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Emergence of India as a Lead Market for Frugal Innovation

Opportunities for Participation & Avenues for Collaboration

By: Rajnish Tiwari and Cornelius Herstatt

CONSULATE GENERAL OF INDIA
HAMBURG

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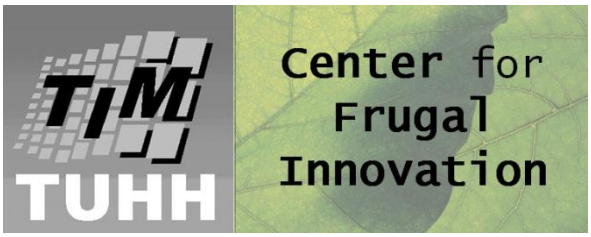

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अमंत्रं अक्षरं नास्ति, नास्ति मूलं अनौषधं।

अयोग्यः पुरुषः नास्ति, योजकः तत्र दुर्लभः॥

(शुक्राचार्य)

There is no letter in the alphabet, with which (at least) some mantra does not begin;
There is no plant on earth, whose roots are completely devoid of medicinal properties;
There is no human being, who is completely incapable;
Rather, it is the promoter, with the ability to recognize this hidden potential, who is rare.
(Ancient Sanskrit saying from India, attributed to Shukracharya)

NOTES

This publication is a result of a non-commercial collaboration between the Center for Frugal Innovation at Hamburg University of Technology (TUHH) and the Consulate General of India (CGI) in Hamburg. The publication draws on recent, published research of the authors. The views expressed herein are those of the authors and do not necessarily reflect the view of the CGI or the Government of India.

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LIST OF ABBREVIATIONS

ATM	Automated Teller Machines
FDI	Foreign Direct Investments
OGIN	Open Global Innovation Network
R&D	Research and Development
SCV	Small Commercial Vehicle

FOREWORD

India has been making steady economic progress ever since the process of economic liberalization was initiated in 1991. Significant increase in disposable income, growing domestic consumption and the demographic dividend that India is endowed with, have set Indian firms on the path of innovation. A unique paradigm of resource-efficient "frugal innovation" has taken firm roots in the country, which has become a fountainhead for innovative products and services characterized by high quality solutions and extreme affordability, cutting across industries.

India-based companies, domestic enterprises as well as local affiliates of global multinationals, are showing the way in mastering this seeming paradox of achieving high tech, state-of-the-art innovations while minimizing the costs associated with them. India's educational and institutional infrastructure carefully built and nurtured by successive governments in the post-Independence period, acts as a key enabler for this innovative capability.

As these robust and affordable solutions are increasingly sought after in other countries owing to several socio-economic and environmental factors, India is advancing to the position of a "lead market"; a pivotal, global leader whose "innovated in India" products and services are in high demand elsewhere. Not only other developing and emerging economies, but also - and increasingly so - Western countries are discovering the attractive value proposition of frugal innovations, as the export success of India's small car industry documents. Indian companies are on a globalization path and efficient and effective frugal products and services are their key to success in expanding overseas.

In the backdrop of these developments it is my pleasure to present this report on "Emergence of India as a Lead Market for Frugal Innovation: Opportunities for Participation & Avenues for Collaboration" authored by Dr. Rajnish Tiwari and Prof. Dr. Cornelius Herstatt of the Center for Frugal Innovation (CFI) at Hamburg University of Technology. The report is a result of collaboration between CFI and the Consulate General of India, Hamburg. The report intends to provide insights into recent developments and market opportunities for the benefit of German companies looking to source cost effective products from India or expanding their

collaborations with Indian companies as well as Chamber of Commerce and policy makers from both sides.

I would like to thank the authors and CFI for their efforts towards this fruitful collaboration and look forward to continued partnership. The publication of this report was made possible under the Market Expansion Activities Programme of Investment & Technology Promotion Division of the Ministry of External Affairs.

December 2013

Dr. Vidhu P. Nair
Acting Consul General

PREFACE

Having been associated with research related to innovation and research and development (R&D) in India as well as with overseas Foreign Direct Investments (FDI) by Indian companies for nearly a decade now, it is our pleasure to prepare this report on behalf of the Consulate General of India, Hamburg.

For a number of reasons we believe that the phenomenon of "frugal innovation", affordability-driven products with attractive value proposition, marks the advent of a new paradigm, which is set to stay here for some time. Several industrialized economies are embracing austerity measures; environmental concerns are putting a question mark over the practice of planned obsolescence and, there is vast market of a growing middle class across developing and emerging economies that strives to use state-of-the-art and affordable products and services, not stigmatized by labels such as "Jugaad", "cheap", or "low tech".

It is out of this realization and conviction that we have established a Center for Frugal Innovation (CFI) at our university. Through collaborative effort of academics, practitioners, and policy makers from leading institutions across the world CFI seeks to work on conducting and promoting research, consulting, and education in the field of affordable and sustainable innovations. The results of this collaboration are intended to enhance the innovative and competitive performance of enterprises while contributing to the greater good in the form of solutions leading to a better quality of life.

One of the missions of CFI is to make a substantial contribution to research and implementation of frugal innovations by supporting policy makers in creating conducive framework conditions and assisting public authorities in promoting programs and actions leading to the greater good. It is therefore with great pleasure that we submit this report to the Consulate General of India, Hamburg and hope to contribute to enhancing Indo-German relations.

We would like to take this opportunity to thank Dr. Vidhu P. Nair, Acting Consul General, and Mr. Parminder Singh Bandechha, Commercial Officer, for initiating the idea and giving us this opportunity to showcase our research to policy makers in India.

