WP2012-06-06

27-Jun-2012

Values in vogue: Institutional pathways for sustaining grassroots innovations for creating public goods

Abstract

The institutional pathways through which grassroots struggles and initiatives can not only be articulated but also nurtured are crucial for inclusive development. It has been noted earlier that to institutionalize even a small change, multiple interventions are required at different levels and in different systems. The paper is divided in four parts. In part one, the nature of institutions is discussed in the context of economic situation and socio - ecological conditions The nested nature of institutions provides space for different interest groups to negotiate outcomes of collective preferences. These outcomes may not be optimal given the asymmetry in power and negotiating ability. While discussing the policy options for strengthening institutional environment, need for reshaping the structure of governance is stressed. Two particular recommendations pursued through 13th Finance Commission leading to establishment of District Innovation Fund and Centre for Innovations in Public Systems. The management of technological interface is discussed in the context of continuing inertia in society in dealing with longstanding social problems. An example of techpedia.in as well as IGNITE awards of National Innovation Foundation [NIF] as a way of forging new institutional platforms for promoting creativity of technological youth and young school children. Finally, the institutional context of reduction of transaction costs of various actors is described suggesting the need for mass sourcing of ideas to make society creative, collaborative and compassionate.

Draft for discussion:

Values in vogue:
Institutional pathways for sustaining grassroots innovations for creating public goods

Anil K Gupta, Prateek Gautam, Ramesh Patel, Hema Patel, Purshotham Patel, Chetan Patel, Alka Patel, Nirmal Sahay, Riya Sinha, P.Vivekanandan, Balaram Sahu, Sunda Ram, Vipin Kumar, Nitin Maurya, Mahesh Patel, Chinzah Lalmunzuala, Vivek Kumar, T.N.Prakash, Rajeev Pandey, Ganesham Pogula, Jahoor Ahmed, Kishore Kalita and other members of Honey Bee Network

The building blocks of an innovation eco system include formal as well as informal institutional mechanisms, actors, processes and policy making and influencing system. In the earlier paper[1], we described how the activities of Honey Bee Network redefined the concept of national innovation system. Union Cabinet, Government of India took a decision in June to change the pattern of funding NIF [National Innovation Foundation] such that it has now become a grant-in-aid institution of Department of Science and Technology. NIF and its activities no more have to be a footnote in the policy documents or planning framework of the country. Eventually, we hope similar changes will take place all over the world in years to come. Knowledge, innovations and ideas from common people in the informal or unorganized sector will become *sine qua non* of the innovation eco system of any society. Recently, one of the most prominent business magazine viz., FORBES made a pioneering departure from the conventional system of media management. The Deputy Editor of the magazine invited the readers to nominate the ideas that they would like to see on the cover page of magazine in the next year as ideas or innovations of the future. To communicate the concept of sourcing ideas from common readers, the magazine took the example of Honey Bee Network and cited the amphibious bicycle developed by Mr. Saidullah as a potential innovation of future. In the wake of recent floods in Pakistan, such a cycle could provide succour to lot of affected people. Honey Bee Network is slowly influencing the pedagogy of learning from common people not just in media but also among the public and private institutions. In a National Conference of Food and Beverages Industry, a presentation on grassroots innovations and their potential role in transforming the industry was received very attentively. Slowly and slowly, the logic of learning from masses and their struggle for survival is emerging. We are still a long way when these struggles will guide the design of public policy and institutions.

In this paper, we provide a discussion on the institutional pathways through which grassroots struggles can not only be articulated but also their creativity can be supported for providing sustainable solutions. It is understood that institutionalization of even a small change requires interventions at multiple levels and in diverse systems [Gupta and Mathur, 1984]. The paper is divided in four parts. We discuss the nature of institutions in part one followed by the

[1] Policy gaps for promoting green grassroots innovations and traditional knowledge in developing countries: Learning from Indian experience, first policy brief, April 2010

technological interface in part two. The policy interface is discussed in part three. The transaction costs framework including *ex-ante* and *ex-post* transactions costs is described in part four to understand the barriers which come in the way of innovators and other stakeholders before a viable and mutually helpful coalition can emerge. The contention is that the institutional eco system requires considerable retuning and redesign before it becomes truly inclusive and helpful to the innovators. This is the second paper in the policy series. It essentially draws upon the work being pursued in the project on Grassroots Innovations for Inclusive Development at SRISTI.

PART I

Nature of institutions:

For any social change, or even continuity, the emergence, sustenance and decline of different institutions is very crucial. While some institutions must continue, others must die so that the disadvantaged groups whom we characterize as knowledge rich, economically poor people can get their due. In an earlier study for Convention on Biological Diversity, a whole range of portfolio of monetary and non-monetary incentives for individuals and groups were discussed [Gupta, 1995]. The idea was to highlight that institutional pathways for promoting innovations have to be paved with stones of support from both formal as well as informal institutions.

What do institutions do? They reduce transactions cost of different actors, generate predictability in respective behaviours, provide assurance, help in converging mutual expectations in a collective choice dilemma and help in evolving rules that are seen as fair, just and accessible in a given distribution of power. For an eco system to be viable, all the three kinds of costs in managing innovations have to be identified and met viz., governance, technology acquision and provision and transaction costs. The governance at community level as well as at other levels in the society may be mediated by different layers of public institutions such as village council, district council or administration, state government and parastatals, and central government and various other councils. The private sector and the civil society organisations apart from people's movements also play an important role in shaping the structure of governance.

The technologies used in everyday life demonstrate the values and the ethics that structure of governance legitimize for different classes of people or social groups. Inertia in certain sectors and alacrity in others demonstrates unequivocally how the institutions deal with the social problems. To illustrate, during 25th shodh yatra in Bastar region in Central India affected by serious naxalite or Maoist violence in June 2010, it was evident that state and market had failed to provide even the basic tools for adding value in local resources or reducing drudgery, be it paddy transplantation or thrashing or extracting kernel of various seeds used for oil, food, nutrition or medicine. Given the reach of satellite dishes for receiving television signals, it is not difficult for tribal people to understand the discrimination. Their restiveness is then just an obvious response. For the state, it is a law and order problem, for people, it is a problem of discrimination and injustice. The fact that they are able to evolve many creative solutions even in such situations shows the buoyancy of their spirit. We will revert to the problem of technological inertia later. Suffice to state that many institutions, even of indifference can only be noticed by the outcomes of decisions in various domains of everyday life. By ignoring such

institutions, we do not only lose vital information about the values in vogue at different levels, we also lose the room for manoeuvre.

While dealing with transaction costs, one has to recognize that when we ignore these, they don't go away. These are passed on to the weaker partner in the transaction. There are two kinds of transaction costs: [a] *ex-ante* i.e., the costs incurred before entering into a contract or an agreement; and [b] *ex-post* i.e., the costs involved in enforcing the contract. The role of access to resources, power, information, institutions and technology becomes critical in identifying and apportioning the costs. Likewise, the kind of assurances institutions provide about horizontal behaviour [how will others respond given my response, also called collective choice problem] and vertical behaviour [how will future returns influence my present options or choices and to what extent do I have assurance about future outcomes] influence the outcomes. The ability or skill to convert access into investments [social or financial] determines the extent to which people can actually use the opportunities available. The attitude is both an endogenous as well as exogenous variable. Our attitudes are shaped by our experiences. But, our intrinsic way of thinking and attitude towards life also shape the experiences we have. Attitude about the resources, institutions and culture influence the way we invest in the institutions governing ecological, cultural and other material resources. The 4-A model linking access, assurance, ability and attitude helps in sieving the policy choices through a sustainable matrix [Gupta, 1997].

Socio ecological context of institutions:

In a three yearlong action research study, more than 32 years ago, Gupta discovered that ecological conditions define the range of economic enterprises that can be sustained in a given rainfed dryland region. However, the scale at which the portfolio of enterprises is evolved by different households depends upon the access to factor and product markets as well as non-monetary kinship networks. These in turn influence the perception and response to risk which affects the cash flows. Eventually, the stakes people have in the conservation and management of natural resources evolve on the basis of household budgets being surplus, subsistence or deficit [Gupta, 1981, 1984, 1988][2]. Contrary to the conventional view, more precarious the economic condition, longer is the stake people have in the conservation and augmentation of natural resources. That is why it is only the poorest tribal people who have conserved forests for so long when these have been cut in most of the places with much higher education and development [except northeast]. The institutions that ignore and neglect local innovations coexists with the institutions that help in conserving resources based on which creative individuals and communities experiment and innovate. We have to develop a pluralistic framework for understanding the dynamics of various nested institutions, which provide space for different social tendencies to manifest. Some people who exploit natural resources in a non-sustainable manner and also gain power may exploit both formal and informal institutions constricting the space for more deserving to articulate their values and creativity. But, recognition to the creative minority does disturb the precarious institutional homeostasis. The

[2] Gupta, Anil K, 1981, "Viable Projects for Unviable Farmers - An Action Research Enquiry into the structure and Processes of Rural Poverty in Arid Regions, Symposium on Rural Development in South Asia, IUAES Inter Congress, Amsterdam"; …….. 1984, "Institutionalizing Learning to Unlearn: Socio-Ecological Paradigm";……..1998, "Survival Under Stress: Socio Ecological Perspective on Farmers' Innovation and Risk Adjustments", published in Capitalism, Nature and Socialism,5, 1990, 79-96.

constraints in the ecological environment do stimulate social struggles at different levels and in different forms. Some will succumb. Some will struggle. Others will transcend.

