Chapter 13
Innovations in the Era of Globalization: Challenges for Indian Economy

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13.1 Introduction

Strong innovation activity is an indicator of favorable business environment and itself a determinant of economic development. Especially now when the world is getting flatter and markets operate under unified rules, government, and firms have a challenging task to create and support a system for efficient innovation and creativity outcomes. Thus, the main objective of this paper is to give a comprehensive overview of threats and challenges for the national systems of innovation in India. The findings of this study suggest that globalization has changed competitive forces on the world market, making product and quality demand more homogenous. However, innovative activity varies across countries due to differences in culture, the level of education and access to it, government's expenditures for R and D and overall investment activity and foreign trade.

13.2 Literature Review

13.2.1 Globalization and Innovation Process

Globalization has become a subject of multiple discussions and fierce argumentation among scholars, business people, and policymakers for decades. The concept first appeared in lexicon of OECD representatives in the mid-80th of the twentieth century. Majority of international organizations considered new phenomenon as

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G. Chakrabarti and C. Sen (eds.), *The Globalization Conundrum—Dark Clouds behind the Silver Lining*, https://doi.org/10.1007/978-981-13-1727-9_13

increased and unrestricted movement of goods, services, and factors of production across countries. Globalization through market openness and liberalization might undermine national economy if latter is unprepared to changes. Nowadays it has become a fact that globalization has been constantly creating multiple challenges and benefits for all participants of international economic relations over the past decades (Singh 2017).

A range of firm-based theories of international trade link innovation with product features, form strategy, competition, and market conditions. According to Raymond Vernon theory, country-innovator becomes exporter of new products at the early stages of product life cycle, but it loses gradually its export potential over time as product gets more mature on the market (Vernon 1979). Michael Porter's theory argued that competitiveness of nation depends on the capacity of its industries to innovate and upgrade. Sophisticated market conditions urge firms to invent new products and ways of doing business (Porter 2011). In particular, more knowledgeable and demanding customers expect to receive better products and consumer experience comparing to the customers without any expectations about quality or service level. Consequently, major part of innovative products and processes touch upon marketing activity as important business function, that links innovations with market demand.

Globalization became possible through the willingness of major actors on a global political arena regarding integration, coordination and opening up their markets toward more dynamic international exchange. Particularly, transnational corporations (TNCs) are active participants and beneficiaries in globalization process. They have shifted a major part of manufacturing, R and D and other non-core business activities outside home countries to developing ones to reach cost-cutting and market access targets (Prasada 1997).

India perceived the idea of globalization since 1991 and witnessed it in 1995 by obtaining a membership in the WTO. Due to a number of previously implemented reforms, country has managed to engage in foreign R and D activities in product development for regional markets and generic technologies conducted by TNCs (Singh 2017; Prasada 1997).

13.2.2 National Innovation System

According to the scientific reflections of Stiglitz J. and Dasgupta P., competition is an inherent feature of the capitalistic economic system. Three-dimensional features of competition are reflected in the price and non-price forms, but the most important is a competition of inventions and innovations (Dasgupta 1980). Globalization has weakened producers' pricing power, decreased product life-cycle, minimized first-mover advantage, thus product innovations nowadays are of extreme importance for survival and business success (Agarwal and Thiel 2012). The twentieth century was a starting point of active spillover and dissemination of innovations across counties through their national innovation systems. The existing variety of

national systems of innovation (NSI) aimed at reaping its best from international economic order, regulation, and mechanisms of distribution of innovations.

The first known definition of NSI underlines institution nature of NSIs interpreting it as "set of institutions in the public and private sectors whose activities and interactions initiate, import and diffuse new technologies" (Freeman 1995). Functional analysis brings the meaning of NSIs from narrow, where "R&D institutions—firms, industrial research institutes, research universities and state government laboratories–create and disseminate innovations" (Nelson 1993) to broader one—adding to above mention definition the range of political, socioeconomic, cultural factors and institutions that affect innovation process (Lundvall 1992).

