Innovation policy evolution: The Indian experience

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Abstract

Innovation policy exists in space-time manifold, which means that policy goals, rationales and instruments may transform, institutional context is changing, and new stakeholders and new roles of old actors may appear. Embracing this challenge is possible by strengthening interdisciplinary approach and incorporating a historical view. The proposed paper is an attempt to contribute these challenge by telling 'policy story' of the specific country in the specific historical period. The paper focuses on Indian innovation policy for inclusive development, and its metamorphosis connected to changing the political, economic and social environment.

Recent years innovation policy studies focus on inclusive development in increasing degree. An appearance of inclusivity as part of economic development agenda is connected to contradicting results of economic advancement in emerging economies of global South. Increasing disparities and inequalities, social and economic exclusion as lack or absence of access to resources, goods, and services for large groups of rural and poor urban population, which reside in informal settings in many developing countries - all these factors attracted the attention of scholars, policymakers, and international organizations. Aiming to address these challenges, they started elaborating the concepts of inclusive innovation and inclusive growth (OECD, 2015, 2017; Paunov, 2013; Cozzens & Sutz, 2012). The primary focus of these concepts is poor people and marginalized groups of society and the ways of meeting their needs. Inclusivity is perceived mainly in dual mode: poor as consumers and poor as producers (Chataway et al., 2013; Johnson and Andersen, 2012). From policy perspective, the ways of addressing these needs evolved from idea of reducing the costs and increasing the availability of goods and services for the poor (Prahalad, 2005; Kaplinsky et. al, 2009). The concept is expending to the wider idea of promoting sustainable livelihood and income-generating opportunities for the poor (Utz & Dahlman, 2007; Gupta, 2010). In reality, the research works of both ways lack holistic approach and provide part of the picture referring specific products, or marginalized groups, or innovation system stakeholders (Chataway et al., 2013). Another gap is underestimating the roles, which the actors of innovation system are playing in policy formulating and implementation. In most of the studies, roles and stakeholders are considered separately, in different research domains (policy

studies and innovation studies, for example) (Flanagan & Uyarra, 2016). And last missing part of innovation policy studies is investigating policy dynamics in coherence with other relevant dynamics – electoral, budget, economic or organizational (Kay 2006; Pollitt 2008). Innovation policy exists in space-time manifold, which means that policy goals, rationales and instruments may transform, institutional context is changing, and new stakeholders and new roles of old actors may appear.

Embracing the listed gaps is possible by strengthening interdisciplinary approach and incorporating a historical view (Perez, 2013). The proposed paper is an attempt to contribute these gaps by telling 'policy story' of the specific country in the specific historical period. The narrative approach is seen the most appropriate for this purpose, as it allows crossing boundaries of innovation studies and policy studies, provide material for reflection exercise for scholars from innovation policy field, and discover new insights and dimensions of further studies of inclusive innovation policies. The paper focuses on Indian innovation policy for inclusive development, and its metamorphosis connected to changing the political, economic and social environment.

Appearance of innovation and inclusive innovation agenda

India is a fast-growing emerging economy, which went through many transformations for last 30 years. In 1991 India entered the era of economic liberalization and succeeded in improving GDP growth from an average of about 5.7% in the 1980-s to approximately 7% over the last two decades with the highest double-digit rates between 2005-06 to 2007-08 (World Bank, 2017). Since 1991, income inequality has doubled in India. The consumption of the richest 20% of households grew at almost 3% per year in the 2000s as compared to 2% in the 1990s, while the growth in consumption of the bottom 20% of households remained unchanged at 1% per year (World Bank, 2013). In 2012-2013, the GDP growth rate slowed down and became the lowest over a decade, growing merely at 5.1%. India has one of the highest proportions of informal employment in Asia and large rural sector, which in sum constitutes 80% of vulnerable employment according to Human Development Report (2016). After entering liberalization reforms, many people of India are still experiencing the low level of livelihood.

Social problems and their solving were in the center of government attention since Indian independence. Interestingly, that marginalized or vulnerable groups of society were defined officially in Constitution and included Scheduled Castes (SC), Scheduled Tribes (ST), backward classes, and minorities. The Constitution envisaged many provisions to safeguard and promote their interests in various spheres to ensure social justice. In a wider context, these groups belong

to more numerous segment of society of poor, mostly rural people, who suffer from malnutrition, lack of sanitation and clean water, deprived of access to housing, healthcare, education, and other presences of dignified human existence. The state considered vulnerable groups and society in a whole as recipients and target of public policy.

On the one hand, the matters of support of these groups have been the subjects of social welfare policy, which included mostly public aid, subsidies, and reservation of seats in educational and legislative institutions. On the other hand, solving socio-economic problems of vulnerable groups of society was also related to the science and technology (S&T) field of the country.