In a separate study, SRISTI mapped 5000 innovations and traditional knowledge practices essentially to understand the socio ecological context of the knowledge systems. Some very interesting patterns have emerged indicating a need for revisiting the framework for study of people's knowledge and innovations. The policy options for improving the institutional environment, discussed next provide contingency framework for sustaining the creative potential that exists and stimulating the response that is absent.

PART II

Policy options for strengthening institutional environment:

Reshaping structures of governance: Building on small cog in a big wheel

In an accompanying paper, Gupta [2010] discussed the challenges in leveraging innovations for inclusive governance.[3] A critical problem was that even the innovations, which existed, were often not leveraged for wider social impact. It was suggested that we should not focus excessively only on those innovations which can scale up and thus "we should not downgrade the importance of those innovations which solve only a local problem and which by definition may have a limited potential of diffusion. Scale should not become enemy of sustainability or desirability". Similar to our attempt to map creative mind in the informal sector, a proposal was made to the 13th Finance Commission about creating a national database of innovations in public systems. It was hoped that if innovators were identified in public systems, their response to innovations in informal sector is likely to be more positive. NIF had processed various innovations received by the Finance Commission from different states of the country. Eventually, the Commission recommended:

> Setting up of Centre for Innovations in Public Systems to identify, document and promote innovations in public services across states. A grant of Rs.20 crore has been recommended for the purpose. In addition, "a second grant of Rs.1 crore per district is for the creation of District Innovation Fund [DIF] aimed at increasing the efficiency of capital assets already created." Obviously, we need to go further in creating a small social venture fund in every district to support unconventional ideas emerging from within the system, which can improve the delivery of public services.

Time will tell how far the CIPS goes in mapping creativity in public systems. Way back in 1992, Gupta had edited a special issue of the journal of LBS National Academy, "The Administrator" on administrative innovations. This Academy trains the civil servants who govern the country. For last several years, the experience of Honey Bee Network has been shared with the IAS probationers. To make them realize that innovations don't emerge only from special minds, idea competition has been organized among them to unfold their own creativity. Unless we begin to notice our own ideas, our respect for ideas of others may not arise [although sometimes the opposite is true, we are too obsessed with only our ideas to the neglect of that of others].

---

[3] Gupta, Anil K, 2010, Leveraging Innovations for inclusive governance, Presented at the 5th Civil Services Day organized by Ministry of Personnel, Public Grievance, Pensions and Parliamentary Affairs on 21st April 2010 at Vigyan Bhavan, New Delhi

The innovations in governance also imply that the support system for innovators in different departments whether for education, health, environment, transport, etc., should be conducive to nurture ideas from below. Honey Bee Network could make some impact in the area of scouting, spawning and sustaining innovations from grassroots. But, its impact on incorporating innovations in education, public administration and international policy is still limited. The antibodies against compassionate creative people are far too strong. Humanizing the governance is a longer-term agenda and will require spotting and supporting existing mavericks in the system. We should never under estimate the power of a *small* cog changing the behaviour of a *big* wheel. SRISTI has worked on educational, cultural, institutional and technological innovations. The synergy in these streams of innovations will require an envelope of an inclusive governance structure. This is an issue for which one has to explore many more options.

PART III

Managing technological interface:

In the first policy paper in this series on grassroots innovation eco system, we had mentioned about several dimensions of the eco system such as [a] reaching/scouting the innovators, [b] documenting the innovation, [c] ethics of knowledge extraction and the Honey Bee Network philosophy, [d] characterizing knowledge including prior art, [e] adding value for building horizontal and vertical supply chains, [f] financing of innovations and traditional knowledge and [g] intellectual property rights and technology licensing. In this second paper, we will mention those aspects of technological change *where the inertia is more important than innovation.*

One of the most unfortunate problems with which public polity has not come to grips with is the issue of living with problems unsolved, indefinitely. In his TED talk, Gupta argued that it is this inertia which has to be overcome urgently if the Decade of Innovation has to have any lasting impact on the lives of people [ted.com…….]. There are a large number of problems, particularly affecting women which even the grassroots innovators have not given adequate attention. The formal system of R&D has of course, completely ignored them. Let us narrate an example where such problems when posed to a group of grassroots innovators very creative solutions could emerge which otherwise would have remained obscure. In 1998, a meeting of eight innovators was called at IIMA by SRISTI to brainstorm a very serious problem faced by women while pulling the water from the well. Generally, with decline in water table, the length of the rope to pull the water has been increasing. In many places where recuperation rate is low, farmers prefer open dug wells rather than bore wells. Such is the case in rainfed dryland regions where it takes long time for water level to be restored to its original depth after water is extracted for a few hours. In these areas, women have to use pulley to draw water from the well. When they have to take rest and gasp for the breath while drawing water, they have to keep holding the rope. Sometimes, the grip gets loosened and the bucket falls into the well. Occasionally there have been cases when women have also fallen down in the well. The human ingenuity in the villages worked to develop a bunch of hooks to pull the bucket out but could not work to prevent the bucket from falling down.

In the brainstorming session, several ideas were thought about to design a mechanism to prevent bucket from falling down even when hands were off the rope. The example of sail boat was taken where the ropes have to be pulled to allow winds to row the boats. After six months, Amrutbhai Agrawat, Junagadh, Gujarat came out with an interesting solution. In the first

model, he used a ratchet and also a stopper to press the rope to prevent it from sliding down. Later, he realized that the ratchet is not required. A problem which remained unsolved for centuries, in fact, millennia could get solved by the effort of a single innovator. The technological interface has to be designed which makes such problems solvable.

Last year, SRISTI created a platform viz., www.techpedia.in with the help of engineering students led by Hiranmay Mahanta, himself a student at that time to pool the projects done by engineering students. The idea was that about a million students graduate every year and yet nobody knew what happened to their projects. After about six months with practically no support from government, more than 100,000 projects done by 350,000 students from more than 500 colleges were pooled. In addition, the problems of the grassroots communities as well as micro and medium enterprises were posed as challenges to be addressed by students as a part of their projects. Similarly, grassroots innovations were also listed for further augmentation. A national mentoring network has been started to mentor the partnership between academic institutions and the industry. The Micro, Small, Medium Enterprises [MSME] clusters have been mapped along with engineering institutions so that problems of the entrepreneurs are put on the tables of the students. Likewise, the projects of the students may be used by the industry. Some successes have been achieved. Many of the micro and small entrepreneurs come from rural areas and may or may not have innovation based enterprises. However, while facing the competitions, they have to make incremental innovations. Students gain by getting real life problems to work on and industry gains by getting low cost or no cost solutions to their problems. Some of the same entrepreneurs may also help grassroots innovators in fabricating their products to take them to market. The eco system needs innovator, R&D person, designer, fabricator, user need analyst, testing labs, certification manager, media planners, market researchers, policy makers, etc. Techpedia.in is bringing several of these stakeholders together with very limited resources.

Recently, when NIF organized IGNITE '10 awards for children, former President, Dr.A.P.J.Abdul Kalam exhorted the children to think beyond their own needs. One of the girls who got award was Hetal Vaishnav, class 12, Rajkot, Gujarat. She had found that rag pickers did not collect laminated or multi layered plastics. On enquiry, she learnt that it was difficult to recycle them. She went to the factories which manufactured those kind of plastic packages and found out the chemistry involved in the process. Later, she collected such material and went to her father's factory and developed a composite, almost like a hard board, which could be used for furniture. She got it tested from a public lab. However, her grouse was that she had to wait for a week to get results. If she wanted the result on the same day, she had to pay much more. Further, the fees charged to her was same as would be charged to any company, domestic or multinational. Her grievance is at the heart of the governance system, which at present does not care if children or poor people innovate or do not innovate.

Honey Bee Network has numberless examples where public research institutions have made no major concessions for innovators from informal sector nor for young student innovators. This is a major weakness in the existing innovation interface with the informal sector.

