

Inclusive Innovation in India: Historical Roots

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Abstract Inclusive innovation refers to different types and forms of innovation activities or performance by which we can get more for lesser cost and which could cater and meet the needs and demands of more people. The essence of inclusive innovation is to help poor, marginalized and underprivileged sections of society to improve their livelihoods and enable them to climb up the socio-economic ladder. In the current phase of economic slowdown, increasing unemployment and inequalities, World Bank, OECD and various governments are turning towards inclusive innovation as a new source of optimism or even as a new innovation strategy. Whilst it is being reframed or packaged as a novel or a new strategy, one can trace its historical roots to the AT movement and the Gandhian ideas of economy and society in the 1940s and 1950s. These ideas have inspired and influenced a range of individuals, institutions and civil society groups in inclusive innovation.

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

Development discourses, which influence public policies, have coined new terms and concepts from time to time. The term inclusiveness is however a new addition to the discourse that is current in literature and policy forums. Inclusive innovation has come into prominence as an important development strategy from World Bank, OECD, UN agencies and governments in the last decade. Inclusive innovation has become an umbrella concept encapsulating terms such as grass roots innovation, frugal, *Jugaad* (tinkering), Bottom of the Pyramid and “below the radar” small or Gandhian technologies. Curiously, inclusive innovation is used as a new *mantra* (formula) after the euphoria of globalisation balloon busted.

In the Indian economic and policy context, inclusive growth found expression when India registered relatively high growth rates. In the midst of economists celebrating reforms and high growth rates during 1991-97, Amartya Sen drew our attention to inequality and inclusiveness in no unambiguous terms. He pointed out that, ‘the success of liberalization and closer integration with the

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world economy may be severely impaired by India's backwardness in the basic education, elementary health care, gender inequality and limitations of land reforms' (Sen, 1998: 82). Even though issues of economic growth and inequality remained high in the agenda of 10th Plan, inclusive growth and development found institutional footing only in the 11th Plan (2007-2012).

India has one of the largest social sector programs in the world devoted to inclusive development. Despite this, very little attention is paid to inclusive innovation. The creation of National Innovation Foundation (NIF)¹ to scale up grassroots innovation and ideas from Honeybee Network in 2000 was a major formal step from the government. The concept got further boost with the creation of National Innovation Council in 2010 and the declaration of (2010-2020) as the Decade of Innovation by the President of India. With the launching of India Inclusive Innovation Fund (IIIF) in 2013-14 with a corpus of nearly INR 50000 million (77 million US\$), its importance became evident from the point of public policy². After spelling out what is inclusive innovation, the second section of the paper traces historical roots of inclusive innovation.

I. What is Inclusive Innovation?

Innovation may be defined as a new idea, knowledge and a new way of doing things, which is used by people, markets, firms or other actors in the production process in a society. Generally, markets and firms define knowledge and its translation mainly in terms of "market good" and as an investment factor. From the perspective of inclusive innovation, knowledge is also defined in terms of 'public good' and its socio-economic relevance. Inclusive innovation refers to diverse types and forms of innovation activities or performance by which we can get more for lesser cost and which could cater and meet the needs and demands of more people.³ The essence of inclusive innovation is to help poor, marginalized and underprivileged sections of society to improve their livelihoods and enable them to climb up the socio-economic ladder. Following

¹ NIF is located in Ahmedabad and is Chaired by R.A. Mashelkar and the foundation works in close collaboration with Honey Bee Network located at the Indian Institute of Management, Ahmedabad.

² Sadly, these institutions and policy schemes launched by UPA government found closure with the coming of Modi government. Policy schemes are however transferred and run under different names such as Atal Innovation Mission, Startup India etc.

³ More from less for more phrase has come into sharp focus when World Economic Forum in 2010 organized a special session on 16 November 2010 on this theme. Further, influential people like R.A. Mashelkar, J. Immelt from GE and Carlos Ghosn of Nissan have been advocating this as part of inclusive or frugal innovation at various forums.

Sen (1985), capabilities of persons can be seen as inner potentialities, which can be tremendously improved through learning, training and other interventions and techniques. Mashelkar (2013: 22) defines, “inclusive innovation as any innovation that leads to affordable access to quality goods and services while creating livelihood opportunities for the excluded population”. Anil Gupta (2013: 105) draws our attention to inclusion that may take place in: a) Regions or spaces that are bypassed; b) People who are excluded due to ineligibility, inability to afford, lack of awareness or capacity or appropriate skills; c) Environmental conditions in which the access to certain social needs get adversely affected; d) Sectors, which tend to get neglected could be made buoyant by specific technological, cultural, institutional, or educational innovations; and Skills which are eroding fast could be revived.

From the perspective of knowledge, inclusive innovation does not discriminate between traditional or indigenous knowledge with the knowledge of modern science. Whilst seeking parity between different systems and traditions of knowledge in a pluralistic manner, inclusive innovation strives to bridge and connect indigenous with modern science based knowledge to promote equity and inclusiveness. Inclusive innovation may or may not be R&D based and need not always mean technological innovation. Inclusive innovation also means institutional, individual, social, business and organizational innovation manifested in enterprises, firms and institutions. Inclusive innovation can be conceptualized as “radical” as well as “incremental” types.

