

Inclusive Innovation in India: Contemporary Landscape

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Abstract The essence of inclusive innovation is to serve poor, marginalized and underprivileged sections of society to improve their livelihoods and enable them to climb up the socio-economic ladder. In this article, we explore the contemporary Indian landscape. There is a diversity of institutions and institutional approaches, multiple methodologies and goals in promoting inclusive innovations in this landscape. There are grassroots innovation institutions. All these institutions and groups have demonstrated how to improve the living conditions of poor people and enhance their income. They have developed different methodologies of inclusive innovation to intervene, build capacities and capabilities of poor people towards bridging informal and formal sectors of economy. Indian landscape can now boast of some successful models and a “social laboratory” for inclusive innovation. The challenge, however, remains to replicate and multiply these models to impact other sectors of Indian informal economy.

Keywords Inclusive innovation, inclusive growth, contemporary landscape, grass roots innovation, organizational innovation, Barefoot College, demystifying technology, White Revolution.

I. Introduction

Inclusive innovation gained tremendous global attention in the last decade. World Bank, OECD and emerging economies, particularly BRICS, are paying a lot of attention to the concept in exploring various success stories. Given the economic crisis and unprecedented unemployment rates, inclusive innovation generated a new source of hope amongst think tanks. International agencies such as OECD, EU and World Bank organized at least a dozen international conferences and meetings in the last few years to discuss the emergence of this ‘new’ concept. It is not surprising that success stories from India on inclusive innovation dominate the discussion in these conferences. India is now seen as a social laboratory of incubation and learning in inclusive innovation.

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Though inclusive innovation is reframed and discussed in its new avatar, we can trace its roots to Gandhian economic thought. This was the main theme of our exploration of the paper. Some institutional initiatives and civil society groups created in the post-independence era operate even till date. Some others have come up in the last couple of decades. Given the historical background, this part will explore and map the contemporary landscape of inclusive innovation¹.

From the perspective of institutional role, inclusive innovation strives:

- To have an impact on income distribution with a concern for reducing inequality;
- To improve traditional modes of learning and doing things by individuals, groups and communities in a manner that qualifies it as innovations. These could be grass roots innovations (Kumar et al., 2013), service or organizational innovations;
- To mobilize marginalized sections of society (poor people, workers and farmers) and organize them into different institutional structures (self-help groups, cooperatives, etc.) to enable them to improve their livelihoods and income through various skill and non-skill-based activities; and
- To make accessible the benefits of modern science, technology and medicine to poor and underprivileged sections by various institutional measures.

As already proposed, inclusive innovation can be understood to operate at three broad levels. At grassroots innovation institutions; civil society groups; and formal institutions (public policies and public research system, R&D labs and other higher educational institutions), corporates and international agencies. The linkages between these actors, particularly between grassroots innovation, civil society groups and formal institutions, are both necessary and challenging. Generating knowledge, packaging it or framing it in some form of innovation through value addition and deploying it to service people is a challenging task. This requires translation from grassroots and civil society groups to formal institutions. As Anil Gupta (2013, 104-105) hints, “the terms at which these exchanges take place in technological, educational, cultural or

¹ There are far more number of institutions and groups in the Indian landscape. Cases reported in the paper are some examples.

institutional space vary across countries and sectors. But it is evident that the range of creative expressions of common people in different domains offers a huge opportunity for overcoming asymmetries in access of disadvantaged communities to the various tools and skills of improving productivity, increasing social impact, and inclusion”. The institutional matrix of inclusive innovation may be conceptualized as in Table1.

Table 1 Institutional matrix of inclusive innovation in India

Institutional Characteristics	Grassroots Innovation Institutions	Civil Society Groups¹	Public Policies	Public Research System	Corporate, International aid agencies
Leading Actors (Examples)	Honeybee Network/ SRISTI NIF	SEWA Barefoot College Jaipur foot Aravind Eye Clinic	Bio-diversity registers	CSIR	World Bank Gates & Milinda Foundation
Institutional form	Individuals/ Communities/ Groups	Trade Unions NGOs Cooperative Societies	Govt. regulatory institutions	R&D labs/Educational institutions	Multilateral International Cooperation
Type of knowledge	Traditional/ Indigenous/ Non-formal	Traditional/ Indigenous/ Non-formal	Regulatory policies/ Prescriptions	Applied/ Basic	Best practices/ Learning examples
Form of knowledge	Informal/ Incremental Organizational/ Institutional/ Open/ Codified	Informal/ Incremental/ Organizational/ Institutional/ Open/ Codified	Normative regulation	Codified	Best practices/ Learning examples
Ownership of knowledge and its appropriation	Individual/ Community	Individual/ Community	Government	Proprietary Benefit sharing IPR	Main sponsors
Main Drivers	Organic Intellectuals	Organic Intellectuals	Government	Scientists/ Engineers/ Faculty	Programme Managers
Objectives and aims of Knowledge	Self, community and development Non-Profit	Self, community and development Non-Profit	Public good	Knowledge Advancement /Public and Market good	Transfer of good practices & learning lessons

Note: 1. Not an exhaustive list. There are several equally important groups such as MS Swaminathan Research Foundation, Jaipur Rugs etc. For the lack of space and information only a select number of cases are included here.

II. Grassroots Innovation Institutions

Honey Bee Network (HBN) is a grassroots innovation institution founded by Anil Gupta in 1988-89. It is a network of like-minded individuals, innovators, farmers, scholars, academics, policy makers, entrepreneurs and NGOs with the links and presence in 75 countries of the world. There are three basic principles that bind the institution and are fundamental to the philosophy of HBN. Firstly, it follows a strict norm to assign intellectual property rights (IPR). Secondly, the source of knowledge holder(s) is acknowledged. Thirdly, any rents generated from commercialization of IPR must be shared with the knowledge holder. These are non-negotiable principles of the HBN².