The public sector infrastructure such as Krishi Vigyan Kendra of ICAR [Indian Council of Agricultural Research], Regional Research Laboratories [recently reconstituted as National Institutions] of CSIR [Council of Scientific and Industrial Research] and various other institutions are not ordinarily accessible to innovators from informal sector. Since NIF has MOU

with CSIR and ICMR, it is able to facilitate some of these interactions. However, as mentioned earlier, there is no window of opportunity for young technology students, individual professional entrepreneurs which can respond with alacrity. There is a TePP programme of DSIR which serves some of these people within its capacity. The demand for support is far higher than the supply of resources. Institutional design of technological interface has not yet been taken by National Innovation Council in a concerted manner. Although given its diversified membership, it should not be difficult for it to address these gaps in a time bound manner. But institutional inertia, given the habit of dealing with things in a particular manner, becomes inevitable if the countervailing pressure is not generated. Way back in early 80's an action research project was taken up by IIMA in three districts viz., Jhabua, Panchmahals, and Banswada. These are the three adjoining districts having similar people with dissimilar administration. The idea was to try whether well meaning public servants will create demand systems of clients on them to counter act the pressure from vested interests. Prof. Ravi Matthai and several other colleagues were involved in this study. The idea is still valid. In the normal course, large corporations have the resources to preempt the available capacity to experiment and validate or value add various technologies in public sector. They may not engage so thoroughly because of confidentiality and other reasons. However, where is the justification for responding to the needs of informal sector, which cannot pay the market rates for various services when other clients exist to provide better conservation. The public policy on this subject is not very eloquent or clear. Unless certain quota of services are earmarked for disadvantaged regions and social groups, the chasm will remain causing frustration. It does not take too long for frustration to become desperation. The other alternative is to empower the public spirited professionals and give them much more leverage to assert their spirit and thus contribute towards creating bypasses for the poor. In one after another policy, the impermeability of institutional boundaries create tremendous friction and reticense between providers and the desired users of services and products.

PART IV

Managing transactions costs:

Transaction costs involved in linking innovations, investment and enterprise

The *ex-ante* transaction costs have four components: (i) searching information (ii) finding supplier, (iii) negotiating contract and (iv) drawing up the contract. The ex-post transaction costs include (i) monitoring and compliance, (ii) side payments, i.e., concessions which can make the contract enforceable through modified inducements/ discounts, (iii) resolution of conflicts if any and (iv) redrawing the contract if none of the above help in going ahead with the contract. While designing the eco system, the institutions and actors have to reduce their transaction costs if any mediating platform has to have legitimacy.

i. Searching information: How do traditional knowledge holders or grassroots innovators find out the potential applications of their knowledge for which a third party may have some use and thus the need to enter into negotiation for possible negotiation of contract and share benefits. Likewise, the entrepreneurs who want to set up businesses around innovative products and services have to find out about the potential leads. They may or may not be internet savvy. In some cases, they may not even be educated. The method of searching information has to be compatible with the existing knowledge, capacity and willingness to pursue on the part of seeker of information. At the same time, the format of

information and the language can also make a difference in influencing the reduction of transaction costs. The potential investor may not know both the entrepreneur or the innovator. The available information may not confer sufficient faith in his mind to motivate him to invest. How would then such investors develop partnership with the innovators and/or entrepreneurs. This cost cannot be met only by providing information on the web and that too in English language. The access to multimedia, multi language databases may make it possible for people to learn from each other and also with other stakeholders. In the case of herbal knowledge, the transaction costs of the potential investors, entrepreneurs, and R&D players in seeking knowledge about the local communities with scientific names of the plants is enormously high. In the absence of scientific names (which can only be ascribed after taxonomic authentication), the modern scientific institutions, drug, dye, nutriceutical companies may not be able to make offers of possible cooperation.

Tracking usurpation of one's knowledge rights:

Local communities and individual innovators also need to track the usurpation of their knowledge by unauthorized IP seekers. They will have to have access and the ability to scan the patent applications around the world, interpret and then inform themselves and the patent offices about any suspected violation[4]. Otherwise they will remain dependent on the benevolence of the state or other civil society organization. The bringing of their knowledge into public domain without their authorization by national and international scholars and institutions has been the single most important instrument of exploitation and unfair treatment of their knowledge rights (no research council in developing world or developed countries has yet characterized such a behaviour on the part of the scholars as inadmissible and unethical conduct). In the absence of such a reform as mentioned later in the paper, 'lawful' and 'rightful' disclosure is the only option. The publication of people's knowledge and thus bringing it in public domain reduces the transaction costs of potential users in western and educated segments of eastern society. Their search costs goes down without conferring any advantage to the local communities and grassroots innovators. However, providing synoptic information is extremely useful and can generate tremendous queries for the knowledge holder. NIF received queries for various grassroots innovations from more than 55 countries entirely because it shared the synoptic information on the web.

[4] USPTO has started recently a discussion forum around the patent applications and under certain condition, any prior art revealed by any one on the web can be taken into account while examining that application. But there is no doubt, it will improve the quality of the applications. This innovation is particularly important for those developing countries which do not have enough examiners like India. But the substantive issue is, how to enable communities and local innovators to read these patents put up for discussion in USA and published in other countries, How much public is public domain after all, and for whom? Will information in English be accessible to the local communities not knowing English language? How should translation wiki, as was suggested by a student in Margaret Chong's class at Seattle Law School, be created for worldwide access to different language communities. May be the students worldwide can translate patents apparently based on traditional knowledge or biodiversity in different languages one page a week and soon, we will have enough resources for tracking the unauthorised IP. There is another way to tackle this problem. I have suggested that every patent applicant should declare that all the knowledge disclosed or used while making claims made in their application have been obtained 'lawfully and rightfully'.

Therefore, we should balance the advantage of open source, multi language databases with the disadvantage of disclosing unique knowledge. In the case of multi language database, put up by SRISTI on its website, about 5000 innovations/traditional knowledge practices were put up in public domain so as to generate wider interest in this knowledge system. It is also expected that various intermediary users will share this resource with local communities. The search cost of the communities will not go down otherwise. This is one of the reasons why SRISTI organizes along with the NIF shodh yatras [learning walks] twice a year so that existing knowledge base can be shared with local communities at their doorstep. This is a very costly way of diffusing knowledge though it has its own advantages in terms of cultural and ethical impact it has on the learners' values. An initiative of Honey Bee on mobile is under discussion with some telecom service providers so that almost 500 million mobile phone users can be reached depending upon their need and preferences by the Honey Bee Network. It is a paradox that such an initiative could not be taken off for want of resources for more than five to six years.

ii. Finding suppliers: Having found the sources of information, one has to find providers of information, services and other support systems. For a local healer or conservator of genetic resources to take a sample of their material to a public or private sector R&D lab to get it analysed for potential negotiations is almost well neigh impossible. It is important to create capacity so that they can deal with the knowledge providing, processing and managing institutions at their own terms. For an innovator, to find supplier of facilities for fabrication of machineries, testing, design, packaging and marketing and distribution is not easy. That is why a lot of grassroots innovations remain undeveloped and localized. The cost of finding innovators have been reduced drastically for all stakeholders because of Honey Bee Network's contribution over last two decades. NIF maintains a database and is able to connect people just for a call. The mobile revolution has meant that farmers from different parts of country and the world can call and get information. In due course, once we are able to generate resource for Honey Bee on mobile, we will be able to make lot of the information retrievable through voice protocol without human mediation. The supplier of authentic information, commodities or services may not become apparent or obvious while searching information. Somebody has to authenticate information before a lay person can rely on it. Transaction costs involved in finding supplier should not be confused with just making a website or a database. There is a whole lot of vouchsafing to be done before a bit of information becomes worth engaging with. Similarly, for an investor or entrepreneur or a corporation, finding the right kind of innovation, meeting their specifications may require prior prior art search and benchmarking.

iii. Having found a supplier or potential user of their knowledge, they have to negotiate a contract and use a combination of IP and/or contractual instruments as a basis for negotiation. The tension between individual and collective knowledge, organizing proper representation and nomination for negotiation and having internal as well as external negotiations are other dimensions that come into play. Negotiations between a rural innovator and an urban entrepreneur or investor can involve a whole range of ethical issues of informed consent, capacity to negotiate, honest brokering, etc. SRISTI, GIAN and now NIF help innovators in this regard when opportunities for licensing their technologies arise. There have been cases where entrepreneurs have licensed technologies for which patents were not even granted. The entrepreneurs paid money because they appreciated the spirit

of the negotiating platform, i.e., Honey Bee Network. Therefore, negotiation is not just a matter of finalizing the terms of exchange but also involves influencing the ethical framework in which stronger party does not necessarily take advantage of the weaker party.

iv. Drawing up the contract: To be able to exercise prior informed consent, and then arrive at reasonable terms of agreement which are acceptable within the community and as well as to the negotiating partner involves tremendous complexity, cost and resources. Without meeting these costs and enabling the communities, the contracts may remain asymmetrical and sometimes difficult to enforce. The language of the contract may not always be comprehensible to school drop out innovators. Under such conditions, the responsibility of Honey Bee Network becomes very critical. Some of the interesting dimensions of the contract negotiated so far in the last 15-20 years are:

    a. The first contract SRISTI entered into with a company involved pooling of public domain traditional knowledge and licensed with a small upfront payment.
    b. Licensing of the rights to manufacture and market on district basis. This was perhaps the first time in the country when a technology was licensed to three small entrepreneurs for right to sell in earmarked districts. The fee was hardly USD 500 to 1000 depending upon number of districts. This can help in democratizing the technological innovation and at the same time bring small actor into the market who may otherwise be deterred by the complexity of negotiations and terms. There was no patent granted on tilting bullock cart in this case. However, media attention and awards to the innovator influenced the market for technology.
    c. The licensing to entrepreneurs on exclusive basis with the condition that if they did not sell pre-specified number of products in a year [on which royalty depends], then the license would become non-exclusive.
    d. Incorporating the privilege of marketing the value added product developed by the entrepreneur in his own district. In addition to the royalty and upfront payment, the innovator also gets dealership for a district.
    e. The licensee is enabled to access funds for adding value to the product.

