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Abstract

The supply chain management is at the core of globalising world. Today the large corporations are able to source materials from all around the world and sell it in the most interior parts of the developing and developed world. With the increase in oil prices, this model of globalisation is coming under strain. But there are some other challenges also facing the dominant globalisation model. The call to large corporations to look for the fortune at the bottom of the economic pyramid implied dipping into the limited purchasing power of the economically poor people. Assumption was that given the cultural bias in favour of poor emulating the lifestyle of the richer people ('Sanskritisation'), the possibility of selling products and services at affordable prices to the poor were immense. It did not matter if the market for locally produced goods and services got suppressed, creating a constraint for the growth of above model. Apart from the logistical issues in meeting scattered, small and uncertain demand in rural areas, the ethical and efficiency issues also did not get addressed.

In this paper, I am challenging the viability of current model of globalisation. To me, unless sufficient space is created in global markets for grassroots products and services, the present model is just not sustainable.

I would like to first discuss the emerging innovations at grassroots level which can help us think about new models for moulding markets at local, regional and global level. Later, one can better appreciate the logistical implications of integrating horizontal and vertical markets. Finally, I would like to speculate about the future shape of distributed, modular manufacturing for meeting local as well as global needs.

Linking Vertical and Horizontal Markets for Innovations at Grassroots: Sustainability Imperative¹

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The supply chain management is at the core of globalising world. Today the large corporations are able to source materials from all around the world and sell it in the most interior parts of the developing and developed world. With the increase in oil prices, this model of globalisation is coming under strain. But there are some other challenges also facing the dominant globalisation model. The call to large corporations to look for the fortune at the bottom of the economic pyramid implied dipping into the limited purchasing power of the economically poor people. Assumption was that given the cultural bias in favour of poor emulating the lifestyle of the richer people ('Sanskritisation'), the possibility of selling products and services at affordable prices to the poor were immense. It did not matter if the market for locally produced goods and services got suppressed, creating a constraint for the growth of above model. Apart from the logistical issues in meeting scattered, small and uncertain demand in rural areas, the ethical and efficiency issues also did not get addressed.

In this paper, I am challenging the viability of current model of globalisation. To me, unless sufficient space is created in global markets for grassroots products and services, the present model is just not sustainable. While transportation both ways poses sustainability challenge, there is a slight difference in the well being/welfare outcomes of top down and bottom up supply chains. When the metropolitan consumers create demand for diverse products based on high nutrition and say low productivity crops and other products from dry regions or mountain areas or forests, there could also be an incentive for conservation of diversity. In addition, the flow of income and information

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would create opportunities for investment in the logistics of mass sourcing rather than just the mass distribution and consumption. But in this entire discussion, we are ignoring the role of horizontal markets, i.e., procurement and distribution of goods and services at local level, i.e., from village to village or from small village to town and vice versa. If all other technological paradigms remain constant, there is a limit to which some of the products made for small markets can compete with low cost mass consumption products at much lesser prices. In certain commodities, the smaller logistical loops may give a comparative advantage.

I would like to first discuss the emerging innovations at grassroots level which can help us think about new models for moulding markets at local, regional and global level. Later, one can better appreciate the logistical implications of integrating horizontal and vertical markets. Finally, I would like to speculate about the future shape of distributed, modular manufacturing for meeting local as well as global needs. If the design and the knowledge travel the farthest, the goods and services can indeed travel much smaller distances and generate wider consumption satisfaction. The role of user driven innovations will become vital in reshaping the markets. But users not of existing products but also of potential products for which they will provide the feed forward.

