

# FRUGALITY: THE MISSING PIECE IN INNOVATION AT THE BOTTOM OF THE PYRAMID JIGSAW PUZZLE?

Authors: *Patricia G. Mwangi*<sup>1</sup> & *Kennedy O. Ogollah*<sup>2</sup>

<sup>1</sup>*Department of Business Administration, Chuka University, Kenya*

<sup>2</sup>*Department of Business Administration, University of Nairobi, Kenya*

Contact: [pgachambi@chuka.ac.ke](mailto:pgachambi@chuka.ac.ke)

## ABSTRACT

Given, the changing business landscape globally, innovation is increasingly getting focus as a panacea for economic downturn. However, innovation cannot be a one size fits all solution across the globe since different economies operate at different levels. To achieve economic development, innovation must take into account the constraints within which this strategy is pursued. The bottom of the pyramid consists of people who live on less than \$2/day who are cross cutting in terms of cultures, literacy, capabilities and needs and to profit from these markets, focus must be placed on total value delivery. This creates an innovation opportunity that requires reframing the 'normal' rules of the game and challenging core assumptions. Innovation at the bottom of the pyramid requires commitment to awareness, access, affordability and availability as fundamental constraints for creating business models. Specifically, business models in these markets capture total value through high volumes and low margins unlike those higher up the pyramid. This article presents a conceptual discussion on how firms at the bottom of the pyramid economies can exploit frugal innovation to overcome constraints within these economies. Through analysis of literature, the article argues that the scarcity of resources at the bottom of the pyramid can confer frugality advantages. To capture value from frugal innovation, firms must take into account the specific constraints facing the firm and the market. This requires recognizing that bottom of the pyramid markets are dissimilar with different challenges and so frugal innovation must be tailored to the challenges they intend to solve in order to be sustainable. This article is informative to managers and policy makers pursuing innovation in these markets. It also provides a foundation to strategy and entrepreneurship scholars in reviewing the conditions within which innovation captures value especially in the bottom of the pyramid markets.

**Key Words:** Bottom of the pyramid, frugal innovation, frugal advantages, innovation, economic constraints, emerging economies

## Introduction

The global business environment is changing fast with concerns such as climate change, shifting economic power and technological advancements. Marr (2021) contends that the business landscape is increasingly being shaped by need for sustainable and resilient operations, mix of human and artificial intelligence, shifting talent pool, flatter and more agile organizational structures, authenticity, purposeful businesses, co-opetition and integration and new forms of funding. Additionally, businesses are operating in the midst of increased digitization such that the lines between business and technology are becoming fuzzy. It is against this background that innovation is gaining center space as businesses seek ways of

coping and surviving the changing business landscape. Indeed, innovation is also a driver to many of the changes observable in the business landscape.

Innovation seeks to come up with new products or services and derive value out of them. Innovation seeks to commercialize inventions which could be in terms of products, processes, markets or organizations. Brem (2011) observes that innovation is central to successfully enter markets or drive competition. He further points to innovation and entrepreneurship being the main triggers for the long term success of companies. Baumol (2002) attributed all the economic growth

since the 18<sup>th</sup> century to innovation. It is against such a backdrop that innovation is seen to be the solution to most of the problems being experienced in the world. Besant and Tidd (2015) concurred that innovation jumps out from thousands of mission statements and strategy documents and is indeed on the lips of every politician cognizant that innovation is pivotal to shaping and reshaping lifestyles. They attribute this trend to the recognition that if organizations do not change their offerings and how they create and deliver them, they face extinction.

While innovation is associated with positive benefits, innovation has a dark side to it. Coad *et al.* (2021) opined that innovation should not be simply viewed as either good or bad but rather its nature should be well understood. They argued for a more nuanced discussion that took into account both the direction and rate of change. Further they noted that the effects of innovation, both positive or negative could be distributed unevenly and thus the need to select an environment that weeds out the negative innovations.

De Marchi *et al.* (2022) contended that innovation can potentially lead to harmful impacts on society and the environment. They further noted that innovation could interfere with existing practices thereby resulting in new or deeper inequalities. Coad *et al.*, observed that policymakers tended to ignore the negative side and assumed that innovation was always good and therefore more of it was better. This they attributed to ignoring that innovation effects are reflected in the selection environment for innovation.

