

# **Frugal Innovation in Africa**

## **Towards a research agenda**

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# Frugal Innovation in Africa: Towards a Research Agenda

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## **Abstract**

*Since 2010 the term Frugal Innovation has emerged in the innovation literature. The frugal innovation discourse has its roots in the practitioner community beginning around 2008 exemplifying innovation by Asian firms and by the emerging market giants India and China. In 2010 the term was coined by The Economist to refer to newly arising innovation manifestations in emerging markets, notably in Asia. Not surprisingly therefore, existent studies on frugal innovation have largely focused on Asia. This position paper aims to present a research agenda on frugal innovation in Africa. To arrive at this research agenda we first explore what frugal innovation actually is and whether frugal innovation could be considered as a distinct, new type of innovation. Secondly, we explore briefly how frugal innovation theoretically could be captured if we want to understand frugal innovation in Africa and confront these with the empirical realities in today's Africa. We conclude by presenting a research agenda, which evolves from the discussions in the preceding sections.*

## **1. Introduction**

The frugal innovation discourse has its roots in the practitioner community beginning around 2008 exemplifying innovation by Asian firms and by the emerging market giants India and China. Since 2010, the term frugal innovation has become wider known because of a special report of The Economist on innovation in emerging markets (Woolridge 2010). And increasingly the term can be traced in the academic literature dealing with innovation management and organizational theories, with a micro-level emphasis on firm-level business models and their direct business consequences when aiming to reach the so called Bottom of the Pyramid (BoP). But as George et al. (2012:665) observe “the richness and variability of the phenomena involved highlight questions that remain unanswered by current organizational and management theory”. Their edited volume of the Journal of Management Studies (49:4, June 2012) provides for a range of articles launching innovative theoretical ideas on how to study inclusive innovation, and partly covers frugal innovation for that matter. For example, the ideas of Amartya Sen on poverty and well-being, capabilities, and development as freedom (Sen 1999) are explored for improving our understanding of new product adoption at the BoP (Nakata & Weidner

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2012) and understanding the societal impact of business-driven ventures in the BoP (Ansari et al. 2012). A recent special issue in the journal 'Innovation and Development' (2014, nr.1), focuses on the topic of innovation for inclusive development, referring to phenomena and issues that are also relevant for the analysis of frugal innovation (see among others, Santiago 2014, Cozzens and Sutz 2014, and Chataway et al. 2014). Kaplinsky (2011) describes and analyses new developments in the role innovation and technological change play in poverty reduction in low-income countries, and the various, partly new actors that are involved in these developments. Without using frugal innovation as a term many of the phenomena he describes can be referred to as frugal innovation. And Bhatti (2012) does a first attempt towards a theory of frugal innovation by merging ideas from technology innovation, institutional innovation, and social innovation literatures.

The bulk of the frugal innovation literature focuses on Asia. One could imagine though that the frugal innovation discussion bears much relevance for economic growth and transformation and human development in Africa as well. In 2013 therefore, three Dutch universities started a multi-disciplinary collaborative research on frugal innovations in Africa. In this research the central hypothesis is that frugal innovations have much more potential to be relevant for economic transformation and local economic development in Africa than innovations which consider a 'one fit for all' external solution to solve Africa's perceived backwardness in technology and innovation. The overarching question in the research is then about the conditions under which frugal innovations are more likely to offer development opportunities for producers and consumers in Africa.

This position paper presents our research agenda on frugal innovation in Africa. The research agenda is on the hand fuelled by prevailing ideas and theories on what frugal innovation actually is and how it should be analytically captured and on the other hand by empirical realities in Africa. To arrive at the research agenda, we therefore first present in Section 2 a brief discussion on the question whether frugal innovation is a distinctive, new type of innovation that needs further investigation. In Section 3 and 4 we briefly present some initial, heuristic ideas on how frugal innovation could be analytically captured, departing from the ideas of Schumpeter, and confront these ideas with the empirical realities on the ground in Africa. Section 5 concludes by presenting the research agenda.

## **2. Are frugal innovations new and distinctive innovations?**

In this section we deal with the question whether frugal innovations can be considered as new and a distinct kind of innovations? In other words, does the term 'frugal innovation' refer to innovation phenomena that have not been observed before and which therefore cannot be classified and understood with existing notions and theories of innovation? From existing literature becomes clear that there is no consensus yet on how frugal innovation should be defined. Literally 'frugal' means 'sparing or economical' (Concise Oxford Dictionary 2011) or 'sparingly used or supplied, meagre, costing little' (*ibid.*). In its narrow meaning we would define frugal innovation as the stripping of attributes of technologically sophisticated products, systems and services to make them cheaper without losing technical functionalities, and therewith make them affordable for low income customers, either in low, middle or high-income countries. We deliberately use the word 'customers', because we think the target groups of frugal innovations go beyond the stereotyped consumers living at the Bottom of the Pyramid in low income countries. Many frugal innovations do target BoP consumers, but many also do not. The latter target for instance the rising middle income classes in emerging markets, or producers (farmers, manufacturers), or those companies, governmental and non-governmental bodies who deliver public services such as electricity, water, road infrastructure, safety and health. Examples include the Nano car by Tata, meant for the rising middle income classes in India, but also Chinese frugal power tillers for farmers, General Electric's handheld electrocardiogram device for rural health clinics, the 35 US Dollar Aakash tablet for India's school kids, and frugal weather stations developed by Delft University of Technology. Numerous examples can be found and traced in the internet. In sum, frugal innovations is not only about consumer goods; it is also about services and (public service delivery) systems.

Defined in the above narrow sense, one could ask the question 'what's new here'? Bhatti (2012:6-7), for instance, points out that in this meaning frugal innovation is not entirely new. He gives the example of the utility clothing industry in the 1940s in the United Kingdom which - confronted with war induced resource scarcity and low consumer demand - adopted frugal principles as result of the Civilian Clothing 1941 utility scheme introduced by the British Board of Trade in 1941 to ensure that quality consumer goods were available at reasonable prices . And also the UK furniture industry in the 1940s became an industry that was an IKEA *avant la lettre* (Bhatti 2012). And if we look at low income countries Kaplinsky (2011) refers to the literature and thinking on appropriate technology (AT) in the 1970s and 1980s, which received a great stimulus by Schumacher's publication 'Small is Beautiful' (Schumacher 1973). Kaplinsky (2011) also mentions that in the informal sector literature it has been shown already for long time that small scale

and locally owned firms are key providers of tailor made products and services for low income consumers. But both the AT movement and the informal sector studies have for a long time also been 'below the radar' (Kaplinsky 2011) of theories on innovation, technology and economic growth in low income settings (Kaplinsky 2011, Chetaway and Kaplinsky 2014).