There has been a lot of debate whether trade liberalization and increased competition boosts innovations. Typically, protectionism leads to market monopolization and reduces incentives to innovate, though, larger market share generates more sales that might be spent for R and D (Acharyya 1995). Later research, however, stipulate the opposite: free trade based on comparative advantages reduces the costs of innovation through technology acquisition, decreases opportunity costs and accelerates country's innovation catch-up (Altenburg 2008).

13.3 Methodology

This is an exploratory study with a focus on factors, elements, and trends in the national innovation system. Employed methods include a set of recognized and adopted by international organizations qualitative research tools to describe innovation pace, limitations and future prospects to growth (Shwab 2017). The research is backed up by a solid corpus of theoretical developments in the area of NIS, foreign direct investments, global value chains, foreign trade, clusters, globalization, and economic growth (Jurowetzki et al. 2018). The paper tries to highlight main directions, opportunities, and effect for the Indian economy in the twenty-first century.

Following up Global Innovation Index methodology, innovation index comprises an arithmetic mean of output–input sub-indexes. The ratio of output to input represents the innovation efficiency indicator (Cornell University, INSEAD, and WIPO 2017).

GII methodology employs five input and two output pillars with equal weightage of each parameter in the final assessment (Fig. 13.1). The dataset includes 81 indicators drawn from various international organizations like World Bank, IMF, UNESCO, WIPO and private institutions such as Thomson Reuters, Eurostat, COMTRADE database, etc. (Cornell University, INSEAD, and WIPO 2017).

13.4 Findings and Discussions

India concerned about its innovation pace in the early 90s of the twentieth century. Essential improvements in the education system and telecommunication sector have led to a burst in the IT industry competitiveness. Encouraged by the success,

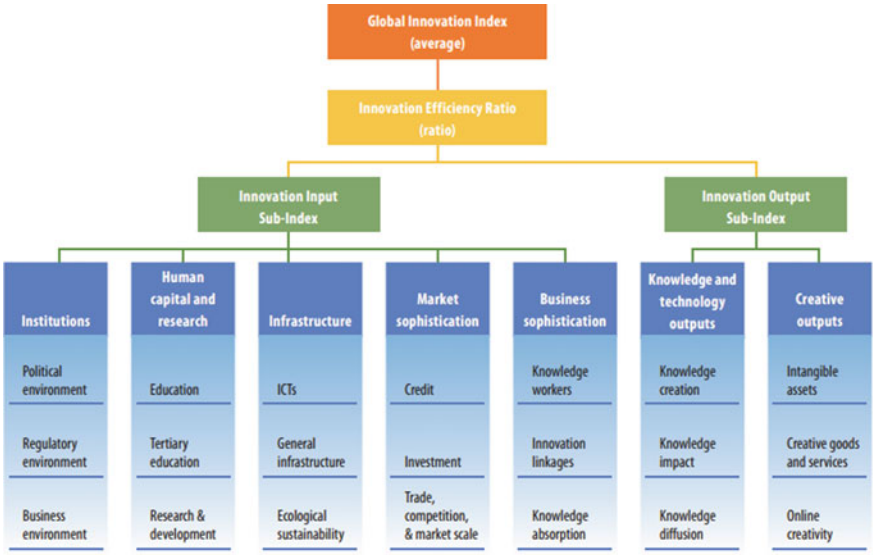

Fig. 13.1 Composition of GII. *Source* Shwab (2017) Retrieved 3/2018

policymakers have designed institutional and financial framework to declare innovations as country's priority (Casanova et al. 2018).[1] On the other hand, stakeholders and policymakers are willing to ensure that all innovations are in total cohesion with sustainable development goals, so that rapid economic growth would not harm the environmental ecosystem. In such a way, business and government try to implement a number of sustainable initiatives, encourage green investment projects, and support social awareness in sustainability issues (Heyden 2014).