Similar concepts have come into usage in the last few years. Inclusive innovation is referred to as frugal innovation.⁴ Jugaad innovation that refers to improvisation by trial and error method (Krishnan, 2010; and Radjou, Prabhu and Ahuja, 2012) is also used interchangeably with inclusive innovation. Predominantly market and profit oriented (market good) frugal and Jugaad have to be distinguished from inclusive innovation which, predominantly stresses public good. In the former, the poor are targeted to exploit market potential to generate more profits at the bottom of the pyramid (Prahalad, 2010).⁵ Market and business potential are very important factors but they are not the primary motive of frugal and Jugaad when we refer to it as inclusive innovation. Here, it will be seen to respond to the limitations of resources, financial or material to

⁴ Tata Nano is often quoted as frugal innovation but our best examples are Jaipur Foot, Narayana Health, Aravind Eye Care (See Krishna, 2017).

⁵ Inclusion merely seen as a corporate strategy for scaling down consumer products and selling is the not the usage and meaning relevant here. However, Jugaad or any other frugal Indian type of inclusive innovation feeding into global usage or its influence to any institute or firm or agency or government concerned with improving the lives of poor is seen in a constructive and functional manner.

serve poor taking into account their paying capacity. Historically speaking, there have been recurrent institutional efforts to reflect on concepts of technology, innovation and development.

II. Historical Roots

One can trace the emergence of concepts like deskilling, destruction of village economy and marginalization of poor to the colonial period. Even though they did not use inclusiveness or exclusion, as such, its meaning came into sharp focus in the debates on industrialization after the Indian Industrial Commission in 1918. The main concern in the debates on industrialization centered around its impact on the village economy, artisans and small and cottage based industries. There are many perspectives on the question of Indian development, particularly on the village reconstruction and rural development in the 1920s. As we will explore, Gandhi's own views on technology and his economic thought have inspired a number of institutions and groups. It has had a lasting impact on shaping their views on the role of technology in improving the lives of poor in villages. No less important, but less talked about, is the pioneering contribution of Rabindranath Tagore on rural reconstruction known as Sriniketan Experiment at Bhirbhum village in Bengal in 1922.

The poet was deeply moved by the condition of rural masses and the deplorable state in which poor people lived. In collaboration with Leonard Elmhirst, a British agronomist from Cornell University, Tagore established the Rural Reconstruction Centre in February 1922, later named it as Sriniketan. Its aim was firstly to win the friendship and affection of villagers, artisans, farmers etc., to understand their problems and concerns to assist them in solving those issues. Secondly, the institute would take up the problems of the village and the field for study to work out solutions in an experimental farm or classroom or a lab. The institute would then transmit the knowledge relating to solutions to various problems back to the villages and people. A range of problem-solving activities and projects were undertaken like helping villagers to sell their farm produce, better methods of growing crops, livestock problems, crafts to sanitation related issues. The activities of the institute were spread over 76 villages in a radius of 200 km. One can say this was one of the pioneering experiments in rural reconstruction through developing innovative solutions. For the poet, 'the problems of rural reconstruction not only required the removal of poverty but also bringing joy to the life of villagers'. Sriniketan is now part of the Visva-Bharathi University, West Bengal.

The other important thinker and leader was Gandhiji who was deeply moved by the poverty of the rural masses (Mukherjee, 1952). Gandhi and Tagore

admired each other in their own ways and in fact shared various views on colonialism, development and rural industrialization for the regeneration of village economy and its sustenance. They however differed on certain instruments and methods towards achieving a broader goal of rural reconstruction. For instance, Tagore was not favourably disposed towards Gandhi's idea of *Charkha* (spinning wheel) and deemed it as inappropriate instrument. On the contrary, Gandhi never took this view literally and argued how this appropriate technology would bring in some relief to a starving farmer. Gandhi pleaded that he had "asked no one to abandon his calling, but on the contrary, to adorn it by giving every day only thirty minutes to spinning as sacrifice for the whole nation".⁶ Gandhi's critique of industrialization did not mean rejecting industrialization in favour of Charkha and its sphere of influence. Rather, he was arguing for a humanitarian industrial policy by which he meant 'a glorified revival of hand-spinning, for through it alone can pauperism, which is blighting the lives of millions of human beings in their own cottages be removed'.⁷ Gandhian concepts such as Charkha and *sarvodaya* (welfare of every person) exemplify inclusiveness and have symbolic value in contemporary situation. They have inspired a generation of institutions and organic intellectuals to promote various types of solutions, techniques and methodologies that we characterize as inclusive innovation.

The basic premise and philosophy of any policy, technology, knowledge and the governance system is that it should think of welfare of each and every citizen in a society. This is the essence of the Gandhian notion of Sarvodaya. John Ruskin's book *Unto This Last* (1904) had a profound impact on Gandhi's thinking, philosophy and action. As Gandhi himself in his autobiography writes he translated the title of the book in *Gujarati* as *Sarvodaya*. Gandhi points out that he understood Ruskin's teachings in three ways:

- a) That the good of the individual is contained in the good of all.
- b) That a lawyer's work has the same value as the barber's, in as much as all have the same right of earning their livelihood from their work.
- c) That a life of labor, that is the life of the tiller of the soil and the handicrafts man is the life worth living.⁸

Gandhi assumed that b) and c) are contained in a) and thus it became the corner stone of Gandhi's philosophy in economics. For instance, several years later in India, Vinoba Bhave put forward the concept of *Antyodaya* (uplift the last). To put this philosophy into practice, Gandhi acquired 100 acres of farm

⁶ See Gandhi on 'The Poet and the Charkha', *Young India*, 5 November 1925.