To indicate the distinctiveness of frugal innovation as a phenomenon, it may not be sufficient to refer to the outcome (the frugal product, service or system) – frugal products and services are not a new phenomenon – but we probably need to include the distinctiveness of the innovation cycle leading to frugal products, services and systems as well. Our argument is that the innovation cycle is different for frugal products, services and systems than for 'ordinary' innovations. This distinctiveness in the innovation cycle is related to the fact that actors involved in frugal innovations have to face three challenges which are all related to the environment in which the innovations are meant to be designed, produced and marketed. This environment is characterized by being resource constrained, with a multitude of institutional voids, and specific needs that arise from customers living at the BoP (Bhatti 2012). The first and second challenge demand ingenious product designs that are less expensive, and easier to use, and in the absence of high-tech innovation systems require less infrastructure.

The third challenge demands that frugal innovation is not just about cost reduction; it is also about value-sensitive design. As Nakata (2012:3) observes reaching the BoP is challenging: the BoP's poverty must be taken into account, along with other issues such as social stigmatization, inadequate housing, infrastructural services and remote locations. The BoP is also highly segmented in terms of income, and comprises multiple cultures, ethnicities, literacy, capabilities and needs (Prahalad 2012:6, Chataway and Kaplinsky 2014). The challenge is, therefore, not just simply providing stripped-down versions of products to middle- and high-income consumers, but instead providing value-sensitive innovations that are truly compatible with the unique circumstances of the BoP (Nakata 2012:3).

In addition, Kaplinsky (2011) refers to three big global changes which will have implications for the nature of technical progress in the 21st Century: the development and extension of global value chains, the global diffusion of capabilities and the rapid growth of consumption in low-income countries (LICs). The former two lead to 'polycentric innovation', which designates the global integration of specialized research and development capabilities across multiple regions to create novel solutions that no single region or company could have completely developed on its own (Singh 2011; Radjou

2009). This is also in line with two important phenomena that can be observed in innovation processes over the last two decades. First, greater product and technology complexity has increased costs and risks for innovators such that these can barely be dealt with by relying on one firm's own limited resources and capabilities alone. This has pushed companies to collaborate with external partners in developing their innovations. Second, the globalization wave of the last two decades has opened up more possibilities for cross-national alliances that contribute to creating competitive advantage in foreign markets (Lavie & Miller 2008). This gives agency to poor producers and consumers, instead of merely relying on industrial technology from the West.

The third big change, the rapid growth of consumption in LICs, creates new markets. Nakata & Weidner (2012) make three observations in this respect. First, the BoP and the rising middle classes represent the most significant remaining, or unaddressed, global market. Second, the people at the BoP do, in fact, have financial resources, representing about five trillion US dollars in purchasing power parity, according to estimates by the World Resources Institute (2007). Third, the BoP and emerging middle classes are receptive and willing to spend money on quality products, provided these are suitable, well-made and reasonably priced. According to Nakata & Weidner (2012) frugal innovations are mainly the result of the recent ambitions of mostly Multinational Enterprises (MNEs) to design and sell products for and this rising consumer markets.

One can also raise the question whether frugal innovations are really innovations or are they merely adaptations of existing products, services and systems? Generally, in innovation theories, innovation refers to "all the scientific, technological, organizational, financial and commercial activities necessary to create, implement, and market new or improved products or processes" (OECD, 1997, cited in Léger & Swaminathan 2007:2). Hanusch & Pyka (2007:280) refer to innovation as the introduction of novelties, covering not only scientific and technological innovation but including all institutional, organizational, social and political dimensions. Hall (2010) argues that the definition of innovation is often highly value laden, depending on the context in which the concept is being used. And as Hall (2010: 2) observes: 'it shares with many other key concepts the paradox that once its importance is recognized, its meaning seems to drain away'. The concept of innovation runs the risk of being overused to the point that it becomes the signifier of nearly everything new, and therefore of almost nothing (Ibid.).

We prefer to consider innovation as a process by which ideas are transformed into practice (Hall 2010: 2, Gewald et al. 2012). And more often than not, innovation comes from the cumulative effect of implementing small-scale ideas over prolonged periods of

time. It is a process that encompasses the acts of numerous individuals, not only the original inventors but also the producers, consumers and middlemen that transmit and operationalize the innovations, making them acceptable to society. Innovation here thus refers to processes of invention, adoption, adaptation, appropriation and transformation, not only of products but also of systems, and not only scientific and technological products and systems, but including all institutional, organizational, social and political dimensions (see also Bhatti 2012). In line with this we would consider frugal innovations to be real innovations because frugal innovations reinterpret, reconfigure and combine existing products, systems and practices. Therewith a typical feature of frugal innovation is that the innovation process is not directed at adding extra attributes but instead getting rid of them, 'doing more with less'. Or, put differently and as a bit of a paradox: frugal innovations are incremental innovations (building upon existing innovations and underlying technologies) but the aim of the innovation is to be 'decremental' (remove attributes with preservation of basic technical functionalities instead of adding new attributes to enhance and increase technical functionalities).

In sum, we think that above developments and changes give rise to a different type of innovations, which we label as frugal innovations. Dealing with low-income settings, and innovating in a resource constrained environment with institutional voids, a different type of innovation arises, one that embodies frugal innovation activity, trying to reach BoP consumers. The frugal innovation process is - in contrast to top-down sophisticated R&D led innovation - one that employs bottom up, human centric, appropriate, local, and cost efficient approaches through processes such as design thinking, bricolage, creative improvisation, lean and reverse engineering. Although none of the concepts are independently new, it is the combination and the shift in how these all works together through varied actors that is new and distinctive. For companies and other organizations involved in frugal innovations frugal innovation forces them to take a fresh look at their business models and innovate in order to come up with quality products at dramatically lower prices (Dabke 2011; Govindarajan & Trimble 2012; Prahalad 2012). Frugal innovation requires business to reconsider and replace existing innovation processes, strategies, finances, partnerships, research methods, business objectives and organizational learning routines (Nakata 2012: 3). Cheap labour does not suffice for this type of innovation as it is more about redesigning products and processes, rethinking the entire production process, discarding unnecessary features and frills, negotiating with suppliers and distributors for the best deals, and finding newer cost-effective means of reaching consumers (Dabke 2011). Frugal innovations reconfigure business models as well as provide new developmental challenges for local and multinational enterprises in

the developing world, with winners and losers. The term frugal innovation suggests new patterns of innovation that have not been observed before (Van Beers et al. 2012:64).