Part One

Emerging designs of technologies, products, social network and services at grassroots

The scouting and documentation of tens of thousands of grassroots innovations and traditional knowledge practices through Honey Bee Network from over five hundred districts has created a vast potential of creating knowledge and entrepreneurship network. The innovations could be in the field of agricultural, transport, farm machinery, other machineries, energy, food processing, herbal medicine for human and animals, other utilities, etc. One can find hundreds of examples at www.nifindia.org and www.sristi.org besides www.indiainnovates.com. Many of these innovations can help in solving

problems in other developing as well as developed countries. For example, a herbal pesticide or growth promoter or herbal veterinary medicine can be useful for agriculture in Germany or Europe as well. Likewise, a small motorcycle based ploughing machine will have less weight, compact the soil less and have greater manoeuvrability on slopes, vineyards or other small gardens. Cycle that generates energy from the unevenness on the ground or the road can be very helpful for mountainous track or other even smooth tracks. Amphibious cycle can be a source of amusement and also exercises where water bodies or channels exist.

There are cell phone based technologies, anti-theft devices such that if anybody intrudes into secure region, SMS would be sent to as many as ten different people intimating the intrusion. Likewise, a truck fitted with a cell phone would intimate at regular frequency the mobile tower zone to the control centre so that the movement is tracked. There are low cost technologies for energy generation and conservation. There are also utilities, which can be multi functional. For instance, a washing cum exercising machine, a two wheeler based mobile washing machine, flour grinding mill, spray paint device, etc. In depressed regions where low-income people cannot afford individual devices, mobile devices can help generate jobs and also meet the needs of disadvantaged people including old people, who may have the devices but not the ability to use them.

The herbal medicine after due validation through formal testing system can provide, in many cases, low cost affordable solutions. Herbal fruit ripeners, nutraceuticals and other functional foods provide wholesome healthy alternatives to chemical based products. The challenge is to link the demand from consumers around the world with the providers and producers at grassroots level. In many cases, the grassroots green entrepreneurs may not have either the skill or the resources to comply with various logistical requirements of such a long distance supply chain.

For local neighbourhood and regional economy, the complexities are lesser but still require transport, packaging and financial systems to be integrated for seamless production and supplies.

Part Two

Integrating vertical and horizontal markets

Logistics for vertical markets for grassroots innovative products and services:

Why is it necessary to link natural diversity underlying varying food and biodiversity systems with global consumption and well being. Let me take an example of one of the most common problems of modern age in developing as well as developed country. This is about arthritic pain. There are two key reasons for the problem: one relates to calcium and its availability in the body and the second, boron, a mineral mobilised from the soil through the food which affects calcium availability as well as other metabolic pathways affecting the pain. Israel has minimum incidence of arthritis in the world possibly because of its soils being very rich in boron. Whereas in many other parts of the world, where boron deficiency exists, the problem is acute. There are studies to show that local varieties of maize, for instance, mobilise much higher quantities of boron than high yielding varieties of maize. The local varieties, we know, are grown in mountainous regions and dry regions, of the developing world. The products made of such grains when consumed by the people needing functional foods create incentives at local level for conservation, higher incomes without spoiling the soil and related eco system and for the logistics team. Likewise, there are large number of other products such as drinks made of cactus, dishes made of bamboo seeds (one of the highest sources of energy) and food products made of minor millets. Unless income from the pockets of richer people does not get spent on buying products and services provided by low income communities, how would income transfer take place.

Let me illustrate the logistical implications of linking Grassroots to Global (G²G). Let us assume that *indiainnovates.com* is a e-commerce enabled platform. It may have a GIS enabled map of the world with different search category for innovative grassroots products. If one wants traditional foods rich in magnesium, or zinc or boron or iron, etc., one can search and find the locations offering different kinds of foods in different forms (biscuits, drinks, liqueur or other products). Once the consumer decides to buy some of these products, he or she places an order. That order is passed on by the portal to courier agency. Since different products have different shelf life as well as requirements of packaging, the courier agency will contact the packaging agency already brought on board. The courier agency provide appropriate package for the products in question. The courier agency takes the package to the household or the community providing the product to put it in the special package brought along with. It is then delivered to the consumer and the payment has already been credited to the account of the producer. Millions of households around the world, below the poverty line, will no more be just the consumer. They would become entrepreneurs and providers³.