Over the past 30 years, both country-wise and world landscape of innovation exports has changed dramatically. Global hi-tech exports reached its peak in 2000 with 24.4% following few consecutive deteriorations. The United States took up leadership in 1999 with 34.3%, however, China in 5 years caught up and even outmatched the US showing 30.4% in 2005. India's innovation exports ratio increased 1.75 times or to 7.13% during 1988–2016 demonstrating consecutive ups and downs (Fig. 13.2).

Yet, there is a lot to be done with innovations in India. According to the latest Global Innovation Index (GII) report, India has taken up 60th rank among 127 economies falling behind BRICS counties like China, Russia as well as Eurasian middle-income countries Bulgaria, Malaysia, Romania, Turkey, Viet Nam, Montenegro, Ukraine, Thailand, Mongolia, and Armenia. However, India is ahead of average lower and middle-income countries. Experts acknowledge rapid

[1]They established a Ministry for Skill Development and Entrepreneurship, created financial schemes for SMEs and incubation programs for startups, announced increased expenditures on infrastructure.

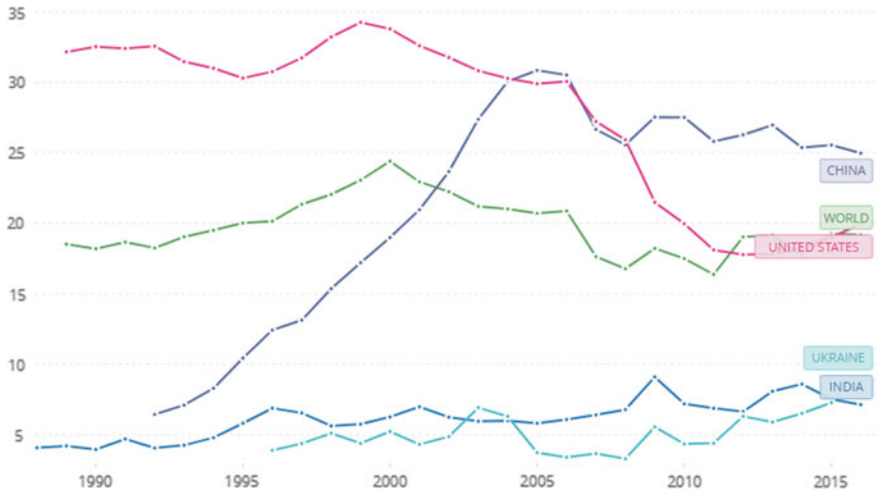

Fig. 13.2 Share of innovation exports to GDP during 1988–2016 (%). *Source* World Bank Open Data Retrieved 4/2018. https://data.worldbank.org/country

innovation pace of Indian economy as an outcome of human capital, infrastructure, and market advancements (Cornell University, INSEAD, and WIPO 2017).

Another metrics of global competitiveness acknowledges India to become a new center of innovation. Innovation catch up would be possible when business and households are ready to incorporate new technologies into their lifestyle and business processes. Thus, country's technological readiness is almost on the bottom of the Global Competitiveness Index 2017–2018 with 107 rank out of 137 (Shwab 2017).

Competitiveness and innovations are tightly interrelated and primarily originate from creativity. Global Creativity Index has estimated strong relationship (0.78) between economic competitiveness and creativity. Correlation of competitiveness, technology, and talent had been estimated at 0.76 and 0.73, respectively, whereas tolerance represented the mediocre effect on competitiveness (Florida 2015). India was ranked 99th in the list of 139 countries by the level of creativity. Interestingly, that technology sub-index as a measurement of R&D expenditures and number of patents per capita is much better (52nd place) than talent and tolerance indicators (92 and 108, respectively). Countries with a lower ranking in technology but with better talent numbers were estimated as more creative in general (Florida 2015).

Also, NIS might be viewed as a standalone trigger of a nation's economic growth (Sesay 2018). Such parameters of NIS like the strength of intellectual property rights (Gould and Gruben 1996), highly technological imports, TRIPS agreement (Ginarte and Park 1997), R and D expenditures are recognized to have a high impact on GDP growth (Falvey 2006).