In an attempt to reconcile the positive and negative effects of innovation, there is increasing focus on sustainable development. This creates a focus on balancing between innovative activities and their sustainability (De Marchi *et al.*, 2022). This view seeks to evaluate the long term and overall effects of innovation. Coad *et al.* (2021) isolate overall harms associated with innovation as public health risks, environmental degradation, harm to society and harm to the economy. This they observed were important since they were more instrumental to policy makers as they could provide the basis for poli-

cy frameworks that reconcile the pros and cons of innovation. Prahalad (2012) argued for going beyond the technological and product perspectives of innovations to the total delivery of value. This, he contended, requires a rethinking of the source, focus and process of innovation. Thus, to appraise innovation and its accompanying value and cost, it is important to consider the innovation context. Thus innovation cannot be approached in a one-size-fits-all approach. The contexts of the different beneficiaries of the innovation must be weighed to determine its potential benefits and costs and its attendant sustainability over time. For instance, the development of electric vehicles may be a suitable innovation for communities with access to electricity but meaningless to communities without. Such an innovation may need to take into account the context of application to be beneficial.

### **Bottom of the Pyramid**

The bottom of the pyramid refers to the group of people who constitute the largest (two thirds) but poorest of the socio-economic status. It is the lowest of the income group. Prahalad (2006) describes the bottom of the pyramid as encompassing the world's four billion poor that is people who live on less than two dollars a day. He argued that wealth distribution and income generation capacity can be depicted by an economic pyramid. The wealthy with a variety of opportunities form the tip of the pyramid while the poor form the base of the pyramid. Many of these people live in developing countries of Africa, Asia and Latin America. Solutions to achieve poverty eradication at the base, he further argued, had eluded aid agencies, donor, public and private entities alike as underscored by the Millennium Development Goals. Therefore, poverty and its accompanying disenfranchisement constituted one of the world's most formidable problems.

Prahalad (2006) identified various characteristics associated with the bottom of the pyramid with the dominant assumption being that the poor have no purchasing power and are not a viable market. Consequently, customers in this market spend on basics and are not concerned with technology and advanced products that are consumed by

their counterparts in the developed markets. Prahalad and Hart (1999) observed that the vast majority of people at the bottom of the pyramid live in rural villages, urban slums and shanty towns coupled with low education levels. Further, they noted that due to the unorganized nature and limited quality and quantity of products and services, the bottom of the pyramid remains largely unnoticed in corporate efforts.

The invisibility of the bottom of the pyramid to corporate efforts has been elaborated into the innovation discussion. Indeed, Karnani (2006) observed that intellectual discourse at the bottom of the pyramid focused on public policy and development economics and it is only recently that management experts have delved into this discourse. Prahalad (2006), paved the inroads to this discussion by arguing against corporate social responsibility as the basis for initiatives at the bottom of the pyramid. To counter that, he argued that there were profits to be made by selling to the poor due to untapped purchasing power. This he argued should be led by large companies thereby helping to eradicate poverty. In short, there is fortune and glory at the bottom of the pyramid.

Attempts to resolve the problems at the bottom of the pyramid have largely taken a one-size-fits-all approach. Simanis (2012) argued that most companies adopted the low price, low margin, high volume model which was flawed. This he associated with the difficulty in penetration of such markets and the cost structures and called for a different approach that recognized the need for high margins even at the bottom of the pyramid and sticking to basic business tenets. This approach is premised on the notion that it is only a profitable business business that can be scaled to meet the objective of poverty eradication to a wider market base. Simanis and Duke (2014) elaborated on this by proposing that organizations could only profit in low-income markets by understanding their challenges which are changing consumers' behavior and changing the way products are made and delivered.

Simanis and Duke (2014) observed that bottom of the pyramid markets presents in a variety of shapes and sizes and they specifically classified them into mature, growth and frontier markets. This they demonstrat-

ed required a multifaceted approach in order to operate in them profitably. Prahalad (2012) observed that the composition of the bottom of the pyramid was not a monolith but rather it was composed of varied needs, capabilities, literacy, ethnicity and cultures. This he noted presented a segmentation opportunity alongside the distinct differences in these markets and any undifferentiated approach was bound to fail. Efforts at the bottom of the pyramid need to take into account the specific conditions in each of these markets and this may even require further segmentation even within countries and regions.

