



UDC 332

FRUGAL INNOVATION AND BRICOLAGE: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

Bricolage, often associated with frugal innovation, entails the resourceful utilization and amalgamation of limited resources, including financial, raw materials, energy, production resources, manpower, fuel, and water. This approach aims to create products or services that are not only more affordable but also more accessible than conventional innovations. In this paper, we present a systematic literature review that explores the intricate relationship between bricolage and frugal innovation. Our review delves into the various definitions of frugal innovation and bricolage, shedding light on the nuanced connections between these two concepts. We analyze both the positive and negative aspects of their interplay. To provide empirical support for our findings, we conducted descriptive and performance analyses using a sample of 675 documents, employing the Watase Uake dataset. Furthermore, we employed the VOSviewer software to perform comprehensive science mapping of the conceptual, intellectual, and social structure in the realm of frugal innovation and bricolage. This mapping offers scholars a quantified and visually informative representation of the evolving landscape within this field. Our research contributes to a deeper understanding of the dynamic relationship between bricolage and frugal innovation, offering valuable insights for researchers and practitioners alike in the pursuit of resource-efficient and accessible solutions to contemporary challenges.

KEY WORDS

Frugal innovation, bricolage, human resources management, leadership.

A limitation of resources access in emerging country or sometimes in an advance country force the companies to reshape their strategy to create an innovation. Hossain (2017) in his study describe that frugal innovation is a form of innovation. Weyrauch and Herstat (2016) characterizing frugal innovation by its focus on core function and essential aspect of the product or service. Furthermore, using minimum resources available is the main goal of frugal innovation. Company must engage the essential capability under crisis or lack of resources situation, which is the capability of being creative on managing scarce resources. This capability also known as bricolage. Baker and Nelson (2005) defined it as "making do by applying combination of the resources at hand to new problems and opportunities. According to Desa and Basu (2013), bricolage focuses on harnessing opportunities and solving problems by taking advantage of existing resources that are devalued, neglected or discarded, and the are generally available for free or at low cost. Furthermore, Santos *et al.*, (2020) in his research found that bricolage capability has a positive impact on the development of frugal innovation in emerging market in times of crisis, based on characteristics such as resourcefulness and improvisation (Davidson *et al.*, 207; Levi-Strauss, 1967), which is necessary to attain substantial cost reduction, focus on core functionalities and enable to do more with less resources (Tiwari and Herstatt, 2012; Radjou *et al.*, 2012; Zeschky *et al.*, 2014). This provides us with an indication that there is a connection between frugal innovation and bricolage.

Based on this indication, there is a connection between frugal innovation and bricolage, this study would like to analyze this connection in further detail. This paper shall contribute a systematic literature review on the connection between frugal innovation and bricolage. The underlying research question of my review is "What is the relationship between frugal innovation and bricolage?". Additional subordinated research questions include what is the



definition of frugal innovation? What is the definition of bricolage? Is there a positive connection or potentials of bricolage for frugal innovation? and is there a negative connection or potentials of bricolage for frugal innovation

LITERATURE REVIEW

Frugal innovation, primarily in emerging markets (J. Prabhu, 2017), begins by addressing the needs of the less privileged and working backward to create innovative solutions in resource-scarce environments. Despite limited resources, its core aim is to meet unmet needs, fostering a collaborative approach among entrepreneurs who learn to improvise when facing constraints (Sheth, 2020).

Frugal innovation is interconnected with terms like constrained-based innovation, grassroots innovation, Gandhian innovation, Jugaad innovation, catalytic innovation, and indigenous innovation (Brem & Wolfram, 2014; Dangelo & Magnusson, 2021). For instance, Jugaad and Gandhian innovation are specific to India, emphasizing creative and skillful solutions using available resources. Constrained-based innovation is a broader concept encompassing reverse, blowback, and trickle-up innovation (Agarwal et al., 2015), including innovations originating in developing countries and adapted for use in developed ones (Von Zedtwitz et al., 2015).

Frugal innovation distinguishes itself by achieving new, satisfactory solutions while coping with scarcity, emphasizing cost reduction and resource-efficient approaches (Bound & Thornton, 2012). It often involves adapting existing products or processes to maintain functionality while minimizing resource use (Rao, 2013). Various researchers offer different definitions of frugal innovation. Prabhu (2017) defines it as creating faster, better, and cheaper solutions with minimal resources. Hossain et al. (2016) describe it as resource-limited solutions designed and implemented despite constraints, resulting in significantly cheaper offerings meeting basic customer needs. Albert (2019) compiles expert insights on frugal innovation (Table 2.2).

Frugal innovation isn't limited to low-cost products but also extends to scalable services (Bound & Thornton, 2012). Examples span various sectors, including information and communication technology, transportation, banking, and health technology (Rao, 2013; Hossain, 2021). Radical service-oriented frugal innovation can involve specialized delivery services designed for economic value (Bound & Thornton, 2012) or collaborative approaches to patient care, as seen at Narayana Hrudalaya hospital in India. These service innovations based on frugal principles foster new partnerships between local businesses, multinational corporations, communities, and governments, promoting ethical resource utilization and inclusivity in implementing innovative ideas. They create opportunities that enhance social and economic well-being for all (George et al., 2012). G. N. Prabhu & Gupta (2014) have heuristically formulated a concept for achieving frugal service innovation, distinct from product-focused frugal innovation. This concept encompasses three heuristic innovation approaches: (1) creative combination of existing materials, processes, and resources through bricolage, (2) efficient reduction of time, material, and human resource waste, and (3) innovation in providing self-service options for users.

