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## Table of Contents

Proposing R&D Bridge Manager Competency Development Framework <i>Nawarerk CHALARAK, Naoshi UCHIHIRA</i>	1
Investigating ASEAN CSR Network’s Influence on Corporate Social Responsibility: The Case of the Food and Beverages Industry <i>Surapa IEMSWASDIKUL, Pittawat UEASANGKOMSATE</i>	7
ICT-based Knowledge Sharing in Rural Agricultural Communities: A Bibliometric Approach <i>Kridtaphob VORRAAKKATHAM, Mongkolchai WIRIYAPINIT, Pattarasinee BHATTARAKOSOL, Kittichai RAJCHAMAHA</i>	15
Design and Research of Lamps and Lanterns Driven by Analytic Hierarchy Process and Chinese Ancient Poetry Semantics <i>Tao WANG, Yanxiao ZHAO, Liangliang ZHANG, Jiaqi LIU</i>	23
Entrepreneurial Leadership and Social Innovation Performance: A Comparison of Projects Under Malaysia Innovation Foundation’s Purview <i>Noorlizawati ABD RAHIM, Nur Fadzlina MAHAMAD RAZI, Zainai Bin MOHAMED, Fatimah Binti SALIM</i>	29
Strategic Framework Towards Open Science Adoption in Malaysia <i>Uwarani KRISHNAN, Noorlizawati ABD RAHIM, Zainai Bin MOHAMED, Fatimah Binti SALIM</i>	36
Entrepreneurial Leadership in Nonprofit Organization: A Case of Malaysian Public University <i>Noorlizawati ABD RAHIM, Zaidatun TASIR, Zainai Bin MOHAMED, Astuty AMRIN</i>	41
Frugal Innovation in SMEs: Challenges and Opportunities of Doing More With Less Strategy <i>Prita Ayu KUSUMAWARDHANY, Imam BAIHAQI, Putu Dana KARNINGSIH</i>	48
How Frugal Innovation is Applied by MSMEs for Sustainability <i>Prita Ayu KUSUMAWARDHANY, Imam BAIHAQI, Putu Dana KARNINGSIH</i>	54
ESG Report Intelligent Writing Assistant - Assist Chinese Enterprises in ESG Information Disclosure <i>Hui-Er CHEN, Ye CHEN, Zi-Qing OU, Chung-Lien PAN</i>	59
Techno-Economic Feasibility of Biogas Renewable Energy Plant: A Case of Malaysian Palm Oil Mill <i>Subramaniam NITAMAKWUAVAN, Noorlizawati ABD RAHIM</i>	63
Success Mechanisms of Smart Factories in Small and Medium-Sized Enterprises <i>Naoshi UCHIHIRA</i>	67
Design Thinking Framework for Values Capturing and Technical Features Validation for Digital Healthcare Platform <i>Keita ONO, Pantapong TANGTEERASUNUN</i>	75
Application of Additive Manufacturing for Resilient Healthcare Sector <i>Rajesh Kumar SINGH, Jaya PRIYADARSHINI</i>	79
Digitalization, Sustainability and Innovation: A Systematic Literature Review <i>Sukmongkol LERTPIROMSUK, Pittawat UEASANGKOMSATE</i>	84
Does the Relationship Between Manufacturing Flexibility and Innovation Speed Depend on the Business Environment? <i>Teerasak KHANCHANAPONG</i>	89

ESG and Carbon Disclosure Practices in China: An Analysis of PwC China’s Tech-enabled Approach <i>Yi-Lin YU, Chung-Lien PAN, Ye-Cheng XU, Ke HUANG, Feng-Jing GAO, Hao-Nan XU, Wen-Shi CHEN, Jia-Tong XIE</i>	96
How High-Performance Human Resource Practices (HPHRPs) Are Applied in a Public Hospital in Response to the COVID-19 Pandemic <i>Teerasak KHANCHANAPONG</i>	101
Resource Allocation Mechanism Considering Combination of Exploitation and Exploration in Ambidexterity with External Factors <i>Takashi KITAGUCHI, Naoshi UCHIHIRA</i>	108
The Research Trends and Directions on Innovation and Dynamic Capability in SMEs <i>Supakanya JUNTARUKKA, Pittawat UEASANGKOMSATE</i>	114
A Framework Validation for ERP Implementation in Thailand: A Case Study Approach <i>Krit PATTAMAROJ, Sakun BOON-ITT, Pathikorn SINLAMAT</i>	120
Technology Acceptance of Digital Bag Tag for Airline Passengers <i>Nathasit GERDSRI, Wasan APINANTASAP</i>	127
<b>Author Index</b>	<b>136</b>