⁷ See Gandhi on 'Science and Industrialization', *Young India*, 17 December 1925

⁸ See Gandhi (1957) p8 1951 first print, In this volume the actual reference is to *Autobiography*, pt. IV, (ChXVIII)

around Durban in 1904, South Africa, known as Phoenix Settlement. In 1906 the experiment was repeated in a refined way in Johannesburg, South Africa on 1100 acres farm known as Tolstoy Farm. Equality and inclusiveness that remained basic to his thinking on economics can be traced to these initial efforts or experiments.

Three influential thinkers who immensely contributed to Gandhian ideas on economy and society were J.C. Kumarappa, Vinoba Bhave and J.B. Kriplani in the 1950s and 1960s. From the perspective of Gandhian ideas, the relevance and meaning of inclusive innovation is intimately linked to the analysis of economics, technology, decentralization and industrialization, among other aspects. According to Kriplani (1961: 232), “Gandhiji conceived of economics not merely in terms of production, distribution, exchange and consumption of material goods and services, but also of how these processes affected the life of the individual and the community and their mutual relations”. In many ways economics and ethics were seen as two sides of the same coin in the Gandhian thought. Gandhi and his close associates developed a critique of western models of industrialization and invoked the relevance of Charkha as a symbol of “appropriate technology” and khadi as a symbol of Swadeshi. These thoughts reflected the social reality of the situation at that time. For instance, 67.5% of Indian population on an average during 1891 and 1921 was dependent on agriculture⁹. Hence, the challenge was to critically analyze the process of industrialization, the pattern of development it generated and the role technology could play in promoting the goals of sarvodaya, swadeshi, among others. This remained the centrepiece of Gandhian economics (Kriplani, 1961), which reverberates even today in a different form. The same proportion of Indian population is dependent on agriculture in 2017. Gandhi was not against modern science and industrialization, as is generally misunderstood, in some quarters. He wanted to reframe the process of industrialization drive to suit social reality of village economy and Indian context of his times. He went on to argue that:

If I can convert the country to my point of view, the social order of the future will be based predominantly on the Charkha and all it implies. It will include everything that promotes the well- being of the villagers. I do visualize electricity, ship building, iron works, machine-making and the like existing side by side with village handicrafts. But the order of dependence will be reversed. Hitherto, the industrialization has been so planned as to destroy the villages and

⁹ What a contrast in similarity. Even in 2017 somewhat similar proportion of Indian population are dependent on agriculture.

the village crafts. In the State of the future it will sub serve the villages and their traits. I do not share the socialist belief that centralization of the necessaries of life will be conducive to the common welfare.¹⁰

Other main Gandhian protagonists were also not against modern science and technology. They upheld the progressive and constructive role that modern science and technology played in the human civilization. But they did not approve of dysfunctional and destructive aspects of political economy of science, colonialism and imperialism. They also did not approve of the way in which knowledge became a tool of hegemony and exploitation. When we look into Gandhi's own views in *Hind Swaraj* (Indian independence or self-rule), *Young India* and other writings, one can see his vehement criticism of modern machines to the point at times it gives the impression that he outrightly rejected all that is associated with industrialization. However, as some commentators have rightly observed, 'Gandhi's critique is hence not a critique of the machine per se, but the opacity and alienation built into the modern incarnation of machinery.'¹¹ The point is that Gandhi's vision of machine and technology and all the knowledge that goes with it has both destructive and constructive dimensions. He was trying to retrieve the constructive side and make it a part and parcel of his economics, morality and freedom. As Kriplani (1961: 247) put forward the position of Gandhian thought:

Science and technology that have so far helped centralization can be harnessed for the service of the small machine capable of being installed in every village home and ultimately workable by electricity. In a country like India, with its large and increasing population, the small machine and decentralized industry can give us goods as plentiful as the big machinery yields to countries with small populations and lower rates of population increase. If science, technology and cooperation have worked wonders in the centralized field of production there is no reason why similar wonders cannot be worked by means of small machine.

¹⁰ See Harijan, 27-28, January, 1940. See also V.V. Bhatt, "Development Problem, Strategy and Technology Choice: Sarvodaya and Socialist Approaches in India", *Economic Development and Cultural Change*, October 1982, 31: pp. 85-99.

¹¹ See undated note on 'Swaraj and Swadeshi – Gandhi, Tagore and Ethics Development and Freedom', by Nalini Bhushan and Jay L. Garfield, Smith College, London, http://www.smith.edu/philosophy/docs/garfield_swaraj.pdf (accessed on 24 April 2014)

