Draft

Tip of the iceberg: tapping the entrepreneurial potential of grassroots innovations[1]

The unmet needs of the disadvantaged people in developing countries have posed a complex challenge before development planners but also provided an opportunity to creative communities and individuals. Many large corporations have convinced themselves that they can serve the poor by producing goods and services at affordable cost. They seldom think of sourcing ideas or innovative products or services designed at grassroots. Despite billions of dollars having been spent on developmental aid or programmes, we still do not find many databases on the web or otherwise of innovative solutions developed by people themselves.

Unless we build upon the resources in which poor people are rich, the development process will not be dignified and a mutually respectful and learning culture will not get reinforced in society. In this paper we do not discount completely the merit of providing certain goods and services to the people at the bottom of the *economic* pyramid. The fact remains that economically poor people are obviously not at the bottom of knowledge, ethical or innovation pyramids.

The search for inclusive development has become imperative because social tensions and disquiet among marginal communities have been increasing in the recent time. Many governments spend more resources on fighting their own people considered as rebels or extremists than on investing in the ideas and imagination of local communities and individuals. This approach is not going to work.

Instead of seeking inclusive development by treating economically poor people as *sink* of public aid, assistance, advice or corporate goods and services at low cost, we should treat poor people as a *source* of ideas, innovations and institutional arrangements with which formal public and private institutions can engage (Gupta,2006).

The engagement between formal and informal sector can take place by recognising, respecting and rewarding creative grassroots knowledge systems. Enabling local communities and individuals to convert their ideas into products and services by blending modern science and technology, design and influx of risk capital constitutes the heart of the Honey Bee Network approach.

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The Honey Bee Network has mobilised more than 170.000 ideas, innovations and traditional knowledge practices from around 545 districts. A majority of them has been scouted by volunteers reaching out to the people. A very small number has reached us on its own. Many times, innovators don't even know that they have innovated. A scarcity of conventionally available materials used for developing a drug or herbal pesticide or veterinary medicine may trigger the search for new materials and/or processes and thus lead to the emergence of a new innovation.

There are many other triggers for an innovative idea to evolve. Sometimes, an accident leads to a new discovery. Innovations also emerge when an idea in one field is applied in a totally different field for new applications using the same principle in an analogous manner. Yusuf in Rajasthan had developed a tractor drawn groundnut digger. The machine would pick up the soil with the uprooted pods, stir it, drop the soil and keep the pods on a sieve. An entrepreneur from down south heard about it, licensed this technology to adapt it as a sea beach cleaner. The principle involved was the same but the domain was very different.

Section II

Building upon people's knowledge: Mobilising multiple kinds of capital for strengthening the innovation eco-system

If there was no Honey Bee Network, one would have to invent it afresh, given the need for sourcing ideas through open innovation platforms and processes. Almost a quarter century ago, it became obvious to us that inclusive development could not be imagined without looking at diversified, decentralised and distributed sources of solutions developed by local people on their own without any outside help. Today, using the Internet, organisations use crowdsourcing to achieve much the same thing. Much is talked about participatory development and social enterprises. And yet, when one looks at sources of ideas on the web or otherwise, based on people's knowledge, one does not go very far.

Obviously, this requires reconceptualisation of the interface between natural, social, ethical and intellectual capital. As argued earlier [Gupta, et al., 1996?], the natural capital was the first capital to come about when human societies began to enclose resources and started asserting individual or collective property rights. The boundaries around a resource or limits on its extraction give rise to the value of *natural*

capital. It can be saved, exchanged or consumed with or without renewability.

Respect for group norms gave raise to *social capital* which required reliance on trust, reciprocity and third party sanctions. If people used a gillnet of mesh size less than four inches leading to catching of small fishes, a community could sanction such behaviour and thus penalise the offender. Compliance with such norms gives rise to social capital. .

When the regulation about one's behaviour takes place from within, it is called *ethical capital*. The sanctions are internal and so are the rewards. When we restrain ourselves from fishing in the spawning period because it is not the right thing to do from the perspective of fish population dynamics and sustainability, it gives rise to ethical capital. There are no external sanctions but only internal guilt and/or a sense of responsibility.

The knowledge about various ways in which people regulate their own behaviour or that of others in managing resources (natural or otherwise) constitute *intellectual capital*. The entrepreneurial outcomes may be guided by individual or collective access to resources or the ability to convert resources into investment with or without keeping social and ethical capital in mind. Not all innovations or innovation based enterprises need to be sustainable or pursue a larger social good. Only a small part of intellectual capital is governed by intellectual property. The protection of the intellectual property can be for defensive or offensive purposes.

