Innovation has become the new buzzword across the globe. International organizations, governments, corporates, academia and civil society see it as the answer to the major economic, social and environmental transformations challenging the models of the 20th century.

Innovations are occurring worldwide and alternative solutions to the existing problems are emerging in all sectors: electric cars, organic farming, renewable energy and e-learning are good examples. These alternatives can be ascribed with qualities such as decentralized, frugal, flexible, smart and democratic, virtues that are lacking in conventional models. They are attributed with the potential to meet the overall global challenges such as climate change and the growing inequalities between and within countries.

What is the real potential of innovation? Does the rapid deployment of innovations lead towards a more sustainable and inclusive society? Can innovations and the emerging alternatives replace conventional models? Beyond technologies, what institutional innovations are required to support sustainable development?

A Planet for Life 2014 aims to answer these questions and explore innovation in all its aspects, through a series of texts written by international experts. The objective of this book is to analyse experiences from across the world and the role of innovation in a variety of areas of development such as urbanization, agriculture and food, the mobility of people and freight, education and the provision of water and energy to all.

The book includes:

• Papers by leading international experts and academics
• New perspectives through in-depth analyses
• Numerous maps, charts and tables
• A wealth of ideas for specialists and non-specialists alike: scholars, policymakers, administrators, concerned citizens, development professionals, entrepreneurs, journalists, students and others.

Jean-Yves Grosclaude, Rajendra K. Pachauri and Laurence Tubiana (Editors)
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Frugal innovation: a pioneering strategy from the South

For a long time, it has been assumed that the North innovates and the South copies.¹ This is no longer the case. On a daily basis in emerging economies such as China, Brazil, India and Africa, thousands of ingenious entrepreneurs and firms are coming up with cost-effective and sustainable solutions that address the socio-economic needs of local communities using minimum resources. They are pioneering a whole new approach to innovation called ‘frugal innovation’, a disruptive new paradigm that the West has much to learn and benefit from.

Too expensive, lack of flexibility, elitist: the limits of the Western approach to innovation

In the twentieth century, as North American and European economies expanded, Western corporations began to institutionalize their innovation capabilities, creating dedicated research and development (R&D) departments and standardizing the business processes needed to take their ideas to market. They focused on managing innovation, just as they managed any other business activity. This industrialization of the creative process led to a structured approach to innovation with the following key characteristics: big budgets, standardized business processes and controlled access to knowledge. But this structured innovation approach, which helped Western economies become highly successful in the second half of the twentieth century, has

¹. This chapter is partially adapted from *Jugaad Innovation: Think Frugal, Be Flexible, Generate Breakthrough Growth* (Jossey-Bass, 2012).
three clear limitations in the volatile and resource-constrained twenty-first century.

First, the Western approach to innovation is too expensive and resource consuming. Western economies have come to believe that their innovation system – like any industrial system – will generate more output (inventions) if fed more input (resources). As a result, the structured innovation engine is capital intensive. It requires an abundant supply of financial and natural resources at a time when both are increasingly scarce. The approach is designed to deliver ‘more with more’ – that is, firms charge customers a hefty premium for over-engineered products and services that are expensive to develop and produce. For instance, the thousand companies in the world that invest the most in innovation – many of which are Western firms – spent a whopping $603,000,000,000 (yes, that’s US$603 billion!) on R&D in 2011 alone. But what did they get in return for this expense? Not much, according to research conducted by the management consultancy Booz & Company. They found that the three Western industries that spend the most on R&D – computing and electronics, healthcare and automotive – struggle to generate a steady stream of groundbreaking inventions, despite their hefty R&D investments. Hence there is a weak correlation between how much money your firm spends in R&D and how well it performs in terms of developing and marketing products that generate a significant financial return. To put it bluntly, money can’t buy innovation. The Western pharmaceutical industry is one sector where the ‘bigger is better’ R&D strategy is clearly running out of steam. R&D spending by big pharmaceutical firms – most of whom are European and US – ballooned from $15 billion in 1995 to $45 billion in 2009. Yet the number of new drugs launched annually has dropped by 44% since 1997. This is especially bad news for big pharmaceutical firms, given that between 2011 and 2016 drugs worth a massive $139 billion are set to go off patent.