Bricolage, originally introduced by Lévi-Strauss, distinguishes the resourceful "bricoleur" from the methodical engineer, emphasizing improvisation and resource utilization with whatever is at hand (Lévi-Strauss, 1966). This concept found its way into entrepreneurship research, shedding light on how entrepreneurs navigate resource challenges (Baker et al., 2003; Garud & Karnøe, 2003). Entrepreneurial bricolage, as defined by Baker & Nelson (2005), involves effectively applying existing resources to new problems and opportunities. It encompasses three key elements. First, it champions improvisation, allowing firms to adapt and innovate, even in resource-constrained situations. Second, it involves resource scrutiny, both internal and external, seeking overlooked or undervalued assets. Third, it emphasizes resource recombination, creatively repurposing materials for new objectives (Senyard et al., 2014). As a strategic approach, entrepreneurial bricolage empowers firms to sustain growth and navigate resource limitations by reshaping existing



resources (Garud and Karnøe, 2003; Baker and Nelson, 2005; Desa & Basu, 2013; Senyard et al., 2014; Yu et al., 2020). It becomes a lifeline in resource-scarce environments, enabling companies to adapt and thrive by repurposing what's available (Baker and Nelson, 2005). Senyard et al. (2014) have even developed measurement indicators to assess entrepreneurial bricolage, aiding in its practical evaluation.

Table 1 – Definitions of Frugal Innovation

Paper	Definition of Frugal Innovation
Basu <i>et al.</i> , (2013)	"Frugal Innovation is a design innovation process in which the needs and context of citizens in the developing world are put first in order to develop appropriate, adaptable, affordable, and accessible services and products for emerging markets." (p. 64)
Brem and Ivens (2013)	"Frugal Innovation [...], which refers to products having extremely high cost advantages compared to existing solutions. They typically do not have sophisticated technological features, but meet the basic needs at a low-cost level by comparably high value for the customer (Zeschky <i>et al.</i> , 2011; Agarwal and Brem, 2012)." (p.35)
Brem and Wolfram (2014)	"A derived management approach, based on <i>jugaad</i> , which focuses on the development, production, and product management of resource-saving products and services for people at the BoP by achieving a sufficient level of taxonomy and avoiding needless costs" (p. 19)
Horn and Brem (2013)	"The concept of frugal innovation aims at modifying and adopting products to foreign, emerging markets on the one hand, and the establishment of R&D capacity and product development centers on the other hand." (p. 943)
Hyvärinen <i>et al.</i> , (2016)	"Frugal innovations have been proposed as a potential approach for serving resource-constrained consumers in emerging and developing markets as well as in the low-growth struck Western markets (Agarwal and Brem, 2012; Rao, 2013; Zeschky <i>et al.</i> , 2011; Zeschky <i>et al.</i> , 2014) due to their notion of affordability, good (enough) quality, and no-frills structure." (p. 2)
Khan (2016)	"Frugal innovation refers to products (both goods and services), processes, or marketing and organizational methods that seek to minimize the use of material and financial resources with the objective of reducing the cost of ownership while fulfilling or even exceeding certain pre-defined criteria of acceptable quality standards (Tiwari and Herstatt, 2012)." (p. 1)
Levänen <i>et al.</i> , (2015)	"It refers to solutions created under the circumstances of resource constraints. It is driven by demand, imitation and low-cost competition in emerging markets where enterprises are developing new resource-scarce solutions for low-income and rising middle income segments (London and Hart, 2004; Simula <i>et al.</i> , 2015; Zeschky <i>et al.</i> , 2011; Zeschky <i>et al.</i> , 2014)." (p. 1)
Pansera and Sarkar (2016)	"According to Bound and Thornton (2012) "frugal innovation responds to limitations in resources, whether financial, material or institutional, and turns these constraints into an advantage. Through minimizing the use of resources in development, production and delivery, or by leveraging them in new ways, frugal innovation results in dramatically lower-cost products and services" (p.14)." (p.4)
Rao (2014)	"[...] products and services made from minimal amounts of raw materials and other resources drawn from the environment The frugal nature of these innovations could typically lower their costs, thereby facilitating deployment in poorer regions." (p. 43)
Rosca <i>et al.</i> , (2017)	"Frugal innovations are not re-engineered solutions but products or services developed for very specific applications in resource constrained environments. They are based on new product architectures that are often quite disruptive; for example, by making a stationary product portable, a frugal innovation may reach an entirely new customer group. (The Economist, 2010; Zeschky <i>et al.</i> , 2014)" (p. 4)
Sharma and Iyer (2012)	"We define resource-constrained product development (RCPD) (as alternative term of "frugal innovation") as the process of developing new products that use minimal resources and are affordable to a broader market." (p. 600)
Tiwari and Kalogerakis (2016)	"[...] frugal innovations have been often seen as disruptive innovations, targeted at the bottom of the pyramid or low-income consumers." (p. 21)
Weyrauch and Herstatt (2016a)	"We propose that innovations are frugal if they simultaneously meet the criteria substantial cost reduction, concentration on core functionalities, and optimized performance level." (p. 12)
Wohlfart <i>et al.</i> , (2016)	"Frugal (i.e., simple, plain) innovations restrict products and services to basic functionalities and embed them in innovative business models to make them affordable for price-sensitive customer groups." (p. 5)

Source: Albert, 2019.

