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Connecting corporations and communities: Towards a theory of social inclusive open innovation

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Abstract

Despite pervasiveness of the market forces and supplementary role of the state and in some cases, even civil society organisations, there are unmet social needs which remain unaddressed by the existing institutions. With industrial growth becoming jobless, the need for new models of social innovation is being felt all around the world to provide jobs to the youth, skills for the new economy and entrepreneurial opportunities for transforming resources and skills. The persistence of some of these unmet needs (also referred as wicked problems sometimes) or unaddressed problems for a long time shows that the existing institutional arrangements are inadequate for the purpose. Innovations are imperative. A socio-ecological system that recognizes and rewards innovation can withstand many external shocks, provided it is agile and innovates quickly to remain responsive to emergent challenges (Anderies, Janssen, & Ostrom. *Ecology and society*, 9(1)2004).

Whether corporations will follow an open innovation approach to blend grassroots ideas and innovations with their expertise in a reciprocal, responsible and respectful manner (Gupta et al., *Journal of Open Innovation: Technology, Market, and Complexity* 2: 16, 2016) is still an open question. The design of appropriate manufacturing and frugal supply chain will then become closely linked with other features of open innovation ecosystem. The debate on the role of social innovation in multi-stakeholder context in European focused on how these innovations fostered trust among different actors and influenced policy (Defourny and Nyssens. *Social Enterprise Journal* 4: 202–228, 2008).

In this paper, we describe the market and social forces which influence the emergence of social innovations through various processes. We then look into the evolutionary pathways for social innovations (Mulgan, *Innovations* 1: 145–162, 2006), to avoid inertia and spur initiatives to bridge the social gap in an inclusive manner through mobilization of youth in particular. The ecosystem for social open innovations provides scope for connecting corporations and communities (Herrera, 2015; Gibson-Graham and Roelvink, *Social innovation for community economies: how*, 2013). Following the theory of reciprocal and responsible open innovation systems (Gupta et al., *Journal of Open Innovation: Technology, Market, and Complexity* 2: 16, 2016), we explore the way barriers are overcome on the way to reach the base of economic pyramid [BOEP] customer.

Technological adaptability and institutional or market adaptability are explored to understand how communities get empowered to deal with corporations through an open innovation platform. The corporations need to be empowered to understand the decision heuristics followed by grassroots and community frugal innovators (Gupta, *Innovations* 1: 49–66, 2006). Just as communities need to be empowered to negotiate fair and just exchange relationship with corporations (Honey Bee Network, 1990–2017).

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Finally, we conclude with the recommendations based on the experiences of grassroots innovators that can enrich both social innovations and social enterprises following commercial as well as social business models for meeting the unmet needs of the disadvantage section of the society.

Introduction

Despite pervasiveness of the market forces and supplementary role of the state and in some cases, even civil society organisations, there are unmet social needs which remain unaddressed by the existing institutions. With industrial growth becoming jobless, the need for new models of social innovation is being felt all around the world to provide jobs to the youth, skills for the new economy and entrepreneurial opportunities for transforming resources and skills. The persistence of some of these unmet needs (also referred as wicked problems sometimes) or unaddressed problems for a long time shows that the existing institutional arrangements are inadequate for the purpose. Innovations are imperative. A socio-ecological system that recognizes and rewards innovation can withstand many external shocks, provided it is agile and innovates quickly to remain responsive to emergent challenges (Anderies, Janssen, & Ostrom, 2004).

Whether corporations will follow an open innovation approach to blend grassroots ideas and innovations with their expertise in a reciprocal, responsible and respectful manner (Gupta et al. 2016) is still an open question. The design of appropriate manufacturing and frugal supply chain will then become closely linked with other features of open innovation ecosystem. The debate on the role of social innovation in multi-stakeholder context in European focused on how these innovations fostered trust among different actors and influenced policy (Defourny and Nyssens 2008).

In this paper, we describe the market and social forces which influence the emergence of social innovations through various processes. We then look into the evolutionary pathways for social innovations (Mulgan 2006), to avoid inertia and spur initiatives to bridge the social gap in an inclusive manner through mobilization of youth in particular. The ecosystem for social open innovations provides scope for connecting corporations and communities (Herrera, 2015; Gibson-Graham and Roelvink 2013). Following the theory of reciprocal and responsible open innovation systems (Gupta et al. 2016), we explore the way barriers are overcome on the way to reach the base of economic pyramid [BOEP] customer. Technological adaptability and institutional or market adaptability are explored to understand how communities get empowered to deal with corporations through an open innovation platform. The corporations need to be empowered to understand the decision heuristics followed by grassroots and community frugal innovators (Gupta 2006). Just as communities need to be empowered to negotiate fair and just exchange relationship with corporations (Honey Bee Network, 1990–2017).

Finally, we conclude with the recommendations based on the experiences of grassroots innovators that can enrich both social innovations and social enterprises following commercial as well as social business models for meeting the unmet needs of the disadvantage section of the society.

Part I

Theory of social innovation

Social innovations emerge to meet the need unmet due to failure of markets, state and even civil society or augment, transform and restructure the existing ways of meeting such needs. Sometimes, technologies emerge which can be applied to deliver existing services better to meet the unmet or under-met needs of the disadvantaged section. Social innovations may involve several channels for serving the society such as social business/enterprise, social innovation based profit or non-profit enterprise, association, cooperative, groups or even individual social change agent. Sometimes, social innovations involve mobilizing people through new social movements. These movements may have a single or multiple locus of institutional core or anchor. The Honey Bee Network is a new social movement without any legal structure or boundary. But it has spawned several institutions such as Society for Research and Initiatives for Technologies and Institutions [SRISTI], Grassroots Innovation Augmentation Network [GIAN] and National Innovation Foundation [NIF] which provide institutional anchor to sustain the movement. It has also networked numerous other institutions, individuals and groups which may partly or wholly subscribe to the network philosophy in serving the society. Social networks play a very critical role in evolution, testing, diffusion and further modification of social innovations (Moore and Westely 2011, Chalmers 2013).

The social business can be defined as an economic activity addressing an unmet need of the disadvantaged people or making an existing delivery system more efficient, effective and accountable to different stakeholders including the people to be supported. Social business can have profit or non-profit purpose but its goal is not profit maximization (Yunus 2010). In the case of profit-oriented enterprise, a large part of the profit goes back to the people. Amul Dairy Cooperative movement is able to give back more than 80% of the value of the milk provided by the farmers to them as payment. In the 20% margin, it manages the entire supply chain, logistics and other manufacturing infrastructure. Incidentally, Amul is the biggest brand of India worth 30,000 cr rupees (USD 5000 mill). A business may share entire surplus with the people involved in the provision of raw material and/or consumption of the final product and service, as is the case with many cooperatives. Such businesses may or may not grow very far depending upon the resources they set aside for replacing the infrastructure [depreciation], skill development and enhancement of capabilities of staff as well as customers, R&D, innovations for designing new products and services to expand market and serve existing clients more empathetically. Social business can be evaluated on the parameter of inclusiveness. There are six kinds of exclusion which a social business or an enterprise should try to overcome completely or substantially. Every social enterprise/innovation/business must serve the people in relatively inaccessible areas, engaged in neglected sectors, having skills for which market has come down or doesn't exist, suffer from seasonal or temporal exclusion and belong to social classes which have historically remained suppressed, bypassed, exploited and under-served and governed by structures which give priority to serve the poor. *If social, sectoral, seasonal, spatial, structural and skill-based exclusion is not overcome, then an enterprise is not inclusive or inclusive enough.* Existing corporations may not have inclusivity in all their functions. They may not hire sufficient women or staff from neglected social classes. But, they may serve them better than others. *It may not always be possible to have inclusivity in all functions and all services and yet such inclusion is desirable.* For example, a social

health enterprise may not have medical doctors coming from tribal or scheduled caste background and yet it may serve the most neglected people in the most affordable and accessible manner. The medicine may be affordable but manufactured by Multi-National Corporations and not small distributed businesses.

