organization/country is conveyed to another, acknowledging its potential and utility, primarily for commercial purposes. The methods employed for this transfer can vary depending on the type of technology involved and whether it is safeguarded by intellectual property rights such as patents, copyright, or trade secrets. The purpose of transfer and commercialisation will be solved upon successful inventions (manufacture of products which satisfy societal needs, identification of potential markets and distribution channels, and building the ability to adopt and absorb. This process can happen between countries, governments, research organisations, private corporations, universities and businesses.

Such organisations conduct research generating path breaking discoveries. These ideas generated over time improve the way we live. Technology transfer professionals or people engaged in the process of transferring technology play a central role connecting these ideas with companies that can turn them into products. Both government and private organisations provide the critical funding that supports this research to help find the next new technological invention. Transfer of technology works in this direction to protect and advance these inventions, sometimes through legal means. Technology

transfer thus advances new ventures, employment opportunities and overall economic growth.

OBJECTIVE OF RESEARCH

The research seeks to achieve the following research objectives

- To understand and study the significance of technology transfer vis-à-vis intellectual property rights protection.
- To critically analyse the effectiveness and the success of the transference of technology.
- To study the implications of intellectual property in technology transfer by weighing transfer with IP as against transfer without IP.
- To examine and compare the different mechanisms for technology transfer by studying some of the case studies of different countries.
- To find out the existing lacuna in the policies and proposing solutions to work out a global exchange forum where swift and hassle free transfer can take place.

SCOPE OF RESEARCH

The scope of the study shall include rationale behind technology transfer and its related aspects, different mechanisms for the same, the role of patents in technology transfer, licensing agreements, license of know-how and loss of confidentiality aspects, liabilities of the contracting parties and significance of Intellectual Property Rights in Technology transfer. The study shall also touch upon the jurisprudential aspects behind technology transfer and the related provisions of TRIPS along with figuring out a need for guidelines on devising a structured mechanism. The scope of the study shall be limited to the abovementioned aspects.

PROBLEM STATEMENT

Technology transfer not only facilitates the flow of technology to the needy countries as a means of commercially exploiting the technology but it also provides an impetus

to the developing countries to strengthen their R&D and come up with such other competing inventions that can aid development of nations better and foster their economies. If this transfer is hampered due to costs prohibitions, unfriendly relations among nations, non-formulation of guidelines regulating effective transfer and poor implementation of the existing policies, then these bottlenecks are killing the very motive of development this mechanism proclaims and guarantees. Hence proposing or coming up with solutions for resolving these issues would help not only further the vision of TRIPS but also aid in strengthening the research and technological base of the nation.

CENTRAL ARGUMENT

The pressing need for technology transfer in today's time has been realised by not just the developed nations in relation to better trade negotiations but also the developing countries which see the opportunity as a means for incorporating the technology to further their domestic industrial trade and development. The issue remains to understand the demand for a particular technology. Not all technology is desired by every country. The need is to build on adaptive technology where technology after bowing should be absorbed to meet the needs and growing concerns.

RESEARCH METHODOLOGY

The methodology proposed to be used for this research for a conceptual understanding of the topic shall be doctrinal in nature for which primary sources like statutes and secondary sources like books and articles shall be relied onto. The guidance taken from the allotted guide shall be fully adhered to. The use of NLUJ library and the internet sources shall be done to collect the matter relevant to the study.

RESEARCH QUESTIONS

1. What are the reasons behind the growing need and importance of technology transfer?

2. What are the different mechanisms of transfer of technology and the adoption of different routes to accomplish the transfer through the chosen mechanism?
3. What are the problems and risks associated with the transfer and to what extent can the effectiveness of this transfer be determined?
4. What are the implications of Intellectual Property Rights in Technology Transfer?
5. How far are the actual practices implementing transfer of technology in compliance with Article 7, 8, and 66.2 of TRIPS which identify the goals of technological innovation and dissemination even to the Least Developed Countries?
6. What are the reasons behind improper implementation of the existing principles governing technology transfer and the lack of a proper laid mechanism? Is it even possible to have a uniform structured mechanism or a uniform code for transfer of technology among nations?