Grassroots innovators employ enormous amount of social and ethical capital and their innovations often reinforce the renewability of natural capital. It is not to detract from the point that innovators can indeed do the opposite, i.e. they may ignore or harm social and ethical capital. The use of dynamite in the sea or lakes to kill fish is a completely non-sustainable act. Likewise, there could be few other examples where grassroots innovations may not be sustainable like in any other knowledge system.

Any country that aims at harmonious and inclusive development will have to draw upon innovations at grassroots level which are clearly distinguished from innovation for grassroots applications.

Section III

The journey:

Grassroots innovations emerge when existing systems and practices fail to serve the needs. These can also emerge through serendipity or a systematic experimentation, trial and error or combining various solutions in new ways. In some regards, the methods of problem solving in the formal and informal sector are not always very different. Formal plant breeders look for odd plants having desirable characteristics and either through recurrent selection or through back crossing incorporate those characters in the established varieties. Farmer breeders in the informal sector also do this. Let me illustrate these processes and explain how the Honey Bee Network emerged to pool such ideas not only from different parts of India but also the rest of the world.

A farmer from Haryana, Harbhajan Singh realised that by irrigating cotton crop in alternate rows, one could reduce the irrigation cost by half and also reduce pest control expenses substantially without affecting the yield adversely. The plants when irrigated frequently become succulent and tend to invite pest attacks more often. Such a solution can easily be shared as open source idea and may be relevant worldwide. More than 100,000 farmers committed suicide in the last decade in parts of Maharashtra, Andhra Pradesh, Punjab and other regions of the country due to excessive borrowing for growing Bt cotton and inability to pay debts. When I visited many of the houses of the affected families in Maharashtra and enquired whether they have learnt about non-chemical ways of pest control, the unfortunate answer was, no. There are many examples where farmers are benefited by the open access database of innovations but many more can benefit if the database gets translated in different languages and is shared widely through various social media channels.

Growing lady's finger around cotton crop can be an economical solution for controlling pests. The flowers of lady's finger crop are similar to that of cotton. They belong to the same plant family and they blossom earlier than cotton. By attracting pests, they can reduce the burden on cotton. This crop alone consumes of about 40 to 50 per cent of the total chemical pesticide in the country. Several hundred solutions developed by different farmers are already available at www.sristi.org/hbnew/honeybee_database.php. How did these solutions get pooled?

One could add many more questions but the answer has to be found in the approach of scouting, spawning and supporting grassroots innovations and outstanding traditional knowledge practices as attempted by the Honey Bee Network.

I began to discover that farmers could do right things, sometimes for wrong reasons. During the above study, I discovered that some farmers in that region grew coriander around the field of chickpea apparently to repel the pest. A friend at ICRISAT did research on it at my suggestion and found that coriander did not repel the pest but actually being nectar rich, attracted the predators. The outcome was the same but the underlying logic was different. Thus, there is a role for formal or institutional scientists in validating and value adding in people's ideas.

Nurul Alam, then budding scientist in Tangail was walking with me in a village and both of us observed a lady disrooting sweet potato vine sleaving only one or two at each node of the cuttings. We asked the lady for the reason behind this. She replied that planting these cuttings for growing sweet potato without removing some roots will result in long tubers with thin skin reducing storage time.. However, the customers in the market liked round tubers, thus for longer shelf life and better customer response, her action made eminent sense. When have we learnt so much from such poor people as a part of pervasive pedagogy?

When I came back from Bangladesh, where I was paid in dollars, I felt slightly guilty. Did I deserve my success or did the people like this lady who taught me so much also have a share in it. If she did, then how much of what I earned went to farmers like Ram Nivas or the communities and individual innovators from whom I learnt all this while. I tried to argue with myself that I had done a great deal for public policy or institutional reform based on these insights and perhaps my guilt was misplaced. It didn't work out. The argument I had to confront was that my conduct was not different from that of other exploiters in society who exploit the poor in the land, labour or credit market. I was doing the same in the idea or knowledge market. I did a review of my ethical dilemma and value conflicts with the help of a staff, Ramkumar, and realised that academics when confronted with such a dilemma have to find their own answers. One day, the metaphor of the honeybee came to help out. If only we could follow the values embedded in the honeybee, we could liberate ourselves from the shackles of an exploitative self-image.