The design of institutional platforms that reduce or eliminate the ex ante and ex post transaction costs of product and service providers and users in a given situation of social inequity may depend on the degree of openness for mutual learning between formal and informal sectors existing in the eco-system. *Higher the openness, greater may be the flexibility in designing open innovation platform.* The conventional framework of open innovation has referred to corporate willingness to learn from outside but less often about the extent to which a corporation shares its knowledge with outsiders. The central tenet of the Honey Bee Network has been openness in sharing, learning and valorizing people's knowledge through cross pollination and linkage with formal science and technology, business and financial sectors.

Many farmers and artisans share their innovations openly without caring about the possible revenue they could have generated by keeping it confidential or restricted. A concept of *technology commons* was developed to ensure that despite IPR protection, people to people sharing is allowed and encouraged. However, the grassroots innovations can be accessed by a commercial company only through license (Sinha 2008, Gupta 2012). This is a hybrid version of open and close system of innovation. Generally, most grassroots innovators benefit from the feedback they get from the community members including users and non-users of their innovations. In some of the open innovation communities in formal sector, similar values exist.

There has been a long debate about the difference between social innovation, social enterprise and social business. The *social innovation* is a creative and compassionate solution for an unmet need of a disadvantaged social segment so far excluded from the benefits of development. It is not necessary that the solution may emerge only from the people who are affected by the problem. When it does, it becomes an example of social innovation *from* grassroots. When it is developed by outsiders such as a corporation or a public sector agency or a voluntary organisation, it becomes innovation *for* grassroots. One can also have social innovations emerging at grassroots though with or without involvement of people as designers and/or users or both. When such solutions have to be provided to several communities on an ongoing basis, one needs an operational, logistical supply chain. Such manufacturing and supply of solutions may take place on commercial basis or not for profit basis. It can also happen that moderate profits are generated but not shared with the promoters as applicable in section 8 companies or what Prof. Yunus calls as social business. The programmed development and delivery of goods and services at the door of needy communities with or without full cost recovery is called *social enterprise*. The line between social innovation and enterprise is fuzzy. *Once an activity acquires an entrepreneurial propulsion backed up by a budget and a revenue recovery system, it acquires an enterprise format.* The cost of services or products may be met by third party or through CSR funds, through crowd funding or endogenously by the community itself [Fig. 1].

The emergence of social innovations in any society indicates that some of the unmet social needs have spurred experimentation for searching a solution. Market failure occurs when the cost at which solution is available is beyond the reach of majority of those who need the solution. The state failure takes place when public policy either

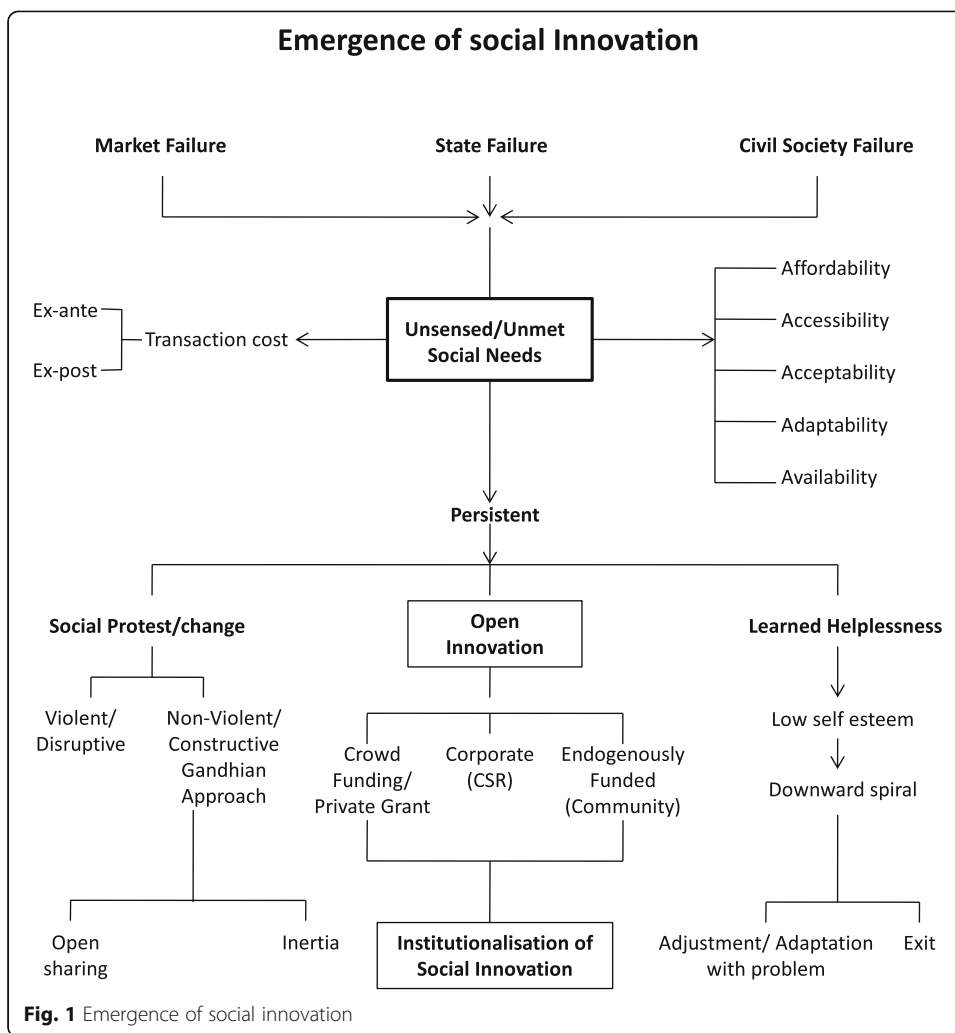


Fig. 1 Emergence of social innovation

does not target the most affected people or uses indicators which do not ensure that the most needy benefit from existing delivery systems. Civil society failure happens when even the voluntary organisations find it either infeasible or lack resources to reach the unreached social segments. In such a situation, some of the affected people or other individuals may develop an accessible, affordable, adaptable solution available to the most needy ones. If these initiatives are converted into innovation through open learning and open sharing, then social innovation also becomes an open innovation. Sustainability of such solutions depends upon the degree of reciprocity among provider, consumer and facilitator of the delivery systems. To illustrate, in many of the semi-arid regions with limited irrigation potential, high climatic fluctuation, markets are often weak because of poor infrastructure. Even the public systems are weak because often the state uses such locations as punishment postings for laggard officials. Since neither the bureaucratic system nor the political system is much inclined to serve the interests of such people, the instances of apathy and inadequacy are rampant. In one such case, during our learning walks, Shodhyatra, we came across a practice for pest control which are very sustainable and extremely affordable. The problem of termite attack in wheat in drylands is quite pervasive. Most farmers being poor, cannot afford chemical

pesticides which are also not very effective in such cases. The private sector agencies and public sector scientists have not paid adequate attention. A farmer shared a very interesting and extremely affordable solution. He mentioned that while irrigating the wheat crop, they put cut pieces of cactus like *Euphorbia* or *Opuntia* in the irrigation channel. The latex of these cacti dissolves in the water and spreads in the field to help control termites. This is an open innovation socially extremely useful and affordable by the poorest people and developed also by the poor people.

Social innovation by women: a case study of recipe competitions

We conduct recipe competitions during the Shodhyatras to celebrate local culinary creativity and innovation as a social innovation. Women use their knowledge of edible and therapeutic weeds or companion plants (weeding is mostly done by women), waste from fruit and vegetables like the pericarp, etc. Tables 1 and 2 lists uses of weeds reported in three villages of eastern Uttar Pradesh (Dey, Singh and Gupta, 2015). Women share their knowledge and innovations in open, beyond the caste, class or other boundaries. This helps them to effectively cope with the stress period in the households. It was recommended that to strengthen the agency/ability of women, we need platforms like The Honey Bee Network where peer group exchange of knowledge and expertise is encouraged and facilitated. Such institutions will also maintain an open database of such knowledge which can be recalled, retrieved and redistributed whenever needed. It has to be in a media and language with which the women in the region are comfortable and conversant. "The knowledge transfer across generations, particularly among women is vital for maintaining sustainability quest of vulnerable communities." (Dey, Singh and Gupta, 2015).