India becomes a member of WIPO in 1975. In an attempt to protect its intellectual property over the past 20 years India has filed more than 460 complaints and

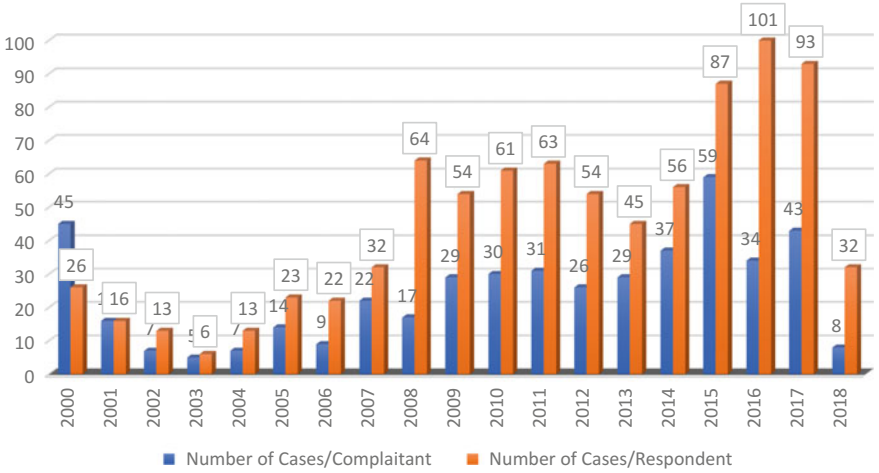

Fig. 13.3 Dynamics in India's IP compliant-respondent cases. *Source* WIPO statistics database. Retrieved 3/2018. http://www.wipo.int/amc/en/domains/statistics/countries_yr.jsp?country_code=IN&party=R

become respondent in 860 cases. Increasing number of complaints demonstrates poor IP protection and the fallacy of inventions (Fig. 13.3).

An empirical study of BRICS national innovation systems has revealed the significant statistical impact of high-tech exports, government expenditures on R and D, patent number, the quantity of scientific personnel, student enrolment in science and engineering. Estimation proofs that increase in these NIS components by 10% induce economic growth from 0.15% up to 0.02% (Sesay 2018).

To take NIS through the prism of capabilities, three dimensions is applicable: innovation, production, and social capabilities. Measure suggested for innovation capabilities are the following: (1) scientific and engineering articles (per capita); (2) USPTO patent applications (per capita); (3) R and D expenditures (% of GDP); (4) Trademark applications (per capita). Production capabilities include ISO 9001 certification (per capita) and Internet users (per capita). Lastly, social capabilities incur years of schooling, adult literacy (% of adults), and index of bureaucracy quality (Fagerberg et al. 2017). All of them are aimed at revealing critical knowledge-based inputs for GDP growth. Strengthening NIS, technology transfer, and knowledge sharing.

During 1996–2015, the USA has maintained its leadership in R and D expenditures with 30.5% share. In contrast, China had an even worse situation with R and D financing than India in 1996, but already in 2 years, it caught up. Existing India's share remains on the level of 1996 and comprises 0.63%, whereas Chinese expenses for science have increased 3.67 times—from 0.563 to 2.033% (Fig. 13.4).

Another comparative study of innovation capabilities and NIS improvement of China and India emphasizes the importance of economic reforms, technology policies, and the emergence of innovative cities in innovation development (Fan 2018).