Different terms are used as well in business literature to refer basically to many of the phenomena that are captured by the term 'frugal innovation' as well. Examples include 'reverse innovation' (Govindarajan & Trimble), 'resource-constrained innovation' (Ray & Ray 2010), 'cost innovations' (Williamson 2010) or 'Jugaad Innovation' (Radjou et al. 2012). Although a precise delineation of the term frugal innovation is still lacking, we still prefer to use the term frugal innovation instead of the other concepts, because these concept may be too restrictive to capture the phenomena under study, by either putting emphasis only on the cost dimension ('cost innovations), the source and direction of the innovation ('reverse innovation', 'Jugaad innovation'), or the environment in which the innovation takes place ('resource-constrained innovation').

The notion of 'inclusive innovation' has been introduced as well recently, defined as "the development and implementation of new ideas which aspire to create opportunities that enhance social and economic wellbeing for disenfranchised members of society" (George et al. 2012:663). 'Innovation for inclusive development' (Fernando 2014) is a variation on this notion. We think though that frugal innovation and inclusive innovation are not by definition the same, although in the existing literature on frugal innovation hidden assumptions can be found which suggest that frugal innovations are inherently also inclusive or sustainable innovations. Bhatti (2012:14), for instance, states that frugality is an ethically conscious choice (related for instance to environmental awareness). Frugality is not just about what is required but also how something is used by embracing reduction or elimination of waste. And further on: "frugal innovation is marked today by a concern to social inclusion and equality." (Bhatti 2012: 26). Intuitively, one may agree with Bhatti that 'doing more with less' is intrinsically beneficial to the environment, and providing affordable solutions to low income groups may contribute to poverty alleviation, but whether these effects take place will very much depend on the intentions of the one who introduce the frugal innovation. Standards play an important role here. For example, the small OMO washing powder sachets produced and marketed by Unilever are known to be low-cost and effective in cold water, safe to the environment and people, and contribute to better hygiene, but in many places sachets from other producers are cheaper, which has only be realized by lowering the standards under which these sachets are produced. Cheaper ingredients may be used that are harmful to the skin after washing, or may pollute surface water (see also Van Beers et al. 2012). So, the extent to which frugal innovations are also inclusive innovations will among others depend on to what extent designers and producers adhere to standards in order to make or keep the frugal

innovation inclusive. Whereas many multinational companies from industrialized countries in Western Europe and North America are kept accountable by their customers in their home markets for what they do in markets in LICs, this hardly occurs in the case of Chinese and Indian companies, let alone African companies. In short, processes of frugal innovation may well involve 'stripping' for example existing environmental and labour standards, which may lead a 'race to the bottom' as companies might be less interested to uphold existing international standards.

From a producer's perspective it can also be questioned whether frugal innovation is by definition inclusive. In case large multinational companies (MNCs) design, produce and market frugal products, services and systems they might crowd out local designers and producers. Especially those MNCs who have a large own home market for their frugal produce, such as in India and China, are able to attain substantial economics of scale leading to low prices which for the companies involved is off set by the high volumes they can sell. In Africa, the complaints of local entrepreneurs are identical across the continent: African markets are over flooded with frugal products from India and China, leaving no room for developing and up-scaling local entrepreneurship in frugal products.

Frugal innovation and inclusive innovation are therefore not by definition the same. We may therefore not talk about the same phenomena and the same actors involved. Frugal innovation and inclusive innovation are at most two circles that partly overlap, and where they overlap frugal innovation is inclusive innovation or *vice versa*, but there is substantial discrepancy as well. Not all inclusive innovation are or need to be frugal, not all frugal innovations are or need to be inclusive.

### **3. Can Schumpeter help?**

In our research on frugal innovation in Africa we aim to improve our understanding on if, how and to what extent frugal innovations can be relevant for economic transformation and development in African countries. Understanding the link between innovation and economic transformation and development is central in (neo-) Schumpeterian Economics, which deals "with the dynamics processes causing qualitative transformation of economics driven by the introduction of innovation in their various and multifaceted forms and the related co-evolutionary processes." (Hanusch and Pyka 2007:280). This section explores briefly its key elements and how this may help to improve our understanding of frugal innovations and its relation to economic transformation.

Innovations are a dominant force in economically transforming societies. This was emphasized by Schumpeter (1911) when he introduced the process of creative destruction. This is the destruction of products or production processes due to the introduction of new (innovative) products and production processes. Creative destruction drives economic transformation in a capitalist society. Schumpeter expected the creative destruction to come mainly from (often newly established) entrepreneurs operating in competitive markets. Innovation processes are erratic and risky though. Out of 3,000 innovative ideas only 1 is successful as a commercially viable product (Schilling 2005). The uncertainty of the innovations process induces innovating entrepreneurs or firms to control their external environment by growing in size. Larger firms are better able to control their external environment. Moreover, they have more financial means and they are able to spread R&D costs over a higher turnover thereby reducing fixed costs per unit product. The idea of large firms being in a better position to produce innovations is referred to as Schumpeter II (Schumpeter 1942) which juxtaposes the 'older' Schumpeter I, which expected newly established entrepreneurs to take the lead.

The ideas of Schumpeter have spurred further theoretical thinking and modeling, becoming manifest in Schumpeterian endogenous growth models and what is called Neo-Schumpeterian Economics (NSE). Besides Schumpeter the intellectual roots of NSE are Evolutionary Economics, Complexity Economics, approaches dedicated to change and development, and systems theory (see Hanusch & Pyka 2007 for a good overview).