The Creation of the Honey Bee Network

As I have said before, the emergence of the Honey Bee Network philosophy based on the behaviour of a honeybee helped in redefining the relationship between the formal and informal sector. Just like honeybees, we have to follow at least four principles: [a] we should cross-pollinate ideas i.e., promote people to people learning which is possible when communications take place in local language, [b] akin to flowers we should not let people feel short changed because their knowledge is being taken without their consent or involvement. Flowers in fact attract the bees for their own good, [c] the knowledge providers should not be anonymous, instead their identity should be acknowledged and their intellectual property rights should be protected and [d] if we get any rewards, compensation, consultancy income or any return from the commercialisation of their knowledge, a reasonable share should go back to them. Honeybees after all don't keep all the honey with themselves. The local language versions of the Honey Bee Newsletter try to fulfil the crosspollination function of the Network. The Shodhyatras also provide a platform for sharing information across language and regional cultures. The acknowledgement of not only the knowledge provider but also those through whom the innovations are scouted overcomes their anonymity and generates scope for reciprocity. A fair and just sharing of any wealth that may arise, either at the end of the knowledge aggregator, as in the honey comb, or at the end of the licensee of an innovation, fulfils a benefit sharing function.

To provide institutional support to Honey Bee Network, Society for Research and Initiatives for Technologies and Institutions [SRISTI] was set up in 1993, Grassroots Innovation Augmentation Network [GIAN] was set up in 1997.National Innovation Foundation [NIF] was set up in 2000 at the initiative of Ministry of Finance, Government of India, under Department of Science and Technology [DST] as an autonomous institute.

SRISTI took another initiative in 2009 to create a portal viz., www.techpedia.in which already has summaries of more than 100,000 engineering projects pursued by 350,000 students from over 500 institutions. Idea is to put problems of the informal sector and small-scale industries on the agenda of students so that more inclusive development takes place.

The Honey Bee Network has spread in over 75 countries although it is much stronger in some countries like China, Malaysia, Indonesia,

Namibia, etc. The strongest network outside of India is in China followed by Malaysia. China already has a database of 3000 grassroots innovations on its website. An international congress on creativity and innovations at grassroots was held in the first week of December 2012 at TUFE [Tianjin University of Finance and Economics], China and in India.

Section IV

Lessons from Grassroots Innovations: Need for a paradigm change

The transaction costs coming in the way of innovators meeting investors or entrepreneurs triggered the need for policy or institutional innovations. Several lessons follow, which could help a country or community in replicating the spirit of the Honey Bee Network.

The first lesson is that the asymmetry between the rights and responsibilities of those who provide knowledge, ideas, and innovations and the ones who benefit from it cannot be left uncorrected for achieving sustainable outcomes. Should people remain poor because their ethics was superior while we enrich ourselves for the opposite reason?

The second lesson is that ex-ante and ex-post transaction costs of innovators, investors and entrepreneurs can be overcome only by providing a handholding institutional support.

The third lesson is that notwithstanding the excessive stress on micro finance, the role of micro venture finance has remained obscure. If risk capital was crucial for information, a communication technology revolution, a biotechnology revolution, will it not be equally critical for a grassroots innovations based entrepreneurial revolution? But despite hundreds of conferences on the subject of Micro Finance, the concept of a Micro Venture Innovation Fund MVIF is still to become mainstay of public policy for the grassroots up development. The National Innovation Foundation (NIF) set up the first full-fledged MVIF in 2003 with the help of the Small-scale Industries Development Bank of India (SIDBI). It provides risk capital to grassroots innovators under single signature without any collateral.

The fourth lesson is that intellectual property protection can indeed work for the poor though not in the same context as used in Western societies. The Honey Bee Network was the first to suggest that patents could help the poor as well. The concept of Technology Commons[2] has evolved recently as a part of the doctoral thesis of Riya Sinha, a colleague at the Honey Bee Network. It

[2] See, Gupta, Anil K, 2012, How to protect the inventions of the poor, http://www.scidev.net/en/science-and-innovation-policy/supporting-grassroots-innovation/opinions/how-to-protect-the-inventions-of-the-poor.html

implies that people to people learning, imitation, copying is not only allowed but encouraged but people to firm has to be through license only.

The fifth lesson is to expand public pool of readily usable social and technological innovations through various incentives to innovators to share their ideas and practices without feeling short changed or remaining anonymous.

Balancing the social need for faster, easier and more affordable technological and other products and services, with the need to incentivise innovators, the Honey Bee Network developed a concept of GTIAF (Grassroots Technological Innovation Acquisition Fund) first formally articulated in 2003[3] but implemented by NIF in 2011[4]. Patent rights of dozens of technologies were acquired from innovators by paying upfront a notional amount to create a public pool of these innovations for licensing at no or low cost to small entrepreneurs within and outside India. All the plant varieties and other innovations here and thousands others at www.sristi.org are available to communities in the third world right away for alleviation of poverty by expanding innovations as public goods. Thus, patents (hardly about 570 filings so far) are important, a public pool of open access innovations and sustainable practices for agriculture, energy and other purposes are even more important[5].