# Frugal Innovation in SMEs: Challenges and Opportunities of Doing More With Less Strategy

Prita Ayu Kusumawardhany  
Technology Management Dept  
Institut Teknologi Sepuluh Nopember  
Surabaya  
Surabaya, Indonesia  
pritaayu.k@gmail.com

Imam Baihaqi  
Business Management Dept  
Institut Teknologi Sepuluh Nopember  
Surabaya  
Surabaya, Indonesia  
ibaihaqi@mb.its.ac.id

Putu Dana Karningsih  
Industrial and System Engineering Dept  
Institut Teknologi Sepuluh Nopember  
Surabaya  
Surabaya, Indonesia

**Abstract**—The concept of frugal innovation (FI) has many positive sides such as how to provide customers with value-added and affordable solutions. Sustainability as one of the opportunities of FI can be created but the negative sides as challenges and positive sides as opportunities have not been explored much. This study aims to identify the challenges and opportunities of FI that will be faced by Small, Medium Enterprises (SMEs) in developing countries. A systematic literature review was used to address the gap. Therefore, it is important to develop a balanced knowledge of the topic based on a comparative perspective to gain a holistic understanding of frugal innovation. First, it points out the understanding of FI, overlapping concepts, and FI in SMEs. Second, it identifies the main challenges and opportunities of FI.

**Keywords**—frugal innovation, SMEs, sustainability, innovation

## I. INTRODUCTION

In today's modern era, there are many factors that can drive the success of a business such as unique and useful products for many people, creating services or services that are needed by the community, and various other factors. But the factors that are key to the success of today's industry-leading companies are driven by innovation. The contribution of new start-ups to the country's economic development is undeniable, but such ventures face many challenges [1, 2].

Innovation management practices in developing and developed countries are different. Most innovation programs are built on the assumption of prosperity and abundance. Opinions about pricing premiums and abundance as drivers of innovation are met with conflict, especially in emerging markets, resulting in contemporary ideas, namely affordability and sustainability [3]. The massive economic growth in developing countries has led to significant scientific interest in innovation management practices [4]. Small, Medium Enterprises (SMEs) face many challenges when implementing innovation management practices. Due to the lack of high-tech and other strategic assets in SMEs when compared to large companies, SME's innovation activities differ from those of large companies [5]. The majority of SMEs have a low-income segment. Thus, Consumers in the low-income segment are very price sensitive and focus on affordable prices.

The majority of customers in developing countries need affordable products, so it is necessary to use resources that can be used effectively to run a sustainable business in developing countries. Developing countries have many customers who cannot afford conventional products and services, so they are increasingly looking for products that are good enough but affordable [6]. Many businesses face resource constraints to be able to cut costs, including the substitution of input materials for cheaper alternatives as well as energy efficiency measures and further vertical integration to reduce costs [7]. Therefore, businesses need to increasingly focus on developing solutions for low-income customers and integrated design solutions as a way to serve and satisfy the under-served needs of customers living in poverty [8, 9]. For this reason, the application of innovation that is suitable for developing countries is frugal innovation (FI).

Innovation's activity that is suitable to be applied in developing countries is FI. FI as a strategy to produce new, low-cost, and resource-saving products and services aimed at providing affordable products and services for low-income groups. FI needs to be a long-term strategy because it is important to answer consumers' demands for quality, value, and increasing purpose [10]. FI is a new genre of innovation and strategy to do more with less or to focus on the "less is more" principle. Businesses need to learn to do more with less and for more people, it is suggested to be one of the facets of sustainability [4, 11]. This strategy combines the thrifty ingenuity of developing and advanced R&D capabilities of developed economies so that companies can create high-quality products and services that are affordable, sustainable, and beneficial to humanity as a whole [12].

## II. UNDERSTANDING FRUGAL INNOVATION

FIs in developing countries can have a significant impact on society, as they serve underserved customers and promote sustainability. Therefore, the right business model is essential for commercial success and sustainable development [9, 13]. FI is a response to severe resource constraints by designing and developing products with tremendous cost advantages when compared to existing solutions at affordable prices and value innovation [14, 15].

Initially, the main focus of Frugal Innovation (FI) was to serve low-income customers in developing countries as a potential to promote local economic development in low-income neighborhoods for profitability [16]. However, challenges arising from society, the environment, and the economy have forced organizations to innovate, manage change, and adopt new activities toward sustainability. resource savings are required so that they can be used and implemented properly by considering the structure, the entire production process, and the business model [17]. Unlike other types of innovation, FI offers a triple bottom line (TBL) approach. TBL is a strategy for sustainable development which is an approach that looks at social impacts, environmental benefits, and business opportunities [18, 19, 20]. FI can be one which is an economic model in which planning, sourcing, procurement, production and reprocessing are designed and managed, both as processes and outputs, to maximize ecosystem functioning and human well-being and challenge the workforce to engage in business innovation training and develop innovation programs that are aligned with increasing business sustainability [21, 22].