December 2013 Rajnish Tiwari & Cornelius Herstatt

EXECUTIVE SUMMARY

In the recent years the world has seen a number of economic developments with far-reaching consequences. First, sustained economic growth in the previous two decades has seen the rise of a sizeable middle class worldwide with considerable & increasing disposable income generating new impetus for consumption. Second, multinational firms from "emerging economies" have advanced to a major source of worldwide outward Foreign Direct Investments (FDI). Finally, a new paradigm of innovation that is rooted in affordability, state-of-the-art quality and an attractive value proposition ("frugal innovation") is increasingly gaining ground in both developing and developed countries for various and varying reasons. These three developments are closely interrelated as will be shown in this publication.

India has emerged as an epicentre for frugal innovation owing to several factors such as a large and growing economy, a favourable ecosystem for innovations, and its increasing integration in the global economy. As these frugal products increasingly diffuse in markets outside India's borders, the authors argue that India's emergence as a "lead market" for frugal innovation creates new opportunities for participation and avenues for collaboration. While Indian firms can seek access to new markets including in the industrialized world, there are significant avenues for participation and collaboration for Western firms that help reduce technical and market uncertainty in the innovation process, creating an attractive "win-win" situation.

1. Introduction

India has been home to a series of disruptive and potentially game-changing innovations in recent years. Termed as "indovations" by the business press such innovations – e.g. GE's handheld electrocardiogram (ECG) Mac 400; the world's cheapest passenger car, Tata Nano; or Vortex's solar-powered Automatic Teller Machines (ATMs), Gramateller – may be regarded as products characterized by their affordability, robustness in dealing with infrastructural deficits, and (at least) "good enough" quality in a volume-driven market.

Such innovations are often motivated by resource constraints; forcing firms and users to think out-of-the-box and create solutions which can circumvent limitations imposed by the infrastructural and business environment. "Mangalyaan", the recently launched Mars mission of India forcefully documents this (Patairiya, 2013). With a total cost of about $75 million this high tech product is reportedly less expensive than a passenger airplane.

There is reason to believe that the phenomenon of "frugal innovation", affordability-driven products with attractive value proposition, marks the advent of a new paradigm, which is set to stay here for some time. Several industrialized economies are going through a phase of economic hardship and the countries in the European Union as a whole are embracing austerity measures. Besides, very real environmental concerns are putting a question mark over the practice of planned obsolescence that has traditionally characterized innovations in the Western markets for nearly a century now. And, finally, there is a growing middle class across developing and emerging economies that depends on affordable products and services rather than going for high-end brand names.

The spark triggered by such innovations emanating often from India, in many instances, tends to jump outside the political/geographic borders of India in the form of exports; often to other developing nations with comparable socio-economic conditions, and in some instances also to industrialized countries (Immelt *et al*, 2009; Govindarajan and Ramamurti, 2011; Kumar and Puranam, 2012). India is widely considered to be at the forefront of innovation activities emanating from the emerging economies due to factors such as innovation friendliness, capacity for technology absorption, and the size and quality of its human resources.

This leads us to see India as a "lead market" for frugal innovations, whose innovative products and services transcend its politico-geographic boundaries and diffuse into other markets. A lead market can be defined as following.

> "A lead market is a national market, which primarily on account of the size of its domestic demand, its access to technological capabilities and its embeddedness in the global economy provides key innovation impetus to a particular category of products." (Tiwari and Herstatt, 2014: 205)

According to Beise (2004: 998): "Innovations that have been successful with local users in lead markets have a higher potential of becoming adopted world-wide than any other design preferred in other countries". Lead markets derive their strengths from factors such as their demand advantage, cost advantage, export advantage, market structure advantage, and technological advantage (Beise, 2001; Tiwari and Herstatt, 2014)

LEAD MARKETS

"In most industries, a few key markets lead the industry's evolution. They are often the largest, most sophisticated and most competitive markets in which the nature of impending global changes is first mirrored. Results of competitive battles in such markets usually have a great deal of influence on the future world-wide competitive positions of firms. In the telecommunications switching business, for example, the United States is perhaps the principal lead market in the world. In the consumer electronics industry, in contrast, Japan, the United States, and a few of the major European markets share the lead position. These are the markets that provide the stimuli for most global products and processes of a multinational company. Local innovations in such markets become useful elsewhere as the environmental characteristics that stimulated such innovations diffuse to other locations."

Box 1: Elaborating the concept of lead markets[1]

This publication examines the avenues for exploiting India's advantage in frugal innovations and realizing its "lead market" potential so that its products and services cannot only successfully diffuse to other markets creating new markets for its firms but also for firms in other countries, especially in the developed nations of the industrialized countries, to partner with Indian firms and participate in these opportunities. Access to proven technology and engagement in open global innovation networks (OGINs) can reduce the market and technology uncertainty for all parties concerned and open global markets for them.

[1] Source: (Bartlett and Ghoshal, 1990: 242 f.)

The publication is structured on the following lines: After this introduction, section 2 elaborates the concept of frugal innovations. In section 3 we provide evidence for India's emergence as a lead market illustrated by a few select examples. Section 4 explores market opportunities for frugal innovations in Europe, while section 5 looks at the avenues for collaboration. The publication concludes with section 6.

2. Frugal Innovation: Concept & Framework

In terms of dictionary meaning frugal refers to "economical in use or expenditure; prudently saving or sparing; not wasteful; entailing little expense; or requiring few resources". It therefore implies "careful and saving use of resources", e.g. "through prudent planning in the disposition of resources so as to avoid unnecessary waste or expense". Not surprisingly, its antonyms are "wasteful; extravagant; luxurious; or lavish".[2]

Seen in conjunction with innovation, frugal products and services seek to minimize the use of material and financial resources in the complete value chain with the objective of substantially reducing not just the price point but the complete cost of ownership/usage of a product while fulfilling or even exceeding pre-defined criteria of acceptable quality standards (Tiwari and Herstatt, 2014).