Second, the Western approach to innovation lacks flexibility. With so much money invested in R&D, Western firms have become risk averse in their approach to innovation. They have implemented standardized business processes such as Six Sigma (an integrated set of management techniques designed to decrease production defects and increase operational efficiency by standardizing processes) and ‘stage gate analysis’ to manage and control their innovation projects. These structured processes were expected to drastically reduce uncertainty – and the risk of failure – from the entire innovation process and make R&D projects more predictable in both execution and outcomes. But these structured business processes and methods are unfit to deliver the agility and differentiation that enterprises need in a fast-paced and volatile world. Built around stable and predictable processes, programmes like Six Sigma cannot enable the rapid change that companies need as they seek the necessary agility to mass customize products and services, to satisfy increasingly diverse and finicky customers, and to keep up with technology shifts.

Third, the Western innovation model is elitist, insular and non-inclusive. Throughout the twentieth century, Western firms built large R&D laboratories that employed hundreds of top scientists and engineers, based on a belief that knowledge is power and that controlling access to it was key to success. Thus innovation
became an elite activity controlled by a few high priests: engineers and scientists working under conditions of secrecy in in-house laboratories situated close to their headquarters. Only these chosen few were invited into the R&D department and given the resources and permission to innovate. Any new knowledge they generated was closely guarded. Collaboration with other employees – let alone outsiders – was shunned. The assumption was that to dominate markets through innovation one needed two things: top-of-the-line technology and ownership of the best intellectual property, both of which could be bought with enough money. However true that assumption might have been in an earlier industrial era, it is far less valid now. Part of the old belief was that only a bunch of smart PhD scientists could invent new things. As a result, top-down R&D systems are often unable to open up and integrate bottom-up input from grassroots citizens. The Western R&D model is elitist also on another level: it yields over-priced products and services that only the affluent mainstream customers in the West can afford, thus not availing these offerings to low-income segments of Western economies who cannot afford them. Thus, this elitist R&D system further marginalizes these underprivileged groups.

**Innovate faster, better and cheaper: the need to build a new innovation engine in the West**

Bottom line: the processes, systems and mindsets that underpin the structured approach to innovation that dominated Western economies throughout the twentieth century are now failing. The Western innovation engine has become too rigid, elitist and bloated to remain effective. It consumes a lot of resources and makes a lot of noise, but produces little of much significance. Sadly, this bigger is better approach to innovation seems ill-suited to address the needs of millions of cost-conscious middle-class consumers – the bedrock of Western economies – who have suffered from stagnant wages and dwindling purchasing power in recent years. Adjusted for inflation, the average middle-income American family earned only 11% more in 2010 than it did in 1980, whereas the richest 5% in America have gained a 42% income boost. As a result, the 5% of Americans with the highest incomes now account for 37% of all consumer purchases. Fifty million Americans currently lack medical insurance, and a whopping sixty eight million Americans are unbanked or underbanked – i.e., they cannot avail themselves of the full range of financial services offered by traditional banks. These numbers are not expected to improve significantly in the coming years given the slow US economic recovery. As a result, for a growing number of marginalized middle-class Americans, the American dream might remain just that: a dream.

The situation is worse in European societies where a lingering economic recession is deepening poverty and rapidly depleting the consuming middle class. While Spain and Greece are most afflicted by the crisis, wealthier nations like France and Germany aren’t spared either. For instance, the number of Germans identified as middle class has dropped from 65% in 1997 to 58% in 2012. And in France, the average salary has fallen by 24% while living costs have shot up by 30% between
As a result, US and European consumers are becoming frugal and choosing to buy affordable products and services that deliver more value for less cost. For example, nearly one third of European consumers are willing to buy a low-cost car rather than a premium vehicle. This frugal mindset is especially prevalent among Western youth who grew up in a recessionary period, which explains why, for instance, the purchase of new cars among young Americans aged 18 to 34 dropped by 30% between 2007 and 2011.

