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FRUGALITY, GRASSROOTS AND INCLUSIVENESS: NEW CHALLENGES FOR MAINSTREAM INNOVATION THEORIES

ABSTRACT

Intriguing and provocative concepts such as frugal innovation, BOP innovation, empathetic innovation and inclusive innovation are attracting the attention of many scholars in emerging countries as well as raising concern in the Western. Those notions are often indicated as ‘below-the-radar innovations’. There are several reasons to believe that technical and social changes originating in the developing world will become a major driver of innovation in the near future. For those reasons it is crucial to understand how innovation is planned, design and deployed outside the comfortable territory of Western paradigm. The objective of the present article is to provide an overview of the alternative innovation paradigms that are emerging in the developing world. On the other hand, the article aims at analysing the determinants and drivers that are at the base of below-the-radar innovation.

Keywords: below the radar innovation, bottom of the pyramid, frugal innovation, grassroots innovation.

INTRODUCTION

Uberaba is a small town of the State of Minas Gerais in Brazil. In 2002, in response to continuous and long electrical shortages, Mr Alfredo Moser discovered that it was possible to illuminate his house with solar light using plastic bottles hanging from the roof. After nearly 10 years, MyShelter Foundation¹ remodelled this simple innovation and began to install it in the peripheral slums of Manila, Philippines. By September 2011, around 15,000 “Liter Bottles” were already providing sun-light to thousands of slums all around the country. This simple, and smart solution, which costs just 1 dollar, is an amazing example of “eco-friendly frugal innovation” and, according to its promoters, it is likely to spread to other Asian countries.

¹ <http://isanglitrongliwanag.org>

The “Liter Bottle” case is not an isolated case of innovations that draw on energy and resource scarcity in developing countries. An increasing number of people in the developing world is now facing scarcity of energy supply, freshwater, food and other basic needs. This scarcity mainly affects the poorest 80% of humanity who lives on less than US\$10 a day (UNDP, 2008), the so-called Bottom of Economic Pyramid (BOP). How do those people cope with scarcity? Are they waiting to be saved by the affluent industrialised North or are they rather finding their own way to survive? Such a question has been largely neglected by Western analysers. Only recently this uncharted territory has become to be explored by some scholars who are convinced to have found a “Fortune at the bottom of the Pyramid (BOP)” and, even more important, an immense and prolific Living Lab for innovation (Prahalad, 2010). Innovation in the developing world is certainly occurring. However its nature and origins are still obscure and misunderstood. On the other hand, the great majority of world population lives in developing countries. The way this young and increasing population will deal with resource scarcity is essential to understand the future economic development on a global basis and, even more importantly, the future of global environmental sustainability. The understanding, thus, of innovation process in the so-called South of the world is crucial. The exciting question for the future research agenda is if the developing world is able to trigger new technological trajectories. If so, many other questions will become germane. How much will they consume? How will they keep warm, cook, move and so on?

The last decade has seen an increasing connection between emerging countries like China, Latin America and some African countries. As they share expectations and problems, it would be interesting to understand the process of sustainable practices diffusion between these countries. Even more important it might be to find out if those practices can potentially have a disruptive impact on industrialised countries leading to what Seely-Brown calls Innovation blowback (Brown, 2005). As Kaplinsky argues, *“there are many reasons to believe that changes originating in the South will become a major driver of innovation in the 21st century”* (Kaplinsky, 2011). It is probably too ambitious to think that Emerging Economies will lead a global sustainable transition, but it is improbable that they are going to be simply passive spectators.

Two main research questions guided the work: (i) how does the academic world approach below-the-radar innovation? (ii) What are the main determinants of those

innovations? The objective of the present article, thus, is to provide an overview of the theoretical approaches that have been formulated to describe innovation at the BOP. In particular, the work aims at identifying the different features that characterise innovation in resource-constrained environment drawing on the extant literature. Furthermore, the paper aspires to make a valuable comparison of the main academic perspectives that have been provided during the last decade and depict a preliminary framework to describe the innovation process in the developing world.

The paper is organised as follows: the first part is dedicated to overview the extant literature dedicated to the study of the so-called below-the-radar innovation. The second part attempts to combine the different approaches described in the literature to provide a common ground to identify the main drivers of those covered innovation processes. Finally an agenda for further research in the South as well as in the North is proposed.

