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Title:

**Frugality in Community Practice:
Everyday Life in Uganda's Off-Grid Energy Services**

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Abstract

Purpose: This study aims how Frugality occurs within specific social and institutional contexts through the lens of Frugal Innovation (FI). It focuses particularly on the local practices and implementation processes surrounding the product, rather than on the product itself. Using an off-grid solar lantern rental business in Uganda as a case study, it seeks to clarify how Frugality is formed within local life practices and relationships during the operation and use of the service.

Design / Methodology / Approach: This study is based on qualitative fieldwork in Uganda, which involved semi-structured interviews with service providers, local agents, and users, as well as field observations. Data analysis was conducted using ATLAS.ti, combining deductive and inductive methods.

Findings: Based on the analysis, the solar lantern itself, designed and manufactured outside of Uganda, does not clearly exhibit typical characteristics of Frugal design. However, still the practices of those involved in service provision and use, including repair, feedback, payment, and collaboration, displayed how Frugality is socially shaped and sustained. These activities helped as mechanisms that enabled daily life through creativity and collaboration, despite resource and institutional constraints.

Originality / Value: This study presents a complementary perspective that focuses on aspects of Frugality emerging within local practices and social relationships. Through examining this case, it suggests the possibility of understanding Frugality as a context-rooted, dynamic practice.

Keywords

Frugal Innovation, Social Practice, Uganda, Off-grid Energy, Context, Collaboration, Local Development

Paper Type

Research Paper

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Chapter 1 Introduction

1.1 Background and Problem Statement

Economic growth and urbanization continue to advance across Sub-Saharan Africa; however, achieving a stable electricity supply remains a significant challenge. Although electrification rates are increasing in some countries, disparities persist between urban and rural, as well as peripheral, areas. Reliable access to electricity remains limited among privileged populations, presenting a complex challenge that involves the interplay of social, economic, technical, and institutional factors. Against this setting of structural constraints, locally rooted solutions, such as off-grid power and distributed energy supply, have gained increasing attention in recent years. These initiatives represent practices that seek to reconstruct essential value for daily life within limited resources that align with the principles of Frugal Innovation (FI), which reframes constraints as opportunities for innovative problem-solving.

In Uganda, many regions still lack adequate power infrastructure, and there are even substantial amounts of the population unable to benefit from national electrification policies. In this context, the challenge extends beyond simply delivering electricity. Instead, it concerns how introduced products and services become embedded in local matters of life and social relationships, and how they ensure sustainable development. Existing technology and business introductions often see their sustainability undermined by a disconnect between usage, institutions, and society. This research aims to elucidate how, under such institutional, social, and technological constraints, people's creativity and collaborative practices help compensate for disparities in energy access.

The concept of Frugal Innovation (FI) provides a useful framework for understanding this issue. FI has evolved as an approach that creates products and services that function adequately and are affordably accessible under resource constraints. Earlier research focused primarily on product design characteristics, cost reduction, and simplified design; but at the same time, recent scholarship has increasingly drawn attention to the dynamic processes through which Frugality is formed, as well as socially maintained, via practices of use and collaboration.

The case, an off-grid solar lantern rental business in Uganda, of this research offers an attribute relevant to this emerging understanding of Frugal Innovation. Nevertheless, frugality does not explicitly appear in the product design itself of this case; observations suggest that frugal characteristics are formed and maintained within local social relationships through

practices such as use, repair, and sharing. This study, therefore, tries to adopt a perspective that views frugality as a social phenomenon shaped through people's collaboration and usage practices within constrained environments. It seeks to elucidate these dynamics from a position that supports existing Frugal Innovation research. This position aligns with the theory of technology introduction in development studies. Toyama (2011) indicated that technology "amplifies" existing capacities and institutional foundations rather than automatically compensating for deficiencies. Correspondingly, Heeks (2022) identifies the "Design–Actuality Gap" as the discrepancy between design and actual implementation, emphasizing the critical importance of contextual fit. These arguments suggest that the value of technology or products is not inherent but is co-constructed through users' practices and social relations.

1.2 Research Aim

This study aims to understand and complement existing discussions on the design characteristics of products and technologies by examining Frugal Innovation (FI) from the perspective of the social practices that emerge during its operation and use. In the Ugandan off-grid solar lantern rental business discussed here, the products themselves do not clearly exhibit typical Frugal design characteristics. However, Frugal elements were identified within the surrounding everyday practices of use, repair, sharing, payment, and collaboration, which adapted to the constrained environment. This study, therefore, focuses on this case to clarify how the components of FI are implemented and socially reconstructed through people's collaboration, relationships, and life practices in the field. Especially by considering not only Frugality as a product but also the forms of Frugality that emerge through the use of the product and collaboration with actors, this research aims to gain case-based insights into FI as a contextually grounded phenomenon.