In addition to becoming more cost-conscious, Western consumers are also more environmentally conscious and clamouring for eco-friendly goods and services that use fewer natural resources. For instance, 71% of American consumers now consider the environment when they shop, up from 66% in 2008. And more than 80% of European citizens believe that a product’s environmental impact is a critical element in their purchasing decisions.

It is clear that Western corporations must build a new innovation engine that allows it to innovate faster, better and cheaper – and produce affordable and sustainable offerings that serve the needs of increasingly frugal and eco-conscious Western consumers. To do so, the North must look for inspiration in... the South.

**Frugal innovation: a new approach pioneered in the South**

Developing and emerging nations like India, China, Brazil and some African countries are pioneering frugal innovation – a new model of innovation that is diametrically opposed to the costly, rigid and elitist R&D-driven approach to innovation prevalent in the West. Unlike the structured and resource-intensive Western innovation model which strives to do more with more, frugal innovation is the ability to do more with less – that is, to create significantly more social value while minimizing the use of scarce financial and natural resources.

Frugal innovation is the method used by thousands of ingenious entrepreneurs and companies in emerging economies like Kenya, India, Peru and the Philippines to develop affordable and sustainable solutions using limited resources. These frugal innovators view harsh constraints – e.g., lack of electricity or water – not as a restraining factor but as a creative opportunity to innovate and generate more value for local communities. For example, in India, Harish Hande founded SELCO – which provides solar energy at affordable prices to over 125,000 households in far-flung rural areas by leveraging an extensive grassroots network of micro-entrepreneurs who sell and maintain solar lanterns in their local communities (for this achievement, Hande won the 2011 Ramon Magsaysay Award, that is often referred to as “Asia’s Nobel Prize”). And in Peru, a country with high humidity and little rainfall, local engineers have invented an advertisement billboard that converts humidity in the air into drinkable water (generating nearly 10,000 litres of potable water within three months).

In addition to grassroots entrepreneurs, many local companies in emerging markets are also using frugal innovation techniques to create affordable solutions on a large...
scale to deliver greater value at lower cost to millions of low-income consumers. For instance, the Indian industrial conglomerate Tata Group has developed Nano, the world’s cheapest car priced at $2,000. The group has also invented Swach, a low-cost water purifier that uses natural elements like rice husk to filter water. Both the Nano and Swach are frugal solutions aimed at the hundreds of millions of Indians who live at the bottom of the economic pyramid. Similarly, the Kenyan telecom operator Safaricom pioneered M-PESA, a mobile payment service that enables Kenyans to send and receive money using their mobile phones without needing a bank account. Today, over 15 million Kenyans use the M-PESA – that’s larger than the number of Kenyans who have a bank account!

All these entrepreneurs and companies in the developing world who practice frugal innovation embody the spirit of jugaad – a colloquial Hindi word that translates into ‘an innovative fix, an improvised solution born from ingenuity and cleverness’. Jugaad is the resilient art of detecting opportunities in the most adverse situations and resourcefully improvising ingenious solutions with limited means. Jugaad goes by different names in different emerging markets: Brazilians call it jeitinho; the Chinese refer to it as sizhu chuangxin (in contrast with shanzhai, which means copycat); the Kenyans call it jua kali. Whatever the name of its regional variants, the jugaad spirit is evidence that developing nations are able to come up with original solutions on their own to solve local problems.

The frugal innovation model – enabled by an ingenious jugaad mindset – that is pioneered in Africa, Latin America and developing Asian countries not only debunks ‘the North invents, the South copies’ myth but also provides a cost-effective and sustainable alternative to the resource-intensive Western innovation model that is showing its limitations. In striking contrast with the expensive, rigid and elitist Western R&D model, frugal innovation is an approach that minimizes use of resources, allows for greater flexibility and facilitates greater collaboration and engagement in local communities. Let us study how, in practice, this is achieved by analysing the operating methods of frugal innovators.

