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## Frugal Innovation - New Paradigm in Innovation Management

Ana Bisha

University of Tirana, Albania

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### Abstract

This paper presents an in-depth systematic review of frugal innovation in businesses, using a systematic literature review (SLR) approach to perform a comprehensive literature review. The study aims to research the concept of frugal innovation, its paradigms and approaches, and how they affect businesses processes. The review process involved an extensive search across several reputable databases, including Directory of Open Access Journals (DOAJ), EBSCO, Emerald Insight, IEEE Xplore, JSTOR, ScienceDirect, Scopus, Springer, Taylor & Francis, and Wiley. An initial identification process yielded 461 articles. Following a rigorous filtering process based on relevance, quality, and alignment with the research objectives, a total of 162 articles were selected for the final analysis. The findings of this review provide critical insights into how businesses leverage frugal innovation to achieve cost efficiency, competitiveness, and sustainable growth.

**Keywords:** frugal innovation, business, jugaad, competitiveness, emerging markets.

### 1. Introduction

Frugal innovation (FI) has emerged as a significant paradigm in modern business, particularly within resource-constrained environments (Leliveld & Knorringa, 2018; Santos et al., 2022; Pisoni et al., 2018). Defined by its focus on creating cost-effective, efficient, and accessible solutions, FI addresses the needs of underserved markets without compromising on functionality and quality (Farooq, 2017; Radjou & Prabhu, 2015; Tiwari et al., 2016). This approach has attracted growing interest from both academia and industry due to its potential to drive sustainable growth, enhance competitiveness, and tackle global challenges such as poverty, sustainability, and environmental issues (Prabhu, 2017; Rosca et al., 2017; Levänen et al., 2016; Pisoni et

al., 2018).

Frugal innovation offers a novel strategy for businesses, enabling them to achieve economic, social, and environmental gains by maximizing efficiency with limited resources (Radjou & Prabhu, 2015). It emphasizes key principles like resource efficiency, inclusivity, and affordability, that makes FI a driver of sustainable growth and competitive advantage (Jayabalan et al., 2022; Leliveld et al., 2023; Asakawa et al., 2019). FI has been applied across multiple sectors, including information and communication technology (ICT), transportation, banking, engineering, and healthcare (Hindocha et al., 2021; Barnikol & Liefner, 2022). This study, however, focuses on the management aspects of frugal innovation within the business sector. While interest in FI is increasing, particularly in small and medium-sized enterprises (SMEs), significant gaps exist in understanding its adoption and long-term effects on competitiveness (Gómez et al., 2024). The study aims to review the literature of FI in order to understand how this concept is defined and what are the paradigms and approaches that makes FI a propriate strategy for businesses to be competitive in market place. Thus, this study fill a gap and provides novel insights on literature. The rest of this paper is organised as follows. The following section describes the method used for the review. Then, the subsequent section synthesize the literature on the frugal innovation literature, and the last section includes, implications in businesses, conclusion and limitations.

## 2. Method

This study adopts a systematic literature review (SLR) approach, as outlined by (Tranfield et al., 2003) and (Hossain and Anees-ur-Rehman, 2016). SLR is recognized for providing a more rigorous, replicable, and transparent method of reviewing literature, which is achieved by adhering to three key stages: (1) planning the review, (2) conducting the review, and (3) reporting and dissemination (Tranfield et al., 2003). In the first stage, we defined the research focus and after that planned the research protocol to ensure a comprehensive and systematic exploration of the topic. 10 databases were selected for literature search (as detailed in Table 3) to capture a wide range of relevant studies.

In each database, we searched with the keyword “frugal innovation” to ensure the inclusion of only academic papers. To maintain a high standard of quality, we filtered the results to include only peer-reviewed articles published between 2013 and 2023. We excluded book chapters, working papers, documents, interviews, and reports from our review. Furthermore, to keep our analysis focused on the business and management domains, we applied an additional filter to include only articles from these fields.

Table 1. Database selection

No.	Database	Documents
1	Directory of Open Access Journals (DOAJ)	49
2	EBSCO	50
3	Emerald Insight	29
4	IEEE Xplore	40
5	JSTOR	12
6	ScienceDirect	62
7	Scopus	161
8	Springer	22
9	Taylor & Francis	26
10	Wiley	10
<b>Total</b>		<b>461</b>

Our initial search yielded 416 documents across the selected databases. After eliminating duplicates, we were left with 320 documents. We then excluded 113 documents that were either book chapters, interviews/short communications, or unrelated to the fields of management and business. To further refine our selection, we carefully read the abstracts of the remaining articles to ensure their relevance to frugal innovation in business. Ultimately, we identified 162 articles that met all the criteria and were included in the final review. A synthesized summary of this methodology is presented in Figure 1, which visually represents the systematic approach followed in this study.

