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Frugal and reverse innovations – Quo Vadis?

Henri Simula*, Mokter Hossain and Minna Halme

Aalto University, P.O. Box 11000, FI-00076 AALTO, Finland

The concepts of frugal and reverse innovation are recent entrants to the innovation literature. Frugal innovation conveys the important idea of innovating under circumstances of resource scarcity. Reverse innovation refers to another significant turn in thinking and practice – innovations from low-income contexts can enter wealthier markets, a major shift from the previous innovation paradigm. There are some hallmark examples of these types of innovation but the current academic literature is still limited. The purpose of this article is to study these concepts and present a conceptual framework that combines underlying drivers. We also present ideas for future research avenues.

Keywords: Conceptual framework, frugal innovation, innovation management, reverse innovation.

Introduction

THE body of knowledge on contemporary innovation management mainly focuses on new products and services targeted at markets in developed countries where customers are capable of purchasing expensive high-end products. At the same time, rapid population growth is ongoing in developing countries, where people are naturally seeking new ways to improve their life, so those countries have become a focal point for new markets¹. However, products designed by Western firms for wealthy customers are not affordable for the majority of people in low-income emerging markets. Consequently, the solution is to innovate and work differently; merely stripping down existing products is not going to be the answer².

Low-income emerging markets increasingly provide new sources of innovation. This trend will deliver new prospects for innovative and open-minded firms to find new business opportunities. What this means in practice is that the innovation loci and foci are changing and there is a need to update innovation management theories, models and frameworks. Frugal and reverse innovations are creating new markets both in emerging economies and developed countries by serving previously underserved customer groups. So both of these concepts entail the idea of targeting a new customer base. Even though the target customers for frugal products and reverse inno-

vation are different, they overlap in various facets. Frugal innovations first serve low-income customers in emerging markets. When some of those innovations migrate to developed countries, we can speak of reverse innovations. Zedtwitz *et al.*³ argue that a firm's ability to leverage the potential of reverse innovation increases its likelihood to succeed in the global innovation landscape and thereby capture value.

Prahalad⁴ lists several prejudices held by large multinational firms concerning low-income emerging markets, especially Bottom [Base] of the Pyramid (BoP) markets. For instance, people on a low income cannot afford products and services sold in developed countries; that is, Western firms might perceive that their cost structures prevent them from serving BoP markets. In addition, firms might think that only developed countries appreciate and will pay for technological innovations. This kind of logic inevitably leads to Western firms thinking that there is no potential in BoP markets. As a result of such beliefs, despite the high potential, only a handful of firms are currently active in frugal innovation and reverse innovation. We want to clarify the role of frugal and reverse innovation and provide new insight on these concepts.

While frugal innovation aims to serve low-income customers in emerging markets, reverse innovation as its name indicates reverses the 'chain of order', and thereby provides means originating from scarcity to serve a set of value conscious customers in developed countries. As Govindarajan and Trimbel⁵ postulates we understand why a poor man wants a rich man's product, but why would a rich man want a poor man's product? This counter-intuitive phenomenon seems at least in theory to have a place in the West. The underlying reason is the fact that the developed countries are doomed to a long period of austerity due to the stagnation of economic growth, the middle class being squeezed and governments curbing spending. For instance, some 50 million Americans lack medical insurance and 60 million lack standard bank accounts⁶. This indicates that a set of people in the developed countries is by necessity becoming increasingly cost aware.

Research question

Examples of frugal innovation abound, whereas to date there are limited cases of success with reverse innovations. Frugal innovations are prevalent in emerging markets such as China, India and Africa. Western firms

*For correspondence. (e-mail:

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increasingly engage in frugal and reverse innovations by developing products and services with good-enough functionalities⁷. Frugal innovation occurs in several contexts and industries. There are many cases in the healthcare, energy production and transportation sectors. However, the dilemma is that the term frugal innovation is employed to describe a wide range of products and services. There is only limited knowledge on how reverse innovation is organized in firms². And which products and services can be considered reverse innovation?