It is science alone that can solve the problem of hunger and poverty, insanitation and illiteracy, of superstition and deadening custom and tradition, of vast resources running over waste, of a rich country inhabited by starving people. I do not see any way out of our vicious circle of poverty except by utilizing the new sources of power which science has placed at our disposal.

Saying of Jawaharlal Nehru, the first Prime-Minister of Independent India

(Science Reporter, 1964)

The government of Narasimha Rao kept following this approach after liberalization reforms launch in 1990th. The 8th Five-Years Plan (1992-97) announced technology missions aimed at the integration of S&T in the socioeconomic sectors for improving life conditions of apopulation. The 9th Plan (1997-2002) harnessed this vector. Each of twenty-four socio-economic ministries established Science and Technology Advisory Committees (STAC) for developing science and technology programs in the respective sectors. Specially constituted Inter-Sector S&T Advisory Committee (IS-STAC) ensured their cooperation with other S&T infrastructure, including institutions supporting indigenous technology (9th Five Year Plan, 1997-2002). An example illustrating this approach is an Integrated Mission for Sustainable Development launched by the Department of Space in 1990th (Rao, 1991). During the drought of 1987 all over the country, Department of Space used a remote sensing technology to explore the possibility of drought mitigation. The results were quite impressive, and Planning Commission expanded this program in 153 districts during the year 1992. The methodology was also used for addressing land and water development and management.

There were quite many similar programs and projects, which were financed mostly by the government. R&D investments of private sector grew in 6 times from 1995 to 2005, but the overall share of private R&D funding increased from around 10% to 20% of total R&D projects

costs (Abrol et.al, 2009). The government did not cut budgets of S&T sector drastically but undertook efforts of commercialization of scientific knowledge. Technology funding and innovation support were implemented by various state institutions through different governmental schemes and programs. For example, the Department of Scientific & Industrial Research (DSIR) of Government of India was engaged in up-scaling technologies under its TePP and TDDP schemes[1]; the Technology Development Board (TDB), under the Department of Science and Technology (DST) was an operator of manufacturing and commercializing of all technology-based products (Abrol et.al, 2009).

In 2008, National Institute of Science, Technology and Development Studies (NISTADS) released the first of its kind report 'India, Science, and Technology: 2008'. The Report presented 'a capture of multiple facets of Indian economy and society where S&T makes contributions'.[2] It was the first systematically elaborated research and analysis of role and tasks of S&T in changing economic and global environment. One of the most significant conclusions of the Report was recognition of systemic nature of the low level of technology dissemination and appropriation for socioeconomic development of the country. Authors admitted that 'central technology dependence syndrome' or high level of S&T system centralization 'obstructed the growth of community and area centric S&T capability essential to meet the challenges of modernization of the rural economy, climate change and such other activities, which critically depend on 'peoples participation' for success.' The possibility and need for contribution of NGOs and communities to effective S&T development were recognized.

The voluntary sector has always been well developed in India. The reason originates from the cultural concepts of *daana* (giving) and *seva* (service), established in the ancient religious scriptures of Hinduism (Sugirtharajah, 2001). From the times of independence till the end of 20th century, NGOs played the role of a service provider or subcontractor of the state (Kudva, 1992). Liberalization reforms and subsequent growth of disparities in the socioeconomic development of society led to an intensification of NGOs-State communication in pursuit of finding the balanced approach to development. In 1992, 1994 and 2002 Planning Commission hold all-India conferences for representatives of NGOs and central and regional governments to co-create the framework of further close cooperation. NGOs were involved in developing the 10th Five Years Plan Approach. . In the Tenth Plan Approach, the government admitted the shift in its role from resource distributor to facilitator of favorable procedural and institutional environment, which is 'considered essential for every Indian to realize his or her potential' (10th Plan Approach, 2001).

The government had taken over the years too many responsibilities on itself with the result that it not only marginalized individual initiative but also succeeded in imposing severe strains on its financial and administrative capabilities. More importantly, in the face of momentous changes in the domestic economic policy in the last decade and an equally fast-paced integration of our economy with the emerging global order, investment planning is no more the only, or the only predominant, or even the most effective instrument of pursuing development. Planning has to necessarily go beyond undertaking mere budgetary allocations between competing sectors and regions. It has to address with greater vigor, the need to release latent energies and stimulate private initiative in various facets of our development process. Ultimately, we have to plan for an environment that provides ample opportunities for all to actualize their potential individually as also collectively for the nation as a whole.