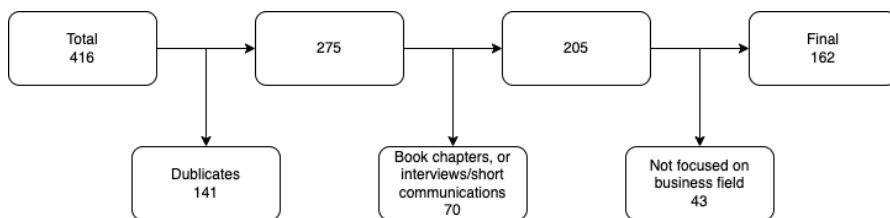


Figure 1. The process of article selection

### 3. Literature Review

Over the past two decades, frugal innovation (FI) has attracted significant attention as a transformative form of innovation (Pisoni et al., 2018; Tiwari et al., 2017). Throughout its evolution, FI has overlapped with various other concepts (see Table 2). Main focus of FI is the principle of “doing more with less,” which involves increasing

both economic and social value while minimizing resource consumption (Radjou & Prabhu, 2015). FI is primarily concerned with rethinking products, processes, and business models to serve underserved populations, particularly those at the base of the pyramid (BoP) (Basu et al., 2013; Tiwari & Herstatt, 2014; Lehner, 2016). It not only focuses on affordability but also integrates sustainability and social impact (Tiwari & Herstatt, 2014; Zeschky et al., 2014; Bhatti, 2012).

Table 2. Some key terms that have been used or associated with Frugal Innovation

Term	Definition	Authors
Jugaad Innovation	Refers to a flexible, frugal, and innovative approach to problem-solving that is widely practiced in India. The term "Jugaad" is a colloquial Hindi word that roughly translates to "a hack," "a quick fix," or "an innovative solution born out of necessity."	(Radjou et al., 2012; Radou & Prabhu, 2014)
Resource-Constrained Innovation	Refers to the process of developing innovative solutions under significant limitations in resources such as financial capital, raw materials, technology, or human expertise. This approach is characterized by the necessity to "do more with less," using knowledge and creativity to overcome barriers and create value despite constraints.	(Beise-Zee et al., 2021; Zeschky et al., 2014)
Frugal re-engineering	Refers to the process's focus on enhancing process-oriented technologies while significantly reducing development costs.	(Tiwari et al., 2017)
Grassroots innovation	Refers to a bottom-up approach, where the innovation process is influenced by the unique social, cultural, and environmental contexts of the community.	(Smith et al., 2014)
Bottom of the pyramid innovation	Refers to the development of products, services, or business models specifically designed to serve the needs of the poorest socioeconomic groups, often referred to as the "bottom of the pyramid."	(Banerjee, 2013; Cañeque and Hart, 2015)

<b>Lean innovation</b>	Refers to an approach to develop new products, services, or processes that emphasizes efficiency, customer feedback, and rapid iteration. It combines principles from lean manufacturing, which focuses on minimizing waste and maximizing value, with innovation practices that aim to develop ideas in response to customer needs quickly.	(Tiwari & Herstatt, 2012)
Disruptive Innovation	Refers to innovations that significantly change or break existing markets or industries by offering simpler, more affordable, or more accessible alternatives to existing products and services.	(Tiwari & Herstatt, 2012; Pisoni et al., 2018)
<b>Bricolage</b>	Refers to combinations of the resources at hand to new problems and opportunities.	(Iqbal et al., 2021)
<b>Shanzhai</b>	Refers to production and sale of cheap local products of globally branded goods and services.	(Kroll & Liefner, 2021)
<b>Gandhian innovation</b>	This is a form of Jugaad innovation that aims to integrate local competencies and searches for collaboration to improve the social wealth of BoP .	(Agarwal et al., 2017)
<b>Catalytic innovation</b>	Refers to a subset of disruptive innovations with a high emphasis on social change, scalability, and sustainability.	(Agarwal et al., 2017)
Inclusive Innovation	Refers to innovations designed to include and benefit all segments of society, particularly marginalized groups.	(Knorringa et al., 2016)
Reverse Innovation	Refers to the process where innovations developed for emerging markets are subsequently adapted and used in developed markets.	(Govindarajan & Trimble, 2012; Simula et al., 2015)

FI is considered a new paradigm in innovation management because it provides solutions for businesses facing resource constraints, especially in emerging markets (Le, 2023). While the concept's origin is debated, scholars often link it to frugal engineering and the Hindi term "jugaad," meaning an improvised solution born out of necessity (Rao, 2013; Ananthram & Chan, 2021). Jugaad reflects an entrepreneurial

spirit in India, characterized by flexibility and adaptability (Dabić et al., 2022). The Economist popularized the term “frugal innovation” in 2010, linking it to *jugaad*. By focusing on affordability, sustainability, and social impact, FI often leads to solutions that are more affordable, durable, and easier to use compared to traditional alternatives (Ebolor et al., 2022; Farooq, 2017; Niroumand et al., 2021). This innovation approach is especially important in developing economies, where it addresses the unique needs of low-income consumers. Table 3 summarizes key definitions of frugal innovation from the past decade.