BELOW THE RADAR INNOVATION: AN OVERVIEW

For almost the totality of human history technical change has occurred mostly in an un-planned and spontaneous way. For centuries innovation has been largely drawing on the ingenuity of individual inventors such as Mr Alfredo. Even the industrial revolution was mainly triggered, at least in its initial phase, by the genius of individual 'bricoleurs' (Freeman & Soete, 1997). It is worth to note that, as Schumpeter (1934) realised in the first half of 20th century, formal R&D driven innovations are a relatively recent phenomenon. There is vast empirical evidence that suggests that, even in developed countries, formal R&D only accounts of a small proportion of sources of innovation (Fagerberg, Mowery, & Nelson, 2006). In the developing world, innovation carried out by medium size firm and multinational corporations (MNCs) is still scant. According to Naude et Al (2011), innovation in low income countries only counts for the 5% of economic activity and is mainly factor driven. In medium income countries, in process of catching-up, innovation is efficiency-driven and represents the 10% of economic activity. But actually innovation in developing world is taking place in a big variety of forms that are often neglected by the mainstream literature because of their unconventional nature. Only recently, many scholars have focused their attention on those below-the-radar innovations with a particular interest in the those innovations that occur at the BOP

(Hart & Christensen, 2002; Hart, 2011; Kaplinsky, 2011). But what is innovation at the BOP? Is that really different with respect to innovation in more affluent countries? The next section aim at reviewing the recent literature on the so-called below-the-radar innovation arguing that there is no substantial difference between frugal or grassroots innovation and the innovation process that characterises more developed countries. The only difference lays in the context and in the way innovation emerges and diffuses.

Bottom of the pyramid propositions and its critics

The extant literature suggests that innovation in the developing world can occur as a process of catching-up (Kim, 1980), as an indigenous process of development of new products and services (Cassiolato, Lastres, & Maciel, 2003; López-Claros, 2011) or as a process of frugal reengineering of pre-existing technology (Radjou et al., 2012). Among those ‘innovation modes’, the solutions that seek to alleviate poverty and create economic opportunities at the BOP are gaining an increasing importance. The notion of BOP was introduced by Prahalad in 2005 in his book “*The fortune at the bottom of the pyramid: eradicating poverty through profits*” (Prahalad, 2010). The central argument of the book is that the poor are potential consumers and, since they represent a big portion of humanity, they also are an immense unexploited market. The BOP is excluded from mass consumption because of its very limited purchasing power. If one finds the way to turns the poor into consumers she finds a fortune and an almost unlimited market. Serving the BOP would be a win-win process because private companies would have new and unsaturated markets and poor would access to consumer goods that are now inaccessible because too expensive. Such an approach discloses a new challenging operational theatre for innovation. In order to be appealing for those at the BOP, innovation has to be design to do more with less and for more people (Prahalad & Mashelkar, 2010; Prahalad, 2012). According to those scholars, the only organizations that are able to implement such a strategy are the MNCs (Kanter, 2008).

The idea of scaling consumer goods to reach the lowest level of social pyramid is not new. Although with different aims, it was introduced by Schumacher in the ‘70s (Schumacher, 1973) and then absorbed by NGOs and grassroots movements in the last 30 years. More recently, this concept has been introduced into the debate of

creating or finding new business opportunities to overcome the saturation of traditional markets. According to Hart and Christens (2002: 56), *“the theory of disruptive innovation suggests that existing mainstream markets are the wrong place to look for major new waves of growth”*. In the attempt to validate the Prahalad propositions several scholars around the world have focused their attention on the BOP and there is an increasing empirical research activity on this topic (Kandachar & Halme, 2007). However, from a theoretical perspective few attempts have been carried out to define a theoretical framework to address innovation at the BOP. Anderson et al. (2007) identified a set of common features that characterise innovation at BOP: affordability, acceptability, availability and awareness. Prahalad himself has tried to identify specific patterns of innovation based on the analysis of China, India and Brazil. Those countries are already aware of this change and are implementing four different strategies (Prahalad & Mashelkar, 2010):

- Applying disruptive business models to acquired western technology
- Inventing new usages and business model for acquired technology
- Creating new technology rooted in local context
- Creating new business models to exploit endogenous technology

Nonetheless, if the BOP propositions set the scene for a total unexplored territory for innovation, there is no agreement in the literature about the benefit of the Prahalad assumptions and, in particular, about the role of MNCs in this process. The majority of the cases collected do not provide a clear idea about the social and environmental effects of BOP products. What is more, few empirical works mention ecological sustainability (Pitta, Guesalaga, & Marshall, 2008).