1.3 Research Question

Main RQ:

How is Frugality socially constructed through community practice under resource constraints, and how do these practices shape everyday life and local understandings of Frugality?

Sub RQ:

- How are Frugal Innovation initiatives accepted, adapted, and embedded into the everyday practices and livelihoods of local communities, and what kinds of changes or transformations occur through this process?
- How do different Actors interact and cooperate in the implementation and use of Frugal Innovation, and in what ways do these relationships contribute to the formation, operation, and maintenance of Frugality?

1.4 Contribution

- While respecting the product and technology characteristics emphasized in conventional Frugal Innovation (FI) research as an essential foundation, this study seeks to take a complementary view by conceptualizing FI as a phenomenon formed and maintained within social interactions and contexts. This approach demonstrates a perspective that understands FI not as a static artifact but also as a dynamic process shaped through on-site practices.
- Based on this case of Uganda's off-grid solar lantern rental business, this study focuses on the process through which Frugality is formed and maintained while adapting to the social context via everyday practices such as use, repair, sharing, payment, and collaboration. Through this analysis, a complementary perspective might be presented for understanding Frugality as a relational and operational phenomenon that emerges within people's actions and relationships.

Chapter 2 Contextual Background

2.1 Socio-Economic Context of Uganda

This section aims to provide an overview of the socio-economic characteristics of Uganda, the region under study, and to clarify the institutional and economic foundations that enable Frugal Innovation (FI).

Official Name	The Republic of Uganda
Capital City	Kampala
Independence	9th October 1962
Official Language	English
Currency	Shillings (UGX)
Population	50,015,092 (2024)
Population Growth Rate	2.9 Percent (Census, 2024)

Table 1 - Overview of Uganda (cited from national statistics and World bank)



Figure 1 - Map of Uganda and neighboring countries (Encyclopaedia Britannica)

Uganda is a landlocked country in East Africa, sharing borders with Kenya, Tanzania, the Democratic Republic of Congo, Rwanda, and South Sudan. Its southern region borders Lake Victoria, one of Africa's largest lakes, where fishing and small-scale commercial activities thrive, particularly along the lakeshore. The country is also characterized by relatively stable annual rainfall and a warm climate, with extensive land suitable for agriculture. Uganda covers an area of approximately 240,000 square kilometers and has a population of about 45.9 million (World Bank, 2024). The capital, Kampala, functions as the economic, administrative, and cultural center. Uganda's population has surged over the past two decades, nearly doubling from approximately 24 million in 2000 to 45.9 million in 2024 (World Bank, 2024). The annual average growth rate of the population is approximately 3%, one of the highest levels in Sub-Saharan Africa. In addition to this, approximately 80% of the population is under 35 years old, which indicates a youth-dominated demographic structure (World Bank, 2024). This rapid population growth and youthful composition serve as sources of economic energy, but they also generate social challenges such as unstable employment, insufficient education, and skills training.

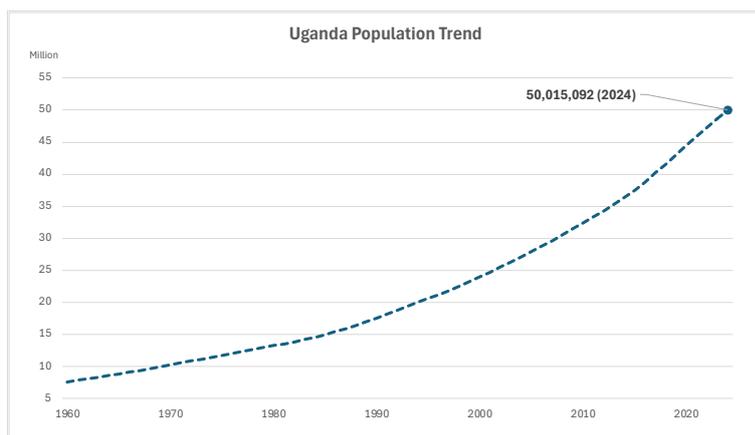


Figure 2 - Population trend in Uganda (World bank data)