In addition to the differences amongst the bottom of the pyramid markets, Prahalad and Hart (1999) observed that managers have widely held assumptions about them. To begin with they assume that the poor are not the target markets of multinationals since they cannot compete in such markets due to their cost structures. Secondly they assume that the poor cannot afford and do not have use for their products and services and thus they focus on the tip of the pyramid. Additionally, they assume that the bottom of the pyramid has no bearing on their long term viability and so leave them to nonprofit organizations and governments and as a result never consider such markets leading them to innovate around sustainable development. Finally, managers only have intellectual excitement in the developed markets and are not interested in business challenges with a humanitarian aspect. It is due to these assumptions that businesses ignore bottom of the pyramid markets. These assumptions are also applied collectively to the bottom of the pyramid which is misleading. While some may hold in some segments at the bottom, they do not apply to all and they all may not apply to one segment in totality. This suggests that it is absolutely important to understand variety that is the bottom of the pyramid.

Simanis (2012) contended

Simanis (2012) contended that for profits to be possible at the base, two conditions are vital that is the firm can leverage on existing infrastructure that is applied in serving the richer clientele to serve the poor and the consumers know how to buy and apply the product.

These conditions are rarely, if ever, applicable across the base of the pyramid. Indeed, Prahalad (2012) observed that the poor are found both in urban and rural settings with different levels of awareness and access to infrastructure. Karnani (2006) observed that the poor at the bottom of the pyramid are geographically dispersed and are culturally heterogeneous which tends to reduce the economies of scale in serving these customers. Further, there are discrepancies in terms of transportation, communication, media and legal infrastructure which exaggerates the costs of doing business. Simanis and Duke (2014) argued that to profit at the base, firms needed to surpass two common but often underestimated challenges. These they noted were the changing consumer behavior and changing the way products are made and delivered to customers. These challenges often necessitate extra costs and changes in value chains which require firms to have a realistic assessment of the opportunities at the bottom and match them with their resources, skills and capabilities.

In recognition of the challenges at the bottom of the pyramid, Prahalad and Hart (1999) advocated for a model that creates a convergence between low cost, good quality, sustainability and profitability. This requires a paradigm shift from the assumption that serving the bottom of the pyramid takes cheap and low quality products to understanding that it requires firms to bring the best technology and global resources to address local opportunities. This means that innovation becomes a key imperative in this endeavor. However, this kind of innovation requires clarity in the boundaries that shape the opportunity in terms of cost, quality, sustainable development, local knowledge, needs and volumes. To innovate within these boundaries requires firms to take cognizance of the variations that exist at the bottom of the pyramid and customize their business models to suit the constraints. Prahalad (2012) concurs that there is no universal bottom of the pyramid solution but rather solutions must be customized to the target within the bottom of the pyramid. This, he elaborates, requires a deep immersion into consumers' circumstances to obtain insights that help to define the boundaries for innovation as well as recognizing

that such innovation is not just about a product but rather about developing an appropriate ecosystem for the business model to function.

Prahalad (2012) proposed the 4As as opposed to the 4Ps of marketing in order to customize a market approach at the bottom of the pyramid. The 4As namely awareness, access, affordable and availability must be a central commitment to innovation at the bottom of the pyramid. Awareness requires that the consumers and producers of products and services at the bottom of the pyramid must know what is available and how they can apply it. Access involves ensuring that consumers including those in remote locations can access the product or service which in essence requires focus on the infrastructure available to all the consumers. Affordability involves providing world class quality at lower prices and not poor quality products. This, Prahalad noted presented the most difficult conundrum for firms from developed economies since the bottom of the pyramid requires quality products at lower prices and not luxury. Finally, availability implies that there must be an uninterrupted supply of the products or services.

Karnani (2006) contended that the profits at the bottom of the pyramid proposition was simply a mirage since the market was relatively small and diverse and so the proposition could end up being harmful to the very people it was meant to protect. He therefore termed the bottom of the pyramid proposition a dangerous delusion especially when it ended up with firms exploiting the poor or disadvantaged with low capacities to choose lives they valued. Prahalad (2012) noted that firms could make breakthrough innovations addressing the 4As and the resultant challenges and thus called for working within these constraints to innovate and create sustainable development. These contentions align in the need to weigh in the constraints at the bottom of the pyramid in order to provide sustainable innovations. Innovation at this point should seek to avail quality products or services at affordable prices driven by a clear definition of value as seen by the target consumers.