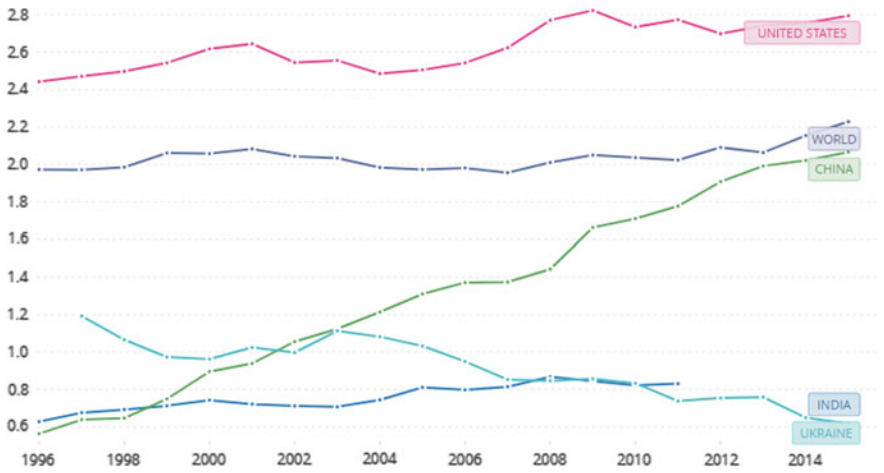

Fig. 13.4 R and D expenditures as a share of GDP during 1996–2015. *Source* World Bank Open Data Retrieved 4/2018. https://data.worldbank.org/country

Nowadays, there are three innovation hubs in India—cities which are recognized to be innovative centers of innovations, among them Bengaluru, Pune, and Mumbai, which are famous for IT and chemical industry developments (Shwab 2017).

Sluggish growth of governmental expenditures has demonstrated the inability of institutions to manage and intervene innovation process mainly due to some structural patterns. Around 55% of all R and D funds was made by the government for military and fuel supply purposes. Namely, India is proud of its weapon, nuclear, and space deployments. Such products as missiles, rocket systems, night-vision devices, reactors, satellite, and launch vehicles were recognized to be competitive by many customers inside and abroad (Mashelkar 2007). India enjoys one of the largest space budgets among G20 countries allocating more than $1 billion. The country benefits heavily from exporting the majority of space technology products. Moreover, economic growth is associated with the contribution of this industry in output (OECD 2011). Other sources of financing refer to higher educational establishments—about 4%, and private business—38% driven by pharmaceutical and automobile industries. Despite this, India demonstrates growing scientific output in terms of SCOPUS publications and growing patent filing activity (Padmanabhan 2018).

13.4.1 Organizational Behavior Toward Innovations

According to early study, innovations in India are predominantly minor, i.e., cost-reducing in nature contrary to major or quality-increasing innovations (Acharyya 1995). A distinctive feature of India and other developing markets lies in the area of "reverse innovations". They are aimed at serving and satisfying need of

a low-income population at the bottom of the pyramid markets. Big business and multinational corporations are enabled to offer low-cost products by introducing innovations into product design, distribution channels, and commercial models (Wolf 2011; Agarwal and Thiel 2012). Even IT-sector with its highly technological developments does not produce radical innovations, and most of the employees are engaged in IT services rather than R and D developments (Taganas and Kaul 2006).

Another research of Bangalore auto SMEs studied out the effects of innovations on employment and labor productivity. Incremental nature of innovations caused employment growth but not productivity. Obviously, that employees do not work effectively as they do not obtain benefits from sales of innovative products. Furthermore, capital to labor ratio growth is twice lower than labor productivity growth, thought the relationship between these variables is enough strong. Neither of the auto-component producers have obtained any national or international patent, which gives little room for sustainability (Subrahmanya 2010).

Clusters as a form of innovations are under-evaluated in terms of innovation development. Among 350 SME-based clusters and 2000 artisan-located ones, around 119 have strong export potential. Reasons for low competitiveness are productivity, technology, and infrastructure issues faced by companies. Indian clusters can benefit from technology and know-how transfer. There are suggestions to set up Special Service Centers (SSC) to incorporate best practices in a product upgrade, process innovations, staff development, and foster innovation-support policies. Organization background for SSC comprises a pool of firms, their associations, governmental institutions interested in tackling industry issues and challenges. Successful cooperation of Indian and Italian clusters in agri-food and leather industries point out the way toward business growth and technological improvement through technology acquisition on a partner basis being a part of the international cluster (Gomes 2001).