The modus operandi of frugal innovators
The pervasive scarcity and the demanding nature of the consumer base in developing nations make local innovators masters of frugality. These innovators are able to get more from less by applying frugality to every activity they perform at every step along the value chain. They are frugal in how they design products, how they build them, how they deliver them and how they perform after-sales maintenance. Their frugality shows up not only in their parsimonious use of capital and natural resources but also in how they maximize their limited time and energy: rather than doing everything themselves, they rely extensively on partners to perform various operations, thus saving time and energy. These innovators employ several frugal approaches to gain more from less. First, they strive to reuse and recombine what they already have. Unlike Western R&D engineers, innovators in emerging markets avoid creating something entirely new, from scratch. Instead, they seek to reuse or
discover new combinations of existing technologies or resources both to come up with new solutions and to commercialize them in markets. For instance, Zhongxing Medical, a Chinese medical device maker, borrowed Digital Direct X-ray (DDX) equipment technology from its parent company (Beijing Aerospace) – which wasn’t using it effectively – and re-engineered DDX for use in everyday applications like chest X-rays. As a result, its X-ray machines cost just $20,000 to build, compared to $150,000 for the equivalent GE and Philips models (which use DDX only for high-end applications). By creating low-cost, mass-market applications out of an underused technology, Zhongxing cornered 50% of the Chinese X-ray machine market – forcing its rival, GE, to cut its prices by 50% while Philips, unable to compete, withdrew from this segment altogether.

A second strategy employed by frugal innovators to create more value at less cost is to design ‘good enough’ solutions that are simple to use and easy to maintain rather than over-engineered, complex and onerous offerings. Rather than wowing customers with the latest technologies and sophisticated features, these innovators develop functionally minimalist solutions that address their customers’ most fundamental needs – rather than desires. They may not get it right the very first time. Through trial and error and rapid experimentation, however, they eventually zero in on the set of features – and the business model – that would deliver the highest value at lowest cost for their customers. For instance, eager to save the lives of the twenty million premature babies who are born each year worldwide – many in developing nations – Jane Chen, Linus Liang, Naganand Murty and Rahul Panicker cofounded Embrace. Based in Bangalore, India, Embrace designs and markets a portable infant warmer that looks like a tiny sleeping bag and gives mothers in rural areas of India, China and Africa greater mobility and more intimate contact with their early born babies. The bag contains a pouch of a wax-like phase-change material (PCM) that keeps babies warm for up to six hours at regular body temperatures. Intuitive to use and easy to maintain, this infant warmer requires only 30 minutes of electricity to heat up the PCM pouch using a portable electric heater. Furthermore, this design dovetails well with the recommended practice of kangaroo care, whereby a mother holds her baby against her skin (hence the company name Embrace). Most importantly, the Embrace portable infant warmer costs less than 2% of the cost of incubators available in Western markets sold at $20,000 or more.

A third strategy that frugal innovators use to deliver more value at less cost is by enabling low-income customers to procure their goods and services using a flexible pricing model. Take M-KOPA, which was established in Nairobi, Kenya in 2011 with the ambition of becoming the world’s first solar leasing product that uses mobile money (as mentioned earlier, Kenya’s M-PESA service has already made the country a world leader in mobile money). M-KOPA delivers solar lighting to Kenyan rural households using a flexible pay-as-you-go pricing model. M-KOPA initially charges customers a modest amount for the purchase of a base station that includes a solar panel, three lamps and a mobile phone charger. Customers then use M-PESA to pay off the balance in small instalments with mobile money. Customers are supplied light
and power as long as they keep up with the payments. When the entire balance is paid off, customers own the M-KOPA system and get solar power for free. Thanks to its flexible pricing structure, M-KOPA has already enabled over 40,000 Kenyan households to leapfrog from high-cost and polluting kerosene lamps to high-quality systems that deliver affordable and clean solar energy.