### Frugal Innovation

Frugal innovation is an emerging field in the wider innovation discussion which is seen as a novel innovation approach that seeks to design or redesign business models to provide reduced complexity, essential functionality and affordable solutions for the underserved poor. It is a form of innovation that seeks to provide basic functionalities of products and services commonly for the poor. However, with higher levels of economic declines globally, the frugal innovation debate is finding its way into more developed economies. Frugal innovation is ideally intended towards developing products and services that fit the special needs and requirements of non-affluent customers. It can be conceptualized as an attempt to maximize the ratio of value to resources that is doing better with less and for more people (Prabhu, 2017).

Weyrauch and Herstatt (2016) isolated three characteristics that define frugal innovation that is substantial cost reduction, focus on core functionality and optimized performance level. Frugal innovation must be able to attain lower prices for the customer compared to other solutions available for the customer. The focus on the core functionality on the other hand entails making products that are user friendly and easy to use compared to what is available to customers that is it directly targets user requirements. Frugal innovation also requires a critical examination of the performance and quality levels required. Optimized performance implies that the innovation must provide value for the customer taking into account the variety of customer contexts. Thus it must meet the de facto purpose and local conditions better than available solutions. Weyrauch and Herstatt further added that frugal innovation could possess additional characteristics like being scalable and sustainable.

Vadakkepat *et al.* (2015) argued that frugal innovations have the capacity to convert the poor from passive recipients of aid to active consumers of products and empowering them through affordable products and services. They noted that consumers at the base of the pyramid operate in geographically remote environments which are resource constrained, institutionally void and

less than sufficient technological know-how. These environments tend to be “media dark” and so are denied or unaware of products and how to use them. Frugal innovations can therefore deliver more inclusive growth at the bottom of the pyramid. Citing, the cases of the Jaipur foot and the Aravind eye clinics, Vadakkepat *et al.*, argued that frugal innovations make available important products to the poor by cutting off the frills to make them affordable.

The three attributes by Weyrauch and Herstatt (2016) provide the essence of frugal innovation and this is definitely not just providing cheap products for the poor but rather it is focusing attributes necessary to offer value to the customer at a lower cost. Ideally frugal innovation takes different shapes and sizes based on the varied needs and local conditions and can therefore differ significantly depending on the target market. Vadakkepat *et al* (2015) argued for making products affordable not by just stripping them off features but by understanding contextual constraints associated with cultural norms, society, technical backgrounds and environmental constraints to provide users with focused value. This they noted provided avenues for applying frugal innovation beyond the products to business models thereby scaling and ensuring sustainability of the business models.

Frugal innovation takes various forms depending on the context. Hossain (2018) noted that frugal innovation overlaps with multiple concepts specific to certain countries like Gandhian and Jugaad in India, Gambiarra and Jeitinho in Brazil, Jua Kali in Kenya, Jiejian Chuangxin in China and Kanju in Africa. On the other hand, in developing economies, there are concepts like cost innovation, catalytic innovation, good-enough innovation, resource-constrained innovation, indigenous innovation and bottom of the pyramid innovation. The concept also overlaps with grassroots innovation, blowback innovation, reverse innovation, trickle-up innovation and disruptive innovation in developed economies. Prabhu (2017) concurs that frugal innovation is disruptive in nature since it seeks to take over the market through offering affordable versions of products.

Hossain argues that bottom of the pyramid innovation comes close to frugal innovation but falls short by focusing on poorer customers only. Frugal innovation is aimed at both low-income customers and emerging middle-income segments.

Basu *et al.* (2013) observed that the benefit of frugal innovation is based on its ability to be economically efficient within conditions of severe scarcity. They differentiated frugal innovation and conventional innovation based on the drivers, process, core capabilities and location. Frugal innovation is driven by what customers need not what would be nice to have using a bottom-up process as opposed to top-down. Further frugal innovation relies on the core capabilities of functionality not desirability and design and it is located in developing and emerging markets unlike conventional innovation which is located in developed markets. Frugal innovation requires that the innovator addresses the essence of a problem and thereby provides a real solution to the customers' problems.