10th Plan Approach, 2001

In exactly this period of two-way communication of state and society, institualization of grassroots innovation (GRI) movement began in India. For almost 20 years, volunteers headed by Professor of Indian Institute of Management, Ahmedabad (IIM-A) Anil Gupta, scouted grassroots ideas and innovation in rural India, documented them and disseminated through publishing newsletter in different local languages. This voluntary movement is known now as 'Honey Bee Network' (HBN), 'a crucible of like-minded individuals, innovators, farmers, scholars, academicians, policy makers, entrepreneurs and non-governmental organizations'.[3]

HBN initial goals were search, recognition, and reward for indigenous and traditional knowledge of grassroots people. For the first year of HBN activity, 1,613 innovations and traditional practices were found and documented (Smith et. al 2017). The authors of these innovations were poor rural people; many of them were not educated or even illiterate. Such people constituted the vast informal sector of India, with 98% informal employment in agriculture, 75% - in industry, and 72% - in services (Naik, 2009). The sector that was always perceived as a social burden demonstrated a powerful potential for creating innovative solutions.

The first step to institualisation of HBN activity was done in 1993 when Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) was established. SRISTI's foremost activities were validation and verification of GRI with the use of facilities provided by IIM-A. At the same time, SRISTI initiated building institutional environment for converting innovative ideas and traditional knowledge of grassroots people in innovative products and technologies for their further diffusion through commercialization or free dissemination for the benefit of the society. The whole ecosystem for grassroots innovation (GRI) support was created (see Table 1). The system integrated efforts of formal actors, such as central and regional government bodies, educational institutions, banks, and private corporations, to award, support

and diffuse GRI occurred mostly in informal settings (Cozzens and Sutz, 2012; Gupta, 2014). This experience was applied to discover and utilize creative potential of other groups of society, such as students and children.

HBN experimentation in building the ecosystem explored and problematized important issues of inclusive innovation development and support. Some of them HBN addressed through networking with other stakeholders; others needed changes on a policy level.

1) Informal sector can be a source of innovation, and poor people can act as problem-solvers, not just as aid receivers. There is a need for unleashing this potential through providing them capabilities to innovate and monetize their knowledge. HBN[4] created the infrastructure for making innovation of grassroots people competitive. It allowed many grassroots innovators consolidate their monetary position (Smith et. al, 2017, p. 154).

2) IPR protection became one of the most significant directions of HBN activity. Besides the ethical importance of this matter, strong IPR protection allowed informal innovative products and practices integrating into the processes of the formal innovation system. This type of inclusiveness, when society acts as an innovator, generates new opportunities for more balanced and inclusive development of innovation system.

3) HBN has discovered practices of knowledge sharing and product adaptation occurring in rural communities.[5] Free knowledge exchange among grassroots people and communities ensures a high level of knowledge use and adaptation to local needs. Therefore, a new hybrid model of IPR management called 'technology commons' has emerged (Sinha, 2008). The 'technology commons' model ensures GRI to be free for people-to-people (p2p) copying but requires purchasing a license in case a people-to-firm exchange. It hybridizes the open-source model with a stratified IP-based closed model (Gupta et al. 2016) Open p2p access aims to stimulate people to learn and triggers adaptation of innovations to local but segmented needs. At the same time, corporate sector would be welcome to license the technology along with various improvements and share the benefits with the members of 'technology commons' (Sinha, 2008).

4) All processes inherent to formal innovation support (IPR, value addition) have high transactional costs. These costs are even higher for GRI, as grassroots innovators have no access to formal innovation infrastructure. HBN found a way to reduce these costs through involving formal stakeholders in some processes. Institutions of the academic sector are actively involved in validation, prototyping, testing, and business incubation of GRI. This activity is beneficial for institutions as it makes education process more practice- and problem-oriented, and R&D - more

utilized. A number of private companies are providing their distribution nets for grassroots products marketing.[6]

5) The specificity of grassroots innovators is that most of them are not educated or even illiterate, and so have limited or no access to "conventional" incubating institutions of the formal innovation system. To address this challenge, HBN is applying a model of in situ incubation (Solanki et. al, 2016; Gupta 2017). All incubation facilities (financial or technical support, mentoring, etc.) are provided to the innovator at his/her place.

One of the valuable results of HBN activity was the elaboration of the successful model for providing needs of vulnerable and marginalized society through enabling their knowledge by institutional infrastructure and practices supporting the innovative and entrepreneurial activity of these vulnerable groups. The expanding HBN work for students and children demonstrated the sustainability of this model and potential for scaling up.