BOP propositions have also many critics who question the Prahalad top-down approach as well as the very basic assumption of poor as consumers. One of the sharpest criticisms comes from Karnani (2009: 1) who writes: *“This romanticized view of the poor harms the poor in two ways. First, it results in too little emphasis on legal, regulatory and social mechanisms to protect the poor who are vulnerable consumers. Second, it overemphasizes microcredit and underemphasizes fostering modern enterprises that would provide employment opportunities for the poor. More importantly, it grossly underemphasizes the critical role and responsibility of the state in poverty reduction”*. He mentions also several cases where MNCs impact seemed to

be less effective and even negative. Many feminist NGOs strongly criticised the case of Unilever advertisement of whitening products that allegedly promote racist messages among disadvantaged women in rural India (Karnani, 2007a, 2007b, 2011). Moreover the environmental perspective is almost untouched. Selling shampoo in smaller packaging, as Prahalad suggests and Procter & Gamble is already doing in India, will actually increase wastes with minimum impact on poor welfare.

Another criticism drawn on the fact the concept of BOP is fuzzy. Quite often, Prahalad refers to emerging middle class that in West would appear as low-income people. Kolk et al.(2006) reckon that, in order to improve their condition, poor must be included in the production process. MNCs turning them in consumers do not solve the problem. They can even damage the poor substituting priorities in consumption.

So far MNCs do not seem to change drastically their business strategy towards the BOP. On the contrary, some preliminary empirical work depicts a more complicated scenario (Rivera-Santos & Rufín, 2010). With respect to the Top of the Pyramid (TOP) network of enterprises, BoP initiatives are less centralised and less linear because of the presence of non-market members. They are concentrated in clusters with few connections with each other (like villages). The relationships with other actors are very diverse to fill institutional gaps, so they include NGOs and smaller communities. The member diversity is an essential factor. They are mostly carried out by small enterprises where informality and personal contacts are very important. They tend to be more unstable and unpredictable than formal networks but also more resilient (Rivera-Santos & Rufín, 2010).

But probably the main weakness of BOP approach in the Prahalad version is the lack of institutional perspective. BOP actors are depicted as isolated subjects without any attempt to describe the institutional, cultural and even historical settings that are at the base of poverty. As a consequence, London argues that instead of exploiting the fortune at the BOP, we need to create a fortune at the BOP. He compares the donor-led initiatives with enterprises-led ones finding that both approaches have common failures such as lack of local stakeholder involvement and long term sustainability (London & Anupindi, 2011). He discovered that successful initiatives at the BOP imply a strong commitment in setting alliances and participative ventures with local actors and local institutions (London & Hart, 2004). In short, bottom-up learning is critical and social aspects are essential. In order to be effective, innovation must be

socially-embedded. To London and Hart, mainstream initiatives fail in assessing correctly the BOP. They focused on the services or infrastructure deployed instead of long-term overall impact. A holistic framework is needed to assess the complex dynamic of the BOP, refine business models and attract potential partners (London, 2009).

As mentioned above, the environmental discourse is completely absent in the BOP propositions. To fill this gap, Hart (2011) introduces the concept of green leapfrog or trickle-up effect. As eco-friendly technologies and practices always represent a disruptive change in developed countries, where standard technologies are well established, they are often hampered by the pre-existing technological regimes. Those constraints are often loose at the BOP. The absence of technological lock-in and the lack of strong legal frameworks to enforce specific socio-technical regimes might potentially give the way to the development of a huge gamma of alternative technological paths. In this view, the BOP environment is a fertile ground to test and experiment sustainable technologies like off-the-grid energy production, organic farming, micro-finance etc. It has been hypothesized that, once tested and validated, those experiments would be ready to invade Western markets with a disruptive effect (Christensen, Craig, & Hart, 2001). Two paradigmatic examples in this sense are the portable ECG machine for rural India and the ultrasound device for rural China developed by GE. When the GE's portable ECG was redesigned by its Indian branch, the cost shrank from \$10,000 to \$1,000, whilst the Chinese were able to reduce the cost of the ultrasound device from \$30,000 to \$10,000. Those achievements have been possible rethinking the way GE used to design its products (Immelt, Govindarajan, & Trimble, 2009). The local branch used costless material, less plastic and smaller LCD screens. They preferred local engineers, redesign the software to reduce the memory requirement and used the same printer as that used in bus terminal kiosks in India (Kriplani, 2008). But maybe even more important, those pioneer machines are now being sold in the United States. This process is known as reverse innovation and is quite the opposite of the technology transfer that characterised the early globalisation dynamics (Govindarajan & Trimble, 2012).