There are several arguments which have been put forward against purchase of green goods from developed countries. One of the most oft-repeated arguments is that ecological footprint. There is a merit in the argument so long as it is applied both ways, i.e., footprint of goods exported and imported. In general, we must try to reduce the footprint and I will discuss in the next part the model to attempt that. However, at this stage, we have to balance the need for sustainability with the compulsion for viability of the household economy in the marginal environments. Continued poverty in such regions would have much larger footprint on the global environment than anything else. Therefore, relative externalities of the grassroots to global supply chain and of degraded

³ This framework is completely opposed to the idea of Fortune at the Bottom of the Pyramid. To treat poor as only consumer is to deny them a destiny of dignity based development. Some of the status goods marketed to disadvantaged community may prop up their self-esteem for a while but they compete with some of the essential consumption by mothers, children and the old people in the same family. One might argue that markets cannot be the watchdog of such mindless promotion of consumption of goods not necessary for well being and development. It is not too long ago when consumer organisations around the world campaigned against promotion of milk powder as claimed to be better than mother's milk.

environment in the absence of such a supply chain, will have to be evaluated. Another argument is to support local agriculture so that land use and associated lifestyles can be managed. This argument also has merit. But this should be seen in light of WTO provisions, which seem to justify opening of the domestic markets for subsidized food products from the west. One has to balance the need for fair trade with fair consumption, distribution and consequent lifestyle. Certain kinds of lifestyles in the developing and the developed world are not sustainable. We have to ask self-critical questions about them. Even in the engineering sector, we should think about distributed fabrication and manufacturing.

The idea of fab lab developed by a group of scientists around the world led by my dear friend, Neil Gershenfeld at MIT is a very promising one. To enable common people to hone their skills and fabricate chips, other products using open source software and widely available tools at low cost and with high precision is a goal worth pursuing. The idea is that knowledge is globalised as a public good and is applied to local conditions through a set of easily affordable tools, packed may be in mobile workshops. The network of innovators and tinkerers, roadside mechanics and other artisans may like to use these tools to fabricate products and services at low costs and with high precision. Extending the argument, we should not be surprised if mobile phones are fabricated in different districts and only key the library or catalogue of key components is transported from one part to another. Thus, bulk will reduce and the footprint will go down, the participation of users in designing products suiting to their needs will increase and the economy will become much more distributed in its character. Similar may be the case with many other knowledge intensive products. The days of mass consumption of centrally manufactured goods and services seem to be coming to an end.

Designing horizontal markets: following from the verticals discussed above, the design of horizontal markets will be quite different. The nature of packaging required for short distance consumption obviously does not have to be of the same quality as would be necessary for long distance. The nature of goods and services, which can be consumed

locally, will also vary because of relative symmetry in the access to basic raw materials and skills. There are several models that can be tried. More than a decade and half ago, an innovator Upplenchwar tried an interesting experiment. He had developed a herbal pesticide. He wrote the formula on the school wall of his village and also sent postcards to thousand villages in the district with the formula. He made a simple point. Anybody could use the formula and develop the herbal pesticide, but if some people found the drudgery of pooling the materials and making the product too much, they could buy ready made product from him. We are testing this model in Gujarat. The logic is that knowledge is open source and production can also be democratised. However, for those who want to avoid the hassle (number of such people is very large), a local distribution chain has to be developed.

Another model was tried in Kerala as a part of micro finance movement. In Idukki district, NIF join hands with a Honey Bee Network partner PEDES to pool the traditional knowledge of women around different issues ranging from weaning foods, child care, women's health, food processing, skin care, herbal cosmetics, etc. During monthly meetings, such knowledge was collected, sorted out, screened and the best practices were pooled to develop products. These products were packaged locally for sale to other self-help group of women. Horizontal market of this kind is small. However, with better logistics management, one can integrate both horizontal and vertical markets.