The basic motivation of this study is to investigate what are frugal innovations and reverse innovations. The principal research question is: How are frugal and reverse innovations interrelated and why is it important to study them? The purpose of the study is also to link frugal innovation with reverse innovation to clarify the commonalities and differences between the two concepts. We also propose a framework, clarify the concepts themselves and suggest new avenues for future research.

Frugal innovations

When an innovation meets the needs of customers with low purchasing power, typically located in low-income emerging markets, it is considered a frugal innovation^{8,9}. Frugal innovation can be seen as a means to serve resource-constrained customer segments. While frugality in essence involves a lower price for the customer, there are multiple paths to better affordability. That can be achieved simply through low-cost manufacturing, low-cost materials or low labour costs, in essence through lowering costs in any part of the process. Sometimes, frugal innovation also involves eliminating non-value-adding functions and occasionally frugal product or service innovation contains features unavailable in existing solutions². Design focused on basic functionality and minimal feature sets is a key aspect of frugal innovation.

Although frugal innovation as a phenomenon is not new, the related literature is still in its infancy. One related issue is that there are several other terms to describe it². Innovation made possible via low cost structures is termed cost innovation in English¹⁰, Shanzhai innovation in Chinese¹¹ and Jugaad in Hindi¹². Frugal innovation is emerging under various identities, such as cost-constrained innovation, cost-innovation products, or good-enough products^{12,13}. While firms have traditionally focused on structured tools, processes and techniques to manage innovation, Jugaad refers to grassroots solutions less concerned with formal innovation processes and more with people and creativity¹².

Frugal innovation means the practice of developing relatively cheaper products to create value (i.e. low cost solutions) for customers with low purchasing power^{14,15}. It is a concept that focuses on simplicity and frugality, whereas traditionally, innovation activities have been

capital intensive, required large facilities and highly qualified personnel¹⁶.

Frugal innovation stems from resource scarcity: utilizing limited resources to meet the needs of low-income customers¹⁷. It is based on the idea of turning resource constraints (i.e. financial, material or institutional) into advantages¹⁸. Some frugal innovations are grassroots innovations created at BoP, usually due to necessity, hardship and challenges. Commercial frugal innovation targets the unmet needs of customers who are otherwise off marketers' radar because of their low purchasing power and different needs. Frugal innovations can comprise both product and services, and the interrelated business models⁸. While the growth wave was previously based mainly on innovation focused on wealthy countries¹⁹, there is now an increasingly significant opportunity for Western firms, at least in many cases, to begin innovating for low-income emerging markets, where over four billion people live on a minimal income²⁰. Even though studies have cited examples of frugal innovation mostly from China and India, Prathap²¹ found that countries such as Russia and Argentina have a better record than India in frugal innovation practice.

Frugal innovation can be defined as a product, service or a solution that emerges despite financial, human, technological and other resource constraints, and where the final outcome is less pricey than competitive offerings (if available) and which meets the needs of those customers who otherwise remain un-served¹⁴. Thus, frugal innovations combine low-cost solutions, low-cost manufacturing and low-cost materials with design that focuses on basic functionality and minimal feature sets. In this context, the key words are resource scarcity, simplification, environmentally sustainable and lean practices.

Taxonomic issues relating to frugal innovation

Firms should be aware that low-income emerging markets cannot be approached with the same mindset as their traditional markets; they need to be willing to experiment and employ innovative thinking and approaches to business, and occasionally resort to bricolage²². In other words, retrofitting business models from a developed market is not sufficient, and neither is making cheap versions of products to be sold in developing markets^{4,5}.

Carlos Ghosn, the CEO of Renault-Nissan defines the concept of frugal engineering as follows: Frugal engineering can be considered a systematic approach to make the underlying constraints irrelevant or at least less important, whereas the driving force of frugal innovation is innovating under resource constraints. In that sense, frugal engineering is a conceptually different topic and beyond the scope of this study.