Frugal Innovations tend to have a disruptive character (cf. Christensen and Raynor, 2003), as they often involve a new business model, which seeks to reach out to the group of price-sensitive and hitherto *unserved* consumers (den Ouden, 2012). However, they do not necessarily signify a business model that "picks off the least attractive customers of established firms" (Christensen and Raynor, 2003: 46), as is probably best exemplified by the concerted efforts of many global carmakers to wrest away market share from Maruti Suzuki in India, which primarily serves cost-sensitive customers. Moreover, frugal innovations can have a sustaining effect for the business of an incumbent already engaged in serving this customer segment, as is again best exemplified by Maruti Suzuki and the Tata Group of India. Innovations by ISRO also illustrate the point in that these are frugal innovation but not necessarily always disruptive in nature.

Frugal innovations tend to share several characteristics with "lean" innovations that seek to work "efficiently with knowledge" to turn it faster into "value" (Sehested and Sonnenberg,

[2] Source: http://dictionary.reference.com, last retrieved: 23.10.2013.

2008). According to *Schuh et al.* (2011) one of the core element of Lean Innovation lies in defining, structuring and prioritizing "values" for specific innovation projects. While frugal innovations undoubtedly seek to rationalize the innovation value chain, their objectives might differ considerably. Whereas the end outcome of a lean innovation project need not necessarily be a low-cost product, it takes much more than efficient management of the innovation process to come up with a successful disruptive, game changing innovation.

Frugal innovations can fully encompass the key characteristics of individual related terms such as "Jugaad", "Grassroot Innovations", "Bottom of the Pyramid" (BOP) with its various variants, and "Inclusive Innovations" (Gupta, 2010; Singh *et al*, 2011). For reasons of space, it probably suffices to say that the term *frugal innovation* can act as an integrating mechanism to bring these various concepts under one umbrella. A key difference to essentially cost-driven (BOP oriented) approaches lies in the fact that frugal innovations are not necessarily targeted at the very bottom of the economic pyramid. Rather, they seek to address customers that, *by compulsion or choice*, seek products whose overall cost of ownership is placed significantly below standard (entry level) products. So far, needs of such customers have been often left unserved.

The inherent characteristic of frugal innovations lies in its value proposition that enables robust and good quality able to cope with given infrastructural difficulties while reducing the cost of ownership for the customer. The potential customer should not only actually *possess* the means to pay for the product. Rather, he should be also *willing to spend* his scarce resources on that particular product; because the company is mostly competing against non-consumption. Simultaneously, the product should possess volume-potential to enable sufficient profit incentives despite thin margins.

The striking difference to other concepts is noteworthy because one major issue affecting conventional BOP markets has been that of quality perceptions and image concerns of those very people, whom the firm intends to serve. Whilst firms have generally worried that high-quality, low-priced products may eat away into their regular business, customers have generally acted in a reserved manner while accepting products that were specifically designed and marketed as "low-cost products".

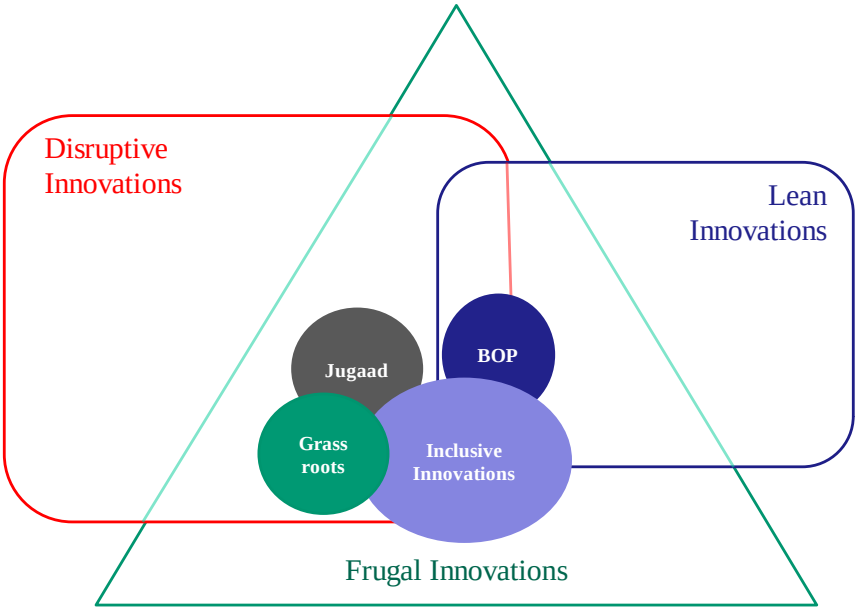

Figure 1: Conceptual context of frugal innovations

Our long-running, cross-industry research shows that frugal innovations are characterized by affordability, robustness, user-friendliness, scalability, and an attractive value proposition. A recent comparison of product prices has shown that frugal innovations can lower the price point by anywhere between 50% to 97% (Rao, 2013). Targeted at consumers who might hitherto have never had the occasion to use a similar product they should be able to cope with "unsophisticated" users, and withstand hazards like dust, heat or power failure. Such frugal products – aimed at serving volume-driven markets with comparatively thin margins – can lead to success in price-sensitive markets of the developing world.

What frugal is not!

There is a famous cartoon by India's legendary cartoonist R.K. Laxman, which shows a minister along with his secretary standing opposite a slum apparently discussing its removal. The secretary is seen suggesting: "It will be a problem demolishing it, sir. Why not just put a board 'low cost housing complex' and leave it?" That sums up beautifully what frugal innovations are *not*. Frugal does not mean a poor-quality, off-the-mark, improvised solution; often sold as a "Jugaad" product.