Inclusive innovation development: moving towards policy agenda

HBN is positioning itself as "knowledge center/network which pools the solutions developed by people across the world in different sectors and links, not just the people, but also the formal and informal scientists, policy makers, innovators, green entrepreneurs and educationists" (retrieved from the HBN website). Therefore, HBN activity is expanding to communication and networking with various actors, including policymakers and science community. This networking generated discussion of the innovative potential of society inside government circles and gained the support of politicians. For example, the former president of India (2002–2007) Dr. Abdul Kalam became the patron of a national competition of original technological ideas and innovations by children; published a yearly book of innovations of grassroots people, and actively proliferated the idea of recognition and celebration of the creativity of grassroots people. Networking and communication ensured support of HBN activity by national government ministries, such as Science and Technology, Agriculture, Rural Development, Finance, Animal Husbandry and Veterinary Services, Environment and Forests, Planning Commission, Education, Water Resources, and Human Resource Development (Burton 2003). The government supported HBN initiatives. Under the auspices of Department of Science and Technology, the Micro Venture Innovation Foundation was established in 2003. MVIF provides venture funding to grassroots innovators on one signature, without any guarantees and guarantors. These funds provide financing exclusively for risky innovations with limited or no commercial market. One of the main criteria for the selection of projects for funding is their

social value and social good. Grassroots Technological Innovation Acquisition Fund (GTIAF) was set up to acquire rights to technologies from the innovators for generating public goods and support GRI of high social impact. Finally, funds for the National Innovation Foundation was released by the government and became later and autonomous body of the Department of Science and Technology. HBN members participated in drafting India's biodiversity bill in 2002, and in pre-budget meetings at the Ministry of Finance. Indirect influence included putting on the agenda issues of protection of traditional knowledge of local communities, development of 'Suggesting Ethical Guidelines for Accessing and Exploring Biodiversity' and many other new questions related to support and celebration of the creative abilities of grassroots people. Following the Lindquist (2001) typology, HBN influenced policy through expanding policy capacities and broadening policy horizons (Burton, 2003), but, as it is shown further, did not change innovation policy regime fundamentally at a time.

Although the 11th Five Year Plan (2007–2012) was based completely on the idea of inclusive growth with admitting state's role and responsibility for this, the tools and initiatives for the realization of this responsibility were still subsidies and public investments. The recognized stakeholders of innovation ecosystem were government, private enterprises, academic sector and two types of 'serving' institutions: intermediaries (technology centers, technology brokers, or business innovation centers) and others (venture capital firms, federal laboratories, and training organizations). Moreover, grassroots innovation was mentioned but not recognized, due to be 'not able to reap sufficient economic benefits for want of backing with adequate resources' (11th Five Year plan, p.168). Although Science, Technology, and Innovation (STI) Policy of 2013 declared that India needs inclusive innovation, by inclusiveness was implied 'access, availability, and affordability of solutions to as large a population as possible'. Thus, the policy was supposed 'to drive both investments in science and investment of science-led technology and innovation in agriculture, manufacturing, and services that lead to socio-economic benefits to a wide cross section of society'. In a way, innovation development framework was similar to S&T one: top-down, within formal settings, and through NGOs as facilitators of policy initiatives. Fundamentally this vision was not changed much.

Interestingly, the 12th Five Years Plan (2012-2017) included ideas, translated by HBN, such as, for example, an idea of IPR regime re-consideration. It was recognized that existing IPR regime led to the monopolization of knowledge and deprived poor people of accessing it. The authors of the Plan acknowledged the need for changing the regime in order India to realize its

potential to produce 'frugal' innovations for inclusive growth. This Plan also reflected the overall transformation of vision on society function in inclusive development. The role of civil society in capacity building for advancing rural and urban development through grassroots innovation and talent management was recognized in the Plan (12th Five Years Plan, p. 289). Next proposed step was institualisation of voluntary sector's participation in the development of policies and programs, and also in mid-course corrections 'to create a window for improvements as well as the incorporation of regional/cultural specificities' (ibid.). Such a difference in approach to inclusiveness in STI Policy and 12th Plan is probably connected to the procedure of documents development. STI Policy is a product of Department of Science and Technology of Government. The 12th Plan was a result of communication and inputs from various stakeholders. Besides 26 steering committees, every citizen of India could contribute the future Plan vision through web-portal. Another reason is in overall positioning of the subject. In STI Policy innovation is considered as an instrument of S&T solutions deployment, and thus, innovation is locked in S&T policy framework (policy rationale, system structure, and policy measures). 12th Five Years Plan considers S&T and innovation in separate sections. The innovation here is acknowledged as 'engine for national and global growth, employment, competitiveness' through finding and implementing affordable solutions for the needs of people. But approach remains the same – supporting/supplying actors and interactions.

<p align="center">Modi and new transformations</p>

26 of May 2014 the Bharatiya Janata Party (BJP) won general elections and a new government of Narendra Modi, the first genuinely post-socialist political leader of India (Jivanta Schöttli & Markus Pauli, 2016), came to power. The main policy agenda announced by Narendra Modi was development and inclusive growth through creating quality employment, power decentralization, improving investment and business climate to provide the best opportunity for market-led economy development.