Social Innovation and community resilience

In addition to the examples of open exchange of knowledge, expertise and resources described in Tables 3 and 1, there are many other examples in the Honey Bee Network [honeybee.org, Sristi.org] of indigenous knowledge and innovation which impart resilience to the communities. Harbhajan Singh, a small farmer from Hisar decided to irrigate cotton field in alternate rows. The water requirement went down by half. The pests attack also got reduced because of less succulence in the plant. The pesticide cost and its adverse environmental effects also got reduced. The challenge in diffusing such social innovations really is that the user cannot be expected to pay for such open source information. Therefore, third party agency has to bear the cost of diffusion. When social entrepreneurs and innovators fail to mobilise resources either through crowd funding or subsidies/grants, such extremely affordable and democratic sustainable innovations fail to diffuse. The process of development then does not become inclusive enough.

Insistence on full or partial payment by users for such knowledge, practices or sometimes even tangible solutions [such as low cost devices for physically challenged people] may lead to exclusion of the most needy and the poorest ones. In this paper, we have argued for a framework that reduces transaction costs on supply and demand side and make such intermediation possible that needs of the most disadvantaged people don't remain unmet. The way institutions are designed and monitored, it is becoming more

Table 1 Some of the plants used in recipe competitions conducted during Shodhyatras

SN	Plant Vernacular name	Scientific Name	Family	Plant part used in the recipe	Life span	Traditional uses	Pharmacology
1	Mokha	<i>Schrebera swietenoides</i>	Oleaceae	Tender branches, leaves, fruits	Perennial	Anemia, dyspepsia, colic, flatulence, skin diseases, leprosy, diarrhea, urethrorrhea, splenomegaly, helminthiasis, boils, burns, rectal disorders, digestive purgative, stomachic, anorexia, haemorrhoids, diabetes and vesical calculi (Nambiar 1996)	Anti-oxidant (root), anti-inflammatory(root), antipyretic (root) (Manda et al. 2009), anti-anemic (root) (Pingali et al. 2015), antidiabetic(fruit), antioxidant (fruit) (Bagali and Jalapure 2010), hepatoprotective activity (fruit) (Bagali and Jalapure 2010)
2	Karad	<i>Dichanthum annulatum</i>	Poaceae	Grass	Perennial	Dysentery and manorrhagia (whole plant) (Nisar et al. 2014); fodder (Khan et al. 2012)	Antiviral (Fraction), antimicrobial (Fraction) and cytotoxic activities (Fraction) (Awad et al. 2015)
4	Mahuda	<i>Madhuca indica</i>	Sapotaceae	Leaves, fruits, rind	Perennial	Leave: chronic bronchitis, Cushing's disease (Prajapati et al. 2003); verminosis, gastropathy, dipsia, bronchitis, consumption, derma topathy, rheumatism, cephalgia and Haemorrhoids (Sunita and Sarojini 2013) Flower: cooling agent, tonic, aphrodisiac, astringent, demulcent, helminths, acute and chronic tonsillitis Seed: skin disease, rheumatism, headache, laxative, piles and sometimes as galactagogue (Umadevi et al. 2011)	Leave: Wound healing activity (Sharma et al. 2010); Expectorant, chronic bronchitis and Cushing's disease, Cytotoxic activity (Saluja et al. 2011); Antioxidant activity, Nephro and hepato protective activity (Palani et al. 2010); Antioxidant activity, Astringent, Stimulant, Emollient, Demulcent, Rheumatism, Piles and Nutritive, Antimicrobial activity (Khond et al. 2009); Verminosis, gastropathy, Dipsia, bronchitis, consumption, dermatopathy, rheumatism, cephalgia and hemorrhoids (Vaghiasya and Chanda 2009), Antihyperglycemic activity (Ghosh et al. 2009) Aerial part: Anti inflammatory, analgesic and antipyretic activity (Shekhawat and Vijayvergia 2010) Flower: Skin diseases (Prashanth et al. 2010); Analgesic activity (Chandra 2001); Hepatoprotective activity (Umadevi et al. 2011) Seed: Anti inflammatory (Gaikwad et al. 2009)
5	Doli	<i>Leptadenia reticulata</i>	Asclepiadaceae		perennial		Stern: Antianaphylact activity (Padmalatha et al. 2002), Vasodilation (Agarwal et al.

Table 1 Some of the plants used in recipe competitions conducted during Shodhyatras (Continued)

6	Mankachu	<i>Alocaceaeodora</i>	Araceae	Leaves and stem	Annual	<p>Leave: skin infections, ear disorders, asthma (Patel and Dantwala 1958); cough, asthma, tuberculosis; (Schmelzer and Gurib-Fakim 2013)</p> <p>Flower: eyesight (Shorrt 1878)</p> <p>Seed: gangrene (Schmelzer and Gurib-Fakim 2008), Aerial parts: oviposition deterrence of storage pests, stimulant and a tonic (Baheti and Awati 2013); Whole plant: anti-abortifacient, tonic, restorative, bactericidal, antifibrifuge, prostitutes wound healer; snake bite (Dandiya and Chopra 1970) (Bhatt et al. 2002); hematopeiosis, dysentery, emaciation, dyspnea, burning sensation, and night blindness (Sivarajan and Balachandran 1994)</p> <p>Leaves: digestive, laxative, diuretic, astringent, rheumatic arthritis (Mulla et al. 2009); styptic, abdominal tumors (The wealth of India 2004)</p>	<p>1960). Hepatoprotective activity (Nema et al. 2011)</p> <p>Aerial parts: Antifungal activity (Mishra et al. 2010), (Kaou et al. 2008), Antimalarial activity (Kaou et al. 2008)</p> <p>Leave: Antiasthmatic Activity (Baheti and Awati 2013), Anticancerous (Sathyanarayanan et al. 2007), Antitumor Activity (Bodhanapu and Sreedhar 2011)</p> <p>Whole plant: Antidepressant (Hakim 1964), Cardiovascular activity (Mehrotra et al. 2007), Oligospermic treatment (Madaan and Madaan 1985)</p> <p>Leave: Antidiarrheal activity, antiprotozoal activity (Mulla et al. 2011),antioxidant, antinociceptive, anti-inflammatory (Mulla et al. 2010); antidiabetic, and hypolipidemic properties (Patil et al. 2012); antifungal (Bhatt and Saxena 1980);hepatoprotective properties (Mulla et al. 2009)</p>
7	Tindodi	<i>Coccinia grandis</i>	Cucurbitaceae	Leaves	Perennial	<p>Leaves: skin diseases (Muthul et al. 2006);jaundice, leprosy, psoriasis (Sijja et al. 2008);asthma (Natarajan et al. 2013), ulcer (Alagesaboopathi 2011) (Vaidyanathan et al. 2013); piles, body cool (Jeyaprakash et al. 2011); rheumatism (Manjula et al. 2013); dysentery (Hasan et al. 2010)</p>	<p>Antioxidant activities (Umamaheswari and Chatterjee 2008); glucose tolerance (Attanayake et al. 2013); analgesic, antipyretic activity (Madhu and Ramanjaneyulu 2013); anti-inflammatory, analgesic (Pari and Kumar 2002); antipyretic (Pari and Kumar 2002; Nazi et al. 2009); hepatoprotective activity (Kundu et al. 2012); antibacterial activity (Sivaraj et al. 2011); Anticancer (Nanasombat and Teckhuen 2009) (Bhattacharya 2011); antidiyslipidemic activity (Mishra et al. 2012); antifungal activity (Bolay et al. 2010)</p>
8	Sejan	<i>Moringa oleifera</i>	Moringaceae	Leaves	Perennial	<p>Asthenia, Cough, Gonorrhoea, oligospermi, Hemorrhoids, High blood pressure, Immune deficiency caused by the HIV, Infertility, Intestinal worms, Fever, Malaria,</p>	<p>Cholesterol lowering action (Mehta et al. 2003); hepatoprotective activity (Pari and Kumar 2002); Cardiovascular Activity</p>

Table 1 Some of the plants used in recipe competitions conducted during Shodhyatras (Continued)