Currently, the applications of frugal innovations are wide. They cover down-to-earth solutions created at a

local level to solve everyday problems, as well as commercial products launched to create profits for a business enterprise. In addition, there are frugal innovations originating from a social motivation. These examples require different business models and diffusion paths. Categorization based on technological novelty would be one way to differentiate frugal innovations; however, drawing a line between low- and high-tech is not without difficulty. For instance, a social enterprise could offer high-end service solutions or utilize state-of-the-art technology, as is the case with, for example, Aravind Eye Hospitals in India.

Grassroots frugal innovations

A need exists that someone, usually a local individual or group, spots and creates a novel innovation. This is 'need-based' ideation. Novel ideas can originate from emerging and developed markets alike. For instance, the idea of using old soda bottles to let light into buildings; or a young boy in Africa who, without any previous knowledge of engineering, innovated the recycling of old bicycle parts to create wind energy.

Commercial frugal innovations

Indian company MittiCool's clay refrigerator is a remarkable example of commercial innovation. All products developed by MittiCool are eco-friendly and can be produced at low cost. The MittiCool refrigerator does not require electricity and can keep vegetables and milk fresh for three days. The Aakash Internet tablet developed by a technology-intensive firm Datawind for the Indian government aims to provide low-cost tablets to students in India. A frequently cited example from India is Tata Nano car, which was launched as an ultra-low priced, safe, affordable and all-weather form of family transport. The main objective underlying the Tata Nano was to develop a car that costs as little as \$ 2,500. Yet another example is Nokia's dust and moisture proof, highly durable 1100 phone that was a great success in low-income emerging markets for which it was specifically designed.

Societal frugal innovations

KickStart's affordable and efficient pumps are a prime example of an innovation with a social motivation, and the outcome of providing a better livelihood for subsistence farmers in African countries²³. Another example is Embrace, designed at Stanford University in the US, where a group of graduate students had the idea of creating an inexpensive infant warmer that functions as a low-tech device. Embrace is described as having the potential to save thousands of babies in the developing world²⁴.

Reverse innovation

It becomes interesting when an innovation originating from low-income emerging markets moves to developed markets. According to Lindegaard²⁵, 'Whether products are developed by Western firms in developing countries and then come to the West or whether they are developed by firms native to low-income emerging markets such as India and China, these generally lower priced products are going to disrupt price structures that Western firms have enjoyed to date.' The main idea behind reverse innovation is the ability to apply frugal innovations in the context of a developed economy, in which there are numerous customers, especially during an economic downturn, who are cost sensitive and do not want to pay for extra features and functions.

The concept of reverse innovation was put on the academic radar by Immelt *et al.*²⁶. They postulated that reverse innovations are low cost innovations that successfully diffuse into developed markets from emerging markets. Similarly, according to Govindarajan and Ramamurti²⁷, reverse innovation refers to cases where innovations are first adopted in low-income emerging markets before they 'trickle up' to wealthy countries. Several other scholars have defined reverse innovation in a similar way²⁸. The reverse innovation concept focuses low price point innovations, which originate from low-income emerging markets, on potential markets among wealthy countries⁵. Reverse innovation is also essential for Western countries to serve rich customers for a different purpose. For example, a portable, ultra-low-cost electrocardiogram machine developed by GE Healthcare in India is used in hospitals in Western countries where installing a traditional electrocardiogram machine is impractical⁵. Even though examples of reverse innovation are limited, a typology proposed by Zedtwitz *et al.*³ shows that there is evidence of various types of reverse innovation in practice.

