Frugal, flexible and friendly innovations for extreme affordability: Engagement with Honey Bee Network

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About 25 years ago, I was in a workshop with carpenters and blacksmiths in rural Karnataka, south India to discuss the way in which local innovators solve their problems. The wood used in the plough shear has to be very strong, dense and durable because of the obvious friction it has to bear while ploughing the land. Traditionally, farmers had used slow growing species like acacia sps, which have dense wood for the purpose. Over a period of time, the front edge of the shear gets blunted. Farmers don't want to throw away the rest of the shear. Thus begins the material science research. The farmer went to the junkyard and started looking for different kinds of scrap of which he could make a shoe to be fitted on the shear. The metallic shoe will increase the life of the plough manifold. The rear portion of the shear has many years left. Finally, the metal used for suspension in the automobile was found to have the right combination of strength, weight, torque and durability. The point is that intuitively the local artisans and farmers have been doing some kind of material science research but, their choices are limited, their repertoire restricted and therefore the outcomes may be sub-optimal.

Two young farmers viz., Mehter Hussain and Mushtaq Ahmed from Assam made a windmill costing Rs.5000/= to pump water for their small farm. Their problem was not to get too much of water too soon. A small hand pump energized by windmill was sufficient for their need. Who would ever imagine an application of this kind and at this cost? When the same windmill was adapted for salt workers in Gujarat, it had to be made of iron and the cost increased to Rs.50000. Although the height was only about 25 feet, it could be bent 90 degrees downwards so that a strong storm can pass over without damaging the windmill. Once you add such a feature, you don't need to make a very strong windmill and you don't need very deep foundation either. The flexibility, the frugality and affordability make such innovations quite user friendly. The interesting thing is that such designs are often a work in progress. The user can still adapt them, modify them and amplify their features.

There are thousands of such examples in the Honey Bee Network database mobilized over last more than two decades from around 545 districts. It took SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions) with very limited resources to mobilize 10000 innovations and traditional knowledge practices in the first ten years. In the last ten years, additional 140,000 ideas, innovations and traditional knowledge practices were mobilised from all over the country through NIF (National Innovation Foundation). A micro venture innovation

fund was set up in 2003 with the help of SIDBI [Small-scale Industries Development Bank of India] to provide risk capital to the innovators intending to become entrepreneurs. Many of these innovations are valorized through linkage with formal science and technology institutions institutionalized through MOU with CSIR [Council of Scientific and Industrial Research] and ICMR [Indian Council of Medical Research]. This year, the Union Cabinet took decision to make NIF the part of National Innovation System by making it a grant-in-aid institution of Department of Science and Technology. This has expanded the opportunities and enhanced the potential. Honey Bee Network and SRISTI have also tried to create global platforms for lateral learning among people and institutions from grassroots innovators. One of such initiatives covered various commonwealth countries, another India, China and Brazil and third Asian Pacific countries including Malaysia, Indonesia, China, Philippines, Vietnam, Sri Lanka, etc. China has taken up the cause of grassroots innovations in a vigorous manner in the last six years. Malaysian Science & Technology Minister visited NIF, SRISTI and IIMA to build a lasting partnership for the purpose. A Global Grassroots Innovation Augmentation Network (GIAN) was proposed along with the Tianjin Declaration for creating online, multimedia, multi-language platform for collaborative design and development – a dream yet to be fully realized.

The lessons for frugal fabrication and people-driven innovations:

a. The trade-off between affordability and accuracy may make a significant difference to the issue of accessibility and effectiveness. More accurate solutions need not always be more effective.

b. Many of the innovators use very old materials and design products using old tools. The library of materials and publication possibilities has not been ever provided to grassroots innovators. If Virendkumar Sinha, a mechanic from Bihar can develop a pollution control device for capturing about a kilogram of carbon a month from the exhaust of 12 HP diesel engine and at the same time reducing the sound by half, it was not too much a tribute to the material as to the design. If his repertoire of material was richer, he could have developed even more efficient solution.

c. The human-powered fabrication tools are a need of the hour given the uncertainties of power supplies and inability to afford a diesel engine. We have several pedal-powered woodcutting, drilling and shaping machines, which can be improvised even further. A library of functional tools, which can help transmit energy from one form to another, will be very useful. Large number of hydro turbine, biomass gasifier, terrain-induced energy powered bicycles, etc., need such solutions. NIF has more than a half a dozen compressed air vehicles and engines where the innovators don’t have access to carbon fibre tanks or other such technologies for

generating more efficiency than what normal tanks make it possible. The central issue is to create a kind of periodic table of materials for different functional and fabrication needs. People at the grassroots level may find such a matrix extremely helpful in narrowing down their search. There is little that modern science and technology has done for knowledge rich, economically poor people. But it can do a lot more. d. One of the possible gains that NSF/ASME can draw from the partnership with creative people at grassroots is access to new heuristics for frugal thinking, flexible fabrication and multi-functional designs. Nature is frugal, resilient, diverse and multi-functional. Getting close to people who are close to nature, 3 and depend on it for meeting major needs may imbue in us a sensitivity, a perception, a compulsion to know, feel and do what we must. Honey Bee Network, SRISTI, GIAN and NIF are keen to forge partnership with all colleagues who are willing to share their expertise with innovators in informal sector and contribute towards empathetic and Gandhian engineering solutions.