METHODS OF RESEARCH

For data collection, various online databases were searched on April 1, 2023, using the keywords "entrepreneurial bricolage," "entrepreneurial leadership," and "frugal innovation." A total of 675 research results were found in the Watase Uake database. The data evaluation criteria were based on language comprehension, focusing solely on English texts. All texts, primarily in PDF format, were reviewed to explore the impact of entrepreneurial bricolage on entrepreneurial leadership and its influence on frugal innovation. This involved reading both the abstracts and the complete articles. Next, 31 identified texts were subjected to qualitative content analysis using an inductive category development approach, as outlined by Mayring in 2014. The initial search was performed through the Watase Uake online application, utilizing features developed by Watase, including Systematic Literature Review with PRISMA. Subsequently, an independent online search was conducted in journals available on Emerald and Scencedirect. Qualitative content analysis, employed as an evaluation method during the data collection phase, allows for the examination of substantial amounts of material while uncovering underlying meanings, following a systematic approach and general procedures. The theory-based material was organized into categories and subcategories, using an inductive approach known as summarization for analysis.



RESULTS AND DISCUSSION

In this paper, we aim to establish a meaningful connection between the concepts of frugal innovation and bricolage, focusing on key elements within each concept. While delving into these subjects, we will consider the facets of frugal innovation, such as frugality, innovation, sustainability, and entrepreneurial bricolage, and relate them to the aspects of bricolage, including effectuation and social enterprise. Frugal innovation is characterized by its emphasis on efficiency and resourcefulness. Frugality, in this context, refers to the efficient use of limited resources to achieve innovation. It involves a mindset of doing more with less, which resonates with the principles of bricolage. The concept of frugality aligns with the resourcefulness aspect of bricolage, where entrepreneurs creatively use available resources to solve problems and innovate.

Frugal innovation and bricolage exhibit significant overlaps, forging a meaningful connection between these concepts. Frugal innovation, fundamentally centered on efficiency and resourcefulness, emphasizes the judicious use of limited resources to foster innovation. This aligns closely with bricolage's core principles. Furthermore, frugal innovation extends beyond cost-effectiveness to encompass sustainability — a facet that resonates with the broader social entrepreneurship theme within bricolage. In bricolage, solutions often address social and environmental challenges while remaining economically viable.

Entrepreneurial bricolage, when applied to frugal innovation, entails the construction of solutions from available resources and opportunities. This mirrors bricolage's ethos of entrepreneurs creatively piecing together solutions. Effectuation, a central tenet of bricolage, underscores the importance of starting with readily available resources, aligning with frugal innovation's resource-constrained nature.

The connection between these concepts deepens when considering the role of social enterprise. Social enterprises, as a subset of entrepreneurial bricolage, embody collaborative and community-oriented approaches, enhancing the impact of frugal innovation. By engaging stakeholders and co-creating solutions, social enterprises epitomize bricolage's spirit and contribute to the sustainability and efficacy of frugal innovation initiatives.

This interplay between frugal innovation and bricolage hinges on shared principles of resourcefulness, creativity, and sustainability. The concepts of frugality, innovation, sustainability, and entrepreneurial bricolage intricately interweave with effectuation and social enterprise within the bricolage framework, offering promising avenues for research and practical applications in the realms of innovation and entrepreneurship.

We focused on the critical process of identifying relevant studies related to our research inquiry. This process involved exhaustive searches across academic databases and via other methods, employing a set of carefully chosen keywords and search criteria. Additionally, we expanded our search scope to encompass conference proceedings, books, and reputable journals to compile a comprehensive list of potentially pertinent studies.

Following the identification phase, we entered the critical screening stage. Here, we meticulously assessed the titles and abstracts of the collected articles to ascertain their alignment with our research topic and objectives. Studies that clearly did not meet our predetermined criteria were systematically excluded at this stage, ensuring that only those studies directly relevant to our research were considered further.

At included studies and report, we retained a subset of studies that met our stringent inclusion criteria. It is essential to mention that the detailed descriptions of these included studies are not expounded upon within the confines of the literature review section. Instead, the rationale for their inclusion is clearly articulated, and the exact number of studies included is noted. Detailed descriptions of these studies, along with their findings, are reserved for later sections of the paper, such as the methodology or results, where they are presented and discussed as needed to support our research claims and analyses.

This paper provides valuable insights into bricolage and frugal innovation across diverse contexts. It challenges the notion that entrepreneurial bricolage, often linked to resourcefulness in low-resource settings, limits long-term growth. Instead, it shows that bricolage positively impacts new venture growth and adaptiveness.