The most distinguishing mark of Neo-Schumpeterian Economics is its focus on novelty, whereby innovation, and in particular technological innovation, is the most visible form of novelty. In NSE innovation competition takes the place of price competition as the coordinating mechanism of interest. In addition, inseparably connected with innovation, true uncertainty in the sense of Frank Knight (1921) enter the scene with important consequences for the analysis. This introduces the possibility of 'potential surprises', and instead of becoming concerned with allocation and efficiency with a certain set of constraints - as neoclassical economics is - NSE is concerned with the conditions for and consequences of a removal and overcoming of these constraints limiting the scope of economic development (Hanusch & Pyka 2007:276). Given its focus, NSE features most in studies of innovation and learning behaviour at the micro level of an economy, in studies of innovation-driven industry dynamics at the meso level, and in studies of innovation-determined growth and international competitiveness at the macro-level of the economy (Hanusch & Pyka, *ibid.*).

In a recent article Hanusch & Pyka (2007) introduce a Comprehensive Neo-Schumpeterian Economics (CNSE). That is, NSE should not only concern itself with

technological innovation, but with all facets of open and uncertain developments in socio-economic systems. CNSE should, for instance, not only consider transformation processes on the industry level, but also on the public and monetary side of an economy. Together these should constitute the three pillars of CNSE. They present several current and future challenges in research on these three pillars. With regard to industry they refer to the increased importance of knowledge, combined with an increasing internationalization of business, which leads to processes of catching up and leapfrogging affecting international competitiveness of nations and regions, and confronting established companies with major technological and organizational transformation processes. Modern innovation processes are more complex and demand collaboration with small and new entrepreneurial and technological start-up companies. To better understand these new patterns CNSE should get rid of the concept of a representative agent (Hanusch & Pyka 2007:282). Heterogeneous agents with varying competences and capabilities, industries at very different stages of maturity, and institutional frameworks differing between sectors, regions and nations coexist, enriching strongly the complexity of the economic systems of analysis. At the meso level several emergent properties and nonlinearities have to be considered then, e.g. unbalanced growth processes, catching-up, leapfrogging as well as forging ahead etc. become part of the economic reality (Hanusch & Pyka 2007:282). In a NSE perspective only a narrow corridor exists for a prolific development of socio-economic systems, namely between the extremes of uncontrolled growth and exploding bubbles on the one hand, and stationarity (zero growth and stagnancy) on the other (Hanusch & Pyka 2007:284). Economic policy is supposed to keep the system in a upside potential. Both the role of finance and the public sector – the other two pillars – matter here.

The above theoretical notions and ideas are very relevant for improving our understanding on how frugal innovation - as a phenomenon which exemplifies current developments in modern innovation processes - relates to and impact on processes of economic transformation. NSE can help us to better understand frugal innovation and its relevance of economic transformation beyond the level of industry or business. In fact, frugal innovation should be analyzed both at the micro (entrepreneur / enterprise), meso (sector) and macro (economy) level, and how these levels are linked matters for the outcome of frugal innovation for economic transformation and development. Understanding of how frugal innovation relates to and impacts on socio-economic systems and trajectories also asks for analysis of other sectors than industry as well, including the finance and public sectors. NSE also draws our attention to the existence of heterogeneous agents who co-exist and interact at various levels, none of them being a role model or being representative for the other. Particular in frugal innovation processes

heterogeneity of agents can be observed. And NSE emphasizes notions like leapfrogging, non-linearity, catching up and unbalanced growth, which may prove very relevant when looking at emerging economies like we intend to do.

#### **4. Making Schumpeter more comprehensive?**

Still, we think, for (C)NSE to be a useful analytical framework for understanding frugal innovation in Africa and how and to what extent it does or does not contribute to economic transformation in Africa, some issues need more focus and perhaps complementary approaches. Our observations in this section are on the one hand informed by some of the features of the empirical manifestation of frugal innovation itself, which seem to be unique to frugal innovation and not accounted for in Schumpeterian theories, and on the other hand by the realities of today's African economies and their transformation.

##### **4.1 The trend towards polycentric innovation: a hybrid of Schumpeter I and II?**

As outlined in the previous section, Schumpeterian Economics makes a distinction between Schumpeter I and II, the former referring to Schumpeter's initial idea that new establishing entrepreneurs feed innovation processes while the latter refers to Schumpeter's later idea that established firms are in much more better position to do so. Baumol (2002), for instance, aims to explain the growth miracle of capitalism in industrialized countries by arguing that the reason for large firms to have a higher probability to be successful in producing innovations is their ability to routinize the innovation production process in order to reduce the accompanying uncertainty of innovation production.

However, also pointed out in the previous section, with the advancement of knowledge and increased globalisation, increasing internationalisation of research and development has been taking place since the mid-1980s (Patel, 1995; Guellec and van Pottelsberghe de la Potterie, 2001; von Zedtwitz and Gassmann, 2002). The access to nation-specific resources results from geographically diverse organisations being embedded in different national innovation systems or because of international co-operative ventures (Miotti and Sachwald, 2003; van Beers and Zand, 2014). And today, routinization of innovation at the firm level requires much information and ideas that can hardly be found inside the control field of one big oligopolistic firm. Chesbrough (2003) introduced the concept of "open innovation", which is the idea that innovating firms innovate with external partners such as suppliers, competitors, customers and public and private R&D institutions. A crucial issue in R&D collaboration is the selection of relevant partners. Many firms are involved in multiple collaboration schemes, which means that they cooperate with several

different partners at the same time. Empirical studies generally show that collaboration affects innovative output of firms positively (e.g. Tether 2002; van Beers *et.al*, 2008).

Still, an important part of globalisation of innovation and technology takes place in large firms, particularly multinational enterprises (MNEs), which have research facilities abroad aimed at adapting products to local markets but also at tapping knowledge and technology from foreign innovations systems. This suggests a Schumpeter-II world in which routinization and bureaucratization becomes the norm. In frontier markets, however, it is necessary to have a guide that is able to show the way around (The Economist, 2013). Particularly frontier markets for frugally innovated products and systems require a polycentric way of innovating. The recent focus of Western multinational enterprises (MNEs) on frugal innovations confront them with new challenges with regard to their innovation processes. Their main focus is still on business models that are traditionally designed for developing and producing products for consumers in high-income countries or the small number of high-income consumers in low-income countries. The increasing focus of western MNEs on frugal innovations in emerging markets requires organizational structures and capabilities to enable the development of frugal products and systems (Zeschky *et.al*, 2011: 40).