Over the years, HBN generated 185,000 ideas, forms of knowledge and innovations from 500 districts³. There are a number of ways by which the network collects and documents innovations and ideas. The two *shodhyatras* (research trekking in rural India) per year in different parts of the country led by Anil Gupta have been the main source of ideas and innovations. The 33rd *Shodhyatra* took place from 24 to 31 May 2014 in Haryana. Each *yatra* covers a distance between 120 to 160 Kms for 7 to 9 days. Only potential ideas and innovations are selected for awards every year. Further filtering is done for scaling up potential innovations and commercialization.

In the last 25 years other institutions have been established. In an effort to systematically create a database of innovations, the Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) was created in 1993. Its main objective is 'value addition in grassroots green innovations, providing them intellectual property rights protection and risk capital support besides helping in the in situ and ex situ conservation of local biodiversity and associated knowledge system. Empowering the knowledge rich, but economically poor people by adding value in their contemporary creativity as well as traditional knowledge. Linking formal and informal science'⁴ and innovation. It also brings out a newsletter of the network in nine Indian languages.

Building on the decade-long experience of HBN and SRISTI, Anil Gupta mobilized the Department of Science and Technology to establish the National Innovation Foundation (NIF) in 2000 to strengthen and expand the activities of grassroots innovation. With the initial corpus of INR200 million

² Discussion with Anil Gupta at IIM A, Ahmedabad, 7 June 2014, See also (Gupta, 2013)

³ Discussion with colleagues at SRISTI, Ahmedabad. 6-7 June 2014.

⁴ See http://www.sristi.org/cms/en/about_us, accessed on 9 June 2014.

(US\$3.09 million), the XIth Plan allocated INR260 million (US\$4.02 million). After NIF came into existence, over 595 patents have been filed in India and 8 patents in US and 27 under the PCT so far. The complete spectrum of scaling up innovations towards commercialization got a big boost with NIF⁵.

In 1997 the SRISTI and IIMA mobilized the Gujarat government to set up the Grassroots Innovation Augmentation Network (GIAN) as the incubator of grassroots innovations and traditional knowledge⁶. In 2012, the Grassroots Technological Innovation Acquisition Fund (GTIAF) was created to acquire IP rights of innovations from the knowledge owners.⁷ The emergence of GTIAF is likely to reduce the transaction costs of small enterprises to acquire innovative technologies, improve their competitiveness and thus generate employment and jobs. Honey Bee Network's web-based Techpedia links students and universities to grassroots entrepreneurs.

III. Civil Society Groups (CSG)

There are a number of civil society groups including trade union based institutions, cooperatives, non-governmental organizations and other enterprises such as hospitals. Civil society groups⁸ are involved in a variety of sectors and exemplify different forms and types of innovations ranging from service, incremental, institutional, organizational and as well as R&D based technological innovations. Whereas plethora of literature in social sciences explored Amul as a case study in cooperatives, others have seen it as a case in "social and solidarity economy" and the way it impacted the lives of the rural farmers in Gujarat⁹. On the other hand, SEWA has been studied as a case in microfinance, social banking, women's welfare and development (Ghosh, 2013). They have never been seriously considered success cases in innovation.

⁵ Discussions and interviews at NIF, Ahmedabad, 28 March 2014; and 7 June 2014.

⁶ GIANS have been set up at Ahmedabad and Jaipur for providing incubation support to grassroots innovators from the regions of West and North India, respectively. For other details See <http://www.gian.org/>, accessed on 9 June 2014.

⁷ This is after adequately compensating the knowledge owners.

⁸ It may be pointed out that CSG used include hospitals in health care as well as firms established by individuals with inclusive goals as the main objective.

⁹ This is the perspective used by Ghosh (2013) in tracing the growth of Amul.

1. Amul¹⁰ and SEWA

Amul dairy cooperative was established in 1946 with a couple of cooperatives. It expanded to 13 with a membership of 924 by 1949. With the coming in of Dr. V. Kurien (known as India's father of White Revolution) and H. Dalaya in the late 1940s, Amul witnessed a phenomenal expansion till the onset of Operation Flood in 1970 to whopping 600 cooperatives with a membership of 148,000 farmers in the state of Gujarat.¹¹ During this period, Amul engineered successfully the transfer, absorption, innovation and commercialization of the scientific process developed by CSIR food laboratory in Mysore for converting buffalo milk into what has come to be marketed as Amul baby food and Amul butter.¹² This was indeed one of the first test cases of indigenization and import substitution. Glaxo monopolized the Indian market in baby food and other firms in butter in the 1940s and 1950s. Amul replaced them to the extent of over 80% by the 1970s. By 2014, Amul dairy spread all over India with more than 55 500 village cooperatives with a membership of more than 10 million farmers characterizing the growth as White Revolution. India currently produces the largest quantity of milk in the world and has overtaken the USA in the last decade.

This is viewed as a major technological innovation achieved under the leadership of Kurien and Dalaya with the support of other political leadership. What is generally ignored in innovation and other studies here is the organizational innovation involved in successfully mobilizing farmers to form 600 cooperatives in two decades. A series of norms, procedures and rules of cooperation that were institutionalized in forming these cooperatives is a case of institutional innovations accomplished by Amul cooperative. The most fundamental principle of cooperation that is the democratic election of cooperative management from village to district to state and then to federation level worked and operated here efficiently. The credit for this style of leadership goes to the personal charisma and humility of V. Kurien.