The debates on industrialization revolved on how to evolve strategies and workable propositions, to bring about equity and inclusiveness. In a large measure, they invoked the debate of ‘large’ versus ‘small’ in technology and the notion of decentralization in economic growth and developmental planning. Even though there were differences over perspectives, methodologies, among Gandhians, the objective they shared was the same. The meaning of inclusiveness was clearly central to their economic thought. As it stands out, J.C.Kumarappa’s lifetime work and action radiated Gandhian ideas in many ways. He joined Gandhi in 1929. Even before he set out to give a concrete action and meaning to Gandhian decentralized development through technology, Kumarappa made environment and sustainability a corner stone of his perspective. He stressed that, “we should never lose sight of that great teacher, Mother Nature. Everything in nature seems to follow a cyclic movement. A nation that forgets or ignores this fundamental process in forming its institutions will disintegrate”.¹² He was aware of the limitations of village economy and tried to balance it with centralized production systems (Govindu and Malghan 2005). He extensively traveled in Russia, China, USA, Europe to understand their socio-economic systems, socialism, communism and capitalism. In bringing together a set of his writings under the title *The Gandhian Way of Life*, Kumarappa (1952: 38,39) stressed:

Though we have emphasized decentralization as a general means of production, yet, we realize that a great many commodities needed by the present day society, require centralized means of production. It is not possible to run railways, produce electricity, supply water and produce instruments.... through cottage industries. Although a compromise is generally an evil, yet under certain circumstances we have to accept a certain amount of violence as necessary evil.

In economic perspectives, Gandhi, Kumarappa and Kriplani shared a common ground in the co-existence of centralization and decentralization as well as small and large technologies.

¹² As quoted in Govindu and Malghan (2005: 4). The original passage has been taken by Govindu and Malghan from the speech J.C. Kumarappa delivered on 5th November 1930 at Lahore on Rebuilding India.

III. Gandhian Legacy and Institutional Initiatives: 1930s to 1970s

Agrarian economy remains the backbone of India today as it was in the 1940s. Impact of industrialization on agrarian economy assumed a great significance in the Gandhian economic ideas. Sustainance of this agrarian economic base became a major preoccupation of Gandhian economic thought throughout 1930s and 1940s. The strategy to balance decentralisation and centralization depended on the importance given to projects of rural industrialisation in the national economy. One of the early practical and institutionalised forms of expression of this effort led to the formation of All Indian Spinners Association (AISA) in 1925.¹³ In about ten years the Khadi production touched about 10 million yards covering about 6000 villages. Gandhi considered spinning wheel, khadi and decentralised production as the basis of *swadeshi* (indigenous or local production) movement and at the same time symbols of *swaraj*. He not only visualized this scheme as a source of sustaining employment but a great source of dignity and empowerment for lakhs and millions of weavers and artisans. In *swadeshi*, Gandhi visualized a form of inclusiveness. 'There is in *swadeshi* no room for distinction between one's own and other people. To serve one's neighbour is to serve the world' (Gandhi 1957: 77).

Encouraged by the response, All Indian Village Industries Association (AIVIA) replaced AISA in 1934. This is the precursor to the current day Mahatma Gandhi Institute for Rural Industrialisation (MGIRI), Wardha, Maharashtra. AIVIA was indeed the first Gandhian institution that conceptualized the need to promote rural technology, modernization of rural industries and to sustain rural economic base against the onslaught of large industrial enterprises. Kumarappa was chosen by Gandhi to lead this movement. India's Nobel Laureate C.V. Raman, J.C. Bose, Rabindranath Tagore, G.D. Birla, Jamanalal Bajaj, among other prominent Indians formed its first governing board of advisors. AIVIA was established in a building in Maganwadi, Wardha donated by Jamnalal Bajaj. Gandhi lived here during 1934-36 and directed the activities of AIVIA.

AIVIA played a prominent role in nurturing and reviving a number of rural industries through developing a number of innovations such as paper and soap making, village pottery, handicrafts etc. Gandhi established Wardha Haat to provide a market space. The new processes, techniques and machines were

¹³ The origins of AISA goes back to 1921 when the All India Congress Committee session in Vijaywada, Andhra Pradesh, initiated a large programme to get 200 000 working charkas for activating and introducing spinning wheels. To carry out this work a Khadi department was created in 1922 by the All India Congress Committee in different parts of the country. This department was replaced in 1923 by the All India Khadi Board which in turn, was replaced by The All India Spinners Association.

displayed and brought to the knowledge of the public through exhibitions. AIVIA activities extended to transformation of villages in terms of sanitation, improved diet, indigenous healthcare and local resource based employment.¹⁴ Importance of research and development (R&D) and the need to create technological capabilities for innovation to promote rural industrialisation was visualized as an important institution as early as 1930s and 1940s in the colonial context. However, this dream of creating a specialized research institution could not materialize till the onset of independence. After independence, Jamnalal Bajaj Central Research Institute (JBCRI) was created in 1955 to carry forward the work of AIVIA. Khadi and Village Industries Commission (KVIC) was created in 1956 to replace AIVIA. JBCRI functioned as a unit of KVIC till 2002 when it was re-christened as Mahatma Gandhi Institute for Rural Industrialisation (MGIRI) in 2003. The main objectives of the institute were to accelerate rural industrialisation and village industries sector; to attract professionals and experts to Gram Swaraj; to empower traditional artisans; innovation through pilot field trials; and to undertake R&D for alternative technology using local resources.