But as we argued above, not only does innovation emerge from MNCs but it also springs from the grassroots (Seyfang & Haxeltine, 2012). Although it is far from being under the radar, the ingenuity of common people to solve practical issues is well

known and it is part of what Levy-Strauss calls ‘social bricolage’: the ability of the people of making sense of the world they live in, transforming it through social and technological change (Di Domenico, Haugh, & Tracey, 2010; Lévi-Strauss, 1966). The next section aims at introducing the main concepts of what we may call ‘innovation from the bottom’.

Grassroots and frugal innovation

The modern conceptualization of the grassroots nature of innovation process might be probably dated back to ‘Fritz’ Schumacher. Schumacher’s approach privileges people over markets when he explicitly states: “*Instead of mass production, we need production of the masses*” (Schumacher, 1973). The underlying idea beyond this approach was that technology is just a partial and temporary solution to problems that are fundamentally social (Smith, 2005). Schumacher ideas have been recently revisited with a slight different perspective by activists and scholars interested in the BOP. This new approach focuses on innovation capability of common people and communities. Innovation originated by users or common people to address very practical problems of daily life are usually known as grassroots (Seyfang & Haxeltine, 2012), users-led (Von Hippel, 2005) or frugal innovation (Radjou et al., 2012). This phenomenon is present in low income countries but it is also rather diffused in industrialized countries as Seyfang and Smith have proved (Seyfang & Smith, 2007). They describe the mushrooming of new innovative practices among the organic farmers’ communities in UK and the creation of new green market niches for a huge variety of eco-friendly products and services. Low-cost innovation niches are diffused among lead users in developed countries in different fields providing to decrease the innovation cost with respect to formal R&D activities (Von Hippel, 2005). Of course different countries have different approaches. In India, for instance, frugal innovations are indicated by the Hindi word “Jugaad”. *Jugaad colloquially means a creative idea or a quick workaround to get through commercial, logistic or law issues* (Radjou et al., 2012). Similar terms are used in other countries like *gambiarra* in Brazil, *zizhu chuangxin* in China, *jua kali* in Africa, *DIY* in US and *solution D* in France (Radjou et al., 2012). Those innovations share some very basic features (Tiwari & Herstatt, 2011): They must be i) robust to deal with infrastructure shortcomings such as voltage fluctuation; ii) fault resistant to cope with unsophisticated or even illiterate users; iii) affordable for larger sections of the society. It is further worth to note that Jugaad

usually flourishes in environments that are supposed to be absolutely non-suitable for innovation. Frugal innovation, indeed, springs from resource-constrained environments (Sharma & Iyer, 2012) and faulty institutional settings (Mair & Marti, 2009). In a nutshell, the lack of material and human resources encourages the development of frugal solutions (Baker & Nelson, 2005). Not only is Jugaad innovation a revolutionary tool in emerging countries, but it also represents an unexpected opportunity for Western companies that are facing low rate growth in the over-saturated markets of developed nations. Radjou et al. (2012) invite Western enterprises to embrace Jugaad to develop competitive advantages drawing on frugal re-engineering.

According to those authors, Jugaad innovation is a potential disrupting force to achieve a breakthrough renovated growth not only in emerging countries, where it appears to be quite diffused, but also in Western companies, that used to be frugal innovators at the very beginning of their history. In the meantime, some people are trying to harvest the spontaneous innovation potential that exists at the BOP leveraging on formal institutions. In India Anil Gupta, who founded the Honey Bee Network to scout grassroots innovators in rural India, is devoted to support BOP innovators with the help of the Indian S&T Ministry (Gupta, 2012; Gupta, 2010a). Gupta's work challenges radically the intimate purpose of innovation drawing on the capacity of common people to create value from scarcity to meet basic needs of other common people in a process that he calls "empathetic innovation" (Gupta, 2010b). The mission of the Honey Bee Network is to map frugal and grassroots innovations and valorises them through innovation contests, patent application support and enterprise incubators (Sristi, 2012). The network members annually undertake "innovation walks" through the most poor and isolated areas in India to scout and study local innovators. Honey Bee Network, together with the National Innovation Foundation, claims to have collected thousands of grassroots innovations that wait to be patented or augmented by reengineering processes. One of the most ambitious goals of the network is to create a global network of grassroots innovators in the developing world with the objective of exchanging, diffusing and scaling grassroots solutions. Most of the innovations draw on traditional knowledge such as herbalist indigenous knowledge. An emblematic example of grassroots innovator is the case of Mitticool. The story of Mitticool is an amazing journey into the ingenuity of