It was the first enterprise to introduce wireless radios during 1950s and 1960s in veterinary services to cater to the needs and demands of farmers and

¹⁰ Much of the discussion on Amul is based on the fieldwork notes and discussions held at Amul cooperative, village milk collection centre, NDDB (Anand) and CFTRI, Mysore during October-November 1981. See also Qureshi et al. (1984) report on technology transfer. Amul baby food from CFTRI to Amul, case is undertaken by the author in the report cited.

¹¹ See short report, *A Sage of Co-operation - The Amul Story*, 1995, Anand Press, Anand; Also 50th Annual Report 1995-96 of Kaira District Cooperative Milk Producers Union Limited, Anand.

¹² See Qureshi et al. (1984).

cattle wellbeing. They set up mini chilling plants at the site of some milk collection centers, located at a distance to dairy plant to increase the storage life of milk. The cooperative made unique innovations in the mode of learning by doing and learning by interaction. These relate to replacing time-consuming fat detection and milk weighing machines by much faster electronic based machines; and also introducing other incremental innovations in packaging, marketing, hygiene, sanitation, preservation, etc. Milk is a perishable commodity and its transportation from several hundred milk collection centers to the main dairy plants involves a series of regimes of punctuality, efficiency and discipline in following routines. All these constitute important elements of institutional and organizational innovations¹³.

As a professional, Kurien's role can undoubtedly be seen as a critical element in the cooperative enterprise. Yet, he truly believed in the principle of learning by interaction with farmers. More fundamentally, with a great sense of humility he held that, "the partnership was based on a relationship of mutual trust, faith, and respect. The professionals, who had the skills and education had to recognize that the illiterate milk farmers had the wisdom passed on to them through generations of tradition" Kurien (2007, 41). Kurien often said that poor farmers are his employers. Secondly, he made the cooperative organization an autonomous entity and always kept the government bureaucracy and government interference at 'arm's length' in the functioning of Amul cooperative institutions such as NDDDB, GCMMF and others. Thirdly, he was a master par excellence in theory and practice of actor-networks in dairy cooperatives fruitfully combining economics, business management, technology and innovation. The philosophy that lay behind the gigantic Amul dairy actor-network was the welfare of farmers, development of village economy and inclusive growth. Baviskar (1998) in a detailed study noted that milk cooperative revolution in large measure overcomes the barriers of caste, class and power. This is something that other rural development programs could not be compared. The National Commission on Agriculture in 1976 and other international agencies in a number of reports acknowledged Amul's impact on social and economic empowerment of rural farmers, particularly in the redistributive effect of rural income (Mascarenhas, 1988).

*SEWA*¹⁴ created in 1971-72 can also be seen as a cooperative enterprise, but is registered as a trade union body. Just as Amul, SEWA is not generally considered an example of innovation. However, when we look into its structure and organization of mobilizing over 1.5 million women (into 20

¹³ From the field notes and interviews with officials at Amul, See note 9.

¹⁴ Information is drawn from the Website of SEWA, See <http://www.sewa.org/>

sister organizations; 14 Federations; 96 cooperatives; 181 Self Help Groups; and 6,000 savings and credit groups and 3,200 producers' groups) to improve the lives of women in 7 states of India, the importance of service and organizational innovation is clearly evident. A predominant section of women members of SEWA is vulnerable poor without any assets or working capital with little or no social security. They become members of SEWA with INR 5 per year. The number of manual laborers and service women categories constitutes 70% membership. This shows the type of work these women can do and the kind of skills they can be imparted through various self-help groups of SEWA. It has worked mostly with women below the poverty line. It has provided a platform and a forum so that the women can canalize their individual strengths. As the Annual Report of 2005 points out, "self-employed women must organize themselves into sustainable organizations so that they can collectively promote their own development".

SEWA is involved in imparting traditional and non-traditional skills and training poor women in a range of activities from food processing and cooking specific items, tailoring, vocational computer, video and print media skills, literacy, nursery raising, artisan, forestry, health and midwife, natural resource training, communication training and dialogue programmes. SEWA has put a lot of emphasis on capacity building in poor women, which are linked to employment and income generation. Each of these activities in themselves may involve little or no amount of innovation. However, organizing women through various programmes and institutionalized self-help groups certainly constitutes organizational and institutional innovations. These relate to advocacy, organizational strength, networking, partnership, leadership and inter-sectoral approach. Institutional innovations relate to norms and best practices in women's welfare that feed into promulgation of laws. For instance, since 1998 SEWA has been involved in the formation of the National Alliance of Street Vendors of India (NASVI) from 14 Indian cities. SEWA has undertaken systematic studies on vendor issues, town planning and norms governing their operation on streets in major Indian cities. The results have gone as inputs to National Policy on Street Vendors in 2004; and the Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act 2014.

SEWA is the first to introduce micro-finance in India. Together with micro-finance, savings and credit based groups, SEWA is an institution that can be seen to have engineered and mastered the experiment of institutional and organizational innovation in the footsteps of Gandhian philosophy. As Anil Gupta recently observed, SEWA's experience can be also considered an

example of service innovations¹⁵. Three survey-based studies have reported on the impact of SEWA. In a survey of 798 women in household microenterprises, Chen and Snodgrass (2001) reported more person-hours of employment, higher earnings and savings. Another study by Schuler, Hashemi and Pandit (1995) reported higher income among two thirds of 50 women since they joined SEWA. As Ela Bhatt (2006) draws attention, Indian experience at SEWA influenced several global grassroots institutions in Asia, Africa, Latin America, Europe and UN Agencies. For instance, it has taken the initiative to establish networks across national borders, HomeNet at ILO. Self-Employed Women's Union in South Africa at Durban is a sister institution of SEWA. Ela Bhatt inaugurated it in 2002. Curiously, Gandhi's ideas on *Sarvodaya*, freedom and human dignity were put into practice at Phoenix Settlement and Tolstoy Farm about a century back in 1904 in South Africa.