Frugal enables excellent value proposition

Rather, frugal innovations enable an excellent value proposition that prudently takes into account the specific needs of the customer and does not seek to compel him (or her) into purchasing more than what his perceived requirements are. In a sense, it is a "democratization" of innovation, because a customer can choose "add-on" features and upgrades depending on his taste, choice and financial resources governed by the parameters of the regulatory quality standards. To illustrate this point with an example, a basic version of the Euro-IV compliant Tata Nano (BS4) can be purchased for as low as Rs. 145,000 (approx. €1,720), or a customer can spend as high as Rs. 265,260 (approx. €3,150) for a CNG-driven Nano LX.[3] This flexibility to "furnish up" rather than "strip down" seems to be at the core of the frugal principle.

Reminding ourselves of the basic objective of innovation activity

At another level, frugal innovations also signify a transition from heavily technology and R&D centred "inventions" to more market-driven "innovations". Frugal innovations remind us that the primary purpose of a product development activity is to tap an unfulfilled demand, and enable consumption. Frugal innovations show that the sophistication of a solution is not by default rooted in the newest *technology* but in a comfortable, robust, and affordable *solution* capable to uplift the standard of living to the next better level.

Drivers of Frugal Innovation

Opportunities for future growth now mainly lie in the unsaturated markets of the emerging economies. The contribution of the developing nations to the global GDP has almost doubled since the advent of the new millennium. With a great reduction in the absolute number of people living below poverty line a new and large class of consumers has emerged in the developing world. Since the purchasing power of the most of these consumers does not allow them, yet, to consume at the same level as the most of their counterparts in the industrialized West, they need products which can match their aspirations while catering to their specific environmental and socio-cultural requirements (Tiwari and Herstatt, 2014).

Research by Elvire Meier-Comte in a specific Western multinational corporation (MNC) context also supports the proposition that even when cost and simplicity play an important

[3] Source: http://www.tatanano.com/price-list.php. All prices are ex-showroom in Delhi, as on Oct. 22, 2013; exchange rate 1 EUR = 84.2790 INR

role in frugal innovations they are not sufficient unto themselves for success unless they respond to local needs and aspirations (Meier-Comte, 2012). These insights are corroborated by statements of practitioners interviewed by the authors. For instance, managing director of a renowned and successfully operating German auto component supplier in India succinctly summarized the "credo to success" during an interview, thus:

> "To succeed in India, you need a product which costs 30% of the global price and offers 95% of the performance" (Tiwari and Herstatt, 2014: 6).

The R&D head of an equally successful carmaker seconded:

> "It's about the aspirations of the youth in India. They want everything; they know everything; but they are not prepared to pay extra!" (Tiwari and Herstatt, 2014: 6 f.)

A study conducted by Denmark-based Universe Foundation has led to creation of a manual for frugal innovations, which states that:

> "Now, there are clear indications that many companies will need to rethink and develop their offerings in an entirely different direction, if they wish to remain relevant to the future growth markets. […] The demands of these consumers, however, are for much lower priced solutions than what Western companies can typically provide." (Universe Foundation, 2013: 2)

The relative importance of developing nations is set to increase even further. They have not only become major recipients, but also major sources, of FDI (see Figure 2).

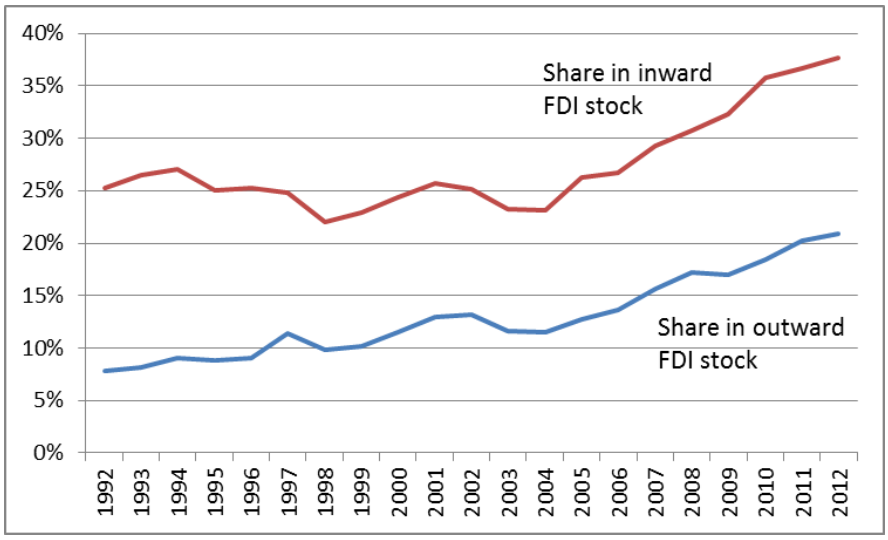

Figure 2: Share of developing countries in global stock of FDI

Between 1992 and 2012, the stock of inward FDI in developing nations rose from $611 billion to $8.6 trillion. At the same time their contribution to the global stock of outward FDI rose from $185 billion to $4.9 trillion. These facts underscore the growing economic activity and a deepening global integration of the developing nations in the economic value chain.

Increased FDI by emerging market firms also leads to bringing in of their frugal products to the Western markets. To pre-empt this threat many Western multinational (e.g. GE and Siemens) are also taking recourse to frugal products. This strategy has been called "reverse innovation" (Govindarajan and Trimble, 2012).

Third, environmental concerns and resource constraints are driving up the price of commodities. UN Data show that the price of commodities, like minerals, ores and metals, has increased up to 322% between 2000 and 2012 (see Figure 3).