9	Bad phal	<i>Ficus benghalensis</i>	Moraceae	Leaves	Perennial	Diarrhoea, dysentery, abscesses (Baquar 1989),	(Faizi et al. 1994); anti-cancer activity (Murakami et al. 1998); Wound Healing activity (Hukkeri et al. 2006) Antibacterial Activity (Rahman et al. 2009); Anti-inflammatory Activity (Kumar et al. 2012); Antiulcer Activity (Devaraj et al. 2007)
10	Arbi	<i>Colocasia esculenta</i>	Araceae	Leaves	Annual	hepatic ailments (Tuse et al. 2009), snake bite, constipation, stomatitis, alopecia, hemorrhoids, general weakness (Awasthi and Singh 2000) (Devarkar et al. 2011)	
11	Kela	<i>Musa paradisiaca</i>	Musaceae	Leaves	Perennial	dysentery, ulcers, bronchitis, diabetics, menstruation (Kumar et al. 2012)	Antioxidant activity (Rao et al. 2014), antitumor activity (EL Hawary et al. 2012)
12	Gular	<i>Ficus glomerata</i>	Moraceae	Leaves	Perennial	glandular swelling, abscess (Paarakh 2009), ulcers, wounds, bilious infection, dysentery (Bheemachari et al. 2007)	Hepatoprotective activity (Patil and Ageely 2011a), Antidiabetic activity (Kumawat et al. 2010), antimicrobial activity (Nair et al. 2005), Antimicrobial, antioxidant, anticancer (Lee et al. 2011), anti-lipid peroxidative (Patil and Ageely 2011b) Hypoglycemic activity (Pari and Maheshwari 2000), analgesics activity (Gupta et al. 2011), hair growth promotion activity (Savali et al. 2011)
13	Brahmi	<i>Bacopa monnieri</i>	Plantaginaceae	Leaves	Perennial	speech disorders (Chopra et al. 2002), in premature ejaculation (Anuradha et al. 1994), flatulence (Mohan and Singh 1996), abdominal pain (Chetty et al. 1998), Aging, Antioxidant, Stress, cough, cold (Pareek 1994), (Malhotra and Moorthy 1973), (Singh and Aswal 1992), rheumatism (Singh 1993), (Bedi 1978)	Anti-inflammatory (Li et al. 2004), Antidiarrheal (Patil et al. 2012), Antibacterial (Shaikh et al. 2010) Hepatoprotective (Mandal et al. 1999) (Channabasavaraj et al. 2008),
14	Kolu	<i>Cucurbita pepo</i>	Cucurbitaceae	Flower	Annual	anemic, healing wounds (Colagar and Souraki 2011),	Antioxidant activity (Meena et al. 2012), anti-inflammation (Hossain et al. 2014) (Mistry et al. 2014)
15	Karela	<i>Momordica charantia</i>	Cucurbitaceae	Leaves	Annual	Piles (Kumar and Bhowmik 2010), diabetes (Leatherdale et al. 1981), (Duke 2002), (Raman and Lau 1996), Respiratory Problems (Ganesan et al. 2008), Cholera (Ahmad et al. 1999), (Jayasooriya et al. 2000)	Antioxidant activity (Tarhan et al. 2007) Antimicrobial activity (Leelaprakash et al. 2011), Antifertility effects (Prakash and Mathur 1976), Antifeedant activity (Bing et al. 2008) Anti HIV agents

Table 1 Some of the plants used in recipe competitions conducted during Shodhyatras (Continued)

16	Bel	<i>Aegle marmelos</i>	Rutaceae	Leaves and Fruit	Perennial	Astringent, diarrhea, gastric troubles, constipation, laxative, tonic, digestive, stomachic, dysentery, brain & heart tonic, ulcer, antiviral, intestinal parasites, gonorrhoea, epilepsy (Anonymous 1989), (Jain 1991a), (Grieve and Leyel 1992), (Gaur 1999)	(Bourinbaiar and Leehuang 1995), Anxiolytic, Antidepressant, Anti-inflammatory Activities (Ganesan et al. 2008)
17	Jambu	<i>Syzygium cumini</i>	Myrtaceae	Leaves	Perennial	Diarrhoea, dysentery (Nadkarni 1976), strengthening the teeth (Kirtikar and Basu 1999)	Antioxidant activity (Rajan et al. 2011), antifungal (Gheisari et al. 2011), antibacterial activity (Poonkothai and Saravanan 2008), Anti-inflammatory activity (Rao et al. 2003), antidiarrheal activity (Joshi et al. 2009), anti stress, adaptogenic activity (Duraismi et al. 2010), Antihyperlipidemic activity (Kamalakkannan and Prince 2003) (Krishna et al. 2009) (Narayanasaamy and Leelavinothan 2011)
18	Pui	<i>Basella rubra</i>	Basellaceae	Leaves	Annual	dysentery (Kumar PKumar 2010), boils (Ramu et al. 2011), Anemia in women, coughs, cold (Rahmatullah et al. 2010), constipation, poultice for sores, urticaria, gonorrhoea (Yasmin et al. 2009), headaches (Jadhav et al. 2012)	Antihyperglycemic effect (Teixeira et al. 1989), Antioxidant activity (Eshwarappa et al. 2014), Antimicrobial, Antioxidant, Anticancer Activity (Kiruthiga et al. 2011), Anti-inflammatory (Roy et al. 2011), anti-allergic activity (Brito et al. 2007)
19	Cholae	<i>Dolichos lablab</i>	Fabaceae	Leaves	Annual	wound (Balangcod and Balangcod 2011), skin diseases (Rahmatullah et al. 2010), tonsillitis (Rahmatullah et al. 2009)	Anti-inflammatory, Anti-Bacterial Activity (Abdul Kalam et al. 2013), antidiabetic activity (Bamidele et al. 2014), Antimicrobial, Antioxidant Activity (Suguna et al. 2015), Wound healing activity (Mohammed et al. 2012)
20	Dharo	<i>Cynodon dactylon</i>	Poaceae	Grass	perennial	Piles, vomiting, irritation of urinary tract, wounds (Khan et al. 2013a); leucorrhoea (Rahman 2014); Epitasis, hematuria, inflamed tumors, cuts, wounds, bleeding	anti-diabetic activity (Singh and Sankar 2012), hypoglycemic activity, Antibacterial (Priya and Jenifer 2014), Antilithiatric Activity (Deoda 2012)

Table 1 Some of the plants used in recipe competitions conducted during Shodhyatras (Continued)

21	Koliyar	<i>Bauhinia purpurea</i>	Leguminosae	Leaves	Perennial	wounds (Chopda and Mahajan 2009); infections, pain, diabetes, jaundice, leprosy, cough (Morais et al. 2005)	piles, cystitis, nephritis, scabies, diarrhea (Sivasankari et al. 2014)	(Soraya et al. 2015); anticancer activity (Kowsalya et al. 2015); Antidiabetic activity (Jarald et al. 2008); Diuretic Activity (Aruna et al. 2013);Antiarthritic activity (Bhargale and Acharya 2014); anticonvulsive property (Odenigbo and Awachie 1993) (Shen et al. 1988) (Subramanian and et al. 1986) (Najafi et al. 2009) (Najafi et al. 2007), Antiulcer activity (Patil et al. 2003a)
22	Puwad	<i>Cassia tora</i>	Fabaceae	Leaves	Perennial	Acrid, antihelmintic, antiperiodic, cardio tonic, laxative, liver tonic (The wealth of India 1992) (The Ayurvedic Pharmacopoeia of India n.d.);	Anti-inflammatory Activity (Maity et al. 1998) (Jain and Patil 2010), Anti-Proliferative Activity (Rejija et al. 2009), Anti-Microbial Activity (Bhattacharya et al. 2010), Antinociceptive and Spasmogenic Activity (Chidume et al. 2002), anticancer activity (Prabhu et al. 2013)	

Table 2 Existing knowledge system around weeds found in three villages of eastern Uttar Pradesh