2. Barefoot College: Innovations by Demystifying Technology

The founder of Barefoot College at Tilonia in 1972, is Sanjit Roy better known as Bunker Roy. In many ways, this is yet another institution inspired by Gandhi's spirit of service to the poor. "The college has adopted Gandhian ideas into its lifestyle and work ethics, holding it true and relevant universally even in the 21st Century. What the rural, impoverished and marginalized think important is reflected and internalized in the beliefs of the college".¹⁶ The college philosophy makes a distinction between literacy and education. The former is what one gets in the school, but education is what one gains from family, tradition, culture, environment and personal experiences. Every individual qualified or illiterate has a common sense and has the ability to learn and master skills.

The contribution of College lies in its innovative ways to impart training and skills by demystifying technology¹⁷. There are five values, which epitomize Barefoot College¹⁸. First, is the process of challenging assumptions

¹⁵ Discussion with Anil Gupta at IIM A, Ahmedabad, 7 June 2014.

¹⁶ See <http://www.barefootcollege.org/barefoot-approach/> (accessed on 10 June 2014). See also Bunker Roy, 'India vs Bharat - A Profile of Neglect and Betrayal', Politics India, December 1996.

¹⁷ See the Bunker Roy, 'Technology, Tradition and the Barefoot College', Technology and Learning, Unesco documented, 1997.

¹⁸ Information and data drawn from Catherine O'Brien (1998), Education for Sustainable Community Development - Barefoot College, Tilonia, India, Ph.D thesis, McGill University, Montreal, March. See also Bunker Roy, 'Ethics of technology transfer',

regarding education and development as this stance facilitates ‘de-schooling and unlearning process’. The Second as Bunker Roy stresses, Tilonia’s approach is to demystify technology in order to serve the wider needs of the people. Literacy, high-powered degrees and qualifications are not an essential factor to disseminate the most sophisticated of technologies to improve the quality of life.¹⁹ Beyond meeting essential needs this process also seen to instill self-confidence, self-esteem and self-reliance. At the same time it instills the sense and orientation that people have the ability and capacity to learn technical information and skills regardless of their formal qualifications. Third, is the emphasis on human resources over financial resources. Develop people rather than targets. Fourth, people’s participation is essential. The College is unlikely to take part in implementing programmes unless there is a high proportion of participation from poor. Fifth, a certain degree of social and political autonomy is seen as an essential factor in the functioning of college.²⁰

For over forty years, Barefoot College has been recurrently innovating different means of educating and imparting skills in modern technological devices towards maintenance, repair and operation. It has time and again demonstrated that even if one is not qualified and unable to get even the lowest level of employment in the government or elsewhere, one can get educated and learn skills. The college trained several thousands of rural poor women and men as night school teachers, midwives, health workers, barefoot solar engineers, doctors and dentists, hand pump mechanics, artisans, architects, phone operators, mechanics, computer instructors and *Khabaad-se-Jugaad* (rag pickers to people who can tinker with things and solve problems) professionals.²¹ The college demonstrated “how sustainable the combination of traditional knowledge (barefoot) and demystified modern skills can be, when the tools are in the hands of those who are considered ‘very ordinary’ and written off by the urban society”.²²

The College is involved in a number of areas, but its work in the area of solar lighting and training barefoot solar engineers mostly women and grandmothers is remarkable. So far, it has trained 740 solar engineers in 64 countries from India, Africa, Middle East, South Pacific Islands, Latin

Chemistry and Industry, 16 December 1991. Personal discussions at Barefoot College 29 June 2014.

¹⁹ Bukery Roy, ‘Technology, Tradition and the Barefoot College’, Technology and Learning, UNESCO (undated).

²⁰ Discussion with Ramniwas incharge of communications at Barefoot College, 29 June 2014.

²¹ See <http://www.barefootcollege.org/barefoot-approach/innovation/>, accessed 11 June 2014.

²² Ibid.

America and Asia. It conducts two training sessions each year by enrolling 100 students from India and 80 from other countries. In India, solar engineers trained by the college manage thousands of solar lights supplied in night schools covering 50,000 children. People trained at the college now maintain and service over 80% of solar lighting in Kargil, Ladhak and Leh regions where grid electricity is scarce or non-existent in homes.

The case introducing solar lighting in Kargil district in the early 1990s clearly demonstrates how the college was able to demystify technology and build local capacities to switch over from Diesel Generating (DG) electricity to Solar Photovoltaics (SPVs).²³ Villages in Nubra and Chang Thang Valleys of Leh; and Zanskar valley of Kargil at 4,500 meters altitude are cut off for over 6 months in a year due to heavy snow and poor roads make the area inaccessible. After a survey in 1989 the college mobilized people for environmentally sustainable solar lighting, installation, maintain and repair of the entire system in 840 houses and in 10 hospital units from 1989 to 1996 in 35 villages (Sanjit Roy 1996). The energy ministry supported this initiative and the college took following steps with the concurrence of local people:

- Without professional engineers, solar engineers trained at the college from local villages and not nearby towns will do the job;
- This will ensure that people with some qualifications have interests and roots in the place they live in;
- Training involved installing solar panels on the roof; entire wiring on the building, fixing solar tube lights, fabricate and solder inverters and charge controllers in rural conditions and cold regions. How to become a trainer and a leader in the village to teach others to avoid outside expertise or dependency.

The success of solar lighting in such adverse conditions strengthened not only the philosophy of College of “barefoot engineers”, but enabled it to work out innovative ways to train local people on water harvesting, solar lamps for night schools, solar cookers and other devices. The Barefoot College is the only campus in the country, which is entirely run by the solar power generating 45 kilowatts of solar modules to cater to the needs of 500 people living in the campus at Tilonia. Innovative teaching methods and skills training are globally recognized as Barefoot College partnered UNESCO’s

²³ Sanjit Roy, ‘De-mystification of SPVs to provide lighting: an example of community - supported on-site initiative in Ladhak in the Indian Himalayas, Energy and Sustainable Development, 2(5), 45-51, 1996. The entire case is drawn from this study.