According to some research, India is classified as a ‘dynamic adopter’ of technologies through its leg behind from UK in both incremental and radical innovations. Main reasons are the poor technical background of entrepreneurs, low R and D intensity, and slow innovation dissemination (Subrahmanya 2005). Though presently India’s innovation policy lacks mechanisms to facilitate firm networking and capacities to absorb innovations as well as ways of technological modernization in non-high-tech industries (Kaul 2002, 2006). India also needs to work on innovation image to combat the established perception of a country-imitator, unite knowledge base, and cultural values to achieve innovation synergy (Mashelkar 2007).

13.4.2 Indian Culture: Hindrance to Innovations or Key to Success

Culture it is a social phenomenon that makes the world versatile and let the idea of multidomestic view on markets to strive. India is well known for its cultural

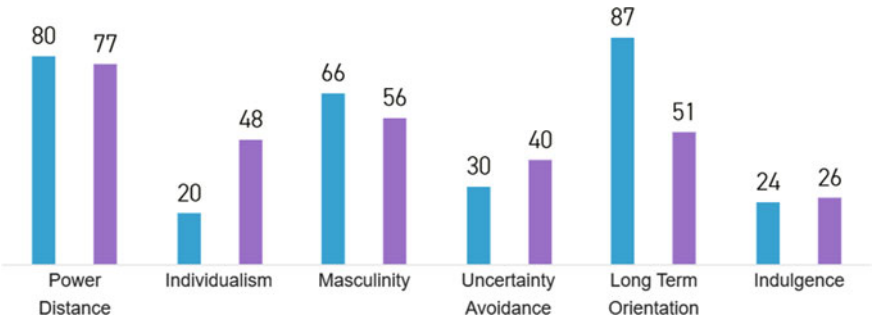

Fig. 13.5 China and India through the prism of cultural dimensions by G. Hofstede. *Source* Hofstede Insights Retrieved 5/2018. https://www.hofstede-insights.com/country-comparison/india/

diversity and relative inviolability of social norms, traditions, and institutions over centuries. Using Geert's Hofstede country comparison toolkit let us compare cultural dimensions of India and China and try to conclude if the differences in culture might affect innovations.

Two countries look similar in terms of high power distance, masculinity, and low indulgence, however, China has more collectivistic aspirations in its cultural genome, low tolerance to risk, and greater tendency to long-term orientation (Fig. 13.5).

13.4.3 Policies to Boost Breakthrough Innovations

OECD report acknowledges growing number of innovation policies implemented by India over the past decade (OECD 2007). In the attempt to tackle innovation challenges of the twenty-first century National Innovation Council and India Inclusive Innovation Fund were set up. The Council designed a 10 years strategic roadmap for innovations with a due date in 2020. Main provisions of a new Science, Technology and Innovation Policy stipulate: (1) priority of certain industries like IT and telecommunication, drug development, agriculture, energy, water, and environmental management; (2) mechanisms for supporting innovation incubators[2]; (3) support of innovation entrepreneurship and inclusive development; (4) emphasize on international R and D cooperation and partnership (Technology 2013). The focal point of this strategy was represented in three domain areas: technologies to satisfy human needs, to create more excellence in business and entrepreneurship and develop knowledge-based industries (Mashelkar 2007).

[2]Small idea—small money initiative, Risky Idea Fund.

By now among large impediments to innovation breakthrough remain low efficacy of government support programs and rigidity of its R and D system, lack of foreign R&D investments, poor quality of tertiary education, deficiency of hi-tech industries. Nonetheless, strengthen the patent law, engagement of scientists in legislation-forming processes, increased governmental awareness regarding innovation, and vast manufacturing capacities have preconditioned technological progress and continue to generate new avenues to rise and operation of NIS under global rivalry (Agarwal and Thiel 2012).

13.4.4 Creativity, Innovation, and Education

Creativity is a personality characteristic, at the same time innovations, are more inherent to groups of people, firms, and nations. It is known that children are more creative than adults but over time there is a tendency to substitute creative abilities with the rational mindset and practical reasoning. Creative capabilities inherently join up with the process of problem identification and problem-solving. Prerequisites to successful innovations are defined as follows: (Datt and Chunawala 2016).