A fourth more-with-less strategy that frugal innovators use is focused on solving the last mile problem – that is, the difficulty of reaching far-flung customers in an economical way. Rather than investing in expensive logistics networks, frugal entrepreneurs in India, Brazil, Africa and the Philippines leverage existing networks to cost-effectively deliver their products and services to people in hard-to-reach markets. In particular, they rely on grassroots partners in local communities to reach more customers and personalize their offerings for them. These grassroots distribution partners are often micro-entrepreneurs themselves. By building on already developed and trusted social networks in emerging markets, frugal innovators can compensate for the poor state of the physical infrastructure there. More importantly, by enrolling grassroots entrepreneurs as their channel partners, frugal innovators drive their own financial sustainability while also creating new economic opportunities in local communities. This is the case for MicroVentures in the Philippines – cofounded in 2006 by Bam Aquino, nephew of former President Corazon Aquino – which is making a wide range of consumer products and services accessible to consumers at the base of the (socioeconomic) pyramid (BOP). Rather than setting up its own distribution network – a costly and nearly impossible task, given the fragmentation of the BOP market spread across hundreds of villages – MicroVentures leveraged an existing ad hoc logistics network made up of eight hundred thousand sari-sari stores (small family-run shops). These tiny stores – found across all seven thousand islands of the Philippine archipelago – are operated by entrepreneurial women who set them up as extensions of their own homes. MicroVentures applied what is known as the conversion franchising model which consists in converting already existing, independently owned stores into members of a standardized and branded network known as the Hapinoy Program. By converting and upgrading some of the existing sari-sari stores into branded Hapinoy Community Stores, MicroVentures rapidly scaled up its distribution network: ten thousand sari-sari stores have joined the Hapinoy Program since 2007 – a figure that Aquino predicts could go up to a hundred thousand in the coming years.

How the West is embracing frugal innovation
Frugal innovation – the ability to create more value with fewer resources – is making its way into Western economies through many channels. To begin with, a new generation of entrepreneurs in the US and Europe are upending existing industry business models by providing Western consumers with alternative products and services that are affordable and sustainable. Inspired in part by their peers in Nairobi, Bangalore and Sao Paulo these Western entrepreneurs in Silicon Valley, New York, Paris and London are adopting the core principles of frugal innovation – that is, they design
good enough products and services that are offered to Western consumers using a flexible pricing model and through an extensive network of partners.

Take, for instance, BlaBlaCar, which has rapidly emerged as Europe’s leading car-sharing community. Launched in 2004 by three young entrepreneurs, BlaBlaCar provides passengers with a less expensive and more flexible alternative to traditional means of transportation like trains. Operating across ten European countries, BlaBlaCar transports over 700,000 passengers every month – more people than the number of passengers travelling on Eurostar (the high-speed train that connects London to Paris and Brussels). BlaBlaCar estimates it has saved £100 million for its drivers every year and saved 700,000 tons of CO₂ emissions. Another frugal innovator developing eco-friendly solutions is Paul Benoit, a brilliant French engineer who founded Qarnot Computing, a start-up that makes digital radiators equipped with microchips that are connected to the Internet. These networked processors can perform computation much faster and cheaper than costlier and energy-hungry data centres – thus making super-computer-like processing power affordable and accessible to the masses. Even better, the energy generated by these high-performance processors gets converted into free and eco-friendly heating for commercial buildings and houses equipped with these digital radiators. The French government is keen to partner Qarnot Computing to integrate its sustainable solution into its social housing projects.

Besides asset-intensive transportation and energy sectors, Western entrepreneurs are using frugal innovation techniques to disrupt other established industries like healthcare, education and financial services – all of which have become too bloated and are failing to provide affordable solutions to all Western citizens. Take healthcare: Erik Douglas and Amy Sheng met at UC Berkeley in Professor Dan Fletcher’s bioengineering laboratory in 2009. The Fletcher laboratory had invented low-cost mobile-phone-based microscopes for remote diagnosis of infectious diseases such as malaria and tuberculosis. Pilot projects in India, Uganda and Vietnam validated the effectiveness of these frugal diagnostic devices. Inspired by this success in developing nations and recognizing the need for affordable healthcare in the US itself, Douglas and Sheng spun out CellScope from the Berkeley laboratory. Based in San Francisco, CellScope is currently developing a suite of optical attachments for smartphones that can convert them into an affordable and easy-to-use at home self-diagnostic device – be it an otoscope or a dermascope – thus giving patients immediate peace of mind and saving them from an expensive and time-consuming visit to a doctor.