Global Partnership for Girls and Women's Education since 2012. The Ministry of External Affairs and UNDP is sponsoring a programme by which African women from villages without electricity are trained at the college. These programmes have enabled to install solar lighting in various African villages in the last few years.²⁴

3. Inclusive Health Care Innovations: Three Cases

A vast majority of poor in India cannot afford modern medical treatments in eye and heart problems. This is where Aravind Eye Care System, Madurai, founded by Dr. G. Venkataswamy; and Narayana Health or better known as Narayana Hrudyalaya, Bengaluru, led by Dr. Devi Shetty²⁵ demonstrate how health care practices and technologies in eye and heart surgeries could be scaled down by applying the principle of inclusive innovation – more from less to serve more. Both cases demonstrate the way in which innovations can become inclusive by continuously reducing costs to serve more and more number of poor and vulnerable without in any way sacrificing high quality health care.

On the other hand, the third case, namely *Bhagwan Mahaveer Viklang Sahayta Samithi* (BMVSS) better known as Jaipur Foot led by Dr. Pramod Kumar Sethi and D.R. Mehta demonstrate another unique example of inclusive innovation to serve millions by scaling up operations to reach a vast section of poor and vulnerable people in the world. It is also a case where an orthopedic surgeon, Dr. Sethi, FRCS, London, collaborated with a team of Jaipur craftsmen led by Ramachandra Sharma to innovate using indigenous materials to produce prosthetics for the poor.

Aravind Eye Care System is a network of hospitals in six cities in Tamil Nadu covering more than 2200 beds and Aurolab where intraocular lenses are produced. Aravind has specialty clinics for Retina and Vitreous, Cataract, Neuro Ophthalmology, Orbit, Oculoplasty and Ocular Oncology, Glaucoma, Uvea, Cornea, Low Vision and Visual Rehabilitation. In 36 years, since its inception, the system has catered to 32 million patients and performed 4

²⁴ See <http://www.barefootcollege.org/solutions/solar-solutions/where-we-work/> accessed on 12 June 2014.

²⁵ Devi Shetty is a world-famous pediatric heart surgeon in his own right. In 1990, he became the first doctor in India to perform neo-natal open-heart surgery on a nine-day-old baby, launching the practice of pediatric heart surgery in India. He also performed Asia's first dynamic cardio myoplasty operation to strengthen a weak heart muscle. He has performed over 20,000 major heart surgeries and has built four of the largest heart hospitals in India. Taken from <http://india.ashoka.org/fellow/devi-shetty>, accessed 12 June 2014.

million eye surgeries. In 2014 diagnostic consultation at Aravind costs just US\$1 or INR 50. In the year 2012-2013, Aravind was visited by 3.1 million outpatients and performed 371,000 eye surgeries. An average surgeon conducts about 2000 cataract operations every year. The complication rate at Aravind is 50% of those reported in U.K.²⁶ Aravind maintains onsite lens manufacturing set-up at Aurolab created in 1992. It has produced 1.8 million intraocular lenses. In 1990s it produced each pair for US\$5 and it dropped to US\$2 or INR100 each distributed in 120 countries of the world. It is the large number of lenses that are produced, which has brought down the costs. Aravind currently accounts for 7% of world eye surgeries in the world. On a typical day at Aravind, one can see 6,000 patients who visit in its network hospitals in Tamil Nadu, which perform 800 to 1,000 surgeries. It holds classes for 100 residents/fellows and 300 technicians each day.

Aravind has a unique system of serving the poor through its camps and hospitals. Poor patients can walk-in-free to pay INR750 or US\$15 for cataract operation including lens and stay in the hospital. The whole system works on providing eye care at a fraction of the cost due to the sheer large number of patients who visit the clinics, hospitals and the everyday eye testing camps. All patients receive the same surgical care regardless of their ability to meet the costs. According to Mr. Tulasiraj, Executive Director at Aravind, “the business model that Dr. Venkataswamy, the founder of Aravind, established, was simple: providing care to those who can afford to pay market rates and then use the profits to fund care for those who cannot”.²⁷ Those who cannot pay will be lodged in dormitories. Those who can afford to pay can choose various levels of luxury including air-conditioned private rooms. There is a process of cross subsidization. Paying customers in large measure cover the costs of those who are unable to pay. More than 60% of the patients are highly cross-subsidized.

Narayana Hrudyalaya or Health (NH) located in Bangalore is another case of high quality health care in heart surgery reaching the poor and underprivileged sections of society at a fraction of the real cost. Its founder, Dr. Devi Shetty, winner of a 2011 Economist award for innovation and is nicknamed, as the ‘Henry Ford of Heart Surgery’ by the Wall Street Journal.²⁸ Contrary to this image of ‘mass production’, his model in many ways reflects

²⁶ See <http://www.aravind.org/Downloads/draravindinterview.pdf>, accessed 12 June 2014.

²⁷ 8 August 2013, The Economist, See

http://www.economistinsights.com/healthcare/opinion/frugal-innovation-healthcare_
accessed 12 June 2014.

²⁸ See <http://online.wsj.com/news/articles/SB125875892887958111>, paper dated 25 November 2009, accessed 22 June 2014.

the Gandhian notion of 'production for masses'. He was personal surgeon to Mother Teresa. One could understand the source of his vision, philosophy to think about poor and design an economic model to serve them. His simple model has the potential to revolutionize the way healthcare is delivered in low-income settings and countries.