Two kinds of organizations for frugal innovation can be distinguished. First, frugal innovations take place in local R&D subsidiaries of MNEs in the new emerging markets like African countries. Zeschky *et.al* (2011) claim this to be relevant based on a case study of the Swiss weighing-instrument manufacturer Mettler Toledo. The advantage of this kind of innovation is partly controlled by the parent firm. The disadvantage is that not the right markets are served. Particularly in case of frugal innovations aimed at supplying to the customers in the Bottom-of-the-Pyramid in Africa cultural differences and specific low-income behaviour of the customers might not be addressed properly (see for example Van Beers *et al.* 2012). These preferences are different in different international markets due to customers' tastes, income or legal constraints.

The second way of producing frugal innovations is through polycentric innovation production in technology networks in which both MNEs and local African entrepreneurs operate and collaborate. This requires a complete different business model and combines elements of both Schumpeter I and II. The Schumpeter II routinization of Western MNEs can lead to learning effects for local African entrepreneurs how to innovate continuously while the Schumpeter I small local entrepreneurs in Africa have a better sense for and information on the needs of the local customers. Locally embedded knowledge and technology networks are an important element in successfully re-engineering high-value

products for low-value but high-volume markets. In Asia, for example, it has been shown that a polycentric approach, whereby Western and Asian companies join forces, results in successful frugal innovations. The Schumpeterian elements here are innovation (novelty) and entrepreneurship (Hagendoorn, 1996; Hanusch and Pyka, 2006). The new point is the international dimension, i.e. technology networks between firms of different size located in different countries with different income levels.

The above observations show that current trends in the development of innovations, including frugal innovations, and in particular in emerging economies such as in Africa, do not fit neatly into Schumpeter I or II. On the one hand, frugal innovation might be driven by individual entrepreneurs in Africa, while on the other hand it might be driven by non-African MNEs that have the resources to engage in R&D. Currently, most frugal products are still being developed and introduced by MNEs, which would make frugal innovation fit in the Schumpeter-II pattern of innovation. But the typical polycentric and knowledge-sharing features and the related business model also have features of a Schumpeter-I pattern of innovation and make frugal products and services the result of a kind of hybrid pattern of innovation, which does not fit the classical Schumpeterian pattern. Moreover, from an African perspective there is evidence that many local entrepreneurs in Africa are innovative, for example in ICT, but for them a key bottleneck is to become involved in wider technology networks that allow them to become more integrated in broader (national and international) innovation systems.

In Africa innovations are much less routinized but show up incidentally when a practical problem should be solved. In order to make innovation a driving force of economic transformation in Africa it is necessary to increase the number of innovations with the help of routinization of the innovation production process. Innovation and technology networks between large oligopolistic enterprises – often MNCs – and smaller local African entrepreneurs can play an important role in making routinization of innovations a dominant force in economic transformation in Africa. The Bottom-of-the-Pyramid can provide a demand-driven force necessary for (frugal) innovations (Schmookler 1966). As local private firms in Africa are generally not very large (exceptions in South Africa and in some of the emerging economies such as Nigeria and Ghana) the required routinization experience should be provided by non-African oligopolistic firms. Therefore frugal innovations developed in innovation and technology networks between Western and local firms may have much more potential to be relevant for economic transformation in Africa than views which consider a ‘one fit for all’ external solution to solve Africa’s perceived backwardness in technology and innovation. Such polycentric networks can also contribute to availability of knowledge on how to use technology.

## **4.2 The role of standards**

In Schumpeterian Economics innovation is considered as being intrinsically beneficial for economic growth and development. Hall (2010:3) notes though that the celebration of innovation in much of the literature as the key component in creativity and entrepreneurship, and thus presenting it as something positive, is unjustified. Innovation is not inherently beneficial. Also the question whether frugal innovation embodies a process of Schumpeterian creative destruction which propels economic growth and societal development should therefore be critically addressed. Processes of frugal innovation may well involve 'stripping' for example existing environmental and labour standards. MNCs from China, India and Brazil may lead a 'race to the bottom' as they might be less interested to uphold existing international standards. These standards (which have not been foreseen in Schumpeterian theories) have become increasingly part of the assessment whether or not innovation contributes to development, and we may need further insights from the economic literature on the developmental consequences of public and private product and process standards to improve our understanding of frugal innovation.

Standards are increasingly recognized as a key global governance mechanism that co-determines access to markets and opportunities for price differentiation (Blowfield, 2007; Knorrinda, 2011). Standards come in many manifestations: public and private standards, product and process standards, quality, environmental and social standards, and in recent years we more often see combinations or hybrids of standards (Henson and Humphrey 2010). Their common denominator is transparent control systems, most often implemented by 'third-party' independent agencies, ensuring the end-user of compliance with specific agreed upon indicators. For example, leading global consumer brands use private standards to reduce risks and transaction costs, and to differentiate themselves from competitors. For consumers, standards transmit information about a product's technical specifications, its compliance with health and safety criteria, and the 'quality' of the labour and environmental conditions under which it has been produced and sourced (Nadvi, 2008: 325). Most standards are so-called credence goods, because consumers cannot deduce the actual implementation of, for example, decent wages for local workers from the physical end product (Linnemann et al., 2006; Tirole, 1988). This means trust plays an important role, trust especially in the independence of the standard setter – with ISO as the iconic example – and trust in the independent monitoring of certification agencies.

Product and process standards influence processes of Schumpeterian creative destruction in contrasting ways. Large established firms use standards to entrench their market positions, to increase barriers to entry, and standards thus function as a line of defence against being swept away by the next wave of creative destruction. Simultaneously, established firms claim that these standards guarantee consumers high-quality, safe, hygienic, and socially responsibly produced products, and that these standards thus function as a line of defence against dangerous, environmentally destructive and human exploitative products and processes. Both processes are important to better understand frugal innovations in Africa.