As a paradigm in innovation management, frugal innovation provides solutions for businesses facing resource constraints while addressing the diverse needs of customers, particularly in emerging markets (Le, P., 2023). Frugal innovation in resource-constrained environments is characterized by a focus on cost, simplicity, and high utility. Tiwari et al. (2016) argue that key aspects of FI include reducing costs by minimizing non-core activities, enhancing the value proposition, and streamlining functions to eliminate unnecessary features. These innovations aim to significantly reduce resource consumption while maintaining quality standards, thereby fostering a frugal environment. Lehner et al. (2018) argues that frugal innovations can effectively achieve simplicity, cost efficiency, and high utility in resource-limited contexts. While, (Berm and Ivens, 2013) suggest that maximizing resource use with added value leads to sustainability and improved market performance. The principles of FI, according to Bencsik et al. (2016), include affordability, customer knowledge-driven insights, and changes in the supply chain.

Frugal innovation is viewed as a user-centered approach to problem-solving, beginning with a deep understanding of user needs and then developing relevant solutions (Leliveld & Knorrninga, 2018). Implementing FI, user participation as co-designers, along with attributes such as sustainability, adaptability, and the use of local resources, is critical (Basu et al., 2013; Bianchi et al., 2017). Brem and Wolfram (2014) in this regard underscore the importance of sophistication and sustainability as essential characteristics of this approach. Angot and Plé (2015) further identify affordability, good performance, durability, and usability as fundamental characteristics of frugal innovation.

FI as a business model, goes beyond innovation; it has emerged as a strategic approach that not only reduces costs but also enhances functionality and inclusion, positioning it as a powerful tool for businesses facing resource constraints (Tiwari et al., 2016; Santos et al., 2020; Shehzad et al., 2023). Increasingly regarded as a new business model, FI emphasizes core functionality and performance while minimizing life cycle costs (Jayabalan et al., 2022). Companies embracing FI create a culture and business model that leverage its advantages, moving beyond just improved versions of existing products. This approach demands careful planning and creativity to optimize design, functionality, and performance under constrained conditions (Sarkar & Mateus, 2022). FI illustrates how resource scarcity can generate competitive advantages (Asakawa et al., 2019). In understanding how to develop a business model that follow FI is important to understand the factors of FI. Even that research on the antecedents of FI

is still limited, there are several factors identified that influence its implementation (Iqbal et al., 2023; Hossain et al., 2021). Organizational learning capability, which involves an organization's ability to adapt, take risks, and absorb new knowledge, is critical to fostering FI (Berndt et al., 2024). Similarly, entrepreneurial orientation defined as a firm's innovative, proactive, and risk-taking attitude helps create a conducive environment for FI (Berndt et al., 2024). Other factors such as leadership, knowledge management, and entrepreneurial ecosystems are also important (Wang & Li, 2023; Le et al., 2022). Technology plays a pivotal but underexplored role in FI (Colledani et al., 2016).

FI is also seen as a business strategy that is guided by several key principles, such as finding opportunities in adversity, doing more with less, embracing simplicity, and fostering inclusivity (Radjou et al., 2012). Bhatti et al. (2020) expanded these principles by introducing concepts like reuse, repurposing, recombination, and speed. Essential dimensions that are critical in understanding how FI meets the specific needs of resource-constrained environments include affordability, simplicity, quality, sustainability, and resilience (Farooq, 2017; Santos et al., 2022). Additionally, Belkadi et al. (2018) emphasize developing products in local R&D institutes, adapting existing solutions, and redesigning production processes. Brem and Wolfram (2014) mention sophistication, sustainability, and an emerging market orientation as essential dimensions.

As FI continues to evolve, it challenges traditional innovation paradigms, prompting companies to adopt more agile, flexible, and resource-conscious strategies. The concept underscores the potential of scarcity to drive innovation and competitive advantage, positioning it as a vital strategy for achieving sustainable development in both emerging and developed markets and help businesses being more competitive.

Table 3. Definitions of frugal innovation 2013-2023

Authors	Definition
(Radjou & Prabhu, 2015)	It is defined as the capability to accomplish more with less, which help to increase economic and societal value and reduce resource consumption.
(Tiwari & Herstatt, 2014)	It is defined as products that retain the necessary quality, reliability, and safety standards while enabling significant cost savings.
(Tiwari, et al., 2014)	FI is defined as "new or significantly improved products, processes, or marketing and organisational methods that seek to minimise the use of material and financial resources in the entire value chain with the aim of significantly reducing the total cost".