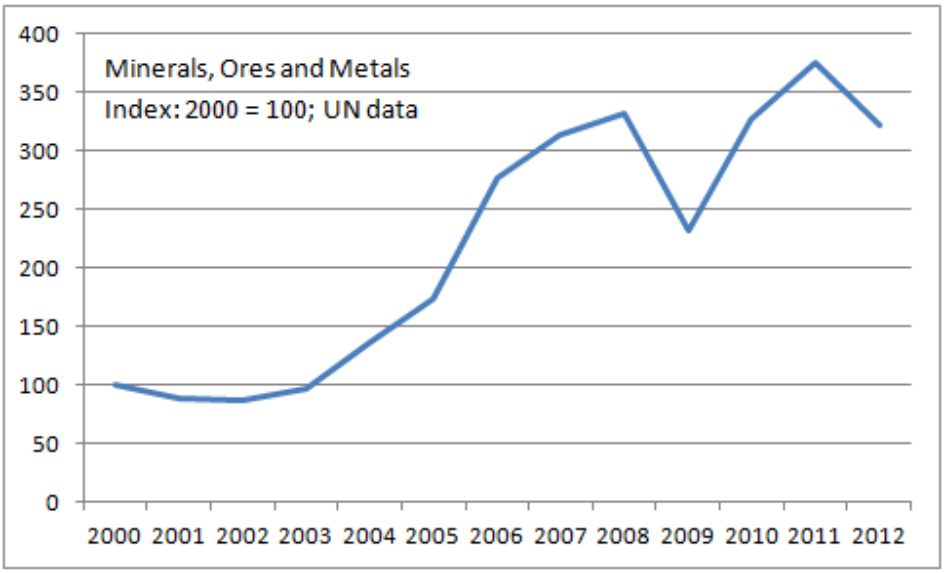

Figure 3: Development of average prices of select commodities (2000-2012)

With increased global consumption, and the entry of a couple of billion new consumers it will not be possible to continue with the treaded path in the use of commodities. We need products that are more efficient and effective in the complete value chain, from development to production and distribution, and from utilization to disposal. The nature, after all, also does not know the concept of "waste".

3. India's Emergence as a Lead Market for Frugal Innovations

With around 1.2 billion inhabitants, India is the world's second most populous country after China. It has seen sustained and uninterrupted growth rates of 5% and above for over a decade now. India has a large middle class which has kept growing ever since economic reforms were initiated in 1991. Estimates about its size vary from 50 million to 470 million.

On educational front too, India has seen remarkable growth. Literacy rate in India, which stood at a meagre 12% at the time of Independence from British colonial rule, had reached 74% by 2011 (GOI, 2012b). The number of universities (including deemed universities) increased from 20 to 611, while the number of colleges went up from 500 to 33,023 in this period (GOI, 2012a). There were 17 million students enrolled in India's institutions of higher education, of which 3.1 million were students of natural sciences. Another 2.9 million were enrolled in an engineering discipline (GOI, 2012a). There are no official figures available about the number of graduates per year. However, it is estimated that there are about 2.5 million graduates every years, out of which 2 million are proficient in English. The number of engineering graduates is estimated at 300,000 a year (Nilekani, 2008).

Notwithstanding, the period after independence till 1991 when India tried to isolate itself in economic matters, it has for millennia engaged with the rest of the world, resulting in a multiethnic society with historical links to the Roman empire, Arabic countries, Eastern Africa, and the Far East (Basham, 2004; Tharoor, 2012). "India's connections with the rest of the world go at least as far back as the Harappan civilization of 2500-1500 BC […]. It could be indeed argued that the India of today is the direct product of millennia of contact, trade, immigration and interaction with the rest of the world" (Tharoor, 2012: 2). India's vast diaspora, its socio-cultural proximity to several countries especially in the developing Asia, and the largely positive associations it has in the rest of the world point towards other advantages rooted in non-economic factors.

Innovations in India

India has made significant strides in high-tech fields. Especially in fields of space research and supercomputing based on "massively parallel processing" it has been able to develop solutions that, though driven basically by domestic resource-constrained settings, have become internationally successful, including in some of the developed country markets (Mashelkar, 2011). India's growing and price-sensitive market has been inducing firms to use

frugal engineering for creating functional and less expensive products without compromising excessively on quality (Economist, 2010b; Freiberg *et al*, 2011).

India's enormously young population with limited budgets and high consumption aspirations provide an ideal experiment ground for many firms. Not surprisingly, India has emerged as a vibrant and versatile source for frugal innovations. Frugal innovations do not relate to hardware innovation alone and often encompass the whole spectrum of product, process, marketing and organizational innovations.

Figure 4: Select examples of frugal innovations for and from India

Since societal constraints, such as low ICT penetration, deficient infrastructure, and low per-capita income are not unique to India, the solutions developed here often offer potential to be implemented in other developing nations of Asia, Africa, and Latin America as well (ADB, 2010; UNCTAD, 2011). India has been endowed with "a deep and backward integrated production structure, but one that past policies have burdened with high costs and technological lags" (Lall, 1998: 223). The removal of the bureaucratic and regulatory restrictions has unshackled India's entrepreneurs (Tharoor, 2007) and its growing trade with African, Asian and Latin American countries (RBI, 2010) especially in the automobile and machinery sectors (WTO, 2010) points towards growing acceptance of "made in India" and/or even "developed in India" products in other parts of the world (Broadman *et al*, 2007; ADB, 2010; UNCTAD, 2011).