Innovation agenda had no separate place in BJP pre-election manifesto. The centric goal of science, technology, and innovation development was declared 'restoring global leadership in S&T' and creating 'science with a human face in the service of the common man', which did not stand out far from statements of previous governments (BJP Election Manifesto, 2014). The Modi's understanding of this quite traditional for Indian governments idea can be observed

through 'vision' documents, released by the new government and set of initiatives, launched in this field after 2014.

There are 'Vision 2035' (TV2035) and Report of the Expert Committee on Innovation and Entrepreneurship, both released in 2015. 'Vision 2035' was prepared by TIFAC (Technology Information, Forecasting and Assessment Council of Department of Science and Technology). The chairman of TV2035 was one of the top nuclear scientist-cum-technocrat Anil Kakodkar.[7] The contributors were representatives of science, educational and R&D institutions. TV2035 was introduced by new Prime Minister Narendra Modi at the 103rd Indian Science Congress. TV2035 translates the idea of the citizens-centric approach to S&T&I development and formulate the future vision of the population of India, their 'prerogatives' or technology-based rights that every Indian citizen must have in 2035. Besides clean water, food, energy, healthcare, education and others, the new 'prerogatives' such as cultural diversity and vibrancy, effective governance and conservation of ecosystem were introduced. The suggested implementation mode is National Missions approach within 12 main sectors. The primary responsibility for technology and innovation ecosystem design must necessarily rest with government authorities. The recognized actors of the system are the state, private business, research institutes, and technology institutes. Comparing TV2035 to Technology Vision 2020[8] the similar ideas can be found: using science and technologies for improving the quality of people's life, empowering R&D for reaching leadership positions in the world, improving governance through decentralization and citizens participation, and missions approach (Kalam & Rajan, 2002). Therefore, TV2035 is more about the use of new words for articulating old ideas.

The second mentioned document 'Report of the Expert Committee on Innovation and Entrepreneurship' is connected to Atal Innovation Mission (AIM) launched by the government in early 2016. AIM is planned to be a platform for the promotion of world-class innovation infrastructure, promoting entrepreneurship in technology driven areas, provide innovation policy inputs, and develop new programs for fostering innovation in different sectors of an economy. Atal Innovation Mission also has the function of a think-tank in innovation sphere. The Expert Committee was established to develop recommendations for AIM development to boost entrepreneurship and innovation in India. Committee chairman is Professor Tarun Khanna[9] , director of the South Asia Institute at Harvard University and Jorge Paulo Lemann, Professor at the Harvard Business School.

In 2015, AIM Expert Committee released Report, representing the concept of Entrepreneurial Pyramid. Entrepreneurship development is seen as the most important challenge to be addressed.

India needs to generate 115 million non-farm jobs over the next decade, so encouraging and promoting self-employment is seen the most important goal. The culture of entrepreneurship should be inclusive and focus on a variety of enterprises, such as young & innovative technology firms, upcoming manufacturing businesses, and rural innovator companies. Entrepreneurs should also be encouraged to help solve pressing socio-economic problems.

(Report, 2015)

Experts suppose that this provides needed social inclusion and open up new markets. The Pyramid consists of three layers of entrepreneurship challenges, which need to be systematically addressed to effect systemic change. The first problem refers supporting early stage start-ups and encouraging innovation in the manufacturing and rural sector through awards, competitions, and prizes for innovation; encouraging corporates' funding R&D at universities; and enhancing the scope and efficiency of business incubators. The implementation is seen through public-private partnerships. The second challenge - institutional inadequacies - is proposed to address through establishing physical infrastructure (incubators, accelerators, venture foundations, and others) and soft infrastructure (assessable expertise, mentoring, and professionals) for improving the institutional framework to make ideas grow. And the third, fundamental challenge is seen in changing societal thinking, which is skeptical towards entrepreneurship and intellectual property rights, pron to rent-seeking, and mistrusting to the government. Experts admit that this challenge may only be possible addressed with generational change.

The Report includes examples of successful policy programs and measures from different countries, review of previous policy documents and initiatives for innovation development, surveys of manufacturing clusters, start-up cluster, and recommendations for further development. In general, the Report is holistically elaborated within innovation system framework. The only missing point is well-defined financial sources for implementation of proposed initiatives. Though, one may conclude that experts are relying on the active participation of private business, which will get in return rules, beneficial taxation and overall improvement of doing business.

The proposed strategy turned into large-scale flagship initiative 'Start-up India, Standup India' aiming to 'build a strong eco-system for nurturing innovation and start-ups in the country which will drive economic growth and generate large scale employment opportunities' (Press Information Bureau, 25-July, 2016). Measures included:

- simplification of procedure for start-up setup and development;
- tax holidays;
- funding support through Fund of Funds with a corpus of Rupees 10,000 crore (about US$ 2 billion);
- credit guarantee fund for start-ups through Small Industries Development Bank of India (SIDBI) with a Corpus of Rs. 500 crore (about US$ 77 million) per year for the next four years;
- facilitation and assistance in IPR filling; and
- setting up 7 new research parks modeled on the Research Park at IIT Madras (Status Report, 2017).