### **Frugal Innovation and Sustainability**

Given the declining economic conditions globally, consumers are becoming more value conscious. Levanen *et al.* (2022) contend that business models are increasingly under societal and operational pressures. The societal pressures emanate from social, environmental and economic aspects that surround the business. On the other hand, operational pressures arise from the resource, institutional and affordability constraints. Businesses are therefore under pressure to design sustainable business models which must be clearly articulated in terms of value proposition, creation and capture.

In addressing the strategies for success at the bottom of the pyramid, Prahalad and Hart (1999) argued that an entrepreneurial orientation is required. Entrepreneurial orientation leads to creation of markets instead of merely serving markets so that the entrepreneur comes up with products that create new value chains. Zeschky *et al.* (2011) argued that firms must rethink their business models for long term success. This is due to the increasing middle class who are keen on frugal innovations and affluent customers

who over time choose products that are less expensive but still deliver. Firms must also establish organizational structures and capabilities necessary to build frugal products. This requires firms to understand the unique characteristics of frugal products. This is crucial for the sustainability of the businesses. Sustainability aims for meeting present needs without compromising future generations ability to meet their own (Albert, 2019). The emerging middle class and the affluent customers choosing frugal products are providing avenues to broaden the market for frugal innovators. Given that frugal products have low margins; a broader market is crucial for long term sustainability by ensuring the long term profitability of the business.

There is an inherent connection between sustainability and frugal innovation. By cutting out the frills on products and services, frugal innovation reduces wastage and provides for better deployment of resources. Albert (2019) observed that it is inherently socially and economically sustainable. De Marchi *et al.* (2022) confirming that social and environmental outcomes should not be assumed in frugal innovation, noted that it can have negative outcomes. They argued that the potential of the frugal innovation to contribute to sustainable development is influenced by the actors developing the innovation. The innovation must also be relevant to be embedded in the local context. The sustainability of the frugal innovation also depends on whether the developer is foreign or local. This implies that frugal innovations need to be specific to the target market and should involve the consumers in developing them giving rise to prosumers.

Basu *et al.* (2013) argued that by applying the core competences windows of opportunity can be opened in resource-constrained areas. This they argued required everyone to understand the needs of the developing world in order to advance to sustainability. This is because frugal innovation can lead to sustainable solutions by identifying the real needs of the target markets and tailoring solutions to those needs. This also allows users to contribute and even develop solutions to their problems and within their conditions or constraints.

This contributes to economic, social and environmental sustainability of the venture by being relevant. This is especially important considering that frugal innovations can have adverse effects e.g. the Tata Nano that has been failing to pass crash tests and sachet packaging that contributes to environmental degradation through waste disposal when they end up in drainages and filling landfills.

### **Frugality-Based Advantage at the Bottom of the Pyramid**

The bottom of the pyramid is riddled with resource constraints which may pose challenges for firms pursuing innovation in these markets. However, firms with an entrepreneurial orientation can turn the obstacles in these markets to opportunities. Indeed, clarity on the needs and the resources available can provide frugal solutions that are sustainable for their intended customers e.g. the skin-to-skin contact wrapping of preterm babies in Tanzania where there are no incubators and clay water filters in Cambodia or the Kadogo economy in Kenya, characterized by selling products at their lowest divisible level and allowing consumers to make small daily purchases.

Asakawa *et al.* (2019) argued that limitations in external resources could confer frugality advantages to the firm. Extending the resource based theory's propositions, they argued that resource scarcity need not be the source of competitive disadvantage but rather provided opportunity to combine elements in a way that offers both cost leadership and differentiation. This view is contrary to the perspective presented by the Porter's generic strategies. Asakawa *et al* delineated three types of frugal based advantages namely input, income and infrastructure frugality-based advantages. Input frugality-based advantages focus on innovations that solve constraints in inputs to the production process e.g. Sony in developing paper magnetic tape recorders due to plastics unavailability while income frugality-based advantages e.g. the Tata Nano aim at addressing constraints in customers purchasing power which is commonly associated with those living at the bottom of the

pyramid. Infrastructure frugality-based advantages e.g. M-Pesa target constraints that arise from underdevelopment of a country's infrastructure including institutional infrastructure.