Botanical name	Use(s) reported in field	Traditional uses	Pharmacology
1 <i>Eclipta alba/ Eclipta prostrata</i>	Indigestion, hair problems	Acidity, Asthma, Constipation, Diarrhea and dysentery, Fever, Gingivitis, Hemorrhoids, Hair fall, Burns, Alopecia, Bronchitis and pneumonia, Loss of appetite, Pimple, Wrinkles (Khan and Khan 2008)	Anti-hepatotoxic property (Kim et al. 2008), Anaphylaxis activity, Immunomodulatory activity (Ghosh 1984), (Roitt et al. 1998), (Hudson and Frank 1991), Antidiabetic activity (Giordano et al. 1989), (Nahar 1993), Anticancer activity (Ruddon 2007), (St. Luke 2007), Analgesic and Anti-inflammatory activity (Singh et al. 2008) (Sawant et al. 2004)
2 <i>Parthenium hysterophorus</i>	Fever	Fever, Diarrhoea, Neurologic disorders, urinary tract infections, dysentery, malaria, inflammation, eczema, skin rashes, herpes, rheumatic pain, cold, heart trouble (Marwat and Khan 2015)	Antioxidant, Anti-HIV Agents, Anticancer (Kumar et al. 2013), Thrombolytic activity (Prasad et al. 2006), Antitumor Screening (Al-Mamun et al. 2010), Antibacterial (Madan et al. 2011) (Fazal et al. 2011), Antifungal (Shazia and Sobyta 2012) (Zaheer et al. 2012)
3 <i>Ipomoea aquatica</i>	Anemia, given to nursing mothers	Itching, Antidote (Shukla et al. 2010), piles, sleeplessness, head-ache (Burkill 1966) (Van Valkenburg and Bunyapraphatsara 2001), Diabetes (Iwu 1993) (Malalavidhane et al. 2000a), high blood pressure, nose bleeds (Duke and Ayensu 1985) (Perry and Metzger 1980), constipations (Samuelsson et al. 1992),	Anti-diabetic activity (Vilasenor et al. 1998) (Malalavidhane et al. 2000b), Anti-microbial activity, Anti-inflammatory activity (Sivaraman et al. 2010), Anti-arthritis activity (Saturnino et al. 2000), Anti-ulcer activity (Sivaraman and Muralidaran 2008), Nootropic activity (Sivaraman and Muralidaran 2010), Anxiolytic activity (Mohd et al. 2011)
4 <i>Malvastrum coromandelianum</i>	Pain	Fever, dysentery, wounds (Shah et al. 2013a), pain, diaphoretic (Amjad et al. 2015)	wound healing activity (Gangrade et al. 2012), Antimicrobial, Anti irritant activities (Islam et al. 2010), Anti-inflammatory, Analgesic Activity (Khonsung et al. 2006)
5 <i>Cleome viscosa</i>	Ear ache, indigestion	neuralgia, rheumatism, pains, head ache, epileptic fits, ear ache (Sankaranarayanan et al. 2010), ringworm, flatulence, colic, dyspepsia, constipation, cough, bronchitis, cardiac disorders (Kirtikar and Basu 1975) (Saxena et al. 2000)	Antinociceptive, cytotoxic, Antibacterial activity (Bose et al. 2011), Anthelmintic, Antimicrobial, Analgesic, anti-inflammatory, Immunomodulatory, Antipyretic, psychopharmacological, Antidiarrheal, Hepatoprotective activity (Mali 2010)
6 <i>Commelina benghalensis</i>	Fever	headache, constipation, leprosy, fever, snake bite, jaundice (Hasan et al. 2008a) (Yusuf et al. 1994) (Yoganarasimhan 1996), epilepsy (Okello and Ssegawa 2007)	Analgesic, Anti-Inflammatory Activity (Hossain et al. 2014), Acute hepatotoxicity (Sambrekar Sudhir et al. 2013), antitumor, anticancer, antioxidant activity (Hasan et al. 2008b) (Mbazima et al. 2008) (Rahman et al. 1990)
7 <i>Digera muricata</i>	Kidney stones, Urinary infection	blood purifier, pulmonary congestion (Shah et al. 2013b), diabetic (Jagatha and Senthilkumar 2011a), urinary discharges (Rajasab and Isaq 2004), kidney stone (Aggarwal et al. 2012) (Sharma et al. 2011)	Hepatoprotective activity (Paulisson et al. 2001), (Friedman 2003), Antimicrobial activity (Mathad and Mety 2010), Anti-diabetic activity (Jagatha and Senthilkumar 2011b), Anthelmintic activity (Hussain 2008), Anti-testicular toxicity (Weber et al. 2003) (Lin et al. 2008), Allelopathic effect (Bindu and Jain 2011)

Table 2 Existing knowledge system around weeds found in three villages of eastern Uttar Pradesh (Continued)

8	<i>Achyranthes aspera</i>	Dysentery	asthma, bleeding, in facilitating delivery, boils, bronchitis, cold, cough, colic, debility, dropsy, dog bite, dysentery, ear complications, headache, leukoderma, pneumonia, renal complications, scorpion bite, snake bite, skin diseases (Jain 1991b)	Spermicidal Activity (Paul et al. 2010), Antiparasitic Activity (Zahir et al. 2009), Hypoglycemic and Cancer Chemo preventive Activity (Akhtar and Iqbal 1991) (Chakraborty et al. 2002), Hepatoprotective Activity (Bafna and Mishra 2004), Anti-inflammatory, anti-arthritis and Anti-oxidant activity (Vijaya Kumar et al. 2009) (Devi et al. 2009), Nephroprotective Activity (Jayakumar et al. 2009), Anti-depressant Activity (Barua et al. 2009), Broncho protective Activity (Goyal et al. 2007), Anti-allergic and Wound Healing Activity (Datir et al. 2009)
9	<i>Oldenlandia corymbosa</i>	Skin infections	skin sores, ulcers, sore throat, bronchitis, gynecological infections, pelvic inflammatory diseases (Chang Chang, and But, P. P. (Eds.). 1986) (Bensky et al. 1993) (Chang 1992) (Qu et al. 1990), jaundice, liver, heat eruptions, vitiated conditions of pitta, hyperdyspsia, giddiness, dyspepsia, flatulence, colic, constipation, helminthiasis, leprosy, skin diseases, cough, bronchitis, necrosis, nervous depression, bile, hepatopathy (Kirtikar and Basu 1994)	Acute oral toxicity test (Awobajo et al. 2009), Cytotoxic Activity (Haryanti et al. 2013), Anti-malarial activity (Mishra et al. 2009), Antioxidant activity (Sasikumar et al. 2010), Abortifacient activity (Nikolaajsen et al. 2011)
10	<i>Phyllanthus niruri</i>	Stones	kidney stones, gallbladder stones, liver related diseases, Jaundice (Bagalkotkar et al. 2006)	Anti-spasmodic, pain relieving & anti-inflammatory (Shanbhag et al. 2010), Anti fertility activity (Ezeonwu 2011), Anti-microbial activity (Lopez et al. 2003), Anti-viral action (Hepatitis B) (Unander et al. 1995), Anti-ulcer activity (Cipriani et al. 2008), Antinociceptive activity (Santos et al. 1995)
11	<i>Phyllanthus amarus</i>	Jaundice	Jaundice, gastropathy, diarrhoea, dysentery, fevers, menorrhagia, scabies, genital infections, ulcers, wounds (Patel et al. 2011) migraine, jaundice (Kala et al. 2006) (Udayan et al. 2007), gonorrhoea, skin disease, malaria (Chenniappan and Kadarkarai 2010)	Anticancer activity (Lee et al. 2011) (Abhyankar et al. 2010), Anti-diarrheal, gastro protective and antiulcer activity (Shokumbi and Odetola 2008), Antifungal activity (Sahni et al. 2005) (Agrawal et al. 2004), Analgesic, anti-inflammatory, anti-allodynamic and anti-oedematogenic activity (Iranloye et al. 2011), Antiplasmodial activity (Ajala et al. 2011)
12	<i>Cyperus rotundus</i> Linn.	Menstruation	Dysmenorrhoeal, menstrual irregularities (Bhattarai 1993), pain, fever, diarrhoea, dysentery, an emmenagogue, intestinal problems (Uddin et al. 2006a) (Vidal 1963) (Umerie and Ezeuzo 2000), analgesic, sedative, antispasmodic	Anti-mutagens and radical scavengers (Kilani et al. 2005), Antimalarial (Thebranonth et al. 1995), Antidiarrheal (Uddin et al. 2006b), Antibacterial activity (Nima et al. 2008), Antioxidant activity (Nagulendran et al. 2007), wound healing activity (Puratchikody et al. 2006)
13	<i>Physalis minima</i>	Urinary tract infection	Earache, stomach pain, pain (Islam et al. 2014), urinary track, diuretic, joint inflammation, blood purifier, skin disease, pimples, liver tonic (Parul and Vashistha 2015)	Analgesic activity (Anand et al. 2014), Diuretic activity Antiulcer Activity (Tammu et al. 2013), CNS depressant activity (Dharanveer et al. 2009), Antibacterial Potential (Patel et al. 2011), Antioxidant Activity (Gupta et al. 2010), Antifertility (Sudhakaran et al. 1999)