Beginning with 300 beds hospital it has expanded to 5,700 beds chain of hospitals in major cities of Karnataka, Hyderabad, Kolkata, Jamshedpur, Raipur, Ahmedabad, Jaipur, Malaysia and Cayman Islands. Currently, it caters to 80,000 patients and performs 3,500 surgeries every month with a success rate of 95%. The Bangalore Hospital performs 30 surgeries per day, which is a world record. The poor pay about INR60,000 or US\$1,200 for heart surgery and others pay INR 130,000 or US\$2,600. This works out to be one fourth or one fifth of the costs (US\$6000) of best private hospitals in India such as Apollo Hospitals or Escorts Hospitals in New Delhi or others in India. In the USA it costs US\$20,000 to US\$100,000. As Aravind Eye Care, there is a model of cross subsidization. NH attracts rich patients because of its quality, excellence and high degree of care, which is extended to all patients without any discrimination. NH system evolved a number of process or organizational innovations, which enable it to lower costs to serve patients. As Govindrajan and Ramamurti (2013) study reveals, NH operates on "a-hub-and-spoke" configuration of assets. Main city hub based hospitals concentrate with high quality talent and sophisticated equipment. Spoke facilities are organized around hubs to reach patients in villages and remote towns from hubs. Spoke facilities focus on routine diagnosis, treatment and care. They feed in patients to hubs for sophisticated procedures and surgeries. Hub and Spoke configuration are highly connected through telemedicine to deliver high quality care over phone. Physician experts read medical images remotely and discuss with their patients. NH evolved unique ways of cost cutting by doubling the working life of sophisticated equipment and medical technology through maintenance and repair system. NH trains technicians and nurses with sophisticated skills to handle various procedures for before and after surgery care. This led to cost cutting by relieving highly skilled surgeons and doctors from wasting time on routine procedures. NH evolved unique Yeshasvini insurance scheme, which costs INR 5 per farmer per month, and they can get healthcare in Karnataka. A number of other process innovations have led NH to become cost-effectiveness without losing sight of quality. NH and Aravind Eye Care have given a high level of importance to learning by interaction and learning by doing in their work culture. Attracting talents and doctors and retaining them while recurrently improving skills seems to be one of the factors behind the success of these institutions and of their leadership.

Jaipur Foot is an indigenous innovation in prosthetics originated out of concern for polio patients and amputees at Sawai Madho Singh Hospital in Jaipur. Dr. Sethi was an Orthopedic Surgeon here and master craftsman Ram Chandra Sharma was teaching leprosy patients to make handicrafts. Sharma under the guidance of Dr. Sethi rehabilitated thousands of patients with their innovation, artificial foot made out of special microcellular rubber. In 1970 Dr. Sethi presented his first paper on Jaipur Foot and later in 1971 at the British Orthopaedics Association meeting at Oxford in 1971. The innovation became revolutionized both in India and the world after Dr. Sethi with Devendra Raj Mehta established BMVSS to provide prosthetics, calipers and other physical aids and appliances free of charge to as many as disabled poor people.²⁹ One of the missions of BMVSS is to “provide economic support for livelihood (on selective basis) as an anti-poverty programme”.³⁰ BMVSS organized 50 camps in 26 countries including war torn countries such as Afghanistan, Iraq, Lebanon, Dominican Republic, etc. so far; and holds 50 camps every year in different parts of India supported by donors or government.

Since its inception, BMVSS has rehabilitated more than 1.3 million amputees and polio patients with Jaipur Foot and other appliances in 26 countries including India. In India, there are 22 branches. The Jaipur Foot is the lightweight fitment preferred all over the world, which can be designed and fitted the same day. The Time Magazine named it as one of the best 50 inventions of the world.³¹ Currently, it costs US\$45 or INR2,200 compared to nearly US\$10,000 or INR500,000 in the USA. Over the last four decades, there have been continuous innovations in various institutional segments of Jaipur Foot involving patient-centric care and management, fabrication processes and materials used, quality control, assessment and feedback of patients, technology and other related aspects. Learning by doing and interaction plays a significant part in everyday innovation as designing customized prosthetics differ from patient to patient needs and demands.³² Prof Klenerman compared the Jaipur Foot with USA’s Solid Ankle Cushioned Heel (SACH) and Seattle Foot at the Royal Liverpool Hospital, UK. “The results showed that the performance of the Jaipur Foot was more natural and closer to the movements of the normal human foot as compared to

²⁹ See The National Medical Journal of India, 21(2), 2008, p.99. Obituary Section. Discussion with D.R. Mehta on 30 June 2014 reveals that Dr. Kasliwal, Dr. M. Udawat and later Dr. Pooja worked on further development of Jaipur Foot.

³⁰ See http://jaipurfoot.org/who_we_are/vision_and_mission.html#.U5qFxs9TUVk, accessed on 13 June 2014.

³¹ Time Magazine, 23 November 2009.

³² Discussion with Dr. Pooja and D.R. Mehta on 30 July 2014 at BMVSS, Jaipur.

the SACH and Seattle Foot”.³³ The innovation system of Jaipur Foot in the last decade is benefited by a large number of collaborations with top universities in the world such as Stanford University, Virginia Tech and MIT in the USA; DELFT University, The Netherlands; five IITs in India, ISRO, Bangalore, etc. It has product development and innovation collaboration with the MIT and Stanford Universities. The Stanford–Jaipur Knee also known as Jaipur Knee is the outcome of this collaboration, which has gone into use in the market. BMVSS is now developing Jaipur Hand in collaboration with Stanford and MIT labs.