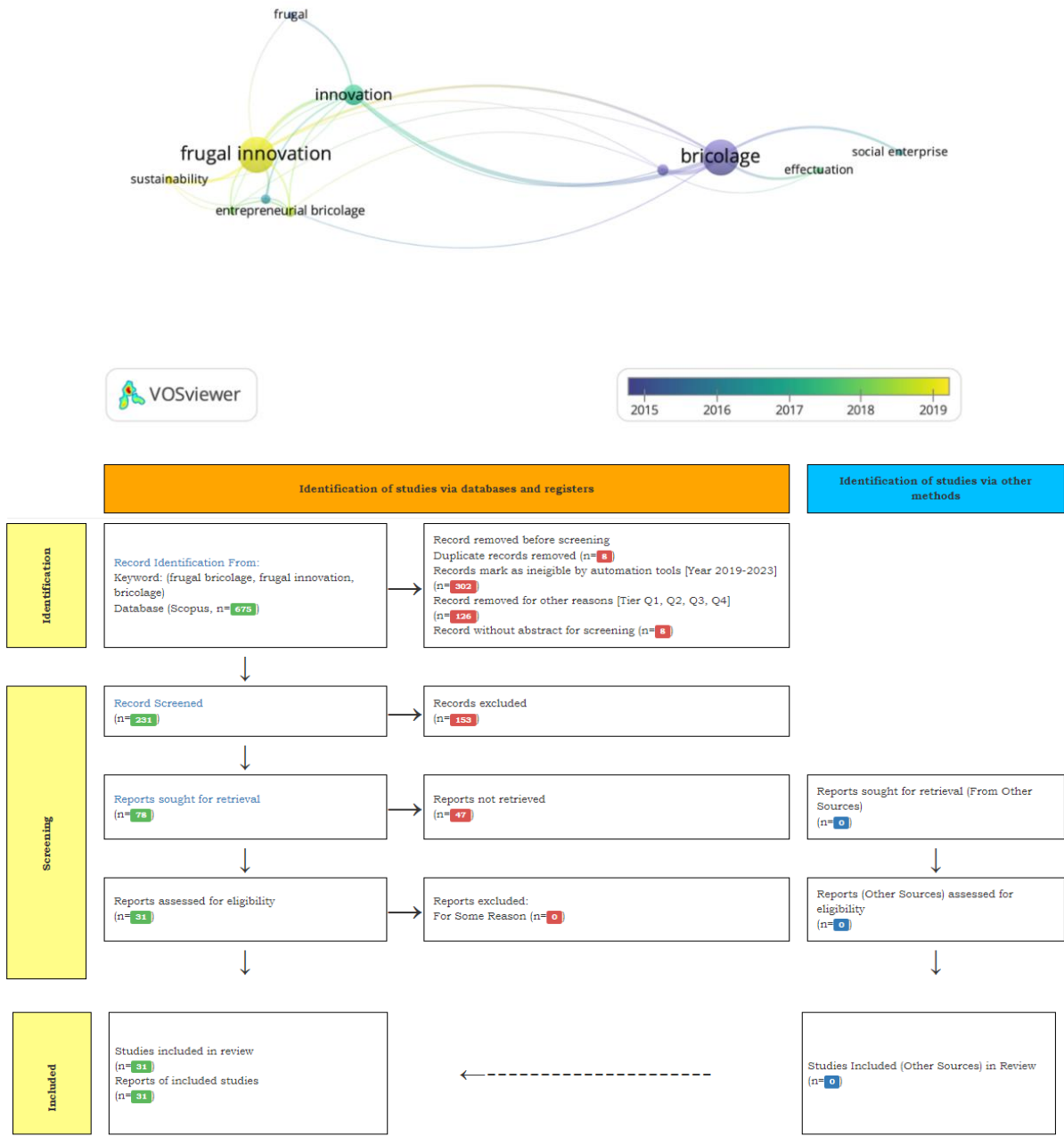


Figure 1 – Result of VOS viewer Frugal Innovation and Bricolage

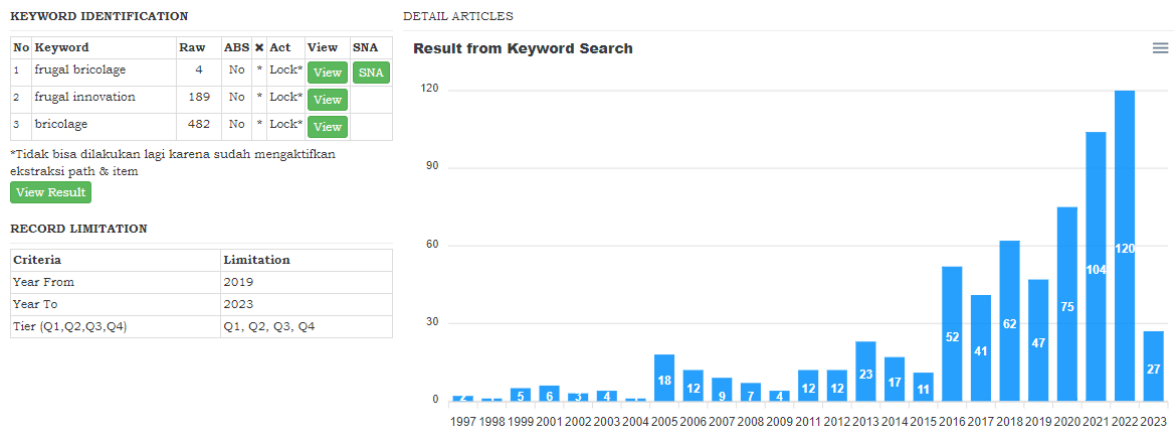


Figure 2 – WataSe Uake Results Diagram



Table 2 – Review results

N	Authors	Year	Title	Findings
1	Busch and Barkema	2020	From necessity to opportunity Scaling bricolage across resource-constrained environments	Enterprises in low-resource contexts often rely on bricolage (i.e., making do by applying resources at hand to new problems). However, bricolage has traditionally been regarded as a way to temporarily get by, potentially constraining growth if continued over time.
2	Yu et al.	2019	Entrepreneurial bricolage and its effects on new venture growth and adaptiveness in an emerging economy	This study found that entrepreneurial bricolage has a positive impact on both new venture growth and adaptiveness. Further, institutional voids have contrasting effects on these two relationships.
3	Ananthram and Chan	2019	Institutions and frugal innovation The case of Jugaad	This qualitative study with eight Indian multinationals finds that jugaad is a response to a complex combination of myriad institutional factors that challenge these multinationals to innovate frugally, enabled by specific organizational characteristics that ultimately lead to jugaad outcomes.
4	An et al.	2019	Configurations of effectuation, causation, and bricolage implications for firm growth paths	Based on a comparison of effective configurations across firm size and development stages, we theorize three paths along which small early-stage firms can evolve into large late-stage firms while maintaining high performance.
5	Yu et al.	2018	Entrepreneurial bricolage and online store performance in emerging economies	Results show that input bricolage has a positive effect on efficiency performance and market bricolage has a positive effect on sales performance, and the relationships between input (and market) bricolage and store performances are significantly stronger with higher level of institutional bricolage.
6	Fu et al.	2020	Entrepreneurial bricolage, ambidexterity structure, and new venture growth Evidence from the hospitality and tourism sector	The results indicate that both the combined and balanced dimensions of ambidexterity play mediating roles between entrepreneurial bricolage and new venture growth performance. By exploring the underlying mechanism of the relationship between entrepreneurial bricolage and new venture growth in the hospitality and tourism sector using a comprehensive theoretical model viewed through the lens of ambidexterity, the theoretical and practical implications for management are addressed, and possible directions for future research are discussed.