1. Role of KVIC

Before India's independence in 1947, the work and activities of khadi and village industries, as seen above, were orchestrated in the Gandhian tradition. After Gandhi's demise, Gandhian institutions and the whole programme such as AIVIA was orphaned. Nehru's views on development and the role of science and technology were in contrast to Gandhian economic thought. When Nehru took over as Prime Minister, the government did accord some space to institutionalize Gandhian institutions. Addressing Chambers and Commerce, Nehru in 1950 underlined the importance of Gandhian thought for the development of cottage and village industries (Gandhi, 1951). On another occasion on 28 December 1955, he stressed that, "if industrial revolution comes, it is not in its old garb. We must have heavy industries, machine-making industries, because they are industries that are essential. On the other hand, we have always to consider in India the very important factor of employment and also of decentralization. Therefore we have to encourage cottage industries in a big way" (Nehru, 1956: 59)¹⁵. An Act of Parliament established KVIC as a

¹⁴ See also the website of <http://www.mgiri.org/about/index.html> MGIRI(accessed 24/4/2014)

¹⁵ Nehruvian economic policies and industrialization framework, in all its ramifications, assigned only marginal resources, science and technology and R&D effort to Gandhian based 'paradigm' compared to 'big science' and large technological projects. Curiously,

statutory body in April 1957 for the development of khadi and other village industries. Gandhian ideas and philosophy influenced a number of institutions, groups and science movements in the post independence period. We shall take up some cases to explore their role and activities.

2. SEWA and Amul

Self-Employed Women's Association of India (SEWA) was established in 1972 in Ahmedabad by a Gandhian Dr Ela Bhatt. This is one of the largest self-help groups in the world. The current membership of SEWA is 1.9 million spread over in more than dozen Indian states. Each member of SEWA belongs to a trade union group such as *bidi* (local cigarette) rollers, construction workers, dairy workers, gum processors, hawkers, salt farmers, weavers etc. Over the years, SEWA has become a movement. The basis of SEWA's emergence was empowering poor women through diffusing skills and training and creating employment opportunities. The major contribution of Ela Bhatt's leadership and success of SEWA is attributed to organizational innovations, particularly participative management and cooperation, service and networking innovations. Dr Bhatt's leadership at grassroots cooperatives inspired a cadre and generations of professionals who joined the SEWA movement to sustain its activities over the last 42 years (Blaxall, 2007). Under SEWA there are 84 cooperatives in dairy, artisan, service and labour, land based, trading and vending cooperatives. Under the government sponsored Development of Women and Child in Rural Areas (DWCRA) there are 181 self-help groups. Further, there are 6 social security organizations in health, women and child cooperatives and a number of micro credit groups. Whereas Dr Ela Batt championed the cause of women self-help groups and their cooperatives, Dr Verghese Kurien and his Gandhian associates championed the cause of milk farmer's cooperatives known as Amul dairy milk cooperative in Anand, Gujarat. Amul championed the formation of 600 rural milk cooperatives between 1946 and 1970 involving 148 000 farmers, which is a testimony to its organizational and institutional innovations. As argued in (Krishna, 2017), Amul could be seen as a model of inclusive innovation. It is also an important case, which demonstrates how small technical changes, and incremental innovations are as important as radical innovations in promoting the philosophy of inclusiveness.

whereas atomic energy, space and defense research were given priorities, in contrast, agriculture was a neglected domain for several years after independence during Nehru era.

3. Gandhian Institute of Studies

In 1960, Gandhian Institute of Studies was established at Varanasi by Jayaprakash Narayan.¹⁶ The Indian Council of Social Science Research supported the institute till 1997. Since 2009 the Uttar Pradesh government has taken over the reins of the institute.¹⁷ The institute came into prominence by the early 1970s as it established the first ever Appropriate Technology Development Unit and collaborated with the Intermediate Technology Development Unit, U.K. (Hoda, 1976). The head of this unit, M.M. Hoda, collaborated with E.F. Schumacher, the British economist and author of, *Small is Beautiful - Economics As if People Mattered* (1973). This institute provided an important platform in late 1960s and 1970s to promote the concept of Appropriate Technology (AT). This led to what we characterize as AT movement in India. The Appropriate Technology Unit at the Institute became an important 'knowledge centre' to coordinate AT groups in the country and link them up with their international counterparts.

4. Schumacher and the AT movement: 1970s to 1980s

India's Third Five Year Plan 1961-1966 had given importance to develop village and small industries sector as the Plan document allocated a separate chapter to this theme:

Village industries, have failed to adopt improved techniques or to achieve economies of scale. Constant adaptation to the conditions of rapid change in a dynamic economy and the adoption of new techniques, methods and forms of organisation are important factors in the stability and development of various village and small industries. The problems ...need to be constantly reviewed and necessary measures taken to realise the full potential of decentralised industry as an essential and continuing element in the national economy. (Third Five Year Plan, Chapter 25)¹⁸

¹⁶ It was registered as society under the Societies Registration Act, 1860 in the year 1962.

¹⁷ The Institute confronted a number of problems since 1990s and the courts had to intervene in support of its continuance. Currently, under the order of court it is being managed and funded by the government of Uttar Pradesh.

¹⁸ See the website of Planning Commission, <http://planningcommission.nic.in/plans/planrel/fiveyr/index3.html> (accessed 26 April 2014)

The Planning Commission invited Dr Schumacher, to study and report on these problems.¹⁹ Even though the policy discourse made several attempts to promote AT, it did not evoke much interest at the level of practice in rural areas in the 1960s. One reason for this could be the dominant influence of Nehru's emphasis on modern science and technology institutions. By 1970s India confronted a series of challenges in social, political and economic spheres. By early 1980s the country witnessed serious criticisms of government S&T policies. Nehru's legacy and his emphasis on S&T were never seriously questioned until the onset of the oil crisis after 1973. The defeat of the Indira Gandhi and the coming of Janata Party sharpened the criticism of Nehru's model of development. Gandhi's economic thought, struck a positive chord among the political intelligentsia of the Janata Party in the 1970s and 1980s. Decentralized development and the focus on cottage, small scale and rural development once again dominated the developmental discourse. At the grassroots level, the concern for environment and the rise of alternative and appropriate technology groups, which drew inspiration from the Gandhian economic thought, signaled the strengthening of AT movement.