grassroots innovators and their capacity to make the most of scarce resources. Its founder, Mansukhbhai Prajapati has grown up in a family of traditional clay manufacturers. In the 2001, an earthquake destroyed Mansukhbhai’s village and surrounding area. Reading a local newspaper, Mansukhbhai’s attention was drawn to a picture of a smashed clay pot, described ironically by the journalist as “Poor man’s fridge broken” (Radjou et al., 2012). This image inspired Mansukhbhai and suggested him to develop an affordable fridge that works without electricity based on the principle of evaporation. *“Water from the upper chambers drips down the side, and gets evaporated taking away heat from the inside, leaving the chambers cool”*(Prajapati, 2012). The fridge, which costs US\$ 50, was a success and has been sold across India and internationally. Afterwards Mansukhbhai managed to scale its production, leveraging his traditional knowledge of pottery to mass-produce a great variety of clay products such as non-stick frying pans, clay pots and water filters. Today Mansukhbhai employs a large number of people in his own community and serves consumers in India and abroad. Recently *Forbes* magazine named him among the most influential grassroots Indian entrepreneurs (Radjou et al., 2012).

In conclusion, the evidence from the field suggests that the grassroots level might be a big source of innovation diversity, but it still not clear how it can create economic value for its promoters (Seyfang & Smith, 2007). Gupta (2010) identified the challenges that grassroots innovation needs to undertake:

- First, as already mentioned, it’s needed to embed grassroots level into the mainstream policy;
- It is crucial to understand the impact and the outcome of those innovation;
- It is also fundamental to identify the condition for germination of innovative processes and the condition for successful diffusion. In short, it is necessary to promote local frugal innovation and move it to global market.

Compared to the classic BOP approach, the frugal or/and grassroots approach reveals a more bottom-up dynamics. In this view, innovation is a ubiquitous phenomenon that exists everywhere. The assignment of scholars and public institutions is to uncover those innovation processes that occur at the bottom and support frugal innovators to access to the market. Moreover, the practice of frugality is also expected to be a useful instrument to improve the efficiency along the value

chains of Western firms that aspire to reduce cost productions and access users in low income countries.

Finally a third general approach to innovation at the BOP is concerned with the concept of social exclusion. The main driver of such an analysis is the concern that the economic growth that characterise the globalization process seems to increase inequality rather than improve the welfare of the poor. In this perspective, innovation at the BOP should be rather designed to include those who have been excluded from the benefit of economic growth. The supporters of this idea usually advocate for an ‘inclusive growth’.

Innovation for inclusive growth

Innovation should yield economic growth, however in the last two decades the process of globalization has created a great deal of inequality. The doctrine of trickle-down that assumed that poor benefit from economic growth and policy benefiting the rich seems to be a myth rather than a fact (Arndt, 1983). Hence, is innovation creating inequality or rather the model of distribution of the wealth originated by this process is not efficient? Technical change affects undoubtedly the wellbeing of large part of population. On the other hand, there is empirical evidence that suggest that inequality hinder development and obstacle innovation (Cozzens & Kaplinsky, 2009; Cozzens, 2008). In short, if economic growth is not accompanied by other measures like the improvement of educational, health and welfare systems that diminish inequality, then further development and growth could be jeopardised. In order to overcome the shortcomings of trickle-down approach, the concept of inclusive development or inclusive growth has been introduced. The concept of inclusive growth refers to a broad-based growth that includes non-discriminatory participation and should benefit the majority of people (Klasen, 2010). According to this position *falling poverty but raising disparity is not inclusive growth*. It implies a qualitative perspective of growth that means an improvement of non-income dimension of well-being such as health, education and environmental conservation. Inclusive development is designed to achieve equal opportunity and participation. According to Sen (1999), developing countries need public policies that aim at creating social opportunities and increase the participation of all the social classes in the economics process. Moreover the perception of well-being can be very different all around the world. It is actually

composed by personal heterogeneities, environmental diversities, different perspectives and diverse social climates. According to this vision, poverty is a deprivation of basic capabilities rather than mere lack of monetary income. In a nutshell, Sen proposes to consider the development process as an expansion of freedom and quality of life instead of as the increment of income.