    There are many other conditions, which have been negotiated to safeguard the interest of the innovator including the right to revert the license if the licensee did not commercialise a technology within a given period.

v. Having entered into a contract, keeping track of the licensing and sub-licensing of technologies by the primary contractor becomes an obligation of the communities. It is possible that the contracting party, in this case, a company or a state agency, may not work the licensed IP from the communities directly. They may sub-license it to a third party who may generate revenues, which may or may not be shared. It is important to keep track of such a process. The enforcement of the conditions therefore requires tremendously important skills and capacities have to be built for acquiring and using those skills. There have been cases where the licensee did not follow all the terms diligently. So far, the Network has avoided legal recourse for settling such problems. However, it is very clear

that in the absence of any power to enforce, a small grassroots innovator may feel handicapped.

vi. Side payments: It is not always possible for communities or individual grassroots innovators to wait for benefits to accrue and share. Upfront benefit sharing may be necessary. Such concessions may have to be negotiated. Some times offering concessions beyond the terms of contract generates confidence. Recently, a firm, Matrix Bioscience, to which SRISTI licensed twelve herbal products developed in its lab gave the name and photographs/sketches of the innovators on the package of these products. This was a side inducement so to say. Likewise, innovators can offer some additional leads if the deal on the earlier one goes well to induce the contracting parties go beyond the terms of the contract. The opportunity exists on both the sides for making terms of contract mutually favourable by offering concessions, discounts or other considerations if the agreed terms of contract are not generating desirable outcomes.

vii. Conflict management: During the benefit sharing process, conflicts may arise. Such situations require capacity building of the community of the innovators to settle the disputes in an efficient manner, without damaging their interests and welfare. Hence, the capacity of the community/innovators to negotiate, identify the right platforms, engage public interest lawyers and supporters becomes crucial to achieving the ends of justice. Here the role of Network and NIF becomes very critical. There have been cases where innovators entered into contract with a company on their own and later when the terms were not upheld, they sought the help of NIF. Sometimes, local collaborators in their anxiety to help the innovators fast, may take recourse to short-circuiting the negotiation and contractual process with best of the intentions. But, given their lack of experience, the innovators may suffer and consider the Network responsible. It is a matter where careful attention has to be paid by all the stakeholders to avoid conflicts to go out of hand. So far, the policy of the Network has been to avoid acrimonious exchanges and thus try to use the power of persuasion. The results have been satisfactory by and large.

viii. Renegotiating the contract: If despite all the persuasion, the existing terms don't work and conflicts cannot be resolved satisfactorily, the renegotiation with the attendant costs is the only alternative. In some cases, this may even be desirable.

Summing up:

The transaction costs framework provides insights about the way institutional pathways emerge in the given context of variable capacity of different actors to bear the cost of various transactions. In a given historical context, different communities and grassroots innovators learn to struggle, succumb or sometime learn to be helpless. But, given a nurturant eco system, the same innovators and creative communities can also have tremendous grit and determination to make a difference. Time and again, we have seen that the tail does wag the dog at different moments in history. Perhaps, in the era of crowd or mass sourcing, the idea of Honey Bee Network triggered more than two decades ago has become even more relevant for transforming societies to become more creative, collaborative and compassionate. In this paper, we have

discussed some of the idea that have a bearing on the emergence of a considerate institutional eco system. We are conscious of the fact that public and private institutions have not yet learnt to cooperate with the informal sector, which provides the most jobs. But, this will have to change. It will require strengthening of the mediating platforms so that transaction costs of various stakeholders get reduced. With very few staff, SRISTI and its collaborators have tried to bring about a transformation in the way Indian society thinks about creativity at grassroots. Its efforts in strengthening the grassroots innovation movement in other countries will be discussed in a separate paper. The China Innovation Network [CHIN] triggered by Honey Bee Network has achieved outstanding success in mobilizing thousands of grassroots innovations in China, many of which can have a positive pay off in other countries as well and vice versa. The grassroots to global [G2g] is another milestone waiting to happen vigorously. Although hundreds of queries received by NIF from around the world already indicate the demand that exists internationally for the technologies existing in the country. Without an ethical framework, institutions can only go as far as they can. The internalization of Honey Bee Network philosophy can help in ensuring greater transparency in transactions. The subterranean normative values underlying creation of public goods which we prefer or cherish will become values in vogue.

Key initiatives for transforming national innovation systems from grassroots perspective:

Dissemination:

1. The old axiom, seeing is believing still holds true. Today, a large number of organisations have facilities for field trials and demonstrations. But the convergence is missing. In the mobile telephony, different channels such as television, internet, phone and other services like GPS, etc., are getting integrated. The results are visible. But, in agriculture, the extension centres of one public institution won't let various other institutions to showcase innovative solutions to the farmers problems at their research and extension farm. There is a case for convergence in these facilities as well. The commitment should not be to the turf but to the delivery of solutions to people.

In each district, there should be a District Innovation Gallery or Forum where various innovations can be showcased. KVKs [Krishi Vigyan Kendra] can be the site of such exhibitions.

2. Public media has almost given up showcasing the public interest innovations regularly. There ought to be regular slots on All India Radio and Door Darshan for sharing information on innovation so that in the regions where no other channel reaches, the message of Decade of Innovation declared by Hon'ble President reaches with a very practical and operational content.

A regular programme, if not every day, at least every week at prime time for sharing the information about innovative experiments being done around the country is necessary to create the right mindset and celebrate the Decade of Innovation.

3. We should mobilize the support of one lac post offices and even larger number of postmen to scout and disseminate innovations in every nook and corner of the country by involving NIF and Honey Bee Network. This will help map the creative mind of the country and also create awareness about existing innovations.

Mobilising postal network for scouting and dissemination will create a foolproof presence of the National Innovation System in every village of the country.

4. More than four crore people travel by Indian Railways every day. In the long distance train, there is an opportunity to offer courses for skill development and also reinforce the concept of life long learning. At the same time, dissemination of ideas about innovation and scouting of the same can also be done through idea boxes at various stations and in trains. In the short distance train, idea competitions can generate lot of interest and people can sms their solutions to various challenges and submit ideas for other innovations. The mindset has to be changed. We have to shed the habit of living with problems unsolved indefinitely.

Minds on move through Indian railways are likely to be more receptive for continuing education, skill development, scouting and dissemination of ideas, innovations and outstanding traditional knowledge practices. This will create traction for innovations on day to day basis and strategies will be dynamically positioned, retailored and delivered involving users/commuters in design and delivery.

5. Reaching students in municipal and government schools to harness the creativity of young ideators and inventors. Within four years of IGNITE competition by NIF, the entries increased from a few hundred to over 2000 from 160 districts in 2010. However, most of these were from CBSE schools or Navodaya Vidyalayas. If Ministry of HRD is brought on board, one can involve municipal and government schools in a big way. The science exhibitions predominantly have demonstration of known concepts though there are always a few innovative ideas. Perhaps one can reach mass level students through state education boards and Navodaya Vidyalaya system.

Harnessing the ideas of young inventors, innovators and ideators from schools in each block of the country will lay the foundation for developing future leaders of innovation movement in the country.

6. SRISTI's initiative of pooling technology projects by over 350,000 final year technology students from over 500 colleges has led to the techpedia.in platform having over 100,000 projects. Gujarat Technical University in collaboration with this initiative has decided to create Navsarjan Sankul [Innovation Clusters] by mapping colleges to the MSME clusters. Ironically, minimum number of, say chemical engineering students are enrolled in colleges around heavy concentration of chemical industry. There is a great deal of rethinking required in linking higher education with the needs of small scale industry and grassroots communities. In the next three to six months, techpedia.in would have another 50,000 projects besides the top five from each college of Gujarat. There is a need to replicate this model in each state. Rajasthan Technical University has already written to us for similar linkage. Efforts are on in other states also. Scouting of projects and dissemination of innovations will also promote greater connectedness to the societal problems. The originality and innovation quotient of the technology projects may have inevitably and irreversibly gone up because doing something, which has already been done, is not going to be easy. The cost and speed at which innovations have started emerging is unimaginable. This is a good illustration of MLM and Gandhian engineering.

Scaling up the techpedia.in as a national portal through public-private and civil society partnership is inevitable to trigger a distributed inclusive model of innovations.

Testing/Calibration/Validation and Value addition:

7. The support system for validation and value addition needs to be augmented by obliging every public R&D institution to set aside resources for testing, calibrating and value addition in the ideas and innovations of grassroots startups and innovators.

There should be a national fund for testing and validation of innovative technologies by individuals at public testing facilities. This will speed up the mind to market journey for innovations from formal and informal sectors.