TABLE I. CHARACTERISTICS OF FRUGAL INNOVATION

Characteristics	References
Scarcity and less resources	Cunha et al. (2014), Luo (2015), Hossain (2018), weyrauch (2018)
Low cost	Weyrauch and Herstatt (2016), Hossain (2020), Khattak et al. (2021)
Create sustainable solutions (sustainability)	Radjou and Prabhu (2014), Brem and Wolfram (2014), Khattak et al. (2021)
Create Value	Radjou and Prabhu (2014), Hossain (2018), Khattak et al. (2021)
Simple Technology	Kumar and Puranam (2012), Brem and Wolfram (2014), Hossain (2020)
Higher market novelty (emerging market orientation)	Radjou and Prabhu (2014), Zeschky et al. (2014); Brem and Wolfram (2014); Ostraszewska and Tylec (2015)
Local Context	Liu et al (2016), Hossain (2018)
Focus on core functionalities	Hossain (2020); Khattak et al. (2021)

Table 1 shows that there are FI characteristics that have been identified based on previous references. The first characteristic of FI is emphasized how ordinary businesses with limited resources can produce extraordinary results. Second, it requires low-cost raw materials, low-cost employees, low-cost products, frugal cost, or cost-innovation on products/services that are good and cheap, reducing costs in the operational process so as to reduce the final price of products/services. Third, creating efficient and effective solutions for the social and environmental needs of customers such as new solutions that offer product/service ease of use, durability, and concern for environmental sustainability. Fourth, out-of-the-box thinking to co-create value with prosumers, and make innovative friends. Fifth, it requires a leap in the form of simple yet sophisticated technologies. Sixth, create a higher market newness that shapes new customer behavior in an emerging market. Next, requires process and product engineering patterns that are oriented to the local context such as the use of local materials, empowerment of local partners, local supply chains, local labor, and enhanced

partnerships with a local business. Then, concentrate on core functionalities to optimize performance levels.

TABLE II. FRUGAL VERSUS LEAN

References	Differences		
	Context	Frugal	Lean
Rosca and Bendul (2016), Hossain (2021)	Procurement	Local suppliers, local materials, Use of waste/recycled products as raw materials, Lower price by reduction by eliminating non-essential features	Standardization and reduction of complex parts which enable economies of scale, Cost reduction, differentiation, and the security of supply
Patel et al. (2021), Hossain (2021)	Manufacture	Good enough quality, developed under resources constraints, focus on core features and promise of optimum performances	Continuous process improvement (CPI), total productive maintenance (TPM), production leveling, mistake proofing, training at regular intervals, adopt changes, and financial availability
Rosca and Bendul (2016), Hossain (2021)	Distribution	Locally available, Accessible to customers, considering the bottom of pyramid (BoP) market as a starting point	Milk-run concepts in order to achieve shorter lead times and lower costs
Rosca and Bendul (2016), Shubin et al. (2018),	Technology	Cleaner technology and cost reduction through technology to attain environmental and friendly practices (easy recycling and disposal of products)	Customer relationship management, easy to disassembly modular design

III. OVERLAPPING CONCEPTS

The frugal innovation approach that is transferred from East to West is becoming more important in literature and practice after lean innovation (LI) which also focuses on increasing efficiency and minimizing waste in the product development cycle. The two paradigms are up-to-date and have created powerful ideas that challenge traditional Western approaches [23]. Therefore, there is highlight similarities and differences between the two approaches, and show the underlying principles in order to develop more efficient products with efficient production processes, especially for cost-sensitive consumers in developing countries.



Based on table II, LI is not just about cost, it's about speed. LI waste less cost because they use a disciplined approach to testing new products and ideas. Meanwhile, FI also saves costs but emphasizes the maximum use of existing and local embedded resources. The concept of FI was born in an emerging market where social entrepreneurs and enthusiast designers have perfected the idea of creating low-cost, highly user-friendly devices that also meet social needs.