As Hoda (1976: 147), head of AT unit at the Institute of Gandhian Studies, pointed out, 'Schumacher's movement of intermediate technology gave a new lease of life to the concept of village development and the Gandhian movement, reinforced as expected by Schumacher's ideas, took a lead in giving a new meaning and a scientific backing to the rural development programme'. This AT Unit attempted to define AT by raising some pertinent questions about the needs and demands of technological inputs in the context of rural areas. As Hoda (1976: 150) advocated, "Appropriate Technology should be neither a second best, nor an outmoded technology but a solution that fits best the local requirement. Four solutions can be envisaged, and a successful innovation policy would probably include some elements of the four. These solutions are: reviving of an old technology; adapting a current one; inventing a new one; and improving the traditional indigenous technology". Those who advocate AT and practice it have a lot to share in common with Gandhian notions of *Swadeshi* (self-reliance).²⁰ One of the technologies that gained a good deal of prominence was the biogas technology. It was projected as the appropriate technology most suitable to rural areas (Krishna et al., 1981; Krishna, 1983). CSIR, ICAR and

¹⁹ In fact as Hooda (1976) points out, E.F. Schumacher was invited by both the Planning Commission and Jayprakash Narayan, follower of Gandhi and founder of the Institute of Gandhian Studies, Varanasi. Before coming to India, Schumacher spent some time in Burma as advisor. Buddhism had a profound impact on Schumacher, which is revealed in the title of a chapter in his book *Small is Beautiful* as Buddhist Economics.

²⁰ See Sunil Sahasrabuday (2002)

other departments under the rural development ministry undertook various projects on biogas from mid 1970s into the 1980s. Sometime around the late 1980s the AT movement, including the biogas technology, begun to lose popularity and support.

Even before the Gandhian Institute at Varanasi institutionalized AT Unit, Appropriate Technology Cell was created in the Ministry of Industrial Development in 1971.²¹ This was the time when India's leading science agency, Council of Scientific and Industrial Research (CSIR) also institutionalized AT concept. The CSIR adopted Karimnagar District of Andhra Pradesh in 1972 as a model backward district to develop through the application of science and technology of CSIR's laboratories. As Subuddhi (2002) points out, the objective of the project was inclusive to include all segments of rural life. Specific emphasis was laid on small farmers, artisans and other occupations to impart skills and up gradation of existing technology so as to impact their incomes and living. This experiment though led to the conceptualization of a national project on Integrated Rural Development Programme (IRDP), it did not sustain CSIR's research agenda of rural regeneration through technology (Maheshwari, 1985). Taking a cue from CSIR, some Indian Institutes of Technology (IITs) adopted other villages as 'model villages' but retrospectively speaking, very little came out of these attempts at IITs.

5. ASTRA

Another important Centre of the AT movement that came up in 1970s was Application of Science and Technology to Rural Areas (ASTRA) in 1974 at India's leading Indian Institute of Science (IISc), Bangalore. Dr A.K.N. Reddy, Professor of Chemistry, was the founder of ASTRA. The purpose to create ASTRA was to promote AT as an important economic strategy. The concern for villages and the significance of small technologies that was at the heart of Gandhian ideas were clearly noticeable in the initial objective of ASTRA. Rajan (2009: 157) conceptualized the work of the Centre and AT as follows:

Developmental strategy should be based, not wholly on the technologies of the advanced countries, but on alternative technologies that facilitate low capital investment, employment generation in rural areas, dispersal of min-production units to the villages and production of inexpensive goods and services of the mass consumption variety. Only such alternative technologies can lead to

²¹ See Government of India, Ministry of Industrial Development, Appropriate Technology for Balanced Regional Development, 2 volumes, New Delhi, 1975

reduced inequalities through the poorest sections of society... Thus alternative technologies are technologies that are directly in the interests of the unemployed or under-employed rural poor.²²

A.K.N. Reddy, a hard-core scientist, clearly understood the social relevance of scientific research and problems confronted by India's poor population, particularly those in villages. He discovered Gandhi and Kumarappa's writings after creating ASTRA but discovered how closely his views aligned with their writings on decentralization, small and rural based technological solutions to meet the needs and demands of poor people in villages. From 1974 to 2005 (till the demise of A.K.N. Reddy), ASTRA group at IISc developed alternative technological solutions on a range of problems on energy, environment and several rural technologies for more than 30 years. This group was rechristened as Centre for Sustainable Technologies around 2006.

6. Other Initiatives

Centre of Science for Villages (CSV) was founded by Devendra Kumar in 1976. It has been doing pioneering work in the rural areas to improve the life of villagers through the application of science and technology. It took off from the premises of Maganwadi in Wardha from where Gandhi started the All India Village Industries Association (AIVIA) in 1934 and J.C. Kumarappa gave shape to the Gandhian concept of rural economy. As its director, Sameer Kurvey observes, "the basic concept behind evolution of CSV was a place which could act as a technology transfer centre and bridge the gap between portals of national laboratories and doors of rural huts. The centre was conceptualized in consultation with the top scientists and planners at the national level".²³ Over the years, CSV was involved in developing appropriate technologies for rural housing.