This is corroborated by evidence presented by the trade statistics, e.g. by export data for engineering goods. According to the Reserve Bank of India (RBI, 2011) India's exports of engineering goods registered a staggering increase from $4.96 billion in fiscal year 1996-97, to $6.8 billion in FY 2000-01, and to $68.8 billion in fiscal year 2010-11. Amongst developing nations, major importers of Indian engineering goods include Malaysia, Bangladesh, Sri Lanka, and United Arab Emirates suggesting an avenue for South-South cooperation. On a more sector-specific level India registered a remarkable increase in the export of its automobile products in recent years (RBI, 2011).

Even though the growth in India's exports to developing countries has significantly outperformed that to the OECD countries and transitional economies in Eastern Europe, the growing scarcity of natural resources and the related environmental concerns (cf. Schumacher, 1995; Gibbert *et al*, 2007), the increasing financial austerity in developed countries (Economist, 2010a; Kus *et al*, 2011; Kulkarni, 2012) and even instance of poverty in the West (Kuchler and Goebel, 2003; Boyle and Boguslaw, 2007) could also offer chances for frugal solutions in those countries.

India's Advantage

Even global giants have been using India's "lead market" position to generate products with a global appeal. While GE's handheld ECG machine Mac 400, developed in India, has already been commercially launched in export markets; some further 30 products are reported to be in its India pipeline. These are targeted at "the Indian and the emerging global markets" and would be launched by GE's Bangalore Centre within the next three years (Mahalakshmi, 2011). One of the main competitors of GE, Germany's Siemens, has launched a whole series of product innovation projects titled "SMART" which has a major focus on India: 60 of the worldwide 160 products have been introduced in India with active involvement of Siemens local R&D capabilities. The stated intention is to tap a market that is estimated to be worth €7 billion. In this respect, Siemens reportedly sees India as one of the few "Lighthouses" with global potential for SMART products developed there (Dachs *et al*, 2012).

India's advantage in frugal innovations stems from the favourable systems of innovation that are at work. Its cost advantage in manufacturing and R&D, presence of a broad manufacturing base, access to innovation networks of multinational firms, and – very importantly – its social capital in the form of embedded first-hand knowledge of resource-constrained environments

and frugality-driven customers creates a unique base of assets required to succeed in this cost-sensitive yet aspiring space.

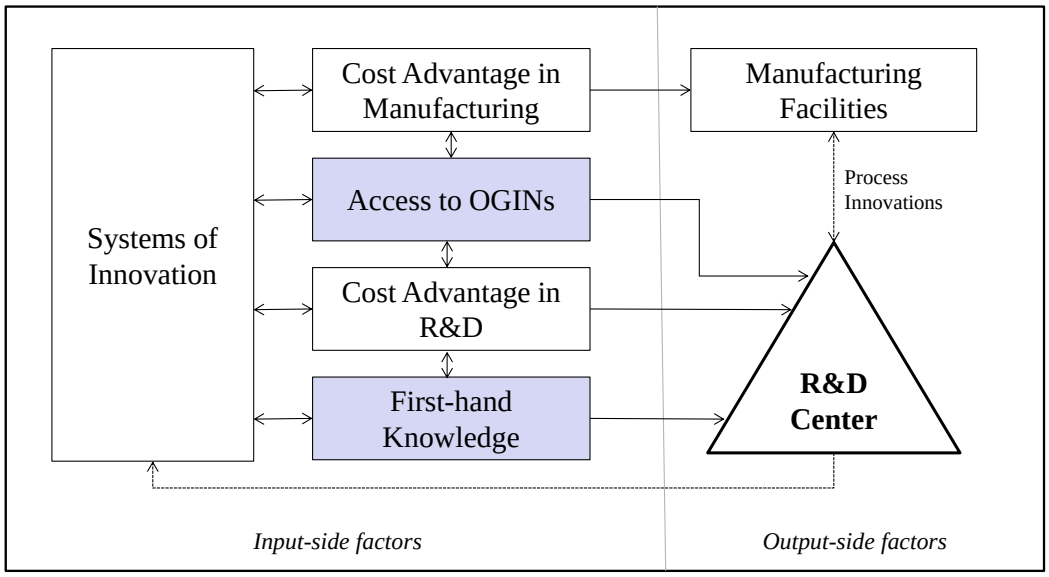

Figure 5: Factors of technological advantage for India

In the following we present a few, select examples of successful frugal innovations emanating from India and having succeeded even outside India's boundaries.

	"Tata Ace" is a small commercial vehicle (SCV) with a payload capacity of 0.75 tons. Launched for a price-tag of approx. $5,000 the Ace cost 50% less than any other four-wheeled commercial vehicle in India. Export markets include countries such as Sri Lanka, Nepal, Indonesia, and the USA.
	"A-Star" is a compact car from the stable of Indo-Japanese carmaker Maruti Suzuki and was styled at the domestic R&D centre of Maruti. Within 3 years of launch it sold over 2 million times. It costs around $7,500 and is a major commercial success in export markets.
	"Tata Swach" is the world's most affordable household water purification system and complies with the U.S. Environmental Protection Agency standards. A global market seems to exist as about 894 million people worldwide lack access to clean water.

	"ChotuKool" is a compact cooling solution. It is equipped to operate on battery or an inverter and uses high-end insulation to stay cool for 2-3 hours without power. With a price tag of about $50 it is about 50% cheaper than the next entry-level fridge available in the market.
	"Gramatellers" can be run by solar power and consume only 10% of the total energy requirement of conventional ATMs. They have an in-built fingerprint identification system. The total cost of ownership for works out to be 50% less than for conventional ATMs.