#### *Standards to entrench vested interests*

Most of the existing literature on standards focuses on how Western governments and firms initially shaped international standards, and were instrumental in setting up standard setting bodies, either public, private, or a mix. In the present globalisation era some of these private standard setters have in effect become key regulators of global trade, separate but arguably at least as important as public attempts to regulate trade in the global economy. Access to global value chains is often only possible for developing country producers when they minimally possess an ISO 9000 certificate, often seen as a necessary but not sufficient condition to be taken serious as a potential supplier. Moreover, especially in more consumer-oriented and higher value products, brand companies nowadays have to go to great lengths to demonstrate 'responsibility' through their full supply chain, and private standards developed for example in cooperation with NGOs – like Fair Wear in clothing - are seen as an effective way of addressing such concerns. However, such certifications are often too costly for small and medium scale enterprises in developing countries, effectively banning them from these higher value added supply chains. These barriers to entry are not insurmountable, as many larger suppliers in global value chains who possess such certifications also sub-contract part of their work again to non-certified smaller suppliers, most often in sectors that are less scrutinized by NGOs because they do not produce identity related consumer goods like clothing, shoes, or mobile phones. Nevertheless, standards have become a major tool for established companies to protect their market share and reputation and to consolidate their 'modus operandi' as the one and only legitimate way of doing business. As such they may well hamper or at least delay processes of creative destruction. Even though frugal products may cost only a fraction of the present high value-low volume products, frugal innovators can only enter markets not governed by such formal standards. This is one of the additional reasons why most frugal innovations at present can only take place in less regulated markets, like the booming new middle class consumer markets in Africa. It is in

these less regulated markets that in particular Chinese, Brazilian, Indian, and, of course, indigenous African producers compete for the Bottom of the Pyramid markets.

#### *Standards to protect consumers and society*

The other side of the coin is that standards do indeed play an important role in ensuring relatively high-quality, safe, hygienic, and socially responsibly produced products. This major acquirement might get lost with frugal innovation strategies that focus on reducing costs and stripping products of all attributes that do not influence its usage and/ or cannot be deduced like in the case of credence goods. An often implicit coalition of major Western brand-name companies, Western governments, trade unions and Western consumer activists lobby against allowing firms to ignore this acquirement. However, in less regulated markets in Africa they might increasingly be swept aside by indigenous firms and new MNCs from China, India and Brazil. While some analysts predict that this will lead to a 'race to the bottom' (Kaplinsky and Farooki 2010), empirically it is as yet an open question to what extent frugal innovations will undercut existing standards. This is a serious concern, so we will investigate where and when stripping of existing higher-value products involves abandoning environmental and labour standards, and to what extent this leads to increased destruction of the environment and labour exploitation. This also highlights that creative destruction does not necessarily improves developmental outcomes.

#### **4.3 African conditions for a Neo-Schumpeterian corridor**

Theoretically one could state that frugal innovations offer an opportunity for African economies to embark on a Neo-Schumpeterian corridor of balanced growth and prolific development. The last decade many African economies have shown non-preceded growth rates, which have raised optimism about Africa's economic future and its ability to raise the standards of living of its people. In the period 2001-20120 the top 10 of fastest growing economies contained 6 African countries, including Angola, Niger, Ethiopia, Chad, Mozambique and Rwanda. The general optimism about Africa's economic future is based on past experiences elsewhere in the world, where high growth rates were accompanied by significant structural changes in production and consumption patterns, which allowed for higher living standards. In addition, it has been indicated above that frugal innovations developed in innovation and technology networks between Western and local firms may have much more potential to be relevant for economic transformation in Africa than views which consider a 'one fit for all' external solution to solve Africa's perceived backwardness in technology and innovation. Such polycentric networks can also contribute to availability of knowledge on how to use technology. And the still wide presence in Africa of unregulated markets in terms of formal standards in combination

with a booming middle class may provide opportunities for African entrepreneurs to introduce successful frugal innovations for the BoP.

But there are several factors which are closely related to the realities on the ground in Africa, which may prevent frugal innovation to be a stimulus for attaining a Neo-Schumpeterian corridor of balanced growth and prolific development in African economies. And part of these realities is also not reflected in CNSE, which limits its applicability for analyzing the relevance of frugal innovations for economic transformation in Africa. Key in the argument of CSNE is that the process of creative destruction includes a shift towards activities with higher productivities, increasing returns to scale and higher wages, a key element also of structural transformation in the history of industrialized and late industrializing countries. For economic transformation to be successful, it is generally thought that countries should strengthen their capacity to acquire greater capabilities to produce more sophisticated, higher-value goods for which demands globally expands as incomes rise. Generally, African economies have shown very little progress in product sophistication since the end of the 1960s. And the question is whether becoming involved in the production of frugal products – which are designed by purpose less sophisticated and represent low value – will enable African producers to climb the technological ladder and therewith induce economic transformation to the same extent as product sophistication would do? In line with the discussion on the standards, it can also be critically ask here whether innovation – *in casu* frugal innovation – is intrinsically beneficial for economic transformation, as assumed by NSE? This is something that needs further investigation.

Spill-over effects from a Neo-Schumpeterian corridor fuelled by polycentric frugal innovation networks may be limited as well because in many African countries industry – and the manufacturing industry in particular – is largely missing. Current frugal innovations we know of are mostly taking place within industrial sectors, much within the agricultural or services sector (the ICT sector being the proverbial exception). The latter two, however, are still the mainstay of many African economies in terms of GDP and employment. This leads to a more general observation that the extent to which frugal innovations spur economic transformation and a neo-Schumpeterian corridor of growth and development, will not only depend on the frugal innovation itself, but also on the economic transformation trajectories currently present in Africa. The African Development Bank recently distinguished four groups of countries in Africa. The first group contains the oil exporters (for example, Angola, Nigeria, Chad, Eq. Guinea); countries that have the highest GDPs per capita on the continent but are the same time the least diversified. Manufacturing and services sector are still low developed and

present maximal 30% of GDP. Pre-transition countries (for example, Ethiopia, Mali, DRC, Sierra Leone, the second group, have annual GDPs per capita below 400 US Dollars, but some are growing very fast. Lack of basics such as strong stable governments, good macroeconomic conditions and sustainable agricultural development may prevent the embark on a road of economic transformation. Transition countries (for example, Uganda, Tanzania, Ghana, Mozambique, Senegal), the third group, have on average a lower GDP per capita than oil exporters and but their economies are growing fast and these countries increasingly export manufacturing products. Diversified countries, the fourth group (South Africa, Egypt, Tunisia, Namibia, Mauritius), have a high urbanization rate, labour costs are generally higher, and households have therefore some discretionary income. Given these different groupings one can imagine that different Schumpeterian patterns of innovation (Breschi *et al.* 2000) and socio-technical systems (Geels 2004) may arise or are needed, and the relevance of frugal innovations and the sectors in which these may be most beneficial for local producers differs also accordingly.