How should be innovation to produce inclusive development? The main argument here is that the organization can and must engage in social innovation activities to empower disadvantaged groups and foster social and economic growth (George, Macgahan, & Prabhu, 2012). Similar to BOP approach, this vision promotes the development of innovative capability to produce low-cost at reasonable quality products or business models in developing countries able to be exported to other low-income countries. According to George et Al (2012), inclusive innovation is the *“development and implementation of new ideas which aspire to create opportunities that enhance social and economic well-being for disenfranchised member of society”*. Christensen et al. (2006: 3) define such innovations catalytic innovations identifying five fundamental features: *i) they create systemic social change through scaling and replication; ii) they meet a need that is either under-served or not served at all; iii) they offer products and services that are simpler and less costly than existing alternatives and may be perceived as having a lower level of performance, but users consider them to be good enough; iv) they generate resources, such as donations, grants, volunteer manpower, or intellectual capital, in ways that are initially unattractive to incumbent competitors; v) They are often ignored, disparaged, or even encouraged by existing players for whom the business model is unprofitable or otherwise unattractive.*

Unlike classic BOP approach, inclusive innovations are not the result of a mere market dynamic. They are the outcome of a complex interaction between local and regional institutions, private sector and local communities composed by grassroots innovators. The inclusive innovation literature, thus, provides a broader perspective that gives room to a more systemic analysis of the innovation at the BOP. Firstly, in order to ensure the success of inclusive innovation the innovator has to be able to create new opportunities to those at the bottom through the creation of new capabilities in the community in which he or she operates (Ansari, Munir, & Gregg, 2012). In this sense, the case of Mitticol is a good example. The Mitticol products are

at the same time frugal and inclusive because Mr Prajapati has been able to create a productive ecosystem that provides valid opportunities to those involved. Another important merit of this approach is the focus on social indicators rather than the commonly used economic indicators (Hall et al. 2012). Raising income is a mean not the end of development that is why inclusive innovation literature stresses the importance of those innovations that privilege social values and public interest on income generation. In conclusion, inclusive innovations to be successful must reduce the inequality produced by an economic growth blindly meant as a mere quantitative increment and focus on the design of more qualitative improvements with local customers, networks, and business ecosystems in mind (Khavul & Bruton, 2012).

HETERODOX INNOVATION: TOWARD A THEORETICAL FRAMEWORK

Although the approaches described above often overlap with each other, they draw on very different theoretical backgrounds. Table 1 is an attempt to summarise the main features of the approaches presented above and highlight the main differences. The early Prahalad’s BOP formulation promotes the idea that poverty and its human consequences might be overcome through profit-based market dynamic led by MNCs. The main assumption is that MNCs seeking new vast markets will benefit poor transforming them in consumers. The Hart & London BOP approach aims to address the bold criticisms raised by the early BOP approach with the help of empirical work. They discovered that MNCs devoted to serve the underserved are more successful if they create alliances and networks with local agents (NGOs, communities and small firms) at the BOP. This approach does not give up the idea of development through profit, it rather humanises the action of MNCs introducing local actors as intermediaries. Jugaad or frugal innovation is probably the most interesting contribute of India to management. Such approach draws mainly on the micro perspective of ingenious entrepreneurs that turn scarcity into competitive advantages. Its potential has not been totally exploited. The challenge is to scale such an approach to overcome the boundaries of private sector and apply it to an institutional level. “*Doing more with less*” will be an imperative at all levels even in developed nations in crisis time. Another important contribute that comes from India is the concept of empathetic grassroots innovator. Contradicting the Maslow’s hierarchy of needs, Gandhian innovators are the living proof that poor ingenuity is a fact that yields

simple and practical innovations even among people who live with less than two dollars per day. Nevertheless this ingenuity is not the result of isolated subjects. On the contrary, it is the product of complex relationship between innovators and the communities they belong to. For those reasons, people like Anil Gupta are convinced that, in order to improve and promote this potential, it is crucial to involve public sector through incubators, innovation contests, and financial support. Finally the concept of Inclusive Innovation aims to combine many elements of the approaches described above. It draws on the notion of enterprise as social agent that, apart from pursuing profit, must play a social role providing useful products and service that decrease inequality instead of promoting it. Such approach implicitly requires a close collaboration between public and private agents.