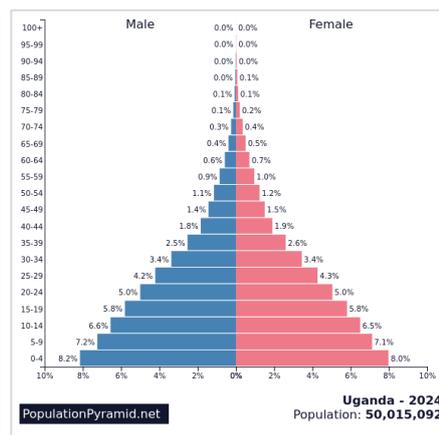


Figure 3 - Population pyramid in Uganda (World Bank data)

Over 80% of the labor market consists of informal employment, which includes key occupations such as street vendors, food stall operators, boda boda (motorcycle taxi) drivers, and small-scale farmers (UBOS, 2021). Much of this work is paid on a daily and commission basis, or in cash. Those can be characterized as a "daily earning economy". According to the World Bank (Poverty & Inequality Platform, 2024), approximately 41% of Uganda's population lives below the international poverty line (\$2.15 per day per capita, 2017 PPP). Moreover, the International Energy Agency (IEA, 2024) reports Uganda's national electrification rate at approximately 45%. Urban areas reach about 83%, but rural areas remain below 20%, highlighting significant regional disparities. Nevertheless, even in urban areas, frequent power outages continue to pose a challenge to the stability of the electricity supply.

Given this backdrop of constrained electricity access, off-grid, decentralized energy supply models, specifically the solar lantern rental services examined in this study, function as crucial local energy infrastructure. These services provide flexible and sustainable electricity access to regions and income groups, representing a socially embodied example of the principles of Frugal Innovation. In socio-economic environments, for example, in Uganda, where multiple constraints related to electricity, employment, and income intersect, Frugality extends beyond merely purchasing "cheap products." It takes on meaning as a practice for circulating limited resources and maintaining and regenerating value within social relationships. Within this context, this research focuses on solar lantern rental services, specifically examining their operational aspects in Uganda.

2.2 Overview of Case Study: Solar Lantern Rental Business

Case Overview: In this research, a case study of a solar-powered lantern rental business operating in multiple African countries is selected. In Uganda, the headquarters (HQ) is based in Kampala, Uganda. The business combines solar energy and digital technology to provide safe and sustainable lighting in areas with inadequate or unstable power infrastructure. The business currently operates across 10 regions and over 120 administrative districts in Uganda, working in collaboration with approximately 2,000 local agents. The service is utilized across a wide range of communities, including rural areas and urban peripheries, covering almost the entire country and functioning as a critical means of electricity access in regions not sufficiently covered by the national electrification policy.

Service Scheme Structure and Operation:

The business operates through a hierarchical network structure: HQ (Kampala) → Regional Warehouse → Local Agent → User (End User). Local agents are primarily retail shop (kiosk) owners or street vendors conducting commercial activities within their communities. Drawing on established trust relationships with local residents, they handle daily lending and return operations.

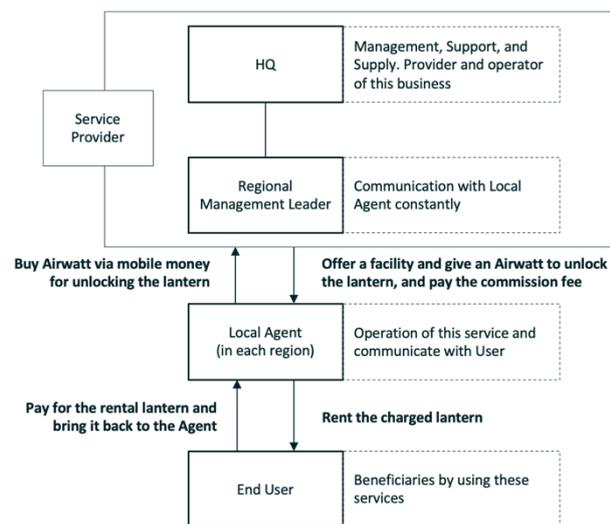


Figure 4 - Communication flow between actors

This Local Agent charges lanterns by using solar panels during the day and lends them to Users from evening into night. Users operate the lanterns overnight (approximately 15 hours) and return them the following morning. After returning, the lanterns are recharged using solar panels and inspected before being loaned out again to the next user. This daily operational cycle aligns naturally with the daily earning economy prevalent in Ugandan society. Within this style of daily income and day-to-day payments, users can secure lighting without any initial investment, establishing a system that enables stable access to electricity services, even for low-income households.