7	Zorina	2021	Overcoming resource challenges in peer-production communities through bricolage: The case of HomeNets	The findings illustrate that communities develop their missing resources by engaging in multiple coexisting bricolage forms and processes, which help them to successfully incorporate the individual and collective resource building efforts of their participants and address the challenges specific to the continuously evolving community.
8	Liu et al.	2021	The more the better vs. less is more: Strategic alliances, bricolage and social performance in social enterprises	With data from 227 social enterprises in China, empirical results suggest that personal network of social entrepreneurs, that is, the "owned" social capital, shall be transformed by the intermediate role of resource bricolage into relation strength, that is, the "used" social capital. The relationship between resource bricolage and relation strength is positively moderated by the marketization degree and social class of social entrepreneurs.
9	Yu and Wang	2021	The effects of entrepreneurial bricolage and alternative resources on new venture capabilities Evidence from China	Moreover, the effectiveness of this strategy depends on the availability of alternative resources, such as resources obtained through external network ties and from founding team members with diverse backgrounds. Our research findings thus provide practical information to help small and new firms get through difficult times without seeking additional resources.
10	Dabić et al.	2022	Frugal innovations: A multidisciplinary review & agenda for future research	the relevance of frugal innovations in combating the COVID-19 pandemic, establishing the key areas for future research in frugal innovation, such as new product development, ease of use, the performance of frugal innovations, strategy, and sustainability, among others
11	Scazziotta et al.	2023	The antecedents of entrepreneurial action: A meta-synthesis on effectuation and bricolage	This study attempts to clarify the antecedents of two crucial concepts in entrepreneurship: effectuation and bricolage.
12	Reypens et al.	2021	Beyond bricolage Early-stage technology venture resource mobilization in resource-scarce contexts	This analysis reveals two resource mobilization trajectories, characterized by different dynamic combinations of bricolage and resource seeking as ventures develop. High-performing ventures increased resource seeking as they developed and dynamically alternated lower and higher levels of bricolage, opting back into bricolage upon substantial resource acquisition. We explain the divergence in trajectories with ventures' re-actions to catalytic events and reinterpretation of their resource spaces beyond local environs.