As a result start-up programs were announced by various organizations from the academic sector, state sector, and banks (see Table 2). Fifteen States released their Start-up policies, which were aimed mainly to create incubation centers for 'growing start-ups'. For example, Rajasthan announced the creation of 500 start-ups in the next five years, for which the opening of 50 incubators in the whole state is planning. For these purposes, the state is going to allocate 5 billion rupees in the next five years. Karnataka projects to create at least 25 technologies to solve social problems of the state, as well as 2,000 start-ups engaged in technological innovation and 600 start-ups based on the development of new products. It is planned to create 1.8 million jobs in the state.

Unlike innovation development, science and technology policy has not been a focus of new government's attention. In the first budget of new government, S&T sector received 362.69 billion rupees (US$6.04 billion), which meant a 4% increase over last year, compared with inflation of 8% (Union Budget 2014-2015). Instead of high budgets N. Modi suggested scientific departments and institutions to inspect their achievements and activity aiming to integrate it in national development. He proposed to use the principal of '5 Es' (Economy, Environment, Energy, Empathy, Equity) as 'a talisman' to ensure that their work had a maximum societal impact (The Hindu, 03 January 2016).

Context of implementation

The implementation principle was phrased by N.Modi as 'Minimum Government, Maximum Governance'. The new government started from changing the institutional system of governance and improving public administration.

The government of Modi liquidated the Planning Commission and created the National Institute of Transformation of India (NITI Aayog) instead. The Planning Commission was, in fact, a parallel cabinet of the prime minister, had very broad powers, in particular, in the allocation of the budget. NITI Aayog does not have such powers and is rather a 'think tank' for the government headed by the Prime Minister of India. Arvind Panagariya, a free-market economist and Professor of Columbia University (USA) was appointed as Vice-Chairman. The core of the NITI Aayog and ministers of new government are people born after 1950 as N. Modi himself. They represent a new generation in Indian politics and rest on the neo-middle class. Modi has chosen the way of 'rapid transformation, not gradual evolution' (Speech, 26 August 2016) through building a demand-driven model of development to reach ambitious goals of India prosperity that previous government could not reach for almost 20 years of economic reforms. 'Clean India', 'Digital India', 'Power for all', 'Housing for all', 'Skill India', 'Make in India', 'Smart Cities', 'Smart Villages' and others - most of the schemes and programs launched by Modi's government were initiated by previous administration. Modi reinforced them and empowered by providing free and open competitive environment, sometimes radically. The most illustrative example is large-scale program 'Make in India' invited multi-national and also Indian companies to manufacture products in India. This program rooted in New Manufacturing Policy 2011 and announced the same objectives.[10] The previous government was quite slow in its realization due to bureaucracy bottlenecks and also environmental and labor welfare concerns. The new government solved it through weakening many labor protocols, relaxing environmental regulations, and removing key mechanisms of community participation in land acquisitions and forest conservation (Ruparelia, 2015). For example, in December 2014, the Modi administration amended the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation, and Resettlement Act. Initially, the Act required the state to obtain the consent of local communities whose land was designated for compulsory acquisition, to compensate landowners between two to four times existing market valuations, and to rehabilitate and resettle all stakeholders whose livelihoods had been affected. The Modi government exempted five areas— industrial corridors, social infrastructure such as educational institutions, and rural infrastructures such as roads, power and housing for the poor, and national defense—from the need to conduct social impact assessments or acquire the consent of 80 percent of all stakeholders. The essential particular of the story is that the discussion of land acquisition act was held at a meeting of the Niti Aayog in July 2015. But a number of Chief Ministers were not presented at this meeting (India Today, 2015).

This led to resistance of NGOs, trade unions, and civil society activists, but apparently, the government shows not many aspirations to communicate and finding a compromise. Vice versa, civil society organizations were accused of having 'subversive links' and of conducting 'anti-national' and 'anti-development' activities that allegedly diminished overall economic output by 2-3 percent of GDP (Nayar, 2014). All these and some others issues, such as pushing Hindutva ideology, excessive power centralization, pro-business economic policy raise the concern that the Modi model contains serious threats to the inclusive and sustainable growth, to India's multi-cultural and pluralist democracy and hard-won social support programs (Tharamangalam, 2016).