Table 2 Existing knowledge system around weeds found in three villages of eastern Uttar Pradesh (Continued)

14	<i>Echinochloa crusgalli</i>	Wound healing	carbuncles, hemorrhage, sores, spleen trouble, cancer, wounds (Duke and Wain 1981)	antioxidant activity, antibacterial activity (Mehta and Vadia 2014), Cytotoxic activity (El Molla et al. 2015), Anti hypercholesterolemic (Sathis Kumar et al. 2013), Antidiabetic activity (Devi et al. 2012)
15	<i>Cynodon dactylon</i>	Menstruation, milk yield enhancer	Scanty, irregular periods (Yadav et al. 2006), piles, irritation of urinary tract, vomiting, wounds (Khan et al. 2013b)	Antioxidant activity (Sies 1997), Anticancer activity (Albert-Baskar and Ignacimuthu 2010), Anticonvulsant activity (Pal 2009), Hypoglycemic activity (Singh et al. 2008), Immunomodulatory activity (Mangathayaru et al. 2009), Hepatoprotective activity (Surendra et al. 2008), Antiulcer activity (Patil et al. 2003b)
16	<i>Dactyloctenium aegyptium</i>	Fodder	fodder (Chaudhari et al. 2013), astringent, bitter tonic, anti-anthelmintic, gastrointestinal, biliary, urinary ailments, polyurea (Janbaz and Saqib 2015), fevers (Choudhury et al. 2010), urinary lithiasis, spasm of maternity, renal infections (Malhotra et al. 1966)	Antibacterial activity (Jebastella and Reginald Appavoo 2015), Antimicrobial activity, Antioxidant activity (Rekha and Shivanna 2014), Anti-diabetic Activity (Nagarajuna et al. 2015)
17	<i>Echinochloa colonum/ Echinochloa crusgalli</i>	Anti-diabetic	Ingestion (Zereen et al. 2013),	http://www.knowledgebankirri.org/training/fact-sheets/item/echinochloa-colona
18	<i>Eragrostis amabilis</i>	Fodder	Fodder (Dangol 2008), Menorrhagia (Ghildiyal et al. 2014)	-----

Table 3 Taxonomy of social innovation approaches (six Bs of basic design approaches)^a

- **Bridging function:** Bridging function implies meeting need gaps by linking the available actors supplying innovative solutions with needy communities. The existing suppliers may even design new solutions after bridges are formed if the need be, with or without participation of users. There are several ways in which bridges are formed among different actors meeting the unmet social needs. Bringing actors together, creating platforms for sharing information and generating mutuality of interest and help in forging bridges. Many online match making platforms provide information of various actors who can on their own form association or partnership. Enabling a two-way flow of information may not be sufficient for forming bridges in every case but it increases the possibility given the willingness among the actors. A platform of voluntary organisations working for the blind and various agencies providing content, technologies, funding, etc., may trigger partnerships. Bridge function is one of the weakest process but a very popular one.
 - **Broker:** Broker reduces the ex-ante and ex-poste transaction costs of the social innovators/entrepreneurs & meets the unmet social needs at mutually agreed terms. Brokers not only bring the actors together but also mediate the deals. Thus, in the above case the agencies working for the blind may not be able to develop proposals, fulfil all the guidelines or generate enough funds to avail of innovative solutions or other support system. Social innovators involved in brokering will reduce transaction cost and create mutuality of interest. Generally, brokers also take responsibility for due diligence which the bridge function may not do.
 - **Benevolence:** A philanthropic or charitable operation under which uniform solutions are offered to the affected people presumably meeting their similar unmet needs. The fit between supply and demand may be optimal or suboptimal depending upon the inherent nature of diversity and variability among users. The charitable organisations may provide uniform solutions or in some cases may agree to adaptation of the solutions for meeting the needs of the user organisations. The benevolent organisations provide bridge and broker the deal and fund it to make sure that needs are met. Sustainability of such platforms or processes may depend upon the continued willingness of benevolent social innovators to underwrite the costs of meeting the unmet needs.
 - **Social Business:** Where a commercial and/or not-for-profit organisation provides a business opportunity to people to meet their own needs or through third party enterprise with or without recovery of full cost of doing so. Social business enterprise can meet partly or fully the unmet needs of the users. There can also be differential pricing of products/services, which may enable their cross subsidization to the consumers. In this model of social innovation, the mediating organisations enable entrepreneurial approaches for meeting the unmet needs. The social entrepreneurs may cover fully or partly the costs of providing products and services. Whether such a system will sustain depends upon the viability of the business plan or ability of the user organisation to cross subsidize different classes of users to run the activity. There are cases when the intermediating organisations provide business solutions but the costs are met by some philanthropists till such an organisation becomes self-reliant.
 - **Bonding:** Social innovation may bring about evolution of common property/pool institutions and/or organisations by bonding communities & harnessing their social capital to meet their needs. Bonding can have implications for the way companies or institutional resources are mobilized or generated locally. These institutions can be autopoietic that self-design and self-governed; or heteropoietic or PPPP (Public-Private-People-Partnership) in nature (Dey, Singh and Gupta, 2017). Social innovators in such cases invest their energy in creating community organisations or fostering social contracts so that with or without outside support, the needs of the disadvantaged sections are met. When differently abled children attend the regular schools, the intervening agencies or social innovators try to make the sighted students take responsibility of the blind ones. The differently abled children learn to share their strengths and seek help when necessary without feeling obliged or patronized. One can have a variety of institutional arrangements for creating social bonds to empower committees to meet their needs autopoietically or heteropoietically.
 - **Bundling & Blending:** *Bundling* approach to social innovation implies creating a bundle or a combination package of existing component solutions or sourcing additional components available locally or externally or both to meet the unmet social need. The users have a choice in some cases to make or modify their own bundle to suit their needs within their affordability constraints. *Blending* approach to social innovation implies re-configuring different components in a manner that the user cannot separate one component from the other. In this case the user has to take all of it or leave it. It cannot modify the blend except through appeal to the provider of blended solution to modify its offering in due course. Both in product and service innovations, a wide scope exists for *bundling and blending* the variety of solutions so as to suit the needs of users. The bundling approach in the case of blind students would mean access to braille books, audio books, various devices for navigation and other services. Depending upon individual preferences one can choose to have all or a combination of some of them to improve affordability and flexibility. In the case of blending, one cannot separate different functions or features. Even if one is likely to use only two out of five features, one has to pay for all five. The re-configuration may not be possible either due to technological constraints or institutional ones.
- It is not necessary that all these approaches occur in mutually exclusive manner. Either over time, i.e., sequentially or over space the functional integration can be facilitated to meet the unmet user needs. Empowerment of the communities meeting their needs through external provisioning may require institution building by the social innovators. This is one area where even corporations or communities are unable to invest long term resources to create capacity among the user community for negotiating appropriate terms of

Table 3 Taxonomy of social innovation approaches (six Bs of basic design approaches)^a
(Continued)

exchange under various functions described here. The reciprocity and mutual accountability in social innovations requires reliance on inclusive open innovation so that all the parties share and seek ideas without reservation or restrictions.