13	Albert	2019	Sustainable frugal innovation - The connection between frugal innovation and sustainability	All texts examined describe a positive connection between frugal innovation and sustainability and/or potentials of frugal innovation for sustainability. Just under half of the authors outline negative connections between frugal innovation and sustainability and/or threats of frugal innovation for sustainability.
14	Hossain	2020	Frugal innovation Conception, development, diffusion, and outcome	The study points out the initiative that individuals take and the challenges they face, from inception to the successful commercialization of their innovations. We therefore portray an overall understanding of the antecedents, processes, and consequences for these entrepreneurs.
15	Winkler et al.	2020	Frugal innovation in developed markets - Adaptation of a criteria-based evaluation model	The results show that the success and/or failure of frugal innovations, as well as the definition of frugal innovation itself, is highly dependent on the market in which it is launched. This paper can also benefit practitioners as it provides tools such as value analysis to optimize the use of the evaluation model and it contributes to the existing knowledge in the area of frugal products and services in general.
16	Mourtzis et al.	2019	Frugal innovation and its application in manufacturing networks	this work presents a framework, which by supporting regional customization and near-optimum production network generation via advanced information and communications technology (ICT) tools, aims to facilitate the implementation of frugal innovation in manufacturing.
17	Lim and Fujimoto	2019	Frugal innovation and design changes expanding the cost-performance frontier A Schumpeterian approach	The study shows that the existing concepts of frugal innovation that emphasize "low cost/good enough" innovation of "simple products" need to be re-examined, because frugal innovation can also be treated as technological product innovation in the sense that it may improve the performance of relatively complex products deliverable through their architectural changes and creation of technological knowledge. This study shows that there is a domain of innovation policies and strategies activating frugal innovations that calls for integrative and strategic approaches, not only to R&D, but also to other value-adding functions of firms and industries.
18	Beltagui et al.	2021	A bricolage perspective on democratising innovation The case of 3D printing in makerspaces	In this article find bricolage entails synergy - combining resources in creative ways - and openness - a willingness to gather and share resources. We confirm that bricolage restricts commercial growth such that a need for more structured processes and perhaps a move away from makerspaces eventually becomes necessary.
19	Hota et al.	2019	Adopting Bricolage to Overcome Resource Constraints The Case of Social Enterprises in Rural India	Our findings suggest that identifying locally embedded village level entrepreneurs is a bricolage activity that social entrepreneurs leverage in the resource constrained environment of emerging economies, especially for the social enterprises that are active in the villages but were founded by social entrepreneurs who are not from these villages.
20	Phillimore et al.	2018	Bricolage as conceptual tool for understanding access to healthcare in superdiverse populations	The concept of bricolage is particularly useful given that superdiverse populations are by definition heterogeneous, multilingual and transnational, and frequently in localities characterised as 'resource-poor', in which bricolage may be necessary to overcome such constraints, and where mainstream healthcare providers have limited understanding of the challenges that populations experience in accessing services.
21	Suire	2018	Innovating by bricolage how do firms diversify through knowledge interactions with FabLabs	FabLabs produce more outputs when they are connected to both small and large firms. In other words, the FabLab's output is sensitive to its industrial partnerships and can be a driver for regional diversification under specific conditions.
22	Hu et al.	2020	The process of resource bricolage and organizational improvisation in information technology innovation a case study of BDZX in China	The following results were found: (1) IT innovation has experienced a transformation from component to architectural innovation, triggering corporate strategic actions; (2) Resource bricolage in IT innovation process is divided into combined resources and resetting resources, and organizational improvisation in IT innovation process is divided into integration capabilities and development capabilities; (3) In IT innovation, the impact of resource bricolage on companies is gradually increasing, while the impact of organizational improvisation on companies is gradually decreasing.
23	Khanal et al.	2021	Frugal innovation and digital effectuation for development the case of Lucia	The case contributes to the literature on ICT4D by illustrating how digital entrepreneurship has the potential not only to bring about economic benefits, but also to stimulate local culture production, an impact of digital entrepreneurship often overlooked in the literature.
24	Korsgaard et al.	2020	It's right nearby how entrepreneurs use spatial bricolage to overcome resource constraints	this study contributes to a contextualized understanding of entrepreneurship by showing how spatial bricolage as a distinct logic can help entrepreneurs overcome resource constraints, and how the spatial context incorporates an important dimension of what constitutes 'at hand' in entrepreneurial bricolage.



25	Taylor et al.	2020	Translating employee-driven innovation in healthcare Bricolage and the mobilization of scarce resources	With top-down models of innovation failing to address the entrenched problems of healthcare, policy-makers have proposed that staff working on the frontline might be better placed to innovate solutions. Drawing on a study of employee-driven innovation in UK public healthcare, the authors explore the process through which staff innovate without the resources that support policy implementation, showing how the translation of ideas from problematization to practice is underpinned by 'bricolage'—the appropriation and repurposing of resources 'at hand'.
26	Melkas et al.	2018	Understanding frugal innovation a case study of university professionals in developed countries	The study aims to contribute to an improved understanding of and readiness for frugal innovation in developed countries. Improved readiness for frugal innovation is necessary to realize the full potential of the concept. Frugal innovation shall be included as an element of the research agendas and teaching in developed countries.
27	Borchardt et al.	2020	Leveraging frugal innovation in micro- and small enterprises at the base of the pyramid in Brazil an analysis through the lens of dynamic capabilities	This study indicates that dynamic capabilities are present in enterprises that are migrating to low income and middle-class consumers, which influences their FI practices. To analyse FI in the context of MSEs at the BOP, the I-P-O framework was adapted. Enterprises that have focussed on extremely poor and subsistence markets develop more disruptive innovation, aiming to reduce the final prices they charge consumers. The primary focus of these enterprises is on maintaining ordinary capabilities. Enterprises that have focussed on low income and middle-class customers have implemented incremental innovation, adding value based on colonial tastes and close relationships with their consumers. Such a strategy demands changes in the physical facilities, use of social media and investment in quality control of these enterprises. Considerations for policymakers and institutions are also presented.
28	Santos et al.	2020	Bricolage as a path towards organizational innovativeness in times of market and technological turbulence	The results indicate that the mediating effect evidenced by the bricolage behavior was supported. In other words, the path from market and technological turbulence to organizational innovativeness is significantly better when permeated by bricolage behavior in the organization.
29	Liu et al.	2020	Social entrepreneurs personal network, resource bricolage and relation strength	With data from 227 social enterprises in China, empirical results suggest that personal network of social entrepreneurs, that is, the "owned" social capital, shall be transformed by the intermediate role of resource bricolage into relation strength, that is, the "used" social capital. The relationship between resource bricolage and relation strength is positively moderated by the marketization degree and social class of social entrepreneurs.
30	Paolino	2020	How to face the unexpected Identification and leadership in managing bricolage	Results supported the research model, illustrating that organizational identification positively predicts individual bricolage, and that the support from the leader, in the form of empowerment and interactive justice, makes this relationship stronger. Robustness checks were carried out, collecting additional longitudinal data from different industries with respect to the main study, and the supplementary analysis corroborated the research model.
31	Niroumand et al.	2021	Frugal innovation enablers, critical success factors and barriers A systematic review	Based on the findings, 'optimization of energy consumption in industries, collaborating with local companies, management supports, paying attention to the needs of the local market and reducing the profit margin' are among the enablers and CSFs of FI. 'Lack of business acumen among local partners, senior management reluctances, challenging in R&D, challenges of prototyping in product development and currency fluctuations' are among the barriers of FI.