Table 1 comparing BOP alternative frameworks

	Agents & Innovation sources	Assumptions	Purpose
BOP Prahalad	MNCs	MNCs have to transform poor consumers providing affordable products	Opening underserved markets. Fighting poverty with a profit based approach
BOP – Hart & London	MNCs, small firms, NGOs, communities	MNCs can serve better the BOP creating alliances with local agents	Opening underserved markets fostering global-local cooperation
Jugaad	Enterprises in the South and Northern subsidiaries	Frugality, that is “ <i>doing more with less</i> ”, is helping firms in the south to growth	Competitive advantages through frugality
Grassroots innovation	Common people and communities	Ingenuity of poor is huge and must be promoted by public institution to create affordable and inclusive solutions	Empowerment of local communities. Meeting basic needs endogenously.

Inclusive Innovation	Social entrepreneurs, NGOs, firms, public institutions	Private and public sector must cooperate to enhance the social engagement of entrepreneurship	Equality, wellbeing improvement, empowerment
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The above mentioned approaches draw on different theoretical basis. The so-called BOP proponents are more rooted in the neo-liberal thinking that consider auto-regulating markets the panacea for underdevelopment (Karnani, 2011). In that sense the classic BOP seems to be compatible with the neo-classical framework and pretend to be a sort of extension of liberalism to an unexplored territory. BOP approach does not require adjustment in policy or any public intervention because the MNCs that would benefit the bottom of the pyramid are already acting freely in a regime or free global competitions. The recipe is quite simple: find out what poor need and then make it affordable. However, to these days, little empirical evidence has been provided to prove that MNCs are really exploring successfully the BOP (Rivera-Santos & Rufin, 2010).

Similarly Jugaad innovation does not present insurmountable challenges for mainstream management theories. What is more, frugality and jugaad entrepreneurs have been often cited as one of the engine of industrial revolution in Europe and US (Radjou et al., 2012). Jugaad proponents suggest rediscovering frugality to overcome the low growth rate of saturated markets in developed countries.

On the contrary, it is not simple to situate the grassroots and inclusive approaches into the mainstream debate about innovation as development tool. First of all only few works have attempted to study the linkages between innovation and poverty and, up till now, there is no comprehensive theory to explain how and why innovation occurs at the BOP (George et al., 2012). The capabilities building approach and the recent work on freedom and inclusiveness as engine of development have just started to disclose the complex dynamic of innovation as development tool (Altenburg, 2009; E. Cozzens & Kaplinsky, 2009; Lundvall, Vang, Joseph, & Chaminade, 2009).

Although theoretically diverse, the approaches used in the exant literature (with different emphasis, see Table 2) depict a precise pictures of the main determinants that move the heterodox innovators that are there described. Those main factors are:

- Social needs: all the cases described in the present literature are focused on solving social problems such as tackling poverty and its consequences;
- Resource constrains: all the innovators described have to cope with scarce or inappropriate resources;
- Market affordability: the products and process developed must be affordable;
- Institutional voids: the innovators often have to deal with faulty institutions, corruption, unclear property rights, inappropriate infrastructures and cultural barriers;
- Environmental concerns: An increasing number of authors in the emerging markets have become more and more aware of the environmental degradation cause by a fast development. Frugal innovation is thought to reduce the impact of this frenetic process.

	Social Needs	Resource constrains	Market affordability	Institutional voids	Environmental concerns
BOP		✓	✓		
Prahalad BOP – Hart & London	✓	✓	✓		
Jugaad		✓	✓	✓	
Grassroots innovation	✓	✓			✓
Inclusive innovation	✓		✓	✓	

Table 2 Determinants of below-the-radar innovation

On the other hand, innovation in emerging countries does not occur simply at the BOP. In the last two decades classic R&D-based innovation has soared especially in the BRICS. Innovation in those countries is taking place at all level of economic pyramid and countries like China, Brazil and India seem to be aware that to address the needs of their increasing middle-low classes they will need not only high-tech expansive gadgets but also and mainly affordable and low-cost products. For those reasons it is probable that emerging country will promote a multiple strategy to innovation with the objective of approaching the technological frontier of developed

countries on one hand, and on the other, addressing the needs of their majoritarian underserved poor population (see Table 3).