Hartmann *et al.* (2010) argue that the current CNSE framework may not be adequate enough to analyze and understand innovation process in developing and/ or emerging countries. Their arguments may well apply to applying the CNSE framework to frugal innovations in Africa as well. Their main argument is that the impact of mass deprivation and social imbalances, weaknesses of the institutional set-ups and (low) future orientation of economic structure in Latin American economies are major factors to be considered in assessing the ability of an economy to reach the Schumpeterian Development corridor where prolific development takes place (Hartmann *et al.* 2010:71). CNSE has to consider the inability of a large percentage of the population to participate pro-actively in innovation and development as well as the structural problems concerning economic efficiency and providing the economic opportunities for learning the solving process. Thus, besides looking at the three CSNE pillars industry, finance and public sector, the efficiency of the economic sector and the enlarging of the capabilities of all actors to contribute to innovation and development must be brought into stronger focus (*ibid.* 73). For developing countries, a fertile combination between the mutual reinforcing factors (i) freedom and social welfare, (ii) the capacity to create, implement, diffuse and imitate knowledge and innovations, and (iii) an efficient and future-oriented economic structure has to be made to achieve socially sustainable Comprehensive Neo-Schumpeterian Development. Hartmann *et al.* (2010:72) considers Sen's capability approach (see, among others, Sen 1999) as a theoretical bridge to connect, adapt and apply NSE approaches to underdeveloped countries and development policy, especially in a globalized knowledge-based economy in which human capital, entrepreneurship and innovation are increasingly becoming the key elements for development.

We think the observations and analysis of Hartmann *et al.* (2010) are very relevant for understanding the relevance and impact of frugal innovation in Africa. Basically, the conditions prevailing and factors at play in Latin America can equally be applied to most African countries as well and seems to be reflected in measurements on the innovative capacity of African economies. In the past three hundred years, the dominant discourse that has developed regarding Africa is one that sees the continent as being 'backward', both technologically and with reference to innovation. Africa is regarded as the continent where innovation 'failed', where the wheel, literacy and industrialization were all 'late'. That Africa is a continent lacking innovation or innovative capacity is an image that is strengthened by the annual Global Innovation Index that aims to capture the richness of innovation in societies and ranks 125 countries accordingly (Dutta 2011). The 2011 index included 27 African countries, with South Africa and Mauritius ranking highest (50<sup>th</sup> and 53<sup>rd</sup> respectively), followed by Tunisia (in 66<sup>th</sup> place) and Ghana (70<sup>th</sup>). However African countries occupied 17 of the bottom 25 places (with Sudan and Nigeria in 124<sup>th</sup> and 125<sup>th</sup> positions respectively). Another recent report on innovation and productivity in Africa concluded that 'innovation is the main driver of economic growth but the capacity to innovate is quite low in most African countries, both in the private and in the public sector' (Wolf 2007: Abstract).

A major question is whether we need to be that gloomy though if we consider frugal innovations. Innovations in Africa may not yet be confined to the introduction of a new item, idea, product, system or institutions, may not lead yet to new technological paradigms, but cumulative innovation is widely manifest in Africa through the recombination, recycling and /or innovative use of existing objects and ideas (see Gewald et al. 2012 for case studies on this). This cumulative innovation is firmly rooted in combining traditional knowledge and know-how with innovations which have been introduced in Africa from outside. African societies are often rich in 'traditional' knowledge, that is, traditional technical know-how, "encompassing the content or substance of traditional know-how, innovations, information, practices, skills and learning of systems such as traditional agricultural, environmental or medical knowledge" (Léger & Swaminathan 2007:16). In Africa, and elsewhere in the developing world, traditional knowledge exists as a differentiated source of information that could provide a basis for original innovation, and for that matter frugal innovation, and hence, a comparative advantage for these activities. Diffusion of this traditional knowledge, for instance in developing frugal innovations in polycentric networks with companies from industrialized countries, may be beneficial for Africa. In this sense one may argue that frugal innovations better fit African conditions in terms of innovative capacity, because

frugal innovations built upon local or traditional knowledge and are generally examples of cumulative innovations.

## **5. The CFIA research agenda**

The hypothesis is that frugal innovation, given its characteristics, offers better chances and opportunities for African producers and consumers to become actively involved in the design, production and marketing stages of frugal products, services and/or infrastructures/systems, than innovations in products, services and systems that are rooted in highly sophisticated technologies, mostly developed and superimposed by actors from industrialized countries. This implies that frugal innovations can play a crucial role in promoting local economic development in African countries. Central and overarching question in the research agenda of the Center for Frugal Innovation is then under which conditions frugal innovations are more likely to offer these development opportunities for Africa. Or (alternatively) which chances and opportunities do frugal innovations offer for promoting and enhancing local economic development in African countries?

To answer this research question and to test the hypothesis several research areas can be identified. These research areas should be considered as fields of interest. The research areas are not mutually exclusive, there is possible overlap, but they represent different perspectives to the same problems, and one research project may incorporate and integrate dimensions from various research projects. Together these research clusters constitute the research agenda of the FIA Center for the coming five years, with the ultimate aim (1) to raise scientific results and insights that can contribute to answer the overarching question, and (2) to disseminate these results in policy circles and among relevant actors involved in frugal innovation in or for Africa.