TABLE III. FI ENABLERS COMPARISON

<i>Hossain (2021)</i>	<i>Niroumand et al (2020)</i>	<i>Shibin et al. (2018)</i>
No electricity required	World-class design	Government funding
Affordable products	Human aspect (manager, employee, and customer)	Government policies & regulations
New products for a niche market	Marketing	Process design capability
Female empowerment	Support (by government and managers)	Supply chain talent
Easy access to frugal products	Knowledge	International rules & regulations
Sustainable product	Social aspect	Social values & ethics
Out of the box thinking	Prototyping	Competition
Low-cost raw material	Cultural change	Infrastructure
Low-cost employees	Environmental aspect	quality & connectivity
Simple technologies	Distinct brand creation	Environmental awareness & knowledge
Low-cost products	Core functions focus	Technology
Local supply chain	Local R&D	
Local employment	Business model by cost leadership	
	Low-cost manufacturing	

IV. FRUGAL INNOVATION IN SMEs

There are different enablers of FI which are identified in Table III. Hossain (2021) mentions that there are 13 enablers of FI in companies in India, Niroumand et al. (2020) mention 14 FI enablers for SMEs in Iran, and Shibin et al (2018) mention 10 FI enablers for SMEs in India from the point of view of supply chain management. Findings from the research of Niroumand et al. (2019), the active supporting dimensions for frugal innovation are world-class design, human aspect, marketing, support, knowledge, social aspect, prototyping, cultural aspect, environmental aspect, differentiated brand creation, core function focus, local R&D, business model cost-

cutting and low-cost production. It can be concluded that the similarity of the research conducted on companies or SMEs in developing countries, but the different FI enablers in each study are due to the perspective and character of SMEs in each developing country.

SMEs need to invest in innovation rather than large companies. Smaller organizations or companies have the advantage of adapting to a changing environment more quickly than large companies. SMEs have the agility and a hierarchy that is not too long so they can make decisions faster. The belief in success also underlines the need for entrepreneurs or small business managers to have an innovative advantage to compete with larger incumbents [6, 24]. There are a number of factors that influence the relationship between innovation and SME performance. Innovation has a positive effect on the performance of SMEs [6]. First, orientation to innovation has a more positive effect on firm performance than orientation to the creation of innovation process outcomes such as patents and innovative products or services. Entrepreneurs and SME managers who focus solely on creating innovative offerings may miss out on an important dimension that is the value innovation can bring to their companies. Second, process innovation results in greater improvements in SME performance.

V. CHALLENGES OF FRUGAL INNOVATION

SMEs need to begin designing market-based, cost-effective solutions that incorporate product innovation and business models to meet the unmet needs of billions of customers. However, FI is not just about products. There is also great potential for business model innovation. There are two types of frugal innovation, namely, cost innovation and affordable value innovation [25].

Frugal does not mean 'cheap'. While the general opinion is that high performance can lead to high costs, frugal innovators argue that they are deliberately trying to position themselves where high performance can be provided at a price that may be considered cheap but without sacrificing performance or quality. Therefore, FI is not constrained as low-cost or low-cost innovation [26]. Cost-effective innovations in services include deep specialization into large niche market segments, step-by-step pricing systems, and efficient use of talent. FI address not only the shortage of skilled personnel but also the gaps in the organization. Economic innovation is also not limited to the low-tech sector. This requires or can be combined with frontier science and technology.

The implementation of FI certainly encountered many obstacles. The author will combine the various challenges identified based on updated references. Identification of challenges will be limited to the reference year 2021 and will be shown in Table IV with the assumption of environmental turbulences which include market and technology changes.

TABLE IV. FI CHALLENGES

<i>Context</i>	<i>Description</i>	<i>References</i>
Mindset	(1) Lack of FI concept understanding, (2) lack of will, (3) lack of knowledge	Abbas and Liu, 2021; Hossain, 2021
Market-Based	(1) low-income customers prefer not to buy products that are tagged as the products of the poor, (2) using poverty for profit gain may not have social change for the poor, (3) romanticizing the poor is not sustainable and harms the poor, (4) profit motives could hinder the development of lasting quality products.	Hossain, 2021
Organizational	(1) lack of motivation in employees, (2) lack of collaboration amongst employees (employee readiness), (3) lack of capacity building and guidance (mentorship programs)	Abbas and Liu, 2021
Governmental	(1) Lack of support, (2) complex regulatory procedures, (3) lack of communication between government departments	Abbas and Liu, 2021
Financial	(1) Lack of funding, (2) perception of financial requirements	Abbas and Liu, 2021
Intellectual Property (IP) Protection	With limited IP support for FI, many inventors feel that patenting is a waste of their time and resources	Hossain, 2021
Policy	Need to develop wider policies encompassing and connecting different regions and organizations to stimulate FI.	Hossain, 2021
Information Technology	(1) IT resources readiness on frugal functionality and (2) customer satisfaction	Shehzad et al, 2021; Vargas et al, 2021

VI. OPPORTUNITIES FOR FRUGAL INNOVATION

FI is about bringing more value to more people at a lower cost. It is frugal because it needs to adopt the idea of simplicity and very low cost without sacrificing the quality of the user experience. It's about getting rid of the extras and providing high-quality, simple, robust, resource-intensive products. FI does more than design cheaper versions of existing products. It requires a whole new way of thinking. It needs to gain a deeper understanding of the true needs of consumers at the bottom of the pyramid, find gaps that can be turned into opportunities, and rethink how to organize business and how it delivers its products.