From the beginning of 1980s, some activists and research based non-governmental organizations began to advocate indigenous systems of knowledge in agriculture, irrigation, rural technologies, environment and ecology, rural health and education. In contradiction to the emerging strong people science movements (PSMs), various groups and institutions posed a countervailing platform in the form of Alternative Science Movement (Krishna

²² Taken from a set of papers of A.K.N Reddy put together in a volume by Rajan (2009). Thanks to Rajan we have all these papers in one place.

²³ As quoted in Times of India, 17 April 2011 article, see

<http://timesofindia.indiatimes.com/city/nagpur/Developing-rural-India-the-CSV-way/articleshow/8002097.cms?referral=PM> (accessed 29 April 2014).

1997).²⁴ Patriotic Peoples Science and Technology (PPST) is one such group that emerged from IIT Madras around late 1970s but became active in 1980s. This group published a journal called *PPST Bulletin* for over a decade in the 1980s and 1990s. Gandhian influence of swadeshi in developing a critique over western technology and development was evident from their “mouth piece”, the Bulletin of PPST:

It is the objective of the Bulletin to attempt a re-evaluation (from the point of view of the non-Western World) of the modern S&T and of the non-Western cultures. This re-evaluation, we hope, will raise the possibility of the development of an alternative S&T; an alternative based on more human values; an alternative that would lead to a better, self-reliant and nonexploitative social order thereby constituting a Patriotic and People oriented Science and Technology.²⁵

Major objective of PPST has been to reconstruct historically the functional significance of indigenous traditions in agriculture, medicine, health, irrigation, building techniques, habitat and the foundations of modern sciences in the Indian tradition. Many of these studies were presented at three conferences and published in PPST's in-house journal in the 1990s. For instance, the research conducted by Dharampal (1971), one of the key actors of PPST and a Gandhian, demonstrates that in the district of Chengalpattu in Tamil Nadu, grain productivity per acreage was higher than in the European regions before the

²⁴ It may be pointed out that the main task and objective of PSMs were to question the process of capitalist development process and globalization through inculcating the basic values of science among people, that is questioning and skepticism, Parameswaran (1994). There were however important inclusive innovation related initiatives under PSM such as the work of Eklavya Group or Houshangabad Experiment in alternative education, Delhi Science Fourm's work on rural technologies. As argued in Krishna (1997: 383), 'PSM groups share the view that capitalist and imperialist forces of hegemony have concentrated science and technology systems in the hands of a few. Hence the task lies in freeing them from the tentacles of domination and exploitation.' The 'ASM groups share the view that the hegemony of modern, Western science and the process of rapid industrialization engineered by it are the root cause of India's general crisis of modernity. ASM groups see the "progress" of Western science and modern technological traditions as running counter to the "cultural ethos and aspirations of non-Western societies such as India' (ibid: 385). There are groups with views, which are quite heterogeneous. For some, as Ashis Nandy, the alternative has to come from outside the western modern science. For some, such as PPST, there is indeed a meeting point between modern science and local indigenous knowledge traditions.

²⁵ See undated document

<http://www.samanvaya.com/main/contentframes/knowledge/articles/pdfs/bulletin.PDF>
accessed 1 May 2014.

advent of British in this region around 18th Century. In the case of traditional irrigation practices, PPST has shown that in Southern India, particularly in Tamil Nadu and Karnataka, the regions rarely experienced drought as the traditional storage systems of water were so efficient that they sustained the needs of the rural villages in the worst of periods when rains failed or the monsoons were delayed. The traditional agriculture and irrigation technologies used cannot be separated from the social and economic organization of the then existing rural society, which were closely related to rural artisanal communities. In the area of iron production, Dharampal (ibid) argues that Indian technology produced as much iron as China and Russia around 1790, and more than the production of any individual European state during the same period. Delhi's iron pillar is often cited to show the excellence of metallurgical and chemical processes in pre-British India. PPST group through various studies argued that the agricultural and industrial base of India was a well-organized and integrated system disrupted by British colonialism.

PPST organized the first ever Congress on Traditional Sciences and Technologies of India at the Indian Institute of Technology, Bombay in December 1993. More than 300 research papers were presented and discussed among 800 participants at the Congress. One of the main objectives of the meeting was to stress the view that indigenous "traditions in the domain of knowledge, skill and production still possess a large functional significance in our present context". In doing so, PPST revised its initial position at this Congress to forge links between modern science and technology and indigenous knowledge traditions and between traditional and modern sectors of economy.²⁶

Influenced by Gandhian philosophy, one of the major environmental groups that emerged was the *Chipko* movement (Bahuguna, 1986a). *Chipko's* (hugging of trees as a form of protest) struggle began in the 1960s by the peasants of the Himalayan region of Uttarakhand to counter the forest management practices, which were seen to disrupt sustainable living of poor people in the hills. Sunderlal Bahuguna and Chandiprasad Bhatt, the two lead actors of *Chipko*, helped transform this struggle into a powerful movement in the 1970s. *Chipko* movement resulted in considerable success in streamlining forest management policies by the early 1980s. The movement led to moratorium on felling of trees in Uttarakhand region. From an ecological perspective, *Chipko* raised larger issues that challenged modern development. Drawing inspiration from Gandhian forms of struggle, Bahuguna recurrently adopted the method of *Satyagrah* (hunger strike) in his struggles against commercial forestry and