(Hossain, 2016)	FI is defined as "a product, service, or solution that arises despite limitations in financial, human, technological, and other resources, resulting in a final outcome that is more affordable than competing options and meets the needs of customers who would otherwise be unserved."
(Bianchi et al., 2017)	Frugal innovation involves developing new, effective, and creative solutions within the context of limited resources environment.
(Weyrauch & Herstatt, 2017)	Frugal innovation is the process focused on cost reduction, main functionalities concentration and performance optimization.
(Pisoni et al., 2018)	FI is defined as an approach that encompasses the entire innovation process or the characteristics of a product or service, and can be applied across various types of innovations.
(Cai et al., 2019)	FI is defined as "novel solutions designed to meet the fundamental needs of consumers in emerging markets by providing excellent value at a reasonable cost."
(Santos et al., 2020)	FI is defined as a multifaceted approach that necessitates a strategy focused on delivering high performance in core functions while reducing costs.
(Govindan, (2022)	FI is defined as an approach that addresses financial, material, or institutional by leveraging these limitations to create an advantage. This approach minimizes resource use throughout development, production, and delivery, resulting in significantly lower-cost products and services.
(Ebolor et al., 2022)	FI is defined as a process that utilize resources in novel ways and develop more inclusive markets that cater to users with affordability constraints, often achieving scalability and sustainability. It seeks to generate value for underserved markets and transform business models, reconfigure value chains, and redesign products.
(Shehzad et al., 2023)	FI is defined as a process of integrating low-cost solutions, manufacturing processes, and materials with a design aimed at achieving essential functionality and a core set of minimal features.

#### 4. Implications, limitations and future research

##### *Implications in businesses*

Frugal innovation is increasingly recognized as a important approach not only in emerging economies but also in developed markets (Weyrauch & Herstatt, 2017).

Its importance comes from the growing demand for low-cost, efficient solutions, as highlighted by Tiwari et al., (2017). FI enables companies to rethink their product development, operational processes, and business models, focusing on affordability, sustainability, and functionality while reducing resource consumption (Lehner, 2016). By leveraging the principles of doing more with less, businesses can create value for underserved markets, especially in emerging economies, where consumer needs aren't met by traditional innovation approaches. FI not only promotes cost reduction and efficiency but also encourages inclusivity and co-creation with local communities, fostering a deeper understanding of customer needs (Santos et al. 2022). This innovation approach enhances a company's competitive advantage by turning resource scarcity into a driving force for creativity and resilience. Furthermore, businesses adopting FI can benefit from increased sustainability through streamlined production processes and improved value chain relationships (Belkadi et al., 2018). As FI becomes part of the strategic planning, firms that successfully implement it demonstrate adaptability, enhanced organizational learning capabilities, and entrepreneurial orientation—key factors in fostering innovation under constrained conditions. That being said, FI presents an opportunity for businesses to not only survive but thrive by addressing global challenges and achieving long-term growth in both developed and emerging markets.

## 5. Conclusion

This systematic literature review has highlighted the role of frugal innovation in business contexts, highlighting its potential as a strategic tool for achieving cost efficiency, market expansion and sustainable growth. The comprehensive analysis of 162 articles highlights the growing importance of frugal innovation in both developing and developed markets. By rethinking traditional business models and embracing resource-efficient approaches, businesses can not only thrive in resource-constrained environments, but can also contribute to broader social goals such as environmental sustainability and social inclusion. Despite the limitations of this study, including its focus on the business domain, the findings provide valuable insights for both researchers and practitioners. Future research should continue to explore the wider applications of frugal innovation across different sectors, as well as its long-term impact on competitiveness and sustainability. As businesses continue to face the challenges of the global economy, the principles of frugal innovation will certainly play an increasingly crucial role in shaping the future of sustainable and inclusive growth.

### 5.1 Limitation

In this study, we focused exclusively on frugal innovation within the business domain, which constitutes the first limitation. Frugal innovation is a multidisciplinary concept that has been explored in various other fields such as healthcare, education, agriculture, engineering, and technology. The second limitation arises from our use

of only “frugal innovation” as keyword in English language for our review. This approach may have excluded relevant studies published in other languages or under different terminologies, potentially leading to a partial representation of the literature. Third, our study focused only on articles, removing books, interviews, and other forms of literature that might have provided additional depth and context of the concept. These sources often offer nuanced perspectives that can complement and enhance the understanding gained from journal articles alone.

However, despite these limitations, our review offers a comprehensive review of the concept of frugal innovation in businesses. It provides valuable implications for practitioners, particularly in emerging economies, where cost-effective and sustainable business practices are increasingly crucial. By synthesizing the existing research, this study not only contributes to the academic discourse but also serves as a practical guide for businesses seeking to implement frugal innovation strategies in resource-constrained environments.

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