IV. Public Policies and Public Research System

It will be naïve to argue that public policies or universities and national laboratories are not involved in inclusive innovation. At the same time R&D and technological projects concerned with the promotion of inclusive innovation have been quite marginal to the mainstream science and technology policies. With the possible exception of institutions such as KVIC and Mahatma Gandhi Institute of Rural Industrialization, there are various types of problems associated with public policies in rural development. Once a scheme is created in the ministry, there are hardly any serious efforts to evaluate its impact before either closing it down or merging it with other programmes. For instance, since 1980s, Integrated Rural Development Programme (IRDP) had more than half dozen schemes on rural youth, women, artisans, Ganga river, wells and self-employment. In 1997, following Hashmi Committee Report the government merged all these schemes under IRDP to create Swarnjayanti Gram Swarozgar Yojana (SGSY). This was disbanded again after the Radhakrishna Committee report in 2008 or merged to launch National Rural Livelihood Mission (NRLM) in the XIth Plan, which was later renamed as Aajeevika and launched in 2011.³⁴ Given a long history of rural development, it will be difficult to spot exemplary cases of inclusive innovation of the order referred to in the previous sections.

There has been a real problem of governance in lead institutions having the mandate to promote the rural technology. Council for Advancement of People’s Action and Rural Technology (CAPART) blacklisted 833 NGOs, for which, funds were routed through it. The Parliamentary Committee seriously

³³ See http://jaipurfoot.org/how_we_do/technology.html#U5qQ5y9TUVk, accessed on 13 June 2014.

³⁴ See Annual Report 2012-2013, Chapter 3, page 24, Ministry of Rural Development, http://rural.nic.in/sites/downloads/programmes-schemes/Rural_Livelihoods.pdf, accessed on 21 June 2014.

indicted CAPART for its inefficiency and malpractices³⁵. About INR1,000 crores are distributed to NGOs since 1986 through CAPART. The former Rural Development Minister, Jairam Ramesh stepped down from CAPART board and recommended its closure or its complete revamping in 2013.

Under the XIIth Plan the government created more than half dozen schemes or programmes as part of inclusive growth involving thousands of crores of rupees:

- Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)
- Bharat Nirman
- Indira Awaas Yojana: a national housing scheme for poor
- Pradhan Mantri Gram Sadak Yojana
- Jawaharlal Nehru Urban Renewal Mission: building urban infrastructure
- National Rural Health Mission
- National Rural Livelihood Mission

Even though these programmes come under what has come to be known as inclusive growth, none of them have had any major objectives to promote inclusive innovation. They have not been able to forge any fruitful links with science agencies such as CSIR or with the National Skill Development Council. CSIR in the 1970s and 1980s initiated inclusive innovation projects such as 'Karimnagar Project' and IITs adopted some villages to evolve rural development 'models' during the same time. Unfortunately, these institutions have lost appetite to devote any substantial resources and effort to inclusive innovation in the last decade and a half. In the case of Agriculture universities and Indian Council of Agricultural Research there are some initiatives.

V. Role of Corporates

A number of initiatives have been launched by private corporate institutions on inclusive innovation in the last decade. Two cases are considered here to reflect on their activities. Tata Consultancy Services (TCS) in 2000 put a team of professionals led by Kesav Nori to design a computer-based multimedia

³⁵ The Hindu, 20 December 2009.

program to address the problem of illiteracy in the country. This resulted in a program called Computer Based Functional Literacy (CBFL), which could enable an illiterate person to learn basics in 40 to 45 hours. CBFL method consists of flash cards, animated graphics pattern for visualization and audio where there is a repetition of sound pattern. This leads to recognition of words through sounds, their retention and recall.³⁶ This is given free of cost to various institutions and disseminated for education through TCS based institutions. This is a need-based innovation inspired to tackle India's vast illiteracy. CBFL program is active in 250 centres in four Indian states in nine Indian languages. As TCS claims, the program so far impacted 200,000 people to become literate in 3Rs (reading, writing, arithmetic). Various state governments have already deployed CBFL at Panchayat and adult literacy programmes. Impressed by the Indian success, the First Lady of South Africa in 2002 recommended to design, develop and deploy similar CBFL programme in Northern Sotho language, which was implemented in Northern Province. UNDP has commissioned TCS to develop a similar program for Egypt.³⁷

In contrast to TCS's educational innovation developed as part of its CSR, the Solar Electric Light Company (SELCO), Bengaluru, is a social enterprise involved in inclusive innovation for improving the living standards of poor households in Karnataka. It operates in solar lighting, water heating and stoves. IIT Kharagpur, graduate Dr. Hande, founded SELCO. He set himself to dispel three myths associated with sophisticated sustainable technology and rural sector, that poor people cannot afford and maintain sustainable technologies. The third was the social enterprises couldn't run on commercial lines.³⁸ Over the last two decades, SELCO was successful in accomplishing this mission. Since 1995 it installed 150,000 solar systems in Karnataka, Maharashtra, Gujarat, Tamil Nadu and Bihar. The firm not only tapped farmers and households who could install and use solar energy during night, but street vendors who lack lighting to sell their products on the streets and by-lanes of major cities in India. SELCO encouraged entrepreneurs who could charge micro batteries and lend them to street vendors on a daily basis at a reasonable cost. This is beginning to spur entrepreneurship in a big way in major Indian cities.

SELCO's success in expansion and survival depended on its innovations which combined the requirements of solar energy, its varied use and ability to pay at different levels of high, medium and low income households,

³⁶http://www.tcs.com/SiteCollectionDocuments/Brochures/CSR_Computer_Based_Functional_Literacy_Brochure_08_09.pdf, accessed on 14 June 2014.

³⁷ http://www.tataliteracy.com/impact_places.htm, accessed 14 June 2014.