8. The ITI and Polytechnics besides other technical colleges should provide their facilities under a national programme for distributed innovation management under NInC [National Innovation Council] for fabrication and other value addition to the grassroots innovators and other individual innovators.

There should be establishment of, first in each district college or polytechnic and later in each block, a fab lab to promote decentralized community fabrication centres for prototyping innovative products and farm machinery. Similar facilities may have to be created for herbal extraction in tribal areas.

9. There should be a dedicated young innovator fund at platforms like techpedia.in to encourage technology students in engineering, agriculture, medicine, pharmacy, biotechnology, etc., to set up at least 10,000 startups in 2012. We should double these numbers every year if we have to usher in knowledge and innovation based entrepreneurial revolution.

A need for dedicated startup promotion fund at techpedia.in or at any other platform to encourage students to set up innovative technology based enterprises.

10. The students in technical institutions should be encouraged to join hands with the startups so that the initial costs of startups goes down and the students get real life experience. For the student startups, we should have at par placement opportunities for them upto two years so that if their enterprise does not take off, they can come back for their employment.

The tie up between startups and the students must be encouraged and in some cases engineered to nourish the eco system for innovation.

11. Members of various science and technology academies should be encouraged to mentor the startups from technical point of view. Similarly, the industry associations should mentor such startups and students working with them or on their own ideas. SRISTI has taken an initiative to map the MSMEs with the engineering colleges in collaboration with technical universities. Once this takes off, the connect between the projects of more than 15 lac technology students and small-scale industry and informal sector will get cemented.

National Mentor Network to be strengthened for mentoring startups in different parts of the country for proprietary or open source social technologies.

Education:

12. Incorporation of lessons on innovation journey of common people in the textbooks will go a long way in moulding the minds. It is ironic that there is not a single such lesson in any of the textbooks as yet.

NCERT, AICTE and UGC ought to be persuaded to accord due place to innovations in the existing textbooks if additional books are difficult to introduce to begin with. Online multi language, multimedia resources also should be generated for the purpose.

13. The educational system in medical, pharmacy, agriculture, biotechnology and other fields of technology education in addition to engineering have to incorporate the project work on persistent unsolved problems of common people. Honey Bee Network has made a list of several such problems, which should be posed, to the students in different streams to challenge them for generating solutions.

Attractive challenge awards must be introduced to incentivise the engagement of bright minds with social problems. An inventory of pending social problems for different regions must be posed to regional technical institutions for a time bound resolution.

India is poised to become an inclusive society through social, technological, educational, cultural and institutional innovations. We have nothing much but only our conventional mindset to lose. Grassroots to Global (g2G) will trigger a new role for India to spread the genius at grassroots for people in other developing countries as well.

Policy gaps for promoting green grassroots innovations and traditional knowledge in developing countries: learning from Indian experience

SRISTI's effort to institutionalize Honey Bee Network experience in the form of NIF (National Innovation Foundation) ten years ago had generated lot of interest in different parts of the world. Several institutional innovations over last two decades have sown the seeds for future transformation to make society more creative, collaborative and compassionate. Inclusive or harmonious development cannot follow otherwise. In this paper, I draw upon the key building blocks of an innovation eco system and redefine the concept of national innovation system which for so long has ignored the innovations and traditional knowledge system in the informal sector. Most of the time, the study of Research and Development [R&D] in the formal organized sector was considered same as a study of innovation system. The network of institutions supporting R&D became part of the larger system and expenditure on R&D became determinant of innovation potential. The creativity of the informal sector was neither taken note of nor ever measured to quantify the contribution it could make to the process of development and the larger innovation eco system. The educational system did not include in past and still does not include reference to creativity at grassroots. The people were supposed to adopt the ideas and innovations developed by the formal system. Almost the entire literature on diffusion of innovations dealt with adoption of technologies developed by formal R&D system.

In such a context, the new trail triggered by Honey Bee Network more than two decades ago was like ploughing a lonely furrow. The genesis of Honey Bee Network is described elsewhere [Gupta, 2003, 2006, 2008]. The contribution of the Network in creating awareness about how common people solve their own problems is beginning to be understood. However, various building blocks of a nurturant system are yet to be put in place. While in India the progress has been slow but steady, in most countries, even the beginning has not been made.

Building blocks of an innovation eco-system:

The motivations for people to solve problems creatively can vary from extreme altruistic to extreme selfish and that is quite understandable. Creation of community and public goods has motivated people from time immemorial. And yet, most public and private institutions are premised on the understanding that individuals or groups will often innovate in their own self-interest. The design of portfolio of incentives, while in general, receives much less attention, but to the extent it does, it considers success of an innovation only or mainly in terms of commercial outcomes. Non-monetary exchanges in society are not considered worthy enough for promotion and support in the innovation eco-system. Even for the innovations which may have commercial future, the institutional arrangements for product development, design, testing, calibration, user trials, investment of risk capital, etc., seem very poorly designed and supported. The eco-system is weak for individual innovators from the professional background as well. Thus, if innovations still take place in public and private sector, formal and informal economy, the credit for much of it should go to the fortitudinous ability of the people. The design of the future eco-system should be guided by the assumption of a highly variegated landscape. Any other assumption could mean that only some who are well-endowed, well-connected and quite resourceful are able to get the support in preference to the small, scattered, segmented and socially disconnected innovators.

1. *Reaching the innovators:* No eco-system would ever serve any purpose if the clients are missing. I have seen many incubators set up by the academic institutions waiting for the innovators. When they don't receive the innovators, they change their policy to work with those who they receive. The means and the ends get mixed up. There are some who do not know how to search but there are others who know but do not want to try. Nothing can be done about the latter. But those who want to know, the experience of Honey Bee Network and the www.techpedia.in can be useful. Honey Bee Network pooled more than 100,000 ideas, innovations and traditional knowledge practices from over 540 districts at NIF (National Innovation Foundation) through an on site search process. Techpedia.in pooled more than 100,000 projects pursued by 350,000 students

in 500 colleges around the country. Search is a labourious process and cannot be restricted to mere advertisements in the newspapers or on visual media. Various methods for searching creative people in rural or urban areas include involvement of students during summer vacation, walk through the rural areas [shodh yatra], meeting of the innovators and experimenters and encouraging them to become scouts, having scouting stalls in the cultural and agricultural fairs, organizing biodiversity contests among children, recipe competition among women and others, competition among grassroots functionaries of state development departments, etc.

Several years ago, Ministry of Science, Technology and Innovation [MOSTI], Malaysia invited me to discuss above framework. They had set up a 200 million Ringat Innovation Fund. But they had not received many entries from rural areas or from young people. After discussing various ideas, which we have tried in Honey Bee Network, I suggested that we should go to a school nearby. Accordingly, a visit was arranged at an hour's notice to a school at Shah Alam. On the spot, we organized idea competition first at individual level on any issue that they wanted and second at group level to find creative solutions for the disadvantaged social groups. Amazing range of ideas came out, some of which were published in Honey Bee [Vol…….]. Thus, creating mental, institutional and policy space for innovations to be articulated is the real crux of the matter.

2. *Documenting the innovations:* In 1988-89, I developed a detailed check list for documenting innovations and traditional knowledge practices. Soon we realized that more disaggregated the categories of documentation, less useful is the data. One can disaggregate a narrative but it was not easy to get the story from disaggregated fields. People don't often think in segmented manner. It is better to have their narrative as it is articulated rather than filling up the form. We curtailed the details and the quality of information improved drastically. We decided that one should begin with only synoptic information and follow it up through a detailed documentation after short listing or screening the synoptic information of the larger pool. The creative tension between holistic and reductionist view of knowledge is very important to understand and appreciate the phenomenological cases of grassroots innovations and traditional knowledge.