The conditions at the bottom of the pyramid are such that there are resource constraints that span the three types of advantages. The poor at the bottom of the pyramid live in both rural and urban setting with differing levels of infrastructure, poor general standards, health problems, depleting natural resources, uneducated populations, limited access to electricity, poor road networks low brand protection, low income levels and poor technological know-how (Prahalad, 2012; Levanen *et al*, 2022). These conditions also vary from one country to another and within each country. Due to these, the conditions at the bottom of the pyramid offer opportunities for the different types of frugality based advantages.

The variety of conditions at the bottom of the pyramid also present challenges in the sense that frugal innovations have to be problem specific. This implies that some frugal products that are appropriate in one setting may not necessarily work in another setting. On the other hand, these advantages need to be transferable to other settings with similar external constraints. This does not prove to be always the case. Asakawa *et al* (2019) proposed that the transferability of the frugality-based advantages depended on the type of frugality based advantages with the input based being the most transferable, then income based and infrastructure based bringing up the rear. This due to the different degrees of internalization and applicability of the advantages. This transferability poses a challenge to businesses as it affects the scalability of solutions developed at the bottom of the pyramid and makes it harder to make profits in these markets. This aligns to the view by Karnani (2006) who opined that profits at the bottom of the pyramid were either a mirage or a dangerous delusion driven by the small size of the market and the consumption levels that feasible in it.

The other challenge that firms grapple with in deriving the frugality-based advantages has to do with the erosion of the advantages over time. This is related to the sustainability of the frugality based advantages. As the economies develop, the constraints decline thereby eroding the frugality-based advantages. Asakawa *et al* (2019) proposed that the sustainability of frugality-based advantages was also tied to the type with the infrastructural based advantages having the longest sustainability since infrastructural constraints took longer to resolve. This is followed by income based since as economies develop the income levels also rise which erodes the income based advantages. Input based advantages have the lowest sustainability due to emergence of domestic suppliers and firms vertically integrating. This erosion of sustainability suggests that the opportunities presented by external constraints require close monitoring over time. This also makes it necessary for firms to consolidate their lessons in different markets and find commonalities that allow them to transfer their innovations across markets where certain constraints exist. This requires the firm to be adaptive and be open to learning. The sustainability of frugality-based advantages also raises the need to develop innovations that are necessary for emerging markets and the affluent to increase their sustainability.

### Conclusion

Given the pressures that are prevalent at the bottom of the pyramid, it is imperative for firms to develop innovative solutions for this market. These innovations have to take into account the constraining conditions that persist in these markets. Therefore, frugal innovation definitely provides the missing piece in the innovation jigsaw puzzle at the bottom of the pyramid. This requires a paradigm shift that perceives the constraints in these markets as opportunities to derive frugality-based advantages. Given, the common pursuit by firms to secure resources to deploy for competitive advantage, firms need to change their mental models to pursue innovations within the boundaries of the resource constraints at the bottom of the pyramid.

Frugal innovations at the bottom of the pyramid cannot be a one-size-fits-all. This is because of the variations among the people living at the bottom of the pyramid. To contribute to economic recovery and development at the bottom of the pyramid, frugal innovations need to be specific to the concerns of the targeted consumers. This requires firms to collaborate more with the consumers and deep dive into the conditions facing each consumer group so that there is clear segmentation of the consumer groups and solutions provided to each. Additionally, firms in this market need proper clustering of the customers to allow for scalability of the solutions provided. This would increase the transferability of the frugal innovations.

The conditions at the bottom of the pyramid also necessitate homegrown solutions as opposed to innovations developed elsewhere and transferred to the consumers at the bottom of the pyramid. The frugality-based advantages offer opportunities for growth of prosumers as opposed to mere consumers. This supports the view that solutions for the bottom of the pyramid may best be provided by the incumbents of the bottom of the pyramid since they have a better understanding of the constraints they face and what viable solutions would look like. This would contribute to the sustainability of frugal innovations.

On the overall, if economic recovery is to be achieved at the bottom of the pyramid, it is imperative for firms, governments and individuals to embrace frugal innovations. This is due to the ability of frugal innovations to be customized to the conditions in these markets and were best suited to provide lasting solutions to the problems faced by the people at the bottom of pyramid. In addition, due to the emerging middle-class and the affluent who are likely to consume less expensive but performing innovations, frugal innovations can be scaled to wider markets thus overcoming the barriers of size of the markets at the bottom of the pyramid. This therefore would enable firms operating in these markets to profit within the constraints in these markets while providing collaborative solutions to the people in these markets.