Other Western entrepreneurs are adopting frugal innovation models to provide affordable financial services to European and US citizens. Recognizing that 24% of US households have neither a debit nor a credit card to buy bus or train tickets online or pay their utility bills or loans online, Danny Shader founded PayNearMe – which enables consumers to make transactions on the Internet and then make cash payments at local stores across the US such as the 7,000 7-Eleven stores. Similarly, in France, Hughes Le Bret, a former banker, cofounded Compte Nickel with tech-wizard Ryad Boulanouar. Compte Nickel is a prepaid debit card that can be activated
in just five minutes at one of thousands of French cafés and convenience stores and costs only 20 euros for an annual subscription fee. Compte Nickel is a boon for the 2.5 million French citizens who are denied service by traditional banks – and it provides an additional source of revenue for small independent shop owners in France, who are reeling under the recession. Le Bret, author of the provocatively titled NO BANK, boldly predicts that within ten years, frugal offerings like Compte Nickel will account for 15% to 20% of the French consumer finance market.

The growing success and impact of these entrepreneurs in the US and Europe is a wake up call for Western corporations. Leaders of Western companies are starting to realize that unless they embrace frugal innovation models, they risk losing their core markets in the US and Europe to nimble rivals who are able to provide affordable and sustainable solutions to cost-conscious and eco-aware consumers. As a result, several Western companies have begun to develop – or invest in – frugal solutions that deliver more value at less cost to Western consumers. For instance, alarmed by BlaBlaCar’s phenomenal growth – with 4,000 new members joining every day – the French national railway company SNCF has decided to revamp its own business model around frugal mobility by, for instance, investing in Greencove, a car-sharing platform that competes with BlaBlaCar. Some Western multinationals are also introducing into US and European markets low-cost products and services that they initially developed and marketed in emerging economies. For instance, GE Healthcare is now commercializing in the US its MAC 400 – a low-cost and energy-efficient ECG device (electrocardiogram) designed by its Indian engineers and originally sold in Indian rural markets. Other multinationals are bringing into recession-hit European markets frugal supply chain processes and techniques that they successfully implemented in developing nations. For example, inspired by its great success in selling shampoo and tea in inexpensive single-serve sachets in India, Unilever is now selling small Surf detergent packages for only five washes in Spain and marketing mayonnaise mashed potatoes in tiny packages in Greece. Similarly, PepsiCo is motivating its supply chain managers in the US and Europe to do more with less by emulating their frugal colleagues in developing nations like India where PepsiCo’s beverage plants generate two-fifths of their energy input from renewable sources like biomass and wind turbines.

The good news for Western corporations is that they can accelerate their frugal innovation initiatives by recruiting a new generation of engineers and managers being trained in leading Western universities. Indeed, top US universities like MIT and Stanford now offer programmes to train future leaders who are able to design and deliver frugal solutions that are relevant not only for developing nations but also for developed economies in the West. At Stanford, the Entrepreneurial Design for Extreme Affordability course teaches students from across disciplines – engineering, business, medicine, public policy and law – how to design and commercialize inexpensive, sustainable and yet high-quality solutions that address the pressing needs of citizens around the world in healthcare, energy and transportation. Similarly, the Tata Center for Technology and Design at MIT is training a new breed of engineers
and managers who can conceive frugal solutions that address basic human needs in resource-constrained communities in emerging economies – and potentially also in developed nations. In Europe, the University of Cambridge and the Hamburg University of Technology host research centres dedicated to creating and disseminating new knowledge in the field of frugal innovation for the benefit of Western corporate leaders and policy makers.