As discussed earlier, reverse innovation runs contrary to the traditional flow of innovation. It challenges the common belief that the wealthy countries are the hubs and origins of innovations, and innovations flow from wealthy countries to emerging economies in a stripped-down version. Developing countries are no longer merely recipients of innovation from wealthy countries. Firms and individuals in developing countries innovate to meet their own needs at a low cost. These innovations may then find ways to diffuse into neighbouring countries at a similar socio-economic level before making their way to other similar markets in geographically distant countries. Some of these innovations are adopted by wealthy countries as they meet the needs of a particular set of customers. However, a fundamental challenge for Western firms wishing to engage in reverse innovation is that their subsidiaries in developing countries have different roles to those of headquarters looking to enact reverse innovation².

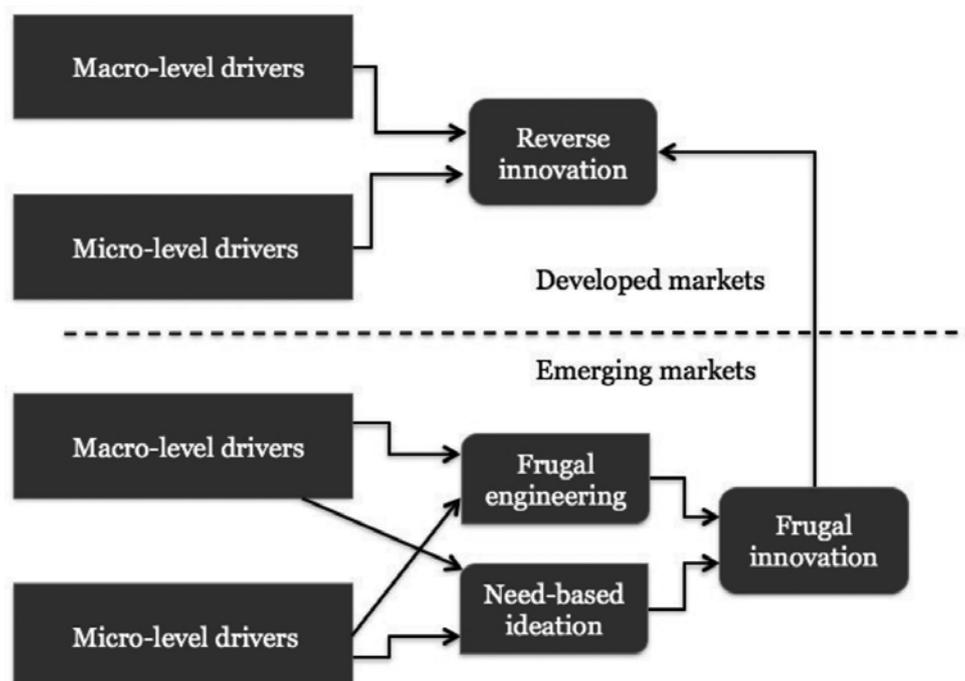


Figure 1. Conceptual model for frugal and reverse innovations.

The freedom of subsidiaries to reverse innovate is another significant issue. Collaboration between headquarters and subsidiaries is necessary for Western multinationals to become successful in reverse innovation²⁹.

Conceptual framework

As discussed earlier, need-based solutions and frugal engineering are the two basic sources of frugal innovation and also the basic building blocks in our conceptual framework (Figure 1). Frugal innovations sometimes become reverse innovations. There are, however, specific fundamental factors underlying both these innovation concepts. These factors are inherently macro- and micro-level, and are discussed below.

Macro-level drivers in developed markets

Many Western economies are afflicted by the economic downturn and their recovery has been slower than expected. Export business has suffered in many countries with resultant high unemployment. These events coincide with increasing scarcity of natural resources, which in turn shows in increased raw material prices, creating pressure to increase various retail prices of products. Political turmoil and aging populations are causing insecurity and a welfare system crisis in many countries. As a result of these and other factors, there is a demand for novel products and services that deliver more value with less resource input and lower cost.