Table 3 – Unpacking innovation in developing countries

	Features	Stakeholders	Approach
Grassroots innovators	<ul style="list-style-type: none"> • Very limited capital • Low technology • Labour intensive 	<ul style="list-style-type: none"> • Single entrepreneurs • Local communities • Micro firms • Clusters of micro-firms 	<ul style="list-style-type: none"> • Grassroots innovation • Inclusive Innovation • Jugaad Innovation
Standard innovators	<ul style="list-style-type: none"> • Small and medium capitals • Low or medium technology • Labour intensive 	<ul style="list-style-type: none"> • Cooperatives • Small firms • Network or clusters of firms 	<ul style="list-style-type: none"> • Jugaad Innovation • Catch-up, imitation and absorption
Big investors	<ul style="list-style-type: none"> • Big capitals • Financial markets influence • Multinational cooperation • High tech and R&D activities 	<ul style="list-style-type: none"> • National or public firms • Multinational corporations 	<ul style="list-style-type: none"> • BOP Prahalad • BOP Hart & London • Classic R&D

CONCLUSIONS AND FUTURE REMARKS

In this paper we attempted to demonstrate that the developing world is a unique context to understand how innovation evolves in resource-constrained environments. What is more, the developing world, and in particular the emerging economies (BRICS), is already testing alternative approaches to innovation that include innovative concepts such as frugality, affordability, inclusiveness and empowerment of common people. We described how the developing world reacts to affordability, institutional and resources constrains with endogenous ingenuity. We illustrated some of the theoretical approaches that are emerging to explain innovation among the poor. Some people look at market dynamic to alleviate poverty, others advocate for new strategic challenges to bridging formal and informal economy. On the other hand many other argue that social aspects will dominate the future scenarios. As a consequence, organizations with strong social orientation are likely to serve better the BOP. In any case, a fundamental error is to think that low income countries are following the same path that developed countries went through during the industrial

revolution. Not everybody wants to look and act like Westerns and this will probably imply a multiple approach dominated by a great deal of variety in the innovation process. The future research agenda for those scholars interested in grasping the innovation potential of emerging countries will mainly include the three concepts introduced by the new Sussex Manifesto (STEPS, 2010):

- i) Directionality: promoting meaningful innovations that favour the majority rather than a narrow elite;
- ii) Distribution: distributing the benefits of innovation equally among society
- iii) Diversity: taking advantage of multiple approaches such as R&D, frugality, grassroots etc.

Moreover a great deal of research is still needed to understand and model innovation at the BOP from an academic perspective. In particular we would propose the following agenda:

- Top-down or Bottom-up approach? There is no clear evidence about what kind of approach is more effective to serve the "un-served" users at the BOP (George et al., 2012).
- Although grassroots innovation has been proved to be a quite diffused phenomenon no systematic assessment of its impact on local communities has been carried out so far. Most of the existing knowledge is based on anecdotic material.
- Micro, small, big companies? NGOs, local communities? Or rather a combination of alliance between different actors? Which types of organization initiate inclusive innovation? Are enthusiastic individuals who refuse the mainstream institutional setting? How is it possible to integrate these initiatives into a global value chain? (Kaplinsky, 2011)
- Mainstream models of innovation usually neglect small-scale technology. As a consequence there is no clear understanding about how policy and institutions can foster innovation at BoP or an effective mechanism to integrate grassroots level in the main stream S&T policy (Seyfang & Smith, 2007). There is a need to research policy implications of grassroots innovations (Kandachar & Halme, 2007).

- Reverse effect. Is the Green Leap hypothesis actually underpinned by empirical evidence? Nobody really knows if users in developing countries are keen to adopt frugality as new life-style. It is not clear how companies in industrialised countries will be able to learn the frugality lessons that come from the south (Immelt et al., 2009).

This agenda is potentially relevant for several reasons. The concept of ‘*Innovation without science*’ and post-modern science is not new, however there exists a quite strong reticence in the academic world to accept it (Gupta, 2009). The implications of such a model on the future of sustainable transition of industrial societies are almost totally neglected. While Western countries have virtually lost their ‘DIY capacity’ to face the environmental challenges created by resource scarcity, frugality from developing world might represent a sustainable alternative to approach a new model of less resource-intensive development in the North. The understanding of new business models designed to do better with less in the South could potentially trigger new technological path in a North obsessed by consumerism and very expensive and resource intensive luxury goods. If they want to accept the challenge of a new multipolar world, Western companies should learn from emerging countries how to be frugal and competitive at global level. The cases of GE (Govindarajan & Trimble, 2012; Immelt et al., 2009) and TATA (Brown, 2005) prove how disruptive new management and business model coming from developing countries can be. It is crucial to understand such a dynamic and, if necessary, absorb and adopt it in the developed world. Finally the research could be a useful exploratory experiment to learn some lesson from a policy perspective. How can the North support its own grassroots innovators? How to promote small scale grassroots initiative in Europe through an effective policy? This is a totally uncharted territory.

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