The study emphasizes the influence of institutional voids on this relationship, highlighting context's importance. In the context of Indian multinationals, it reveals the significance of *jugaad*, illustrating how specific organizational characteristics enable frugal innovation in response to complex institutional challenges. It theorizes three potential paths for small early-stage firms to become larger, high-performance entities, offering strategic insights.

Furthermore, the study clarifies the positive effects of bricolage on efficiency and sales performance, especially in rich institutional bricolage environments. Ambidexterity mediates between entrepreneurial bricolage and new venture growth in the hospitality and tourism sector. In community settings, it underscores diverse bricolage forms and processes' role in resource building, integrating individual and collective efforts to address evolving challenges. In China, it explores how resource bricolage transforms personal networks into relation strength, influenced by marketization and social class of social entrepreneurs.

The paper delves into the multifaceted relationship between frugal innovation and



sustainability, emphasizing the need for a nuanced assessment. It introduces a framework for regional customization and optimal production network generation using advanced ICT tools to promote frugal innovation in manufacturing. Additionally, it challenges the stereotype that frugal innovation solely involves "low cost/good enough" products by highlighting its potential to enhance complex products through architectural changes and technological knowledge creation. Spatial bricolage emerges as a vital concept for entrepreneurs in resource-poor environments. Finally, the research explores how UK public healthcare employees engage in bricolage to innovate despite limited resources. In summary, this paper significantly contributes to our understanding of bricolage, frugal innovation, and their implications, underlining the importance of context, resource constraints, and dynamic capabilities. These insights are relevant for entrepreneurship, innovation, and sustainability in both developed and emerging economies.

DISCUSSION OF RESULTS

Frugal innovation and bricolage, concepts frequently discussed in the realm of business and leadership, particularly in resource-constrained environments, have a profound connection. This paper explores their relationship and addresses related research questions from a leadership and human resources perspective. Frugal innovation, as a strategic approach to problem-solving, prioritizes crafting innovative solutions with limited resources. It gains significance in resource-scarce settings, prompting organizations to adopt an efficiency-focused mindset, emphasizing simplicity and affordability. This entails reimagining existing processes, products, or services to meet the diverse needs of customers, especially those in underserved markets. In the domain of leadership and human resources, frugal innovation necessitates leaders with creative and strategic thinking abilities. They must identify opportunities for resource optimization, process streamlining, and adaptation to cater to a diverse clientele. Encouraging a culture of innovation within their teams, these leaders inspire employees to contribute novel ideas even when resources are limited.

Bricolage, derived from art and anthropology, involves creating something new by utilizing available materials and resources. In the context of business and leadership, bricolage entails leaders adopting an adaptable mindset to overcome challenges, ingeniously combining resources to achieve desired outcomes. The COVID-19 pandemic has introduced significant changes to the economic, business, and technology sectors, creating uncertainty globally. Companies, both large and small, must make quick and informed decisions to shape their strategies, allocate resources, and adapt to ensure economic sustainability. The ability to adapt will separate surviving companies from those that close permanently.

Barney's research (1991) emphasizes that proper management of unique resources and capabilities creates a competitive advantage, resulting in superior company performance. Gong et al. (2018) highlight the association between sustainability, environmental protection, and welfare activities, contributing to sustainable performance. For organizational development, followers must exhibit qualities like openness, enterprise, progressiveness, and assertiveness in a high-pressure environment (Godinic et al., 2020). Alsharif et al. (2021) analyze existing literature, exploring vertical vs. horizontal leadership's pros and cons for sustainable performance during turbulent times.