Micro-level drivers in developed markets

Many customers in both emerging economies and developed economies wish to save money. Cost awareness is naturally a growing trend as the unemployment ratio increases in many low-income emerging markets. In addition, many products have suffered from the so-called over-engineering syndrome, which has created feature fatigue among customers, meaning they are unwilling to pay for too many features they perceive do not add value³⁰. Innovation overload³¹ is a comparable phenomenon that means ‘a consumer’s response to the ever increasing speed of change in information, knowledge, and innovations’. Moreover, people are increasingly considering issues such as sustainability and well-being.

Macro-level drivers in low-income emerging markets

Population growth in emerging economies has been rapid. Also, economic development in low-income emerging markets has been moving much faster than that in Western economies. Urbanization has increased and some cities are growing quickly, for instance in China, Latin America and several African countries, which has created major challenges for infrastructure sustainability. Many developing countries are actively inducing innovation for social development and poverty reduction. The government of India, for example, has legislation and budgetary allocations to find ways to serve low-income people³².

Resource scarcity remains also a key macro-level trend in low-income emerging markets. In any event, while Western markets are shrinking, an increasing number of people in low-income emerging markets are moving from working class to middle class, which naturally invites many multinational corporations to enter these markets in search of new business opportunities.

Micro-level drivers in low-income emerging markets

The transformation of cities and living areas develop at an unprecedented speed in low-income emerging markets. Several technological advancements, especially in ICT sectors, have changed the way people live, work and spend their leisure time. Global community networks influence people's tastes and preferences. People remain cost aware and favour the idea that products do not need to be state of the art, but merely sufficient to meet basic needs. In other words, there is a growing demand for good-enough solutions that deliver value for money.

Discussion and conclusion

Both frugal and reverse innovations are associated with some key practical issues as discussed above. Traditionally, Western firms have aimed to make cheaper and stripped-down versions of their existing products and sell them in low-income emerging markets. Most likely, this mechanism is going to fail as the cost structure will still be too high, which will result in unaffordable price tags for customers in low-income emerging markets. To follow another path, Western firms can design completely revised low-end solutions utilizing local R&D power. Local firms understand local preferences and can create low-priced frugal innovations for local markets. Western firms adapt ideas from low cost market products and utilize these in their design, culminating in cheaper products for their home markets (i.e. reverse innovation). Firms originating from low-income emerging markets will perhaps more often challenge Western firms in their home market with disruptive innovation and unique business models.

It is worth emphasizing that there is a demand not only for innovative products, but also for innovative business models especially designed to serve BoP markets. Although new frugal products can have a dramatic impact on people's life in BoP markets, it is often extremely difficult for individual producers to reach these underserved markets. There are several challenges related to the diffusion of innovations³³ in these markets; for instance, how to turn latent demand into active demand, because the benefits of offered solutions are not obvious to most people in low-income emerging markets. There is also a lack of active engagement and involvement on the part of users in the co-creation of these solutions, and finally a

lack of proper and reliable sales and distribution channels.

Questions that would be important to address in future studies are as follows:

1. How do frugal innovations diffuse among low-income emerging markets and what kind of business models can support this?
2. How can firms from the low-income emerging markets enter the Western markets with reverse innovation?
3. What opportunities exist for Western firms to capture revenue from low-income emerging markets with frugal innovations?
4. How can Western firms build or restructure their business models and strategies to tap underserved and un-served customers with frugal innovations?
5. How can Western firms collaborate with local players in low-income emerging markets on frugal and reverse innovations?
6. What are the barriers for reverse innovation to gain a foothold in developed markets?

While frugal innovation can at best provide solutions with economic and social benefits coupled with savings in natural resources (materials, energy, water) simultaneously, we do not claim that frugal innovation is solution for global problems. It can create controversial situations in which benefits to different stakeholders negatively overlap. Therefore, extensive studies from various perspectives and regions are necessary to gain an adequate understanding of frugal innovation. Extensive studies on frugal innovation may also lead to a better understanding of reverse innovation. However, it is also necessary to consider studies on reverse innovation alone in future research. We believe that more academic studies regarding the pros and cons of frugal and reverse innovation are essential.

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