Discussion and conclusion

India entered 'innovation' period in turbulent time of political and economic changes and overall country transition from paternalistic to open economy with most drastic leapfrog in 2014. The rise of Modi to power meant not only the change of ruling dominance of Indian National Congress but also the end of the post-reforming period of social liberalism and the beginning of neo-liberalism era, which has been put into action by a new generation of Indian politicians. The previous vision and understanding of the social responsibility of the state transformed too. Unlike the Congress, the BJP has not articulated economic and social policies clearly. But measures and initiatives implementing by Modi's government provide clear evidence of changing accents in approaches to policy, rather than the inability to tackle problems of society or neglecting them (Aiyar, 2017). The difference in approach is clearly seen in the way of how old-timer'- TIFAC, and 'newcomer' - NITI Aayog – articulate their vision articulation.

The most important difference in approach is separation of innovation agenda from S&T realm. For years previous governments considered innovation development as part of S&T policy. Innovation was mainly attributed to function of R&D sector, which led to distinct policy framework: outcome oriented; based on modeling, not experimenting; aiming at building or improving institutional environment and its efficiency on provided financing. The inertia of this approach influenced the configuration of national innovation system in India and impeded incorporation of new stakeholders (society) and actors (grassroots innovators) in it.

The new government has not invented new agenda of innovation policy. In fact, the policy rationale and goals remain the same. But policy framework changed towards process orienting, aiming at improving quality of environment, such as accessibility of soft and physical infrastructure, institutional and regulatory adequacy to initiated programs, and others. Innovation is recognized the individual activity - at institution or out of it. Therefore, the main accent is done

on capacity building measures, including enhancing entrepreneurship education and skills; improving access to finance instead direct funding; facilitating technology and knowledge exchange between all actors of innovation and S&T system and promoting awareness and networking among them as well.

This ground perception of innovation as individual entrepreneurial activity has led to policy shifts towards enabling the start-up and new enterprises establishment, or what can be termed as entrepreneurship policy (Gilbert et al. 2004) Innovative pro-poor and by-poor entrepreneurship is more suitable for developing countries as it ensures deeper knowledge penetration throughout society, makes innovation more necessity-driven, and enables smooth and cost-effective transforming the informal sector to the formal one (UNCTAD, 2012).

The results of implemented policy measures and initiatives are not representative so far, most of the programs were launched in 2016. But there are challenges, which can be outlined already. The realization of this policy framework requires much consensus, communication and support from all the stakeholders. Impairment of interests of opposition, NGOs, trade unions is not favorable for building trust between government and society. And confidence is very needful when people are invoked to become risk-taking instead rent-seeking. On the other hand, India needs investments for infrastructure, various industries and manufacturing sector in a whole (OECD, 2009). This is a key for employment increase and raising incomes of millions of poor in India. Modi's government is implementing the most investment-friendly policy for the whole period of independent India. The central challenge now is to find balance between interests of society and investors.

The other hurdle may rise from the mass of start-up programs and initiatives, launched in India. There is a lack of Government's clear understanding of whether they are aiming to create a large number of innovative entrepreneurial firms or facilitate the establishment of a limited number of start-ups but rapidly growing and generating high outcomes. Unfocused start-up development may lead to high costs and extreme shortage of venture capital (Dahlstrand & Stevenson, 2010). To develop this understanding, the government need to track and diagnose direct and the indirect impact of the new start-ups on society, and also to extend venture investments fast and aggressively.

Indian 'story' demonstrates extreme complex context for innovation policy design and implementation. What can innovation policy studies suggest for policymakers to adopt appropriate policy addressing such complexity? The current research directions are fragmented

and reside in different research domains, such as economics, science policy, and innovation studies, development studies, etc. (Dahlstrand & Stevenson, 2010; Martin, 2012; Quttainah, 2015). There is a need for interdisciplinary research platform, integrating these domains to address the whole range of challenges and controversies, to keep interests of all stakeholders and to overcome the system resistance inherent to transitional regimes, inherent to most developing countries.