While emerging economies have already internalized the principles of frugal innovation, Western societies have yet to master the art of doing more with less. In the coming years, as the global economy becomes more integrated, one can expect North-South cooperation to intensify – enabling greater two-way knowledge exchange that can accelerate and deepen the adoption of frugal innovation in both developing as well as developed economies in a synergistic fashion. In the next section we examine how frugal innovation is poised to become the unifying force in North-South engagement in the next decade.

Frugal innovation: the unifying force in North-South cooperation

The dramatic rise of emerging markets is accelerating the transition from a unipolar economic world long dominated by the West to a multipolar economic environment. As a result, the global innovation landscape is also evolving from unicentric (all R&D and innovation concentrated in the North) to polycentric (innovation happening in a diffused manner in multiple regions worldwide). As a result, the trajectories of global innovation – i.e., the various locations where innovative ideas emerge, where they are then developed into solutions and finally commercialized – are starting to change. Taking the perspective of the South, let us study the evolution of global innovation trajectories in a chronological order:

1980s: IMPORTED INNOVATION

Until the 1980s, innovation activities remained concentrated in the West. Multinationals used their big R&D laboratories in the US and Europe to develop new products and services mainly for affluent Western markets, which acted as inspiration for these solutions. Their subsidiaries in developing nations merely imported these Western products and either added or removed features in them to make these offerings more adapted and marketable for low-income consumers in local markets. This phase perpetuated the “North invents, South copies” belief.

1990s: EXPORT-LED INNOVATION

In the late 1990s, multinationals like Procter & Gamble and GE launched large R&D laboratories in India and China. Their main objective was mainly cost saving as they sought to employ qualified but low-cost engineers and scientists in developing nations to work on products still inspired by, and destined for, Western markets. During this period, offshore IT outsourcing providers in India like Infosys and Wipro began to provide outsourced R&D services to multinationals but again to design
solutions primarily destined for Western markets. The South finally proved it could innovate, but did so mainly for the benefit of Western markets.

2000S: END-TO-END LOCAL INNOVATION
As developing nations emerged as the core engine of global economic growth, multinationals began localizing their entire innovation value chains – from R&D to manufacturing – in Africa, India, Brazil and China to effectively serve the local mass markets. For example, Nokia designed and produced all its low-cost phones in India and China using exclusively local R&D and manufacturing capabilities. Similarly, GE Healthcare used its R&D talent in India and China to design from scratch frugal medical solutions – like the low-cost MAC400 and MAC i ECG devices – for local markets. These multinationals were inspired by entrepreneurs and companies in emerging economies who applied frugal innovation techniques to develop and market affordable and sustainable solutions for the masses – like Tata Motors’ $2,000 Nano car or Safaricom’s M-PESA mobile payment service in Kenya.

2010 ONWARD: GLOBALLY NETWORKED INNOVATION
The prolonged economic crisis in the West and the growing scarcity of natural resources have made consumers in the US and Europe frugal and environmentally conscious. As a result, low-cost and energy-efficient solutions are finding relevance
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In developed markets as well. Consequently, multinationals like Unilever, GE, Siemens and PepsiCo are now using their R&D laboratories in India and China to test frugal business models and solutions that can then be commercialized in recession-hit Western economies. This phenomenon is called ‘reverse innovation’. For instance, Siemens’s Indian and Chinese engineers are developing an entirely new product segment called SMART (Simple, Maintenance friendly, Affordable, Reliable and Timely to market) that includes affordable and energy-efficient solutions for emerging market sectors such as healthcare, energy and transportation. Siemens has recently begun commercializing these frugal SMART products in the US and Europe as well.

In the coming years, however, as the global economy becomes more tightly integrated and interconnected, resourceful innovators in the South will be able to combine their ingenuity and expertise with specialized R&D competences in the North to co-create breakthrough frugal solutions that no single region could have entirely conceived on its own. One might designate this synergistic form of North-South collaboration as globally networked innovation.