The sixth lesson is about the need to recognise, respect and reward innovators and outstanding traditional knowledge holders at their doorstep. Twenty nine shodhyatras (learning walks)[6] have been organised so far in 23 states of India and the thirtieth learning walk will be in Manipur, a north eastern conflict prone region of the country. In summer, we go to places which are warm and in winter to places which are cold. Biodiversity and idea competitions are organised among children, recipe competitions among women and innovators are honoured, and centenarians are felicitated. Having walked around 5000 km, one can say unequivocally that there are creative communities and individuals everywhere (not just in India but also in other countries like China[7], Malaysia, Indonesia and Namibia). Malaysia has

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[3] Gupta, Anil K, 2003, National Technological Acquisition Fund: Initiatives for Expanding Public Domain, Editorial, Honey Bee Newsletter, 14(2)1

[4] See www.Nif.org.in/GTIAF for the list of 56 technologies acquired by NIF last year

[5] www.sristi.org has more than ten thousand innovations, sustainable natural management practices, published honey bee newsletter practices and other technologies already in public domain in addition to around thousand technologies at NIFindia.org . This perhaps is the largest public disclosure of survival technologies in the world at one place or through one knowledge Network. Support of IDRC Canada for supporting research for analysis of this database is gratefully acknowledged. Mobilization of innovations in this database has happened largely through Honey Bee Network volunteers, shodhyatras, and summer scouting by students and others over the last 24 years.

[6] See http://www.sristi.org/cms/shodh_yatra1

[7] China has the strongest Honey Bee Network outside of India with more then seven thousand innovations disclosed by about three thousand innovators at the website of China Innovating Network (

replicated the concept of learning walks already. China may have such a walk next year in Henan province.

The seventh lesson is about the need for creating community fabrication workshop facilities at the house of innovators to help other budding innovators and entrepreneurs. These workshops supplement the ones available in cities and augment the facilities of an outstanding innovator. These also act an incentive for those whose communitarian spirit has been evident in them making some of their innovations open-source.

The eighth lesson is about having a partnership between formal and informal science. An MOU has been signed with ICMR and CSIR to pursue medical science and industrial research respectively based on the people's knowledge and innovations. A natural product laboratory Sadbhav-SRISTI-Sanshodhan has been set up at SRISTI through a grant from a private philanthropist in Mumbai more than ten years ago and is now supported by DST and other institutions. It works on the ideas, innovations and traditional knowledge of people only in four functional areas, agricultural, veterinary, human and microbial applications for all the three sectors. Every country should have at least one such lab dedicated to add value to people's knowledge.

The ninth lesson is about investing in ideas of children as part of an inverted model of innovation where children invent, engineers fabricate and companies commercialise. For example, Shalini suggested a modification in the walker used elderly people or those who cannot walk without support. These walkers need to have hight-adjustable front legs so that while climbing on stairs these become shorter or longer as needed. Susanth designed a wheel chair when he was in class ten, which could be navigated by physically challenged people who cannot move hands or legs. They can make use of a sensor attached below the nose by breathing differently.

The tenth lesson is about the need for mobilising technology students as a partner for addressing the problems of the informal sector, MSME (small industries) and other unsolved problems of society as part of their final year under graduate and postgraduate projects (see www.Techpedia.in). Students are encouraged to take real life problems of society as a part of their final year project. There can be a relay of projects over years so that a problem solved partly in one year can be taken up by students elsewhere in the following year.

The eleventh lesson is to mobilise educational, cultural and institutional innovations to enrich the innovation eco-system and not just restrict to technological innovations. The Honey Bee Network has built databases of social innovations. It includes innovations by teachers such as the ones that help in enrolment and retention of girl students. A teacher collected the date of

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CHIN) at TUFE, Tianjin. SRISTI has set up a twin center with TUFE on grassroots innovations and see Tainjin declaration (2008) http://www.sristi.org/cms/shodh_yatra1

birth of all the children born in the village. Every year he bought 300 postcards costing about one dollar and sent birthday greetings to the children. When the parents, often illiterate, came to the teacher to find out why he had sent that letter, he reminded them that he was waiting for their children to be enrolled in the school at the age of five.

There are common property institutions in which communities develop innovative rules to manage natural resources. Similarly, there is a lot of folk cultural creativity which deserves to be recognised to maintain the experimental and creative traditions. For each one of these aspects, one needs to create avenues for documentation, and entrepreneurship development. The Honey Bee Network does not restrict itself to only technological innovations.

Building upon grassroots innovations as a fundamental building block for societal transformation is a valid and viable strategy. Many countries have not yet resolved to scout, spawn and sustain such innovations. But it is hoped that as the income disparities increase and social tensions mount, the policy and institutional space for grassroots innovations will expand. Inclusive development requires harnessing the minds on the margin which are not marginal minds.