Notes

1. *TePP* is Technopreneur Promotion Programme, launched in 1998-99 by the Ministry of Science and Technology to promote and support untapped creativity of individual innovators; to assist the individual innovators to become Technopreneurs; to assist the technopreneur in networking and forge linkages with other constituents of the innovation chain for commercialization of their developments. For more information see http://www.csio.res.in/images/stories/business/tep.pdf\
TDDP is Technology Development and Demonstration Program. For more information please see http://dsir.nic.in/forms/tddp/tdgrants.pdf
2. The report is available here http://www.nistads.res.in/indiasnt2008/index.html
3. See official web-site http://www.sristi.org/hbnew/aboutus.php (accessed 15 April 2017)
4. Hereinafter HBN is used meaning the whole institutional infrastructure around it.
5. There is a database of grassroots innovation available at http://www.sristi.org/wsa/ The descriptions of found innovation could be found in HBN Newsletter at http://www.sristi.org/hbnew/honeybee_database.php
6. Tata Agrico, Future Group, Britannia Industries. See more here http://www.gian.org/news_details.php?news_id=42 (accessed 12 April 2017)
7. Anil Kakodkar (born in 1943) is an Indian nuclear scientist and mechanical engineer. He was the chairman of the Atomic Energy Commission of India and the Secretary to the Government of India, he was the Director of the Bhabha Atomic Research Centre, Trombay from 1996–2000.
8. Technology Vision 2020 was prepared by TIFAC under the chaiman A.J. Kalam with participation of 500 experts. Committee on Vision 2020 had been constituted by the Planning Commission in June, 2000 and released report extending this vision. Available here: http://www.teindia.nic.in/files/reports/ccr/pl_vsn2020.pdf
9. Tarun Khanna (born in 1968) is an Indian-born American academic, economic strategist, who moved to USA to pursue his higher education.
10. The document was accessed in 2011 on the website of the Department of Science and Technology, Government of India (http://dst.gov.in/stsysindia/stp2003.htm). At the moment the web-site is temporary unavailable.

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esc=false&start=1991 (accessed 02.04.2017)

Table 1. Institualisation of grassroots innovation in India.

Year of establishment	Title	Deatails	Main functions
1993	Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI)	Initially cooperated with IIM-A using its lab infrastructure and human resources. SRISTI's laboratories performed the primary microbiological, entomological and chemical analysis of materials or products scouted by HBN	Scouting, validation and verification of GRI; Mobilization voluntary sector for GRI support and development
1997	Gujarat Grassroots Innovation Augmentation Network (GIAN)	Governed by a board of representatives of the Government of Gujarat, IIM-A, commercial bodies such as Gujarat Venture Fund Limited, and social organisations such as Self-Employed Women Association, SRISTI and Gopaldham (Gopald- ham is an organization for economic development of villages and the informal sector). Expanded in a large network, covering the north (GIAN North including Punjab, Haryana, Rajasthan, Uttarakhand, Delhi and Chandigarh), west (GIAN West including the Gujarat, Maharashtra and Goa), south of India (cells of GIAN in Tumkur and Madurai) and Srina- gar (North India). There is also a cell in Assam (East India).	Commercialization of GRI, assistance in IPR protection, technology transfer, business incubating for grassroots people
2000	National Innovation Foundation (NIF)	Established with the assistance of the Department of Science and Tech- nology (DST), Government of India	Scouting and documentation; Value addition, research and development (R&D); IPR protection and licensing; Information and communication technologies application and dissemination; Business development and microventure.
2003	Micro Venture Innovation Fund (MVIF)	Set up with financial assistance of Rs 40 million (about US$ 1 million) from Small Industry Development Bank of India (SIDBI)	Providing financial assistance to grassroots innovators on one signature, with a simple framework agreement without any guarantees and guarantors. These funds provide financing exclu- sively for risky innovations with limited or no commer- cial market. One of the

			main criteria for the selection of projects for funding is their social value and social good.
2012	Grassroots Technological Innovation Acquisition Fund (GTIAF)	It works with GRI of high social impact.	The GTIAF acquires rights to technologies from the innovators for generating public goods.

Compiled by author based on open accessed information at http://nif.org.in; http://sristi.org

Table 2. Selected programs for start-ups

Organization/Institution	Program Title	Main tasks	Status
National Association of Software and Services Companies (NASSCOM)	10,000 start-ups (launched in 2013)	To incubate, fund and provide ambient support to impact 10,000 technology startups in India, by 2023.	211 start-ups have been incubated across warehouses with more than $20 million funding raised.
Central Government, NITI Aayog	Startup India, Standup India	Funding corpus of US$1.5 billion; tax exemptions coupled with other initiatives to boost the start-up ecosystem	
Central Government, Department of Science and Technology	NIDHI, National Initiative for Development and Harnessing Innovations	To take forward student innovations to commercialization stage; To promote student startups from idea level to prototype by providing initial funding assistance.	Support 20 student start-ups in each year financially
All India Council for Technical Education, AICTE	Policy for AICTE Approved Institutions to Promote Student Driven Start-ups	To identify creative students and turn them into start-up entrepreneurs through the reorganization of curricula with a focus on the start-up industry and involvement of experts from business, venture funds and the government to develop these educational programs.	
Ministry of Micro, Small and Medium Enterprises	ASPIRE, A Scheme for Promotion of Innovation, Rural Industry and Entrepreneurship	Setting up a Network of Technology Centers for promoting innovation, entrepreneurship and agro-Industry	It was decided to create two types of incubation centers: Incubation centers for life support and technological business-centers. The centers should develop the commercialization of business ideas aimed at supporting the quality of life of people in an agricultural sector

Compiled by author from open accessed websites of listed institutions.