The quality of resource savings from FI is very important for sustainable development. The strength of FI is the use of resources in identifying cost-effective solutions by considering local conditions that require technology to focus on sustainable development [18, 27]. Although many challenges to FI were identified in this study, research on FI is still very much needed because it also has many opportunities. Table V provides the

results of research that has been carried out by previous researchers which were limited to research in 2021 to provide updated insights that FI has proven to still have a positive impact not only on business but on sustainability and triple bottom line (TBL) which includes people, planet, profit.

TABLE V. FI OPPORTUNITIES

<i>Context</i>	<i>Description</i>	<i>References</i>
Knowledge sources	Knowledge use from both internal and external including (1) knowledge repository, (2) prior experience, (3) personal readings, and (4) search ultimately facilitates FI	Shehzad et al, 2021
Customer Satisfaction (CS)	FI and CS are positively correlated. the FI process is an important element to face, scale, and adapt products or services that the market values.	Vargas et al, 2021
Information Technology	IT resources have a greater influence on frugal functionality, frugal cost, and frugal ecosystem.	Shehzad et al, 2021
Environmental Performance (EP)	FI remarkably affected EP. Practitioners and policymakers are facing intense pressure to improve their EP.	Iqbal et al, 2021
Policy	A strong correlation between higher maturity levels in renewable energy systems (RES) and triple bottom line (TBL) policies that consider the creation of sustainable cities supported by economic, social, and environmental initiatives toward sustainable development.	Lerman et al, 2021
Actors of the innovation	a greater engagement with triple helix actors of innovation (i.e., government, private sector, and universities) for the foundation of sustainability	Lerman et al, 2021
FI Acceptance	FI acceptance determinants such as (1) performance expectancy, (2) effort expectancy, and (3) facilitating condition are positively related to FI adoption	Costa et al, 2021
Dynamic Capabilities	Out of the box management such as (1) adoption of a concept marketing approach, (2) resource sharing strategy, and (3) develop crowdfunding strategy	Abbas and Liu, 2021

VII. SUMMARY AND FURTHER RESEARCH

Various scientific reviews provide an understanding of FI, but it has not been easy to implement FI, especially for SMEs in developing countries. The FI phenomenon always develops following environmental such as markets and technology turbulences. This study tries to provide and elaborates a conceptual understanding of FI by combining perspectives so that it can find gaps in the literature that is in accordance with the conditions of SMEs in developing countries.

The application of FI is not only different between developing countries, but also the size of the business, market

conditions, and the mindset of business actors. FI faces many key challenges such as frugal mindset, market acceptance, organizational capabilities, government support, financial conditions, protection of patents, various policies that still need to be made, and IT readiness. The existence of these various FI challenges is also a challenge for researchers to investigate the extent to which SMEs can actually implement FI properly in order to create sustainable development.

On the other hand, there are many opportunities to remain optimistic that FI implementation can bring prosperity to a business, especially SMEs. Various previous studies have conducted observations, exploratory case studies, tested hypotheses on a number of business actors, then it proves that the implementation of the FI strategy brings many good impacts on business and can create good environmental conditions and social impacts. Opportunities that can be obtained by implementing FI include easy access to sources of knowledge, achieving customer satisfaction, IT development, policies that have a good impact on the environment, collaboration between actors of innovation, market acceptance for FI, and the creation of dynamic capabilities so that they can always adapt and innovate.

The challenges and opportunities identified in this study can stimulate further research. From previous research, it was also found that FI requires multiple perspectives and needs to focus on studying as many cases as possible. This research has presented a negative side that is a challenge for FIs but also a positive side in the form of opportunities for FI implementation. For example, the Frugal mindset, lack of education, lack of capability, and motivation that have been challenging for SMEs, it turns out that if we take a positive opportunity, it is by providing knowledge sources and collaboration between innovation actors which are now easier to obtain and create. A valuable and wider policy is essential to stimulate FI. Not many studies have investigated further the anticipation that must be done to overcome various challenges by creating opportunities, especially for SMEs which still require intensive guidance and assistance to understand the overall implementation of FI. In addition, the comparison of the impact on practice before and after the implementation of FI is still very limited.

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