3. *The ethics of the knowledge extraction:* In a paper, "Who has the right to knowledge" [1988], several issues concerning the knowledge rights of people, responsibility and accountability of outsiders [firms, scientists, public administrators, students, etc.] and the asymmetry in attribution and reciprocity were discussed. Recently, in another paper on "Is just also fair?" [2008], this issue has been revisited. Various editorials of Honey Bee [The eye of the bird, 2010] have also dealt with this issue. No eco-system will be sustainable if shared understanding of various ethical issues involved in knowledge exchange, utilization, benefit sharing, etc., does not evolve. Such an understanding requires formal as well as informal mechanism.

    i. The formal mechanisms can be: [a] requirement on the part of every student or scholar who documents people's knowledge to be obliged to share the findings in local language with the knowledge provider, [b] all degree granting institutions to make it mandatory for such scholars not only to share findings but also acknowledge the knowledge providers specifically as authors of knowledge and not just as participant [as is customary], [c] an obligation not to publish findings which are unique and thus may entitle the local communities or individuals to the protection of their intellectual property rights. Over the years, enormous amount of individual and community knowledge has been brought by outsiders in public domain without attribution, accountability, reciprocity and benefit sharing, [d] requirement on the part of funding agencies at national and international level to require every grantee to observe the principles of attribution, sharing the findings, benefit sharing, etc., without exception. The default condition should be that the knowledge providers will be acknowledged and their Prior Informed Consent is taken rather than keeping them anonymous as is the current practice in many social science research councils around the world.

    ii. The informal mechanisms can be: [a] opportunity to knowledge providers to learn from each other, to do research on their own conditions and to share their knowledge with other communities in local language, [b]

platforms for periodic debate and discussion on various practices among informal knowledge experts to refine and refute various ideas, [c] exchange of knowledge and possible mode of action with the institutional experts so as to learn about multiple heuristics for interpreting their current knowledge, [d] opportunity to pool the practices of different knowledge holders around a common theme for developing better value added practices for common good. A concept of *technology commons* has also been developed to enable such pooling of innovations [primary and derivative] to be licensed at no cost to self-employed people and at cost to commercial enterprises [Sinha, 2009], [e] creation of local language knowledge registers, databases for systematic collection of local knowledge for its transmission to the next generation through formal or informal educational processes and [f] distributed characterization, incubation and augmentation labs which help people to find out about the scientific knowledge about their biodiversity and other local resources *in-situ.*

iii. An eco-system that does not consciously and explicitly acknowledge the knowledge rights of people loses its legitimacy and also mutuality. My feeling is that one reason why lot of organizations have not yet started following Honey Bee philosophy is because of the *ethical load* inherent in it. We have to be appreciative of those mistakes which are unintentional and are borne out of ignorance as distinct from the intentional ones. To illustrate, I tried as a member of editorial board of Indian Journal of Traditional Knowledge to influence the ethical policy with regard to publication of papers in the journal dealing with peoples' knowledge. Several well-wishers of the Network took a critical note of my presence in the editorial board and its violation of the Honey Bee philosophy. Finally, I had to resign from the board because I could not influence the policy. This is going to be a long drawn process before any institution in formal or informal sector anywhere in the world would insist on the compliance with these values. I must admit that some of my own doctoral students have not complied with the norm of sharing their work in local language with the knowledge holders. Therefore, in a very self-critical perspective, I realize that ethics cannot be legislated. It has to be internalized. Eco-

system managers at national and international level [National Biodiversity Authority of which I am a member is as negligent towards these values as Convention on Biological Diversity or WIPO's inter-governmental panel on the subject] have not yet realized the crucial linkage between the interactional values and the institutional health and outcomes. A protocol needs to be developed for the purpose at national and international level.

4. *Characterising knowledge:* Making sense of one's ideas and imagination in a contested domain of private, community and public ownership of knowledge and resources [Gupta and Sinha, 2001 requires negotiations within family, community and larger social network. It is inevitable that secular and sacred get intertwined like a double helical structure of DNA in the knowledge systems[5] [Gupta, 1993, ICCIG, 1997, 1999]. While modern mind can ignore the rituals associated with secular technological practices, for a person deeply steeped in the local culture such separation is not always possible. Perhaps it is also not necessary. Even the modern science has to come to believe the effectiveness of faith and positive expectations. The characterization of knowledge in terms of technical, institutional, socio-cultural and behavioural terms requires longer-term engagement with knowledge providers. While dealing with large numbers, such an engagement may not be possible in all the cases at all the time. Therefore, a precise, easy to understand communication system has to be developed so that exchange of information among knowledge providers, knowledge catalogers and knowledge mediators can take place at mutually acceptable pace and terms. There are several useful practices that can be followed to make this process useful to all actors involved.

    i. When prior art search is done to find uniqueness in the innovation or distinctiveness claims, a summary of the prior art in local language can be sent to the knowledge provider so that her knowledge gets augmented.

[5] Rajani Bakshi, Traditional Sciences Congress, Economic and Political Weekly, 28 [52] 2872-2874 quotes my statement at the Congress, "Perhaps the most emphatic attempt to make a departure from this discourse [relying on notion of cultural pride] was made by Anil K Gupta of the Centre for Management in Agriculture at Indian Institute of Management, Ahmedabad…. referring to several examples of cooperation and reciprocity, Gupta said: "Those who are searching for symbols of restoring our pride will not relate to these cases, because their preoccupation is with symbols of conquest, which dissipate and [have] no concern with this link between secular and sacred". The continuing tradition of creativity had to become the building block of future.

For many uneducated or less educated knowledge holders, the concept of prior art itself may be new. Therefore, it will have to be explained as to why we have to see what kind of knowledge already exists in published or unpublished sources before accepting a claim worthy of further investigation.

ii. Once validation has begun, it is imperative that knowledge holders are kept informed of the progress and the findings from time to time. In the memorandum of understanding [MOU] NIF signed with CSIR [Council of Scientific and Industrial Research] and ICMR [Indian Council of Medical Research], there is a provision for the innovators and traditional knowledge holders to visit the labs and understand the process of validation, characterization and value addition. This kind of interaction involving visit of scientists to the field and vice versa, of innovators to the lab helps both sides in understanding the way formal and informal systems of science and technology characterize knowledge[6]. The characterization of knowledge is also circumscribed by the constraints imposed by what I call as '4S' model [Gupta, 1995], i.e., Space, Season or Time, Sector and Social segmentation. The characterization varies a great deal across time and space and among social communities as well. Same plant is used for one purpose in one place and another purpose elsewhere. Not only this, the taboos on the use of various plants also vary. These variations in the way communities characterize resource are

[6] More than a decade and half ago, I was invited to serve on the evaluation panel of National Institute of Health, USDA and other institutions to look at the programme on Biodiversity Conservation through Drug Discovery. A Nigerian scientist working with Walter Reed Malaria Research Institute was asked during the discussion to narrate an example where a traditional healer claim that the medicine worked but in the validation process, it was found to ineffective. Maurice Iwu, Founder of Biodiversity Conservation and Development Programme in Nigeria recalled one such case in which when the scientists repeatedly went to the healer to tell him that his claim did not work, despite all the care they took, the healer got exasperated. He asked as to how did the scientists give the medicine to the patient. The scientists replied through injection. Healer said, he never gave it as an injection. He always asked the patient to take it orally. He insisted that scientists follow his method and then test. As expected, this the medicine worked. This shows that scientists sometimes might consider their methods to be superior to the ones used by traditional healers. Actually, their methods are only different and unless proved otherwise, these differences should be respected.

understandable. But, the formal taxonomies do not distinguish variability arising out of local taxonomies.

iii. Some of the dimensions, which need to be looked into for making, the eco-system more robust are: [a] the language, some linguists believe, shapes the habit of thought. Therefore, one should be careful in describing the knowledge system in the way one does[7], [b] the parameters of characterization such as the colour, slope, depth, acidity and other dimensions of soil taken into account by the local communities while classifying soil. US Department of Agriculture uses a seven fold classification which is much poorer compared to the classification used by several local communities. Scientists could pay attention to the local parameters with benefits.

iv. The tools developed by modern science can be provided to local communities to strengthen their ability to characterize their own knowledge system. A mobile phone based water quality testing device can easily help in ranking various local solutions for treatment of water. Some of these tools may actually spur more innovations because one would know the relative efficacy of the current solutions more accurately.

v. Databases of functional, structural and cultural explanations of biodiversity-based knowledge in local language are essential to expand

[7] One of the most contested phrases was coined by late C.K.Prahalad as "fortune at the bottom of pyramid". He assumed that large corporations should tap into the purchasing power that poor people have and therefore these people should be treated as potential consumers. He never realized that poor people are not only consumers, they could also be providers of ideas, innovations and traditional knowledge. Thus, the term BOP distracts attention from the resources and skills in which poor people are rich. The experience of Honey Bee Network over last 20 years has demonstrated that poor people are not at the bottom of all pyramids such as the ones dealing with knowledge, values, or institutional networks. Once we characterize poor as consumers, we miss their potential as providers. This is the power language has. Amartya Sen in his paper on Description as a Choice [1981] asked as to why poor people became 'weaker section' after the sixth five year plan in India. He asked rhetorically as to how could those who had to bear the heaviest burden be called 'weaker section'. Another example is the term 'unskilled labourer'. Anybody who has slightest understanding of the variety of skills common people have would consider it a strange term. But, NREGA [National Rural Employment Guarantee Act] classifies 250 million people as almost unskilled. Doesn't this characterization symbolize something fundamentally flawed in the way we treat human potential. To me, the use of the term involves a crime against humanity.

the interpretative capabilities of local communities. Despite billions of dollars having been spent on conferences and research and policy interventions for conservation of biodiversity, development of such databases accessible to people in textual, oral or visual media has not been a priority at national and international level.

vi. Cross-fertilization of knowledge through enabling people from one region doing research in another region is one of the ways in which the ability to characterize environment can be enhanced at community level. Such a mechanism has not been formally evolved but SRISTI is trying to pursue this as a part of Shodh Yatras. Nominees from different remote areas are invited to walk with us and are assisted by knowledgeable students or assistants to enable them to learn about local knowledge in a comparative perspective. This process may trigger and strengthen the polycentric innovation and knowledge network. Unless communities can learn from each other on their own without external mediation and enrich their ability to characterize their own as well as external resources, their capacity to imagine new possibilities for value addition or entrepreneurial exploration may not expand significantly.