We distinguish between the following research clusters:

### **1. Understanding existing manifestations of frugal innovation in Africa**

A literature search has shown that we actually know very little about current and past manifestations of frugal innovation in Africa. A substantial part of the research agenda should aim at empirically identifying and analysing existing and past manifestations and practices around frugal innovations in Africa, and what these manifestations imply for local economic development. A 'Glocal' perspective is needed here. While our main aim is to look at frugal innovation through the lens of local economic development in Africa, we

need to relate local processes to what occurs at national and global level. As explained in the previous sections in this paper, Africa has become increasingly part of global processes and networks, we need to disentangle and interpret these relations with a view from below. Three main sub-areas may constitute this research area:

#### 1.A Identifying actors and their interrelationships

There is a need to better understand which actors play a role in frugal innovation regarding African markets. We are in the first place interested to know whether and to what extent African entrepreneurs are involved in frugal innovation. But we also know that non-African actors from both emerging economies like India, China, Brazil, Turkey and Malaysia, and from industrialized countries in Europe and Northern America have a large stake in introducing frugal innovations in Africa, and in the design, production and sale of the products and services based on these innovations. Can marked differences been observed between these actors in terms of for instance market segments served, type of frugal products and services designed, produced and marketed, technologies used, business model, enterprise form (MNEs, SMEs, micro-entrepreneurs), participation and organization of innovation and technology networks, compliance to safety and sustainability standards, governance and legal frameworks, and so on. And can these different manifestations inform us about the effects of frugal innovation on local economic development? Can marked differences in effects been observed between different manifestations? Such questions may not only ask for empirical research in situ in Africa, but may also include research in other, non-African countries among enterprises and agencies that serve African markets.

#### 1.B Technical Conditions for frugal innovation to take place

This research area will among others deal with the technical infrastructure necessary for frugal innovations to take place. The concept of frugal engineering is considered as an input to build or maintain technical infrastructure at low costs and in a simple way to run for less literate people. A stable infrastructure is relevant for a stable supply of frugal innovations of products to BoP consumers. Relevant question is how can (high) technology solutions be changed/redesigned through frugal engineering such that they can easily be used in a low technology environment?

#### 1.C Social Conditions for frugal innovation to take place

Differences in set-ups and effects on local development may differ because the conditions under which frugal innovation and the production of frugal products and services take place may differ. This part of research area 1 focuses explores to what extent and how the environment in which the actors operate is enabling for frugal innovation that benefit local economic development. Governance issues, including the legal dimensions of innovation, as well as the availability and access to financial institutions, the role of knowledge centers (universities, think tanks, laboratories, vocational training institutes), governmental policies on innovation and industrial development, etc., will be the focus of research projects in this research area.

## 2. Experimental set-ups

Besides investigating existing practices, the Center also aims to raise more insights into the relevance of frugal innovations for local development in Africa by setting up experiments in which frugal innovations are designed and disseminated. These experiments aim at the development of frugal technologies in collaboration with private sectors actors in the Netherlands / Europe and Africa that will translate into frugal products, services or systems for African markets. By setting up and monitoring these experiences, insights can be raised in what the actual possibilities and constraints of developing frugal technologies are for and in Africa, and what would be needed to create situations that African entrepreneurs and consumers would benefit most from the development of frugal technologies, products and services.

## 3. Developing theoretical perspectives

As far as we know, no consistent and coherent analytical frameworks have been developed to understand the phenomenon of frugal innovation, although initial attempts have been made in the last few years (see Kaplinsky ..., Van Beers et al, 2013 = Schumpeter paper). Based on empirical evidence, the Centre aims to develop further theoretical frameworks and methodological tools that can help us to interpret and analyse frugal innovation phenomena. It is without saying that this framework will benefit enormously from a multi-disciplinary approach and perspective, to which innovation and technology studies, (development) economics, anthropology, law and governance, and business (management) studies can contribute significantly.

## 4. Exploring Africa-EU partnerships

The coming years the African Union (AU) and the European Union (EU) will explore and establish new forms of partnerships that will create win-win situations for both sides. Our pitch is that frugal innovation might be an innovative entrance to develop these new partnerships. These partnerships, in which the private sector from both continents will have a large stake, could be organized around models of frugal innovations that both are favourable to Africa and African firms, but also to European firms. Our hypothesis is that European firms can only compete successfully with China, India and Brazil for the upper-bottom and middle of the pyramid consumer markets in Africa if and when they cooperate with African firms and vice versa. Through strategic cooperation and synergizing on complementarities these Africa-EU alliances could compete effectively especially in market segments in which some basic environmental and labour standards are (increasingly) adhered to. This generic pitch seems to appeal to quite different audiences, even though we have little to show for in terms of substantiating statistical evidence or illustrative case studies. The risk is that it proves to be an 'ideational construct' rather than an empirically observable reality that can be further stimulated and enhanced through policy. In order to start substantiating this pitch we need to identify a set of subfields and sectoral case studies, as described in research areas 1 and 2. With inputs with these two areas, it could be further explored how such partnerships would look like, under what conditions they could be successful for both sides, and what national and AU/EU policies are needed to promote such partnerships.

## 5. Frugal innovation models and sustainability

Frugal innovations may lead to products and services that are environmentally damaging, may be a danger to people's health, or may be produced under adverse labour conditions. The stripping down of products and services may lead to a race to the bottom whereby (inter)national standards are neglected. A research area for the Center FIA is to explore how frugal innovation models can be made sustainable in terms of standards in areas of the environment, health, safety and labour, and how governance structures should look like that ensure proper implementation and application of these standards.

## 6. Towards frugal business models

We already pointed out that frugal innovation as a phenomenon does not only refer to the redesigning or re-inventing existing products and services. Frugal innovation also asks for different business models, for different modes of organization. How do frugal business models look like, what have been experiences so far in Africa and other parts of the world, and what can be their applicability to local African settings? Which business models

would fit African local conditions, and what would it imply for policies of national governments, international organizations, NGOs and private sector agencies that aim to promote entrepreneurship in Africa. In this area special attention will be paid to local entrepreneurship. What are the conditions to stimulate local entrepreneurship and how can such be framed that it contributes to local economic development. What role will Western firms play in stimulating local entrepreneurship in African countries.

#### 7. Demand for frugal products and services

As far as we know, there is no study available that has explored the demand for frugal products and services among the BoP and rising middle classes in Africa. What type of products are most wanted / needed, in what sectors (health, food, sanitation, water, energy, etc), by which segments of consumers (urban/rural, income categories, men/women, old/young) and what does this imply for the design of frugal innovations? Frugal innovation is not only about value sensitive design in terms of monetary costs, but also about design that incorporate attributes that respond and correspond to local non-monetary values. These may be in areas such as colours, ways of use, tastes, taboos, and so on.

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