- motivate schoolchildren and undergraduates to identify and solve problems individually appealing to mental and moral obligation to contribute to the society development;
- practice more divergent thinking tests and activities as a way of generating nontrivial business ideas and technological solutions;
- improve teaching mastership and expertise in various areas to be able to expose to greater pool of knowledge and generate knowledge-based problems and innovative solutions.

13.4.5 Conclusions

So far, India has improved its competitive positions by making substantial progress in market regulations, infrastructure development, education, and institutional framework of innovation activity. However, society in India continues to suffer from high level of discrimination and hostility, the majority of the population have no access to high-quality education, areas of technological progress are defined by government R and D priorities and possibilities to export.

Firms in India introduce cost-cutting/incremental innovations which target low-income segments of the market. Still, there is a huge potential for growth considering country's economic growth and increases local demand. All innovation-boosting institutions and policies are in force, although more financial

resources from business, human capital investments, networking, and international cooperation in R and D and technology transfer are required.

To speak figuratively, all these changes are similar to crutches that support movement function of a human body, although they are not able to grant free activity. Movement here means innovation progress, human body its firms that conduct R and D. Proven innovation progress is driven by business initiative, stakeholders' confidence, and market demand. Consequently, all businesspeople and entrepreneurs should focus on creative skills and competencies development, nurturing of innovative mindset at a workplace, organizational design elaboration, proper motivation, innovation network integration, and expansion for the sake of further commercialization.

It is required that higher institutions of educations must elaborate on a new curriculum for innovation-seeking businessmen. Innovation-oriented postgraduate training and MBA programs in business higher education would be able to fill in the knowledge gap.

References

Acharyya, R. (1995). Liberalisation, innovation and exports. *Economic and Political Weekly, 30* (36), 2269–2271. Retrieved from http://www.jstor.org/stable/4403195.

Agarwal, R., & Thiel, M. (2012). A stratagem for responsible business in India and the US: Government innovation or constraint? *Procedia—Social and Behavioral Sciences*, 490–503.

Altenburg, T. S. (2008). Breakthrough? China's and India's transition from production to innovation. *World Development, 32*(2), 325–344. https://doi.org/10.1016/j.worlddev.2007.06.011.

Casanova, L., Cornelius, P. K., & Dutta, S. (2018). *Financing entrepreneurship and innovation in emerging markets.* Academic Press. https://doi.org/10.1016/B978-0-12-804025-6.00005-8.

Cornell University, INSEAD, and WIPO. (2017). *The global innovation index 2017: Innovation feeding the world.* Ithaca, Fontainebleau, and Geneva.

Dasgupta, P. S. (1980). Uncertainty, industrial structure, and the speed of R&D. *The Bell Journal of Economics, 11*(1), 1–28. https://doi.org/10.2307/3003398.

Datt, S., & Chunawala, S. (2016). A comparison of problems at the grassroots level in India identified by adults and children: Implications for design and technology education. *Design and Technology Education: An International Journal*, 10–25.

Fagerberg, J., Lundvall, B. -Å., & Srholec, M. (2017). *Global value chains, national innovation systems and economic development.* Lund: Centre for Innovation, Research and Competence in the Learning Economy. Retrieved from http://wp.circle.lu.se/publications.

Falvey, R. F. (2006). Intellectual property rights and economic. *Review of Development Economics, 10*(4), 700–719. https://doi.org/10.1111/j.1467-9361.2006.00343.x.

Fan, P. (2018). *Catching up in economic transition: Innovation in the People's Republic of China and India*. Tokyo: Asian Development Bank Institute.

Florida, G. M. (2015). *Global creativity index.* Martin Prosperity Institute.

Freeman, C. (1995). The "national system of innovation" in historical perspective. *Cambridge Journal of Economics, 19,* 5–24.

Ginarte, J., & Park, W. G. (1997). Determinants of patent rights: A cross national study. *Research Policy, 26*(30), 283–301. https://doi.org/10.1016/s0048-7333(97)00022-x.