^aSource: Gupta, Anil K., 1987, Own compilation, adapted from <http://anilg.sristi.org/banking-on-the-unbankable-poor/>; Gupta Anil K., 1987, Being Bridges, Brokers or Benevolent Banias, CMA, IIM., Ahmedabad; Gupta Anil K., 1987, Banking in Backward Regions: Banks-NGO-Poor Interface -Alternatives for Action, IIM Working Paper No.675, in Indian Journal of Public Administration, Vol.XXXIII (3) Nos. 662–679, July–September 1987

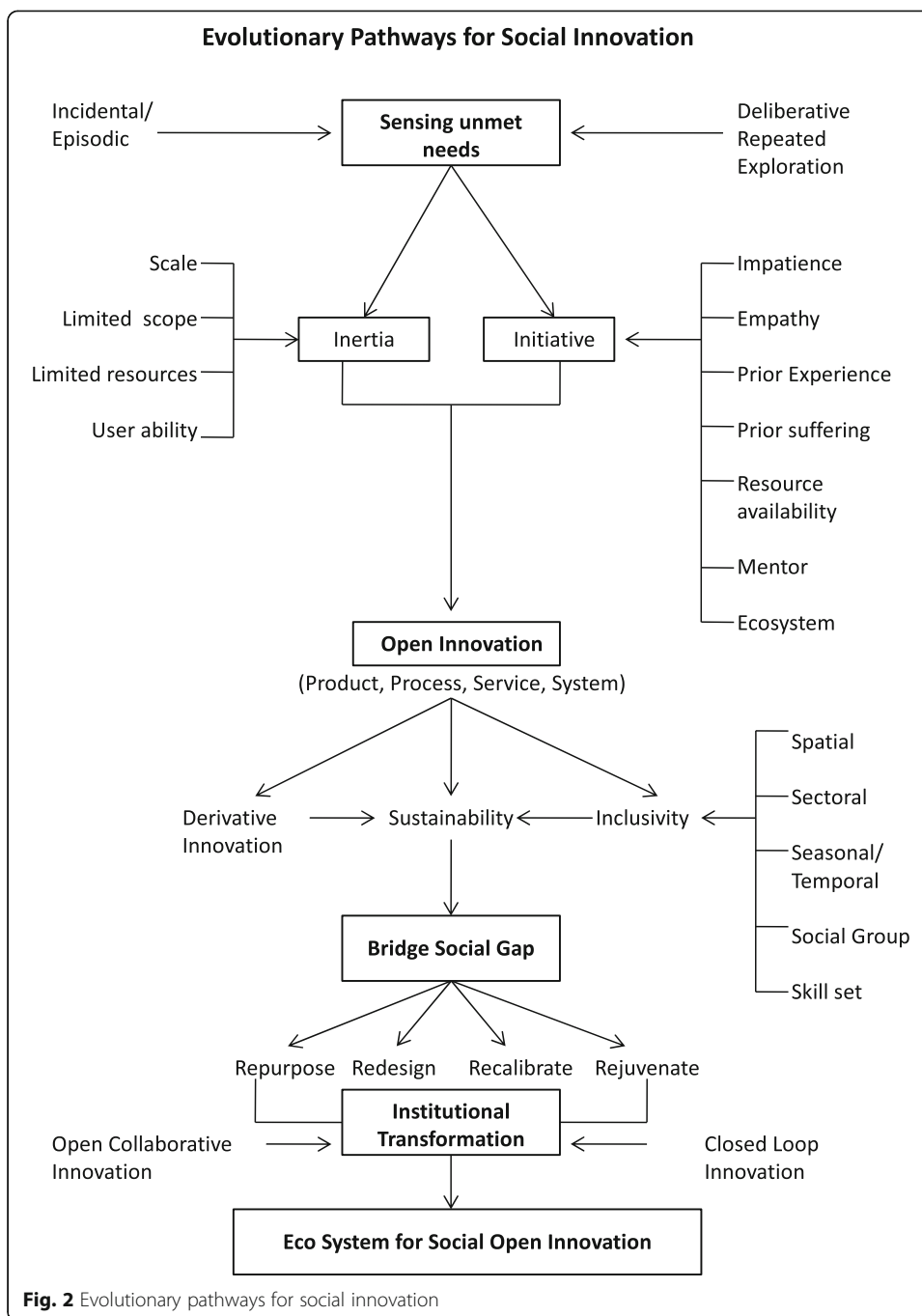
and more difficult even by public institutions to serve the extreme cases of public interest. Limits of market, state and civil society are seldom brought to the heart of popular discourse. But such limitations are not inherent in a capitalistic system (Yun, 2017). The open Innovation conference by SOITCM (Riga, 2017) is actually aimed at transcending such limits.

Emergence of social innovation (Fig. 2)

There are several reasons why needs of some of the social segments remain either unnoticed/unsensed or if noted, remain unmet. The failure of markets, state or even civil society may cause such gaps in meeting the needs persist for a long time. The transaction costs of meeting such needs may be high due to terrain, basic infrastructure, lack of local demand or a combination of other technological, cultural or institutional factors. There are five A's which explain why needs may remain unmet even if some of the transaction costs are met. The solutions may not be affordable or accessible or even acceptable. It is not enough to have *acceptable* solutions because needs may change over time and the change may not be uniform for different community members. In such cases, the *adaptability* of solution and its availability becomes important parameter for supply chain management. What use an *affordable*, *acceptable* and *accessible* solution is, if it is not *available*. Certain needs therefore remain unmet for long time though policy makers or corporations may claim that they have solutions for the same. Suitable interface among natural, social, ethical and intellectual capital helps in overcoming transaction costs (Gupta et al., Gupta et al. 2003, Gupta 2006).

There are several ways in which the community members try to articulate their need. They may protest through violent or non-violent means and if policy doesn't change, the inertia may follow. This may aggravate the frustration and in extreme cases, may give rise to insurgency. The non-violent constructive Gandhian approach may lead to co-creation of solutions through joint action between people and the formal institutions (Guha 2006). People learn to be helpless sometimes. Their self-esteem goes down and the downward spiral of low esteem, low aspirations and low expectation leads to other adjustment with whatever problem exists or may trigger exit through migration or abandonment of the enterprise.

The most hopeful scenario which has been the foundation of the Honey Bee Network is innovation at the grassroots level (Gupta 2013, 2006). These innovations may be supported endogenously by individual innovator or his community, through crowd funding of private or public grants and in rare cases through corporate social responsibility. The open innovation framework may trigger institutionalization of social innovation if the needs are met adequately and the communities and/or



individuals try to improve the ideas on their own. Grassroots innovations provide an opportunity for engagement to not only corporations but also high net worth individuals and any other person who wishes to contribute small amounts through crowd funding.

In the figure two, evolutionary pathways for social innovation are described. Either through some extreme event, accident or otherwise, one may sense the unmet need. Deliberate attempt to study the reasons for unmet needs may also uncover them. If the institutions responsible for meeting the needs are overawed by the scale of

the problem, limited scope of their mandate, inadequate resources or inability of users to use what is available, the inertia may follow (Geels 2004). But, if either some individuals or community feels impatient, empathetic, or has prior experience of solving problems, it may take initiative (Smith and Tushman 2005). Availability of resources, mentors and ecosystem support may also reinforce the willingness to take initiative. The initiatives may emerge endogenously or exogenously [Fig. 2]. They may or may not evolve into an innovative solution. Various facilitative or inhibitory factors may influence this transition. Sustainability of social innovations may depend upon the openness of the learning and exchange platform. Product and process innovations may be accompanied by service and system support by third party agencies or individuals. In a dynamic social situation, neither need remain constant nor the design or delivery system. Continuous derivative innovations are necessary including by the bypassed communities.