Logical decisions by leaders in strategic decision-making directly influence organizational performance (Liao & Zhang, 2020). Managing pressure from various stakeholders while striving for sustainable performance leads to the choice of frugal innovation, which addresses stakeholder interests, including society, regulators, government, and non-governmental organizations (Cunha et al., 2014; López-Fernández & Rajagopal, 2018). Frugal innovation encompasses new processes, business models, products, and services, designed and implemented despite resource constraints (Hossain et al., 2016).

Conversely, Godinic et al. (2020) found that organizational development requires followers to be imaginative and collaborate with managers to utilize existing resources creatively, a process known as entrepreneurial bricolage. Bricolage involves creatively combining available resources to solve problems or seize opportunities (Baker & Nelson,



2005). Entrepreneurial bricolage's effectiveness will determine organizations' ability to capitalize on new opportunities through frugal innovation (Baker & Nelson, 2005; Senyard et al., 2011). In leadership and human resources, embracing bricolage means recognizing resource limitations and fostering innovative solutions by thinking adaptively and leveraging available resources unconventionally. This approach cultivates resourcefulness, resilience, and adaptability within the team.

The relationship between frugal innovation and bricolage is symbiotic. Both concepts share core principles of resourcefulness, adaptability, and creativity, making them highly complementary in the context of leadership and human resources. Effective leaders who embrace frugal innovation understand that they often operate within constraints. They approach challenges with a mindset that encourages exploration of unconventional avenues and the ability to make the most out of limited resources. This naturally aligns with the essence of bricolage, where leaders use their ingenuity to weave together various resources to create something valuable. Leaders who incorporate bricolage principles into their leadership approach are better equipped to foster a culture of innovation. They encourage their teams to think beyond traditional boundaries and experiment with diverse resources to tackle problems. By nurturing a bricolage-oriented mindset, leaders empower their teams to be proactive problem solvers who can navigate complex situations and drive innovation even in resource-constrained environments.

The positive connection between bricolage and frugal innovation lies in the following aspects:

- **Resource Maximization:** Bricolage encourages leaders to extract maximum value from available resources, aligning perfectly with the principles of frugal innovation to accomplish more with less;
- **Creative Problem-Solving:** Bricolage promotes a creative approach to solving problems. This is essential for generating innovative solutions within the constraints of frugal innovation;
- **Adaptability:** Bricolage cultivates adaptability among leaders and teams. This attribute is vital in frugal innovation where unforeseen challenges and limited resources require quick adjustments;
- **Collaboration and Diversity:** Bricolage often involves collaboration among diverse team members, which can result in a broader range of ideas and perspectives. This enriches the potential for innovative ideas within frugal innovation efforts.

While the positive aspects of bricolage are considerable, there are potential challenges to consider:

- **Quality and Consistency:** Overreliance on bricolage may lead to compromises in the quality and consistency of solutions, potentially undermining the success of frugal innovation projects;
- **Lack of Strategic Direction:** Excessive focus on bricolage might result in a lack of clear strategic direction, leading to a fragmented and haphazard approach to frugal innovation efforts;
- **Risk Management:** Bricolage can sometimes overlook potential risks associated with unconventional methods, which could lead to setbacks in frugal innovation initiatives;
- **Resource Allocation:** Inadequate resource allocation and coordination might occur if bricolage is not balanced with a coherent strategic approach, affecting the allocation of resources to priority projects.

RESEARCH IMPLICATIONS

This study provides a deeper understanding of the relationship between bricolage and frugal innovation, highlighting how these concepts interconnect to create resource-efficient and accessible solutions. The findings offer valuable insights for researchers looking to expand the literature on innovation using limited resources. For practitioners, especially in industries with resource constraints, the study suggests strategies for developing affordable



and accessible products and services, promoting inclusive and sustainable innovation practices. Furthermore, the results could inform policymakers in crafting policies that support bricolage and frugal innovation across various sectors, including public and nonprofit organizations, fostering more efficient resource use and innovative solutions to contemporary challenges. The emphasis on resourceful use of resources also serves as a call to organizations to enhance their resource efficiency, whether in terms of finances, raw materials, energy, or labor. In educational contexts, these findings could influence curriculum development in higher education, particularly in programs related to innovation management, entrepreneurship, and sustainability, preparing students to tackle innovation challenges with limited resources. Lastly, the use of VOSviewer for scientific mapping in this study demonstrates its utility in identifying the conceptual, intellectual, and social structures within the field of frugal innovation and bricolage, guiding further research into the interplay between these concepts and their practical applications.

CONCLUSION

Frugal innovation and bricolage share a strong relationship due to their common emphasis on resourcefulness and creative problem-solving. Bricolage can have both positive and negative connections to frugal innovation, offering benefits in terms of resource maximization and adaptability, but also presenting challenges related to quality control and scalability. The extent to which bricolage is beneficial for frugal innovation depends on the context, the specific challenges being addressed, and the balance between improvisation and systematic thinking. In essence, the relationship between frugal innovation and bricolage within the realm of leadership and human resources revolves around the fusion of creativity, adaptability, and resourcefulness. When skillfully integrated, bricolage enhances the potential for successful frugal innovation projects. However, leaders must maintain a delicate equilibrium between improvisation and strategic planning to ensure the quality, sustainability, and overall success of their frugal innovation endeavors. By embodying these principles, leaders can navigate the complexities of resource constraints and inspire their teams to drive impactful innovations.

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