5. *Adding value for building horizontal and vertical supply chains:* The reason languages evolve is to articulate multiple meanings [some intersecting partially or completely and others non-overlapping], which help in expanding the scope for imagination. It is such an imagination or even speculation, which triggers experimentation in some cases. If meanings could not be expanded, then new possibilities would be difficult to conceive. If a language has a word for flying object, *viman,* thousands of years ago, it has created a possibility to conceive a flying object. But, if such an object does not get developed, then it was not because language lacked the capability to conceive or speculate but because of other institutional or cultural reasons. Value addition in local or external resources is important for improving efficiency of resource use, conservation, augmentation and dissemination of service or products to others. Formal R&D institutions perform this function within their mandates and try to expand the potential for value addition in different sectors to meet various social and industrial needs. This R&D process is not restricted to public or private sector only but can also be extended to cooperatives, labour and workers unions and informal associations of farmers,

pastoralists, artisans, etc. In many cases, individuals on their own through their own resources also do research or experimentation and sometimes innovations. While support system for formal sector is well developed though even that can be improved a great deal, the one for informal sector is weak and non-existent in majority of the countries. It is ironic because most societies facing one form or other of rural protest, insurgency, social unrest or violence realize that some of it can be traced to persistent poverty, unemployment and lack of public support for meeting basic needs. And yet, the indifference continues. The paradox is that this indifference, conceptually, leaves lot of space for local experimentation even if sub-optimally and devoid of opportunities for validation through blending with formal science and technology. It is this space that we have explored in the Honey Bee Network and wish to trigger new institutional designs, which can augment ability to experiment and innovate at individual and community level. The horizontal supply chains have existed from time immemorial through weekly markets in the most interior regions whether relying on barter, cash or gift economies. But, with inroads made by modern markets and other institutions, these chains have become weaker. The perception of utility of products and services provided by local experts or entrepreneurs has also changed over time due to media exposure or deliberate public policy. A bone setter who might be a better expert than an institutional medical facility might not get as much attention of the local communities in some areas as she might deserve. This may have nothing to do with her expertise. Local products in various functional domains can be developed by pooling inputs from local villages. The value added products can be packaged for *short distance and short period* consumption. Such a strategy will strengthen local *small loop economies* and reduce carbon footprints, economise on energy consumption and reduce entropy. Some of the raw materials for vertical supply chains also are provided by the similar regions. But, devoid of any stake in the supply chain, the people mainly perform the task of collection of raw materials as labourers. Since no *in-situ* value addition takes place, due to inflationary and other pressures, their real wage rates often go down instead of increasing. While the growth takes place in the value added sector, these regions and people therein remain at the lowest end of the value chain. Their knowledge rights are not protected and their ability to get royalty from the exploitation of these potential rights remains unexplored. Policy gaps both in horizontal and vertical supply chains are many and require systematic attention if the capabilities of local communities for sustainable resource use and improve livelihood have to be significantly augmented. The social

unrest will be otherwise an inevitable consequence. The gaps in the policy for value addition in formal and informal sector are:

Formal Sector:

i. Dedicated fund for product development: Every public R&D lab should have dedicated funds for adding value to innovations and outstanding traditional knowledge practices in the informal sector. However, mere allocation of funds may not be enough. Unless the use of these funds is monitored at the highest level and becomes part of strategy reviews of the institutions, the motivation may not be strong for using these funds. The other sources of fund are always more attractive because of lesser constraint of accountability to society. The peer review and publications can easily sustain the existing R&D system.

ii. Centrally allocated funds from a national council may sometimes be more useful for adding value to orphan projects. The sanctions from such councils may assume a contractual obligation and thus may have higher accountability. The user organizations of local innovators can also be enabled to contract such research to the formal sector.

iii. The agenda setting process for the formal R&D institutions may include selection of specific unsolved problems of economically depressed regions and social segments in the relevant sector. Once such an engagement becomes a part of on going agenda and priorities setting process, the inclusion of the problems of disadvantaged social groups or their innovation may become easier.

iv. The testing facilities in public institutions are often priced at the same rate for formal sector or informal sector[8].

[8] When GIAN (Grassroots Innovation Augmentation Network) had to get a tractor developed by a grassroots innovator, Bhanjibhai tested at a central facility recognized by Ministry of Agriculture for the purpose, the fees asked and paid was same that would have been required from a multi national company. Similarly, when Protection of Plant Variety and Farmers' Rights Authority accepts applications for registration of variety developed by farmers, it insists on similar treatment except when such varieties are accepted as extant varieties. There are no funds earmarked for paying the fees for such purposes from unorganized sector. This is a major lacuna in the current public policy perhaps around the world.

v. The setting of standards for various technologies is known to influence the evolution and diffusion of innovations. However, the ability of grassroots innovators to influence the existing standards is not very high. There has to be a consultancy panel in the Institute of Standards or Bureau of Indian Standard to periodically review the standard in different sectors taking into account the innovations from informal sectors as well.[9]

vi. Distributed testing and calibrating facilities have to be created to bring in higher degree of precision and consciousness about quality in the informal sector. In the case of herbal product, facilities for testing microbial load would help in drawing attention to the need for sanitation and quarantine mechanisms. Similarly, the surface quality affected by welding process and its role in affecting the efficiency of throughput will bring about greater awareness about different kinds of welding and plasma technologies. A similar effort should be made to spread awareness about new materials, particularly composites for grassroots fabrication.

vii. The modular design of products requires availability of various components in blendable formats. If some of the old people wish to have cell phones with only two or three buttons to call immediate kins, they ought to have the facility for such fabrication around the corner. The companies manufacturing cell phones may consider providing different modules for application at grassroots level such that more and more operations become smart. For instance, several innovators have

[9] An innovation developed by Birendra Kumar Sinha for pollution control [sound as well as carbon emission] will not succeed unless the standards for emission levels for diesel engines and generators are changed. Only then, manufactures may have incentive to license the technology and incorporate it in their manufacturing system. The regulatory authorities will have to then develop appropriate norms and monitoring processes to enforce these standards. Market for such an innovation would thus emerge and expand. It may be useful to recall that when American car industry was losing out to Japanese, one of the steps that automobile engineering institute is supposed to have done was to find out in which technology American car manufactures had an advantage. Once it was realized that emission control was one such area, the standards were apparently modified and a comparative advantage for the domestic industry was achieved. Since these standards were non-discriminatory and the Japanese industry had not till then developed breakthrough in this regard, some time was gained. The standards can therefore play a very strategic role in gaining competitive and collaborative advantage.

developed the mobile phone based switches for irrigation pump sets or other amenities at home. At the receiving end, one does not need a full-fledged cell phone. Having a module with just a sim card and a signaling system is enough, which might cost only five or ten dollars instead of 50 dollars for a cheap phone. This will expand the market for smart remote switches for various appliances and equipments.

viii. Sensors and other embedded systems for grassroots applications: Most engineering technologies developed in the informal sector are mechanical in nature and seldom involve use of embedded systems. A farmer, for instance, while ploughing the land and sowing seeds cannot get online feedback about the depth being maintained except by experience that too at approximate level. The performance of some the seeds and therefore the productivity may depend upon constant depth in an uneven or heterogeneous soil condition. Having a depth sensor which would give immediate indication to the farmer would be very helpful to increase pressure in case of manual or hydraulic driven systems. There are large number of other applications in hydro turbines or juice or gel extractors in which feedback from the throughput can help in modifying the conditions of the input energy and torque thus affecting energy efficiency and productivity. The Industrial Training Institutes [ITIs] or polytechnics need to be restructured so as to modify the curriculum, pedagogy and the framework of cooperation between these institutions and local fabricators, artisans and mechanics. Such an interface is more or less absent today.

ix. The packaging industry often considers consumption patterns to be guided by a distance of 1000 miles and consumption after a year. Even if much of the consumption takes place within 100 miles and before three months, the energy is consumed for much longer time and farther distance. This is avoidable wastage. Biological decomposable materials have to be developed for shorter-term consumption and shorter distance transportation. Supply chains both horizontal and vertical will start getting reorganized and also become more energy efficient [Gupta, 2009].

Informal Sector:

x. The value addition process in the informal sector is influenced considerably by access to tools, technologies, materials, testing facilities and the scale of fabrication. While there is a great need for creating facilities in the formal sector, simultaneously one has to improve peer learning potential among the grassroots innovators and traditional knowledge holders. Creation of knowledge networks through mobile phones in local language can be very helpful. Likewise, column in local newspapers and radio can facilitate such learning. Radio has not been used much for triggering dialogue among local innovators at any significant level.

xi. The sharing of facilities requires individual innovator based incubators at grassroots level. This concept was developed in the last few years and several innovators were supported by NIF for the purpose. It must be acknowledged that every innovator would wish to have independent workshop including all the machines necessary for fabrication. The concept of outsourcing, shared facilities and pooled resources is not very popular with them and yet there is no other way one can increase the capacity of maximum people in minimum time and resources.

xii. Building horizontal supply chains will require giving a new direction to the movement of self-help groups of women. Generally, most groups do not spend even one per cent of their savings on buying products made by other groups. The real market pull from their savings is taken advantage of by large corporations. If the micro finance movement has to become entrepreneurial in nature, then value addition by groups in local knowledge and resources would become inevitable. It is important to note that despite millions meetings, papers and discussions on micro finance, there are not even dozens of papers or initiatives or policy dialogues on micro venture finance. That itself shows the depth of the problem.