Gomes, J. (2001). SMEs and industrial clusters: Lessons for India from Italian experience. *Economic and Political Weekly*, 4532–4533. Retrieved from http://www.jstor.org/stable/4411438.

Gould, D., &. Gruben W. C. (1996). The role of intellectual property rights in economic. *Journal of Development Economics, 48*, 323–350. https://doi.org/10.1016/0304-3878(95)00039-9.

Heyden, N. S. (2014). *Global sustainable communities handbook*. Oxford: Elsevier Inc. https://doi.org/10.1016/B978-0-12-397914-8.00006-0.

Jurowetzki, R., Lema, R., & Lundvall, B. Å. (2018). Combining innovation systems and global value chains for development: Towards a research agenda. *The European Journal of Development Research*, 1–25.

Kaul, R. A. (2006). Innovation systems in India's IT industry: An empirical investigation. *Economic and Political Weekly, 41*(39), 4178–4186. Retrieved from http://www.jstor.org/stable/4418760.

Kaul, V. (2002). Innovative clusters: Implications for public policy. *Productivity, 43*(2).

Lundvall, B. (1992). National Systems of Innovations. *Frances Pinter*, 1–10.

Mashelkar, R. (2007). From imitation to innovation. *India International Centre Quarterly, 33*(3/4), 172–181. Retrieved from http://www.jstor.org/stable/23006079.

Nelson, R. (1993). *National innovation systems: A comparative analysis*. New York: Oxford University Press.

OECD. (2007). *Annual report on sustainable development work in OECD.*

OECD. (2011). *The space economy at a glance 2011.* OECD Publishing. http://dx.doi.org/10.1787/9789264111790-en.

Padmanabhan, S. (2018, January 15). *The Business Line.* Retrieved April 4, 2018, from www.thehindubusinessline.com, https://www.thehindubusinessline.com/news/science/indias-rd-expenditure-up/article10033094.ece.

Porter, M. E. (2011). *Competitive advantage of nations: Creating and sustaining superior performance*. New York: Simon and Schuster.

Prasada, R. (1997). New trends in globalization of corporate R&D and implications for innovation capability in host countries: A survey from India. *World Development, 25*(11), 1821–1837. https://doi.org/10.1016/S0305-750X(97)00079-X.

Sesay, B. Y. (2018). Does the national innovation system spur economic growth in Brazil, Russia, India, China and South Africa economies? evidence from panel data. *South African Journal of Economic and Management Science*, 1647. https://doi.org/10.4102/sajems.v21i1.1647.

Shwab, K. (2017). *Global competitiveness report 2017–2018.* Geneva: World Economic Forum. Retrieved from http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf.

Singh, R. (2017). *Indian Economy*. Tamil Nadu: McGrraw Hill Education (India) Private Limited.

Subrahmanya, M. (2005). *Pattern of technological innovations in small enterprises: A comparative perspective of Bangalore (India) and Northeast England (UK)* (pp. 269–280). Technovation.

Subrahmanya, M. H. (2010). Auto SMEs in Bangalore: Does innovation promote employment and labour productivity? *Economic and Political Weekly*, 59–66. Retrieved from http://www.jstor.org/stable/25664225.

Taganas, R., & Kaul, V. (2006). Innovation systems in India's IT industry: An empirical investigation. *Economic and Political Weekly*, 4178–4186. Retrieved from http://www.jstor.org/stable/4418760.

Technology MO. (2013). *Science, technology and innovation policy in India.* New Delhi: Government of India. Retrieved from http://www.dst.gov.in/sites/default/files/STI%20Policy%202013-English.pdf.

Vernon, R. (1979). The product cycle hypothesis in a new international environment. *Oxford Bulletin of Economics and Statistics*, 255–267. https://doi.org/10.1111/j.1468-0084.1979.mp41004002.x.

Wolf, C. (2011). China and India, 2025. In J. D. Siddhartha Dalal (Ed.) *A comparative assessment* (pp. 55–77). RAND Corporation. Retrieved from http://www.jstor.org/stable/10.7249/mg1009osd.12.