In Gujarat, we recently organised a meeting of lead innovator who had developed a motorcycle based ploughing machine. Several imitators, improvisers, other fabricators and users were invited apart from some institutional scientists who had also developed an improved model. After everybody critiqued each other's model, a discussion followed about building future model of 'technology commons'. All the members of local community of fabricators had discussion about the way they can learn from each other. It was agreed that there should be no restriction on learning from each other within a community or nearby region so long as people are using the technology for their own survival. However, if a company wanted to use their technology, they should be required

to take licence. For others, all the improvements along with original innovation were part of technology commons (Sinha 2008). At this stage, a very interesting issue emerged. Should not they agree to have some standard components. If so, will not they all become competitive, cost effective and offer more affordable solutions thus expanding the overall market. This was an idea, which even we had not thought about. This raises an interesting possibility of combining customisation (so necessary for farm machinery) with standardisation.

There can be many more models of horizontal markets. A distributed assembly line where different groups assembled modules which are later integrated to fabricate the final product. Or providing kit bags with some standardised components leaving the local users to provide the remaining components from local materials and thus fabricate the product.

Part Three

The future of logistics

The logistics define the shape of final designs. If the way materials, knowledge and skills are sourced today continues, certain kinds of industries might grow a great deal but overall social harmony might decline. The growth of India and China is not inclusive enough. And therefore, this growth cannot be an engine for long-term sustainable development of the world.

The fuel prices are unlikely to fall in foreseeable future. Within last three years, the rising energy costs have made it very apparent that the philosophy of logistics must undergo a restructuring. The issue of sourcing things where they are cheapest may have to shift towards sourcing from where the knowledge about the things, their use, disposal and recycling is highest. Therefore, there will be incentives for people not just to extract, particularly natural resources, but to do so in a sustainable manner and with knowledge of

their sustainable consumption. The consumers will have to become part of production, distribution and disposal. To some extent, they are. But, their contribution to the design of supply chain, is rather limited. The consequence is that large number of people are not able to express their creativity and innovation in social and/or economic market. We are not reinforcing collective consumption, except in some rare examples of car pooling or collective buying. Sustainable lifestyles require balancing individual interests with collective and public interests. All the three domains of knowledge and resource rights, private, community and public (Gupta and Sinha, 2002)⁴ have to be kept in mind for integrating horizontal and vertical markets.

I hope that the contribution of Honey Bee Network in thinking afresh about the mechanisms of respecting, recognising, and rewarding creativity at grassroots will generate a rethinking in the community of logistics planners. They can reverse or at least balance the heavily biased globalisation model against local innovators and community members. Finally, the mutuality of meanings and interests will emerge between north and south and north in south (the developed regions and people within developing countries) only when vertical markets are integrated with horizontal markets. G²G can remain an empty slogan or can actually become a movement for empowering creative people at the grassroots. The effort of NIF to find markets for products made by grassroots innovators in all the five inhabited continents demonstrate the potential that exist for creating space in global markets for local innovative products. We have to now invigorate local markets for local products as well. The seriousness of the situation can be imagined from the fact that not even one per cent of the savings of the members of micro finance movement, celebrated around the world, are spent on the products and services made by the members of other groups. Their savings have generated markets for the products made by large corporations but not the other way around. Large corporations seldom procure anything practically from such people. The two words of those whose incomes are growing

⁴ Gupta, Anil.K., and Riya Sinha, Contested Domains, Fragmented Spaces: rights, responsibilities and rewards for conserving biodiversity and associated knowledge systems, in Traditional Ecological Knowledge for Managing Biosphere Reserves in South and Central Asia (Eds., P.S.Ramakrishnan, R.K.Rai, R.P.S.Katwal and S.Mehndiratta), Delhi, Oxford & IBH Publishing Co. Pvt. Ltd., 2002, p. 161-181

exponentially and the ones who are finding difficult to make two ends meet cannot remain unconnected for too long. This connection requires blending ethics, equity, environment, excellence, efficiency, empathy and education. I hope that logistics design community will think afresh about the challenges I have posed so that sustainable outcomes become inevitable.

The fact that horizontal markets reinforce democratic and participatory spirit implies the future world could be more humane, less coercive and less extractive.