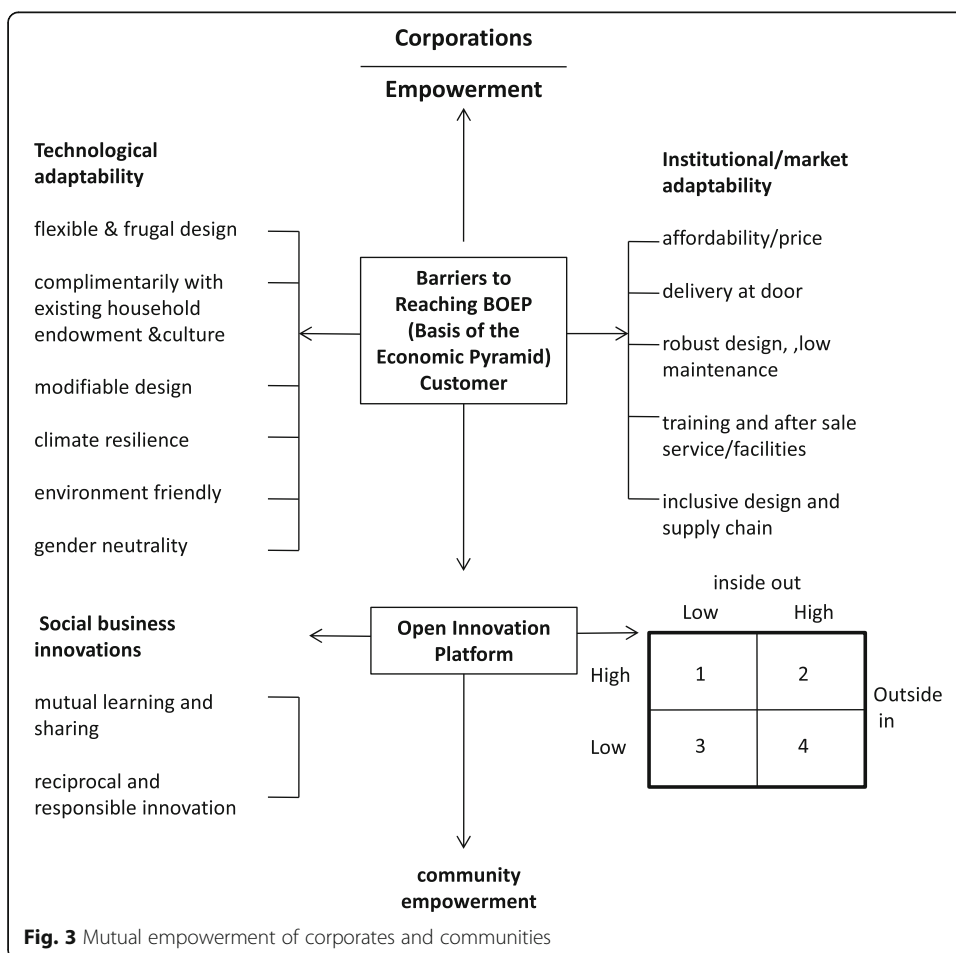
The interplay between inertia and initiative may lead to innovation in product, process, service and system including the excluded regions, communities, sectors, skills or other factors. *Continuous improvements and inclusivity may contribute to sustainability in bridging social gap.* Whether the solutions so generated require repurposing available institutions or technologies, redesigning them, recalibrating them or rejuvenating them depends upon how institutions transform themselves for bridging the social gap. The corporations may also develop inertia and thus may not take initiative to generate social innovations. Small enterprises, communities may also remain timid and limited in their vision without exploring open innovation to learn and share their approach to solving problem. It is true that grassroots innovators follow open innovation far more than large corporations. For every one Tesla which opened all its patents, there are tens of thousands of farmers, mechanics, labourers, artisans, etc., who share their solutions to meet the social gap openly.

The ecosystem for social innovation may however need both the community level initiatives but also corporate contributions beside public policy support. Both closed loop innovations and open collaborative innovation have a role to play in institutional transformation. The design of a mobile phone is a closed loop innovation backed by hundreds of patents. But it also provides open platforms on which different factors can design participative and open access knowledge base and communities. Institutional transformation may involve repurposing the existing institutions or sometimes redesigning. When that is not easy to accomplish recalibrating the monitoring indicators and success factors may become necessary to rejuvenate the institutions. The ecosystem of social innovation does not grow only through transformation of existing institutions. *There are situations in which disruption of established norms and values become necessary to achieve the larger social good so long as the core values of reaching the unreached remain intact.* The classical banking model, trying to serve rural communities through branch network left almost 40 % people of our country unbanked. New payment gateways and channels have made banking accessible to the most remote corners of the country which had not been reached through conventional model. More innovations are called for to incorporate the barter economy still prevalent in tribal areas. The strength of the ecosystem lies in constant recalibration of indicators of performance. More and more difficult

problems must occupy the agenda for action with change in social norms of sensitivity and accountability.

Corporations and communities: mutual empowerment (Fig. 3)

Corporations have been trying to reach the base of the economic pyramid¹ by providing flexibility at institutional or market level or in the design of technological solutions. Corporations have succeeded in delivering small sachets of cosmetics, tea or coffee to millions of villages. And yet, the open source multimedia, multilingual content for educating children has not reached even a few thousands village schools (Gupta et al. 2000). The supply chain efficiency in delivering consumption goods fails to mimic similar efficiency in overcoming anemia among 60% women. Several factors have been discussed earlier responsible for neglect of unmet needs. Corporations need to be empowered to bring in flexibility and adaptability in their technological and institutional functioning. Their ability to develop frugal designs would increase when corporate designers will work with grassroots innovators to learn from their heuristics. Not all designs are modifiable or are climate resilient, environment friendly or gender neutral. But greater connect with the community might develop



empathy and a reciprocal and responsible innovation system may evolve. Amul cooperative model has demonstrated that scale need not prevent close affinity with client's interest. Amul transfers more than 80% of the value of marketed milk products to the milk producers. With almost 30,000 Cr worth brand, it has shown that a completely inclusive service model can be built to provide comprehensive care for household livestock enterprises.

The open innovation platform bringing corporations and communities together to generate, adapt and deliver social innovations can have four possible approaches. Openness is measured here in terms of willingness to share one's knowledge and resources with others that is inside out; and the opposite that is desire to learn from others i.e. outside in. The most indifferent and pessimistic situation is (cell1) when both inside out and outside in are low [Fig. 3]. Such organizations do not want to share with other organizations or the communities what they are good at. Nor do they want to learn from them. It is ostrich kind of behavior which will not lead to much reciprocity or responsibility between corporations and communities. In the second case, the inside out is high and outside in is low. Such ecosystems of organizations encourage pollination of ideas, open sharing of their knowledge as done by Tesla. This pioneering company in electrical cars opened all its patents to encourage competition and installation of more charging stations for customer convenience. Those who have high outside in and low inside out [cell 3] behave like a sponge seeking ideas from others but not sharing much with them. Many large corporations crowd source ideas from outside for frugal and/or social innovations with or without payment. They seldom give feedback to the idea providers as to what did they do with the ideas received and value generated. If they will let idea providers know, how valuable those ideas were, their confidence in their own innovative potential could increase manifold.

The reciprocities between corporations and communities can be pursued through several mechanisms with or without intermediation of third party.

- a) While sourcing ideas, even if corporations don't use these ideas as such but these ideas trigger further investigation, they should acknowledge the idea provider and share some benefits with them. Without their initial trigger, the corporations may not have reached the point they actually reached. A very large industrial house and a national research lab jointly found a lead of developing graphene kind of material from natural resource very useful and interesting. Their representatives even visited the tribal community which provided the original lead. Eventually, through R&D they developed a process which could make a graphene compound providing a lot of potential for commercial advantage. They refused to acknowledge either the community or National Innovation Foundation [NIF] which mediated in the exchange and facilitated their visit in good faith. The patent was filed without any attribution to the Foundation and the tribal community, the question of sharing benefits didn't arise. The Foundation is opposing the patent on various grounds and deeply regrets an unethical behavior on the part of the formal institutions in this regard. The capacity of this Corporation and the concerned national R and D lab needs

- to be improved so as to deal with generosity of knowledge rich, economically poor community with a sense of reciprocity and responsibility.
- b) The mutual capacity building among corporation, community and civil society organizations are required when each fo the actor fails to appreciate constraints and strength of other partners.
 - c) The corporations learn the art of frugal innovations from grassroots innovators and youth and share the art of frugal supply chain with the communities.
 - d) The generosity of communities may sometime motivate the corporate executives to take time off and extend their personal social capital in aid of social innovators.
 - e) Social innovations need not be sustained only through profit based social businesses but can also rely on open source do-it-yourself culture or third party subsidization of the cost of providing services.
 - f) The involvement of youth and children in social innovation movement can prove very helpful since they have much less inertia than elderly people.
 - g) one can hybridize patent system with open source system through the concepts like Tech Commons.

There are numerous ways in which social innovations are nurtured and mutually rewarding relationships can be forged among corporations, communities and civils society organizations. What matters is not only the mutual reciprocity and responsibility but also willingness to learn from each other, build each other's capacity and have graciousness to realise that creative, frugal innovations may emerge from even informal sector, children and bypassed communities.

Endnotes

¹There are several pyramids. People at the bottom of the economic pyramid may not be at the base of ethical or innovation pyramid contrary to what Prahalad (Prahalad 2006) has argued.

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Authors' contributions

The three diagrams have been jointly developed, AG has done the review and explained conceptual part in consultation with GS and ARD; ARD has also done the analysis of uncultivated plants collected during shodhyatra and Honey Bee Network database; Policy implications have been jointly developed though AG has taken major responsibility. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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