Table 1: Select examples of frugal innovations emanating from India[4]

The following product characteristics come to fore when these innovative products presented above, are assessed for their commonalities:

(a) Attractive value proposition
(b) Need for robustness
(c) Emphasis on user friendliness
(d) Need to reduce the overall cost of ownership
(e) Potential for volume-based business

4. Scope for Frugal Innovations in Europe

Slowly, but surely, we witness an increasing demand for affordable, functional, and resource-efficient products in the Western markets. Many consumers in the developed countries are turning apprehensive of over-engineered products and the planned obsolescence, which deliberately creates products that deteriorate almost as soon as the guarantee period is over, inducing the customer to make a new purchase (Slade, 2007).

The earlier-mentioned study by the Universe Foundation (2013: 2) states:

> "Economic growth in Western countries has stagnated and in many regions, the economy is in serious crisis. Consumers are under pressure and reluctant to spend, and public budgets have been reduced. The result is that the middle segment of the

[4] These examples are drawn from (Tiwari and Herstatt, 2014). For further details including citational references consult the original source. Images are courtesy respective manufacturers.

market is increasingly squeezed as more customers are buying cheaper solutions than before."

A recent report even revealed that there are "43 million who do not get enough to eat each day" in Europe (IFRC, 2013). Official data recently released by Eurostat show that 24.2% of the population (120 million people) in the EU-27 "were at risk of poverty or social exclusion" due to material deprivation in 2011, up from 23.6% one year ago. Poverty risk is also not limited to Eastern or Southern Europe alone but even concerns large economies such as France, Italy and Germany, as evident from Table 2.

Country/region	Total	Children (up to 17 years)	Adults (18-64 years)	Elderly (65 and above)
EU-27*	24.2	27.1	24.4	20.4
Euro area*	22.6	25.1	23.3	18.2
Bulgaria	49.1	51.8	45.2	61.1
France	19.3	23.0	20.1	11.5
Germany	19.9	19.9	21.3	15.3
Greece	31.0	30.4	31.6	29.3
Italy	28.2	32.3	28.4	24.2
Poland	27.2	29.8	27.0	24.7
Spain	27.0	30.6	27.2	22.3
United Kingdom	22.7	26.9	21.4	22.7

Table 2: Percentage of population at risk of poverty or social exclusion in select EU countries[5]

Figure 6 shows the EU member states where the share of population at risk of poverty has increased between 2006 and 2012. Surprisingly, Germany recorded the strongest increase. While 11.9% of the German population was seen at the poverty threshold after including social transfers in 2006, this share increased to 15.4% in 2012 (Eurostat, 2013a).

[5] Source: (Eurostat, 2013b); * = estimates.

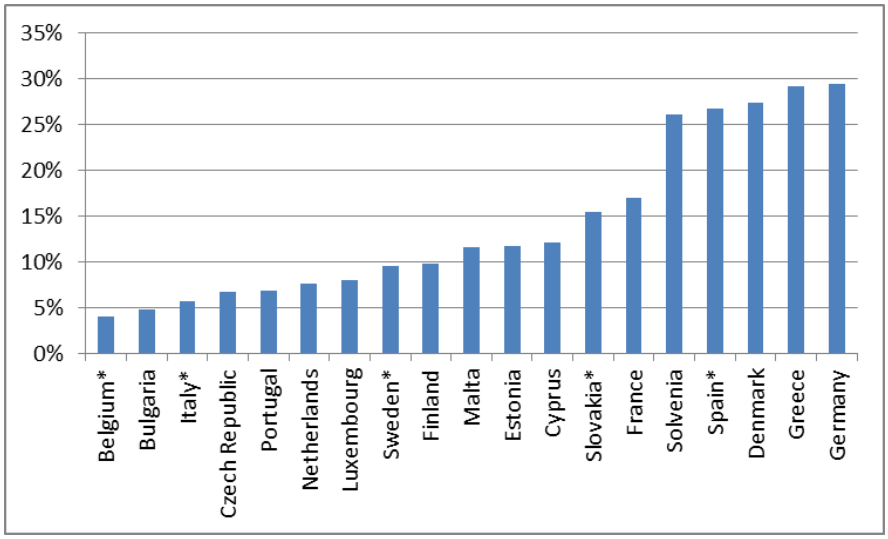

Figure 6: Growth in the share of population at risk of poverty in EU (2006-2012)[6]

Companies like consumer goods manufacturer Unilever are already responding to the increasing (relative) poverty in Europe and implementing the low-cost (frugal) strategies learnt in countries like Indonesia (Daily Mail, 2012; Spiegel, 2012). Unilever has apparently "created a low cost brand for basic goods such as tea and olive oil in Greece" (Daily Mail, 2012). Jan Zijderveld, chief of Unilever's European business, tellingly, said:

> "In Indonesia we sell packs of shampoo for two to three cents and still make decent money. We know how to do that, but in Europe we have forgotten [that] in the years before the crisis." (Jan Zijderveld cited in Daily Mail, 2012)

The demographic developments and the rising costs of healthcare are another reason why frugal innovations would also be increasingly required in the West. Hesseldahl (2013: 24) sees numerous indications that consumers in the developed nations will become "very conscious of choosing solutions that focus on real needs and deliver at low prices".

5. Avenues for Collaboration

One way to achieve the twin objectives of offering quality products at an attractive cost-of-ownership seems to be in making best possible use of opportunities of "open innovation" (cf. Chesbrough, 2003; 2006) on a global scale, as suggested by recent studies. One of these

[6] Source: Own calculations based on Eurostat (2013a); * = data refers to 2011. No data was available for Croatia and Romania for 2006, while 7 other nations (Austria, Hungary, Ireland, Latvia, Lithuania, Poland, and the United Kingdom) could, to varying degrees, achieve a reduction in the share of population at poverty risk.