6. *Financing of innovations and traditional knowledge:* Various models of financing have to be evolved for product development, market testing, demonstration, trial, user adaptation and large-scale diffusion through commercial and non-commercial channels. In the age of market dominance, it has almost become a mantra to suggest that users must pay for

all the services. The paradox is that poorer one is, higher is the expectation of one's ability to bear. The concept of public good has been almost given a go-by in the rush for market driven solutions. Surely, there are technologies for which various kinds of market based solutions can indeed be generated. But, for non-monetary technologies, which may have higher sustainability impact, mobilizing financial resources has become most difficult today. The classical extension of ideas and innovations from lab to land still gets support but from land to lab to land is not something for which a lot of support exists. The system for financing innovations and outstanding traditional knowledge has to fulfill several expectations such as [a] minimal transaction costs for all involved i.e., investor, entrepreneur, mediator or interface managers and innovators or knowledge holders, [b] genuine risk taking ability so that high risk subjects or ideas do not get avoided or eliminated[10], [c] the terms and conditions at which finance is extended should be easy to understand by the lay people, [d] there should be sufficient flexibility in designing financial support system keeping in mind the variability in socio-ecological contexts, [e] the transactions should be premised on trust rather than doubt. Just as innovators and traditional knowledge holders trust the mediators and reveal their ideas, designs, experiences, without seeking any security or guarantee, the financing system should also work on similar trust based principles[11], [f] the transparency should be maintained

[10] In a study during 1979-1984 involving more than 43,000 bank accounts, 644 villages of a drought prone district Mahendraghad and 43 different branches of commercial and cooperative banks, I mapped the resources or the endowments of each village and the portfolio of credit extended by the banks. It came out very clearly that without any communication any sharing of information among the branches, a clear consensus seemed to have emerged about which region to avoid for financing. It was obvious that risk averse institutions and risk averse farmers or pastoralists may not ever meet. Depending upon the respective ability to negotiate risks or having risk hedging possibility, they may meet to varying extent given the heterogeneity of endowments and asymmetry of information. The challenge is to redesign the resource delivery system for different socio-ecological contexts [Gupta, 1998].

[11] When the concept of SRISTI Venture Fund was first mooted at the International Conference on Creativity and Innovation at Grassroots [ICCIG] in 1997 at IIMA, such was the expectation. The setting up of GIAN (Gujarat Grassroots Innovation Augmentation Network) in collaboration with Gujarat Government institutionalized the golden triangle for linking innovation, investment and enterprises. Subsequently, after setting up of NIF, a Micro Venture Innovation Fund [MVIF] of about a million dollar was set up in collaboration with Small Scale Industries Development Bank of India [SIDBI] in October 1993. All the investments under MVIF are made without any collateral and under single signature [see details at www.nifindia.org].

about all the costs incurred on behalf of the innovator,[12] [g] a healthy portfolio should also have a healthy proportion of default caused by unforeseen circumstances or market failure. Claims of 100 or 90 per cent payment have to be seen with suspicion because the background conditions of really poor people would not warrant such a high degree of repayment, [h] the cost at which investments are recovered cannot be uniform for all kinds of investment. Variability on account of sectoral, social and spatial heterogeneity must be factored in phasing the repayment and charging the cost, [I] the indirect benefits of every investment whether in terms of local capacity building or technological or social externalities should also be factored in while calculating return on investment, [j] the linkage between credit and technology may make both more viable in high risk environments, [k] public risk absorption mechanisms are necessary to unleash the entrepreneurial potential in regions which have not had much experience in dealing with external markets, financing systems and other intermediations, [l] pooling of risks may be advised by linking factor and product markets and other kinds of aggregations so that the investee feels comfortable in repaying in kind if cash transactions appear to be difficult, and [m] a concept of Technology Acquisition Fund may have to be developed to acquire the rights to improve, blend, sub-license the technology so that the attachment of the innovator to the technology does not come in the way of its improvement or diffusion. Such a fund has been set up at NIF and likely to be operationalised in the coming year.

Designing an innovation support system requires new instruments of finance, factoring and inter linkage of factor and product markets [some of these were used by informal lenders to exploit the poor people. However, a benevolent banker or risk fund manager or micro venture innovation fund can indeed use the inter linkage of market for the advantage of the innovators. The role of risk capital has been most crucial in transforming the information technology and biotechnology sectors. Absence of such

---

[12] There are funds, which sometime make it obligatory for the investee to buy consultancy services of a chosen consultant who is paid exorbitantly from the loan amount without any responsibility for the outcome. Similarly, enterprises are funded based on the knowledge of innovators who are denied any royalty because their knowledge is supposed to have been significantly improved upon. Such practices do not constitute a good ethical judgment and must be avoided. The lack of knowledge of innovators should not be held against them for not having been able to say no to unfair terms and conditions. The prior informed consent followed by the Honey Bee Network is obligatory in every such transaction.

funds complemented by product development fund has stifled the entrepreneurial potential of the people.

7. *Intellectual property rights and technology licensing:* Notwithstanding various ideological biases for or against IPR system, it is our suggestion that knowledge rich, economically poor people should not be denied their knowledge rights. The framework for assertion and articulation of these rights may vary from place to place and among various social communities and individuals. There should be sufficient flexibility in the formal system to recognize and respect the conventional mechanisms for protecting these rights. There is practically no community that we are aware of which does not have some norms of drawing boundary around the knowledge rights of the individuals or groups thereof. In several papers over the last two decades, various nuances of the tension between the traditional and the contemporary forms of knowledge rights have been discussed [Gupta…..]. The central argument here is that the interaction between public, private and community rights over knowledge vis-à-vis natural resources create a matrix of opportunities. One has to tailor the incentive system so that conservation and augmentation of knowledge and resources takes place in a sustainable manner. Key policy gaps are:

    i. A legally sanctified global registry of local knowledge and innovations to provide incentives to people for disclosure [Gupta, ……]. It was proposed to set up INSTAR [International Network for Sustainable Technology, Application and Registration] at WIPO level so that both the objectives of promoting people to people learning and protecting the knowledge rights could be simultaneously achieved.
    ii. The right to life should obviously take precedence over right to property. The concept of Technology Commons has been developed [Sinha, 2009] so that people to people learning is not impeded and at the same time, people to firm is facilitated through licensing agreements. The idea is that a lead technology or a primary innovation becomes the anchor Technology Commons. All those who have imitated but also made improvements are encouraged to pool the specific improvements in a Technology Common around the lead technology. None of the members of the commons can license technology on their own, but as a group they

can delegate the power to the lead innovator to license the entire bundle or the commons to a third party for a consideration. The rights of the lead innovator would be weighed more than that of those who made marginal improvements. Such a concept does not prevent imitative learning at community level so long as it is used for making one's livelihood possible through self-employment.

iii. A fast track system for protecting the incremental innovations based on Australian Innovation System with maximum five claims, eight to ten years protection and grant within three months at a very low cost without requiring an elaborate examination. Lesser the cost of protection, lesser is likely to be the licensing cost. This will provide opportunity to micro and small entrepreneurs to license such innovations.

iv. A community innovation system to register traditional knowledge in the name of communities so that they have incentives to disclose, learn from each other and license their knowledge to those who can add value and share the benefits from commercialization.

v. Incentives for creative public goods in the form of prioritized and subsidized access to knowledge, technologies and other institutional resources. The experience shows that majority of the people may like to share their knowledge freely without bothering about much reciprocity. The problem is that young people get dissuaded from practicing or improving such knowledge, which they have seen as kept their elders as poor. We have to find the right mix of incentives and institutional support system that nourishes the generosity of local communities without punishing them for the same.

There are several other elements required in the eco-system such as open source platforms for collaboration, low cost access to public databases from which knowledge can be retrieved in local language and in multiple formats, the specialized windows of opportunity for women and focused educational and skill building programmes to augment traditional knowledge and skills.

The public policies for education, health, infrastructure, economic development and conservation of resources have to synergise. In a segmented bureaucratic system, used to working in silos, such synergy is not easy to achieve. However, hopes cannot be pawned in the hands of prejudices. One has to keep an open mind and believe that every public system has mavericks who would turn around the opportunities for the socially disadvantaged sections of the society. Private enterprise can also be motivated to join hands with such mavericks and trigger initiatives, which expand civil society space for experimentation and innovation. One must not ignore the fact that sustainability is a double-edged sword. Every innovation makes certain practices non-sustainable. The trick is to select, screen and support such interventions and initiatives, which do not require a trade off between conservation and creativity, collaboration and compassion and consideration and constraint free dissemination of knowledge and innovations.