Vanguard Western multinationals are already building – and learning to orchestrate – global innovation networks that integrate globally dispersed R&D talent, ideas and capital to provide greater value at less cost to customers worldwide. For instance, the resource-poor Indian rural markets inspired GE to design Vscan, a compact ultrasound device, which was then co-developed by an integrated global R&D team distributed across China, France, Norway and the US. Vscan is now marketed across both emerging and developed markets. Vscan wouldn’t have seen the day if it were developed exclusively in either the North or the South. Similarly, the French carmaker Renault – which launched the bestselling $6,000 Logan car in 2005 – is currently developing the CMF-A car platform out of its R&D laboratory in Chennai, India. Renault will share this platform with its partner Nissan to co-design a whole range of ultra-low-cost and highly energy-efficient vehicles aimed at first-time buyers in India and other emerging markets. CMF-A will leverage extensively Renault-Nissan’s global innovation network that spans across France, India and Japan. Indeed, Carlos Ghosn, the multicultural CEO of the Renault-Nissan Alliance who coined the term ‘frugal engineering’ in 2006, wants to integrate the jugaad mindset of his company’s resourceful Indian engineers with the strong project management skills of its French teams and the deep technical expertise of its Japanese R&D group to create frugal vehicles for global markets.

Multinationals from the South are also building global innovation networks in an attempt to scale up their frugal innovation initiatives by combining their low-cost talent with advanced technologies available in the US and Europe. For instance, Renault’s rival Tata Motors has gradually built a world-class R&D centre in the UK (located on the University of Warwick campus) that is emerging as a global hub for the development of frugal low-carbon automotive technologies for markets worldwide. Similarly, Indian wind turbine maker Suzlon now operates top-notch R&D labs in Germany, the Netherlands and Denmark. Its Western engineers collaborate
with their Indian peers to co-develop renewable energy solutions for both developed and emerging economies.

**Conclusion**
In today’s interconnected and interdependent world, the US energy problem is the same as the Indian one: we have one global energy problem to solve since we all share the same planet. Likewise, we can no longer dissociate the healthcare issues of European countries from those of China with its rapidly ageing population; we have one big global healthcare issue to overcome. Both emerging economies as well as developed nations need affordable and sustainable solutions to address pressing needs in sectors such as education, energy, healthcare, transportation and financial services. Traditional R&D models are too costly and rigid to deliver these objectives. Frugal innovation is a better approach for providing such cost-effectiveness and energy-efficiency. Pioneered in resource-constrained emerging markets, frugal innovation is rapidly being adopted in the recession-hit Western economies as well. One might hope that in coming years, corporate leaders and policy makers in the North will join forces with their counterparts in the South to integrate and network their innovation assets and know-how to co-create frugal solutions that tackle critical socio-economic issues that affect citizens worldwide.
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Innovation has become the new buzzword across the globe. International organizations, governments, corporates, academia and civil society see it as the answer to the major economic, social and environmental transformations challenging the models of the 20th century.

Innovations are occurring worldwide and alternative solutions to the existing problems are emerging in all sectors: electric cars, organic farming, renewable energy and e-learning are good examples. These alternatives can be ascribed with qualities such as decentralized, frugal, flexible, smart and democratic, virtues that are lacking in conventional models. They are attributed with the potential to meet the overall global challenges such as climate change and the growing inequalities between and within countries.

What is the real potential of innovation? Does the rapid deployment of innovations lead towards a more sustainable and inclusive society? Can innovations and the emerging alternatives replace conventional models? Beyond technologies, what institutional innovations are required to support sustainable development?

A Planet for Life 2014 aims to answer these questions and explore innovation in all its aspects, through a series of texts written by international experts. The objective of this book is to analyse experiences from across the world and the role of innovation in a variety of areas of development such as urbanization, agriculture and food, the mobility of people and freight, education and the provision of water and energy to all.

The book includes:
- Papers by leading international experts and academics
- New perspectives through in-depth analyses
- Numerous maps, charts and tables
- A wealth of ideas for specialists and non-specialists alike: scholars, policymakers, administrators, concerned citizens, development professionals, entrepreneurs, journalists, students and others.

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