"new" streams contributing to open innovation and vice versa includes globalization of innovation (cf. Prahalad and Krishnan, 2008). The rationale for this is twofold:

(a) Frugal innovations, even though often disruptive in nature, stand to benefit from new applications of existing technologies after modifying them in a suitable manner. Frugal innovators are less likely to stubbornly re-invent the wheel and may be more open for technology sourcing (Narayanan and Bhat, 2009), and consciously look for analogies in other fields.

(b) Scientific progress, growth in educational standards and the on-going economic development in many countries have created favourable systems of innovation (OECD, 2008b; Buse *et al*, 2010). While globalization has reduced barriers of cooperation, technological development, especially in the field of information and communication technologies (ICT), have reduced barriers of distance. FDI has opened access to global knowhow within internal boundaries of the firm (OECD, 2008a). Even small and medium-sized firms today are able to benefit from " […]market and nonmarket spill-overs, which, in turn, has raised local endogenous innovation and productivity growth." (Islam, 2010)

It seems logical that frugal innovations are best fostered when the sectoral and national systems of innovation in a given location not only enable cost advantages for R&D and manufacturing, but are also endowed with access to OGINs in national and international context.

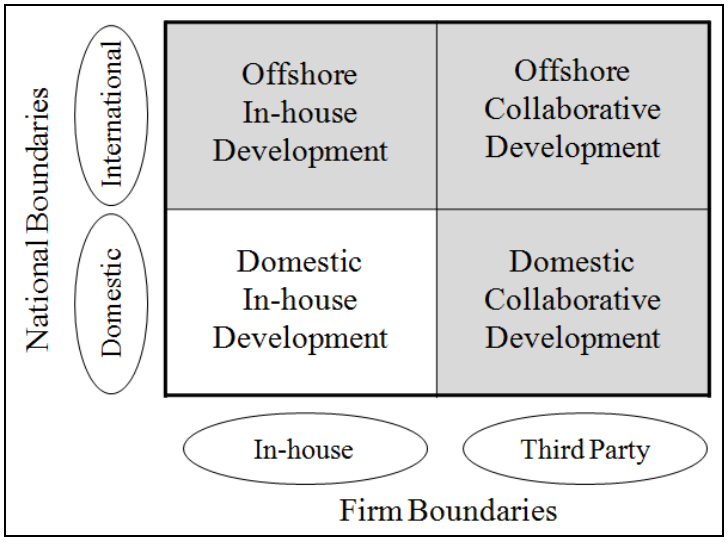

Figure 7: A Framework for open Global Innovation Networks

The cooperation may take place at any stage of the innovation process, which incorporates the whole innovation value chain starting at idea generation and ends with successful market introduction (Herstatt and Verworn, 2004). Figure 7 shows a classification framework for OGINs. This network is basically built on two dimensions that depict firm and national boundaries, respectively. Whilst firm boundaries are defined in terms of legal independence of an enterprise, national boundaries, as used here, refer to international geographic entities that routinely administer their own affairs irrespective thereof, whether or not they enjoy political sovereignty in terms of international law.

Indian firms can partner with global companies, e.g. in Germany, to jointly exploit the vast opportunities for frugal innovations while reducing market and technology uncertainties. German companies could, as well, look at developing and manufacturing their products in India without compromising quality.

6. Conclusions

Today, a singular focus on technology-driven, "high tech, high price" innovations runs the risk of losing the sight of the changing consumer wants both in emerging economies and in the industrialized West. Frugal innovations, with a "high tech, low cost of ownership" approach are the need of the hour and very probably a promising strategy for the foreseeable future in both business-to-consumer and business-to-business segments.

India seems to possess an inherent advantage in creating attractive frugal solutions with global appeal. Its innovation system is endowed with a large and voluminous domestic market; it has significant scientific and technological capabilities and a large pool of skilled manpower; and it is well integrated in the global economy. With factors like these India-based firms are well poised to exploit their strengths in first-hand knowledge of catering to frugality-driven yet aspiring customers. Indian firms can seek access to global markets by addressing consumers that are both cost and quality conscious.

There is a large and unsaturated young population in emerging economies, including and beyond India that is driven by aspirations. This creates a unique opportunity for Indian firms to offer new and affordable solutions, possibly in collaboration with global firms. While high volumes can compensate for thin margins, collaborative development can lower the associated development costs and risks. Collaborations can produce win-win results for all parties concerned. Products that succeed in a lead market like India can be reasonably

expected to have a large potential in other emerging economies with similar socio-economic conditions. But also in Europe and elsewhere there is an increasing demand for affordable, "good enough" solutions.

We may summarize this work on India's possible emergence as a lead market for frugal innovations with a few words of Nandan Nilekani, former Chief Executive Officer (CEO) of India's prestigious IT major Infosys and the Chairman of the Unique Identification Authority of India (UIDAI):

> "A talented pool of workers, along with abundant capital and investment, presents us with immense opportunities for creativity and innovation, which can in turn lead to rapid gains in productivity growth and GDP. This had once enabled Europe to emerge as a centre for manufacturing innovation in the nineteenth century; similarly, at the peak of its dividend between 1970 and 1990, the United States saw the birth of new technology-based industries that determined the direction of the global economy over the past few decades. Such an opportunity – to emerge as the new creative power and a centre for new knowledge and innovation – now lies with India." (Nilekani, 2008: 53)

Indian firms would be well advised to proactively seek collaboration with potential overseas partners, especially in a country like Germany, which is endowed with significant technological capabilities, an enormous market and a lot of goodwill for India. Vice versa is of course also true for German firms in respect of India.

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Front Page Image: Select examples of frugal innovations, images courtesy: respective firms.
Back Page Image: PSLV-C25 undergoing launch rehearsal with the Mobile Service Tower retracted; image courtesy: ISRO.