This would improve the livelihoods of the people at the bottom of the pyramid without subjecting them to the indignities of begging and relying on aid. Frugal innovation at the bottom of the pyramid can therefore spur economic recovery since it has the capacity to solve problems in a profitable, scalable and sustainable manner when it is developed for the people by the people.

## References

- Albert, M. (2019). Sustainable Frugal Innovation – The Connection between Frugal Innovation and Sustainability. *Journal of Cleaner Production*, 237, 117747.
- Asakawa, K., Cuervo-Cazurra, A. & Un, A. (2019). Frugality-Based Advantage. *Long Range Planning*, 52(4), 101879.
- Basu, R.R., Banerjee, P.M. & Sweeny, E. G. (2013). Frugal Innovation: Core Competences to Address Global Sustainability. *Journal of Management for Global Sustainability*, 1 (2), 63 – 82.
- Baumol, W. J. (2002). *The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism*. Princeton University Press.
- Bessant, J. & Tidd, J. (2015). *Innovation and Entrepreneurship*. John Wiley & Sons.
- Brem, A. (2011). Linking Innovation and Entrepreneurship – Literature Overview and Introduction of a Process-Oriented Framework. *International Journal of Entrepreneurship and Innovation Management*, 14(1), 6 – 35.
- Coad, A., Nightingale, P., Stilgoe, J. & Vezzani, A. (2021). Editorial: The Dark Side of Innovation. *Industry and Innovation*, 28(1), 102 – 112.
- De Marchi, V., Pineda-Escobar, M.A., Howell, R., Verheij, M. & Knorringer, (2022). Frugal Innovation and Sustainability Outcomes. Findings from a Systematic Literature Review. *European Journal of Innovation Management*, 25(6), 984 – 1007.
- Hossain, M. (2018). Frugal Innovation: A Review and Research Agenda. *Journal of Cleaner Production*, 182, 926 – 936.
- Karnani, A. (2006). *Fortune at the Bottom of the Pyramid: A Mirage*. California Management Review
- Levanen, J., Hossain, M. & Wierenga, M. (2022). Frugal Innovation in the Midst of Societal and Operational Pressures. *Journal of Cleaner Production*, 347, 1 – 8.
- Marr, B. (2021, Nov 1.). The 8 Biggest Business Trends in 2022. <https://www.forbes.com/sites/bernardmarr/2021/11/01/the-8-biggest-business-trends-in-2022/?sh=3a1a11b421da>
- Prabhu, J. (2017). Frugal Innovation: Doing More with Less for More. *Philosophical Transactions: Mathematical, Physical and Engineering Sciences*, 375(2095), 1 – 22.
- Prahalad, C.K. (2006). *The Fortune at the Bottom of The Pyramid*. Wharton School Publishing
- Prahalad, C. K. & Hart, S. L. (1999). *Strategies for the Bottom of the Pyramid: Creating Sustainable Development*. Ann Arbor, 1001, 48109.
- Prahalad, C.K. (2012). Bottom of the Pyramid as a Source of Breakthrough Innovations. *Journal of Product Innovation Management*, 29(1), 6 – 12.
- Simanis, E. & Duke, D. (2014). Profits at the Bottom of the Pyramid. *Harvard Business Review* 92(10), 86 – 93.
- Simanis, E. (2012). Reality Check at the Bottom of the Pyramid. *Harvard Business Review*, 90(6), 120 – 125.
- Vadakkepat, P., Garg, H. K., Loh, A. P. & Tham, M.P. (2015). Inclusive Innovation: Getting More from Less for More. *Journal of Frugal Innovation*, 1(1), 1 – 2.

Weyrauch, T. & Herstatt, C. (2016). What is Frugal Innovation? Three Defining Criteria. *Journal of Frugal Innovation*, 2(1), 1 – 17.

Zeschky, M. Widenmayer, B. & Gassmann, O. (2011). Frugal Innovation in Emerging Markets. *Research Technology Management*, 54(4), 38 – 45.