²⁶ See Souviner, Congress on Traditional Sciences and Technologies of India, PPST Congress, 28 November- 3 December 1993, (Bombay: Indian Institute of Technology, 1993) on p. 102.

believed in *swadeshi*. Bahuguna recurrently reminded people of Gandhi's dictum, 'nature has enough to sustain all, but nothing to satisfy the greed of few' (Bahuguna, 1986b:28). Toward the late 1980s, he mobilized the people of Tehri region to counter the construction of Asia's largest dam project on the Bhagirathi River as the project threatened to displace 80,000 people in 23 villages. Three lessons put forwarded by Bahuguna (1986a: 9-10) from Chipko struggle concerned austerity in the use of forest products; alternative techniques such as recycling paper, biogas and solar energy for cooking; and afforestation of degraded land.

Whereas the environmental movement, after the Brundtland Report to United Nations in 1987, gained momentum and culminated into various voices on climate change in 1990s, the AT movement lost its momentum in India. The rise and significance of new technologies (ICT and biotechnology), increasing globalization and the so-called miracle of East Asian Dragons in the 1990s influenced decision makers and science and technology policy scholars alike. As East Asia became a new source of learning for technological dynamism and a strategy in S&T policy, AT movement began to lose its constituency and prominence as an alternative by the 1990s. The whole philosophy of AT as a promising 'package' of labor intensive technology, manageable with local resources to deal with local problems, environmentally sound and alternative to foreign technology transfer to avert dependence on developed countries could not sustain the perception of new optimism opened up by East Asia, ICT and biotechnology revolutions.

IV. Concluding Remarks

The term inclusive innovation has come into focus in the development discourse in recent years. It is being projected as a novel concept to address issues concerning increasing income inequalities and poverty. On the basis of our exploration, inclusive innovation can be understood to operate at three inter-connected organizational levels:

- At the ground level it can be found in individuals, groups and communities concerned with innovation from grassroots (Honeybee Network is a good example). This is distinguished from the AT movement which was concerned with innovation for grassroots.
- At a meso level there are a number of civil society groups such as SEWA, Amul cooperatives, etc.; and

- At a macro level there are initiatives by formal S&T agencies and science, technology and innovation policies. There are also various international agencies, which operate at this level.

From a historical perspective, this paper argues that the meanings and types of inclusive innovation, in different forms and manifestations, could be traced back to Gandhian ideas of economy and society. Various civil society groups, institutions and policies directly or indirectly were inspired or influenced by the Gandhian thought and economic philosophy at different points of time in the last six decades. Gandhian ideas should not be seen merely as a political alternative to capitalism and centralization of means of production. They were more concerned with improving rural economy and the lives and livelihoods of poor. At the same time, they were not opposed to various ideas on centralization and forces of capitalism co-existing with decentralized forms of production and devolution of power. Essentially, they argued for prioritising production by masses rather than mass production of goods. In doing so, they were also arguing for some form of level playing field just as the present-day policies are grappling with technological advancements and hyper industrialization. Kriplani (1961) particularly wanted science and technology to become relevant for regeneration of villages. He anticipated inclusive innovation groups and institutions which would energize rural economy, the way modern S&T did wonders for centralized mode of production.

The meanings of *sarvodaya*, *swaraj*, *swadeshi* and *satyagraha*, finds expression in the activities of various institutions and groups such as KVIC, SEWA, Amul milk cooperatives, AT movement, CSIR's Karimnagar project and ASTRA at IISc, Bangalore. Gandhian legacy influenced even science and society based groups such as PPST and environmental groups such as *Chipko movement* (clinging). Even though some groups associated with AT movement could not sustain their activities in the euphoria of globalization, Indian landscape in inclusive innovation has given rise to a number of successful models in different sectors of rural economy (see Krishna, 2017). There is enormous potential to replicate, scale-up and multiply these successful models in other sectors of Indian informal economy. This is indeed a major challenge that faces the present day Indian government.

Whilst we trace the roots of inclusive innovation to Gandhian ideas, one is conscious of the fact that socio-economic ground realities and the contextual situation confronted today have undergone a radical change and transformation. Information and knowledge revolutions, placed before us new instruments, methodologies and ways of dealing with social and economic problems of vast majority of people excluded from the economic mainstream. Gandhian economic thought and philosophy should be conceptualized within these

changed circumstances to find their relevance. The disruptive innovation of new technologies has begun to impact employment sustainability. In poor countries, where more than half the population still suffer under poverty, inequality, ill health and food insecurity, rejuvenated Gandhian economic ideas and philosophy seems as much relevant today as it was in the 1950s. Given multitude challenges in social, political, economic and environmental domains, no one strategy or policy instrument is going to work. Developing countries can no longer rely on trickle down models of high and new technologies alone. There is need to strengthen technological pluralism, wherein, inclusive and sustainable innovation based on Gandhian economics finds a place and assume importance along with other strategies of development. *Let Hundred Flowers Bloom and Let us walk on not just two but many legs.*

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