³⁸ http://www.selco-india.com/about_us.html, accessed on 14 June 2014.

individuals and institutions. As the company points out, “a combination of innovations in products, finance, supply and the service can ensure that reliable and affordable energy can be used to improve the quality of lives of the poor, rural households”.³⁹ Understanding the needs of the people and go into their local circumstances to design, formulate a financial management and work out servicing plan is the main principle underlying innovation process at SELCO.

VI. Concluding Remarks

The contemporary Indian landscape demonstrates the diversity of institutions and institutional approaches, multiple methodologies and goals in promoting inclusive innovations. However, there is a common thread running through diverse cases presented here. That is, the concern for poor and underprivileged sections, in designing and deploying innovations or inclusive methodologies to improve their lives so as to enable them to get better integrated with the socio-economic mainstream. The economic and market factors are seen as important, but are strategically steered to achieve inclusive development goals. This is where the Indian landscape in inclusive innovation is distinguished from purely corporate profit and market-oriented “Bottom of the Pyramid” innovation strategies (Prahalad, 2010). There are institutions and groups in the contemporary Indian landscape, which continue to draw inspiration from Gandhian economic thought. Gandhian ideas on economy and society, in the 21st Century, are as much relevant to the national agenda of inclusive innovation as they were in the 1940s and 1950s, though in a revised framework taking into account ICT and S&T revolutions.

The diversity of innovation landscapes throws up a number of insights and hypotheses for innovation studies. Non-R&D based small incremental, institutional and organizational innovations seem to be as important as R&D based radical innovations. Amul, Aravind, NH and Jaipur Foot, in their own way, draw our attention to these insights. Designing institutional strategies (in forming self-help groups, training for micro enterprises, designing different schemes in insurance and microfinance, etc.) to organize poor people to improve their livelihood at SEWA can be taken as social and network based innovations. In the case of SELCO, contextual factors confronted by poor street vendors and households led the firm to service-based innovations.

³⁹ SELCO Need for Innovations, See http://www.selco-india.com/need_for_innovations.html, accessed on 14 June 2014.

Barefoot College and Honeybee Network clearly demonstrate that poor in villages, particularly people in the informal sector are in no way inferior or disabled either in knowledge or skills in innovation. They have shown how to intervene, build capacities through appropriate innovative methodologies and at the same time bridge informal and formal sectors of economy. The Barefoot college has shown that lack of educational qualifications is not an impediment in managing modern solar energy technology on the part of people in Leh and Kargil districts. Jaipur Foot came into being as a result of collaboration and cross-fertilization of knowledge between indigenous and modern medical knowledge. One of the key persons was an artisan. Honeybee, on the other hand clearly demonstrated that there is a vast reservoir of local and indigenous knowledge traditions that remain untapped and unexplored. Given the limited support to Honeybee Network in the form of NIF, it has shown practical ways to build and expand people's capabilities. There indeed exists a great potential to create new enterprises by innovation from grassroots by blending and bundling it with formal institutions. There is already a blueprint or a viable model of how to add value and scale up grassroots innovations in the experience of Honeybee Network, SRISTI and GIAN.⁴⁰ The challenge lies in the multiplication of such models.

The three cases on health innovations (Jaipur Foot, Aravind Eye and NH) have shown a unique Indian way or a model in scaling innovations. They have shown how frugal and inclusive innovation can be designed to serve poor without compromising world-class quality and excellence in health care. It is no accident that the global CEO of General Electric, Jeff Immelt, observed that, "India is going to redefine the modern practices of healthcare globally. It is going to be determined in this country".⁴¹

When we traverse across this seemingly optimistic and hopeful landscape of inclusive innovation and enter the domain of public policies, one would suddenly bump into irreparable pathways and bottomless sinks. It is rather difficult to find a single success story, which qualifies to be emulated or characterized as a model case. It is rather quite disappointing to note that despite pouring in thousands of crores of taxpayer's money, various government schemes, with some exceptions, have failed to address the problem. The previous government had initiated a large number of social sector schemes under inclusive development, but unfortunately they are not connected or linked to innovation. These programs have no links whatsoever with science agencies. It will be fruitful to devote at least 15 to 20% of the inclusive growth budget to inclusive innovation. Amul, SEWA, Honeybee

⁴⁰ Discussion with Anil Gupta, IIM A, Ahmedabd, 7 June 2014.

⁴¹ Jeff Immelt Interview with Vinod Mahanta, See The Economic Times- Corporate Dossier, 13-19 June 2014.

Network and Barefoot College have the potential to enlarge the innovation base of these social development schemes. Further replication of similar models in other areas where more than 93% of our informal labor force exists is called for. CBFL and SELCO indicate that a private corporate sector does have a big role in inclusive nation building.

One important feature that emerges from cases explored is the role of state mediation. The state support played an important part in the success of grass roots innovation institutions and civil society groups. Equally crucial is the role of intermediary institutions such as NIF in forging links between informal and formal institutions. Innovation and industrial policies together with Department of Science and Technology should assign far greater support to such intermediary institutions in other sectors than it has been doing so far. From a critique of structural relevance, Smith et al. (2013) raise an important issue of whether inclusive innovation has the potential to bring about wider structural changes in society. Inclusive innovation should not be seen as an alternative to either R&D based Schumpeterian innovation or to the national innovation system (NIS). In countries such as India, where more than half our population are poor and live in villages, it certainly has the transformational potential to improve the living conditions of people and enhance their income through alternative innovative interventions. Indian cases have time and again demonstrated their potential to lift people's lives to higher socio-economic thresholds from the bottom of the pyramid. It thus plays a complimentary role to NIS and thereby is an important actor of NIS. Time has come to replicate and multiply these models to impact wider segments of our informal sector. Three cases of health innovation are a special case. Each one of them has shown an alternative and cost effective model compared to those prevailing in urban rich medical institutional structures.

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