Cost Recovery Mechanism: Users pay agents mainly in cash. Agents prepay the service provider via mobile money (e.g., MTN, Airtel) based on this revenue. After payment, agents

load credit onto a dedicated terminal to activate the lantern for rental. This credit is deducted with each rental, and when the balance reaches zero, recharging is required. Agent revenue is also settled weekly as commission (sales fees), with compensation increasing based on sales volume. Furthermore, the Provider set up all the necessary equipment, including solar panels, lanterns, and charging facilities, at the Local Agent's kiosk; therefore, the Local Agent does not have to make an initial investment.

Product Features: The solar lanterns used in this case are off-the-shelf products manufactured outside Uganda (primarily in East Asia) and are not designed or manufactured locally. The materials are lightweight and highly portable, enabling approximately 15 hours of use per charge. Multiple models exist, varying in light output and battery capacity, primarily serving small-scale merchants who operate night stalls and markets.

Research Positioning: This case can be understood as an initiative addressing the social challenge of electricity access in regions with inadequate power infrastructure by utilizing existing products and technology. Yet the product itself exhibits limited frugal design characteristics; its operational approach and decentralized service structure enable sustainable access within constrained conditions. This study focuses on how frugality is formed within society around the product, in this case.



Figure 5 – Solar-powered charging and lantern

Chapter 3 Theoretical Background

3.1 Core Concept of Frugal Innovation

Frugal Innovation (FI) can be understood as an approach that generates renewed solutions to social challenges that cannot be fully addressed by conventional technologies and market frameworks, utilizing constraints as the starting point for creation. Its fundamental principle lies in "doing more with less," characterized by exploring how to creatively build value under constraints, which are limited resources, institutional frameworks, and environmental conditions (Radjou et al., 2012, cited in Leliveld and Knorringa, 2018).

Since the 2000s, FI has gained attention within the broader trend of innovation under constraints, especially in emerging economies (Zeschky, Widenmayer, and Gassmann, 2011, cited in Basu and Sweeney, 2013). Frugal Innovation refers not only to generating low-cost, simple products but also to a social process in which various actors engage within constraints to create, adapt, and reconstruct value. In this context, the process through which innovation gains social acceptance and sustainability involves the practice of inventors, producers, users, intermediaries, and other relevant actors (Leliveld & Knorringa, 2018; see also Bhatti, 2012). A review of prior research demonstrates that Frugal Innovation studies, which initially focused on products and technical efficiency (Weyrauch and Herstatt, 2016) in the early stage, have increasingly examined social and institutional contexts alongside the processes of practice (Basu and Sweeney, 2013).

The following section illustrates this theoretical development, organizing the major currents in Frugal Innovation research and clarifying where the positioning of this study is, within its broader evolution.

3.1.1 Product-Centric Frugal Innovation

Frugal Innovation research at the initial stage was primarily developed from the perspectives of product design and technical efficiency. Zeschky, Widenmayer, and Gassmann (2011) defined Frugal Innovation as technological innovation that optimizes value at low cost, premised on the constraints of low-income markets, especially in emerging economies. This position was further organized by Weyrauch and Herstatt (2016), defining three criteria characterizing Frugal Innovation as follows:

1. **Substantial Cost Reduction:** significantly reducing costs for customers compared to existing products or services. This refers to reducing total costs, including not only manufacturing expenses but also purchasing, operation, and maintenance costs as a whole.
2. **Concentration on Core Functionalities:** focusing on crucial functions for users and eliminating unnecessary extra features. This design philosophy prioritizes ease of use and resource efficiency.
3. **Optimized Performance Level:** ensuring a sufficient and optimal level of quality and performance in the usage environment, without pursuing excessive quality or performance. This emphasizes appropriateness within a specific context and practical performance.

According to Weyrauch and Herstatt (2016), when all three criteria are met, a new invention can be characterized as Frugal Innovation. This definition positioned Frugality as an outcome of technical rationality grounded in product design. However, research at this stage did not sufficiently address social dimensions such as relationships with usage, maintenance, and institutional environments. Therefore, the following research has expanded the understanding of Frugal Innovation into more contextual and social dimensions.

3.1.2 Extending Frugal Innovation to Social Frugality

Research on Frugal Innovation has emerged, expanding as a design approach rooted in broader social and institutional contexts, building upon the initial product-centered understanding. Basu and Sweeney (2013) examine Frugal Innovation as a design innovation process that creates Appropriate, Adaptable, Affordable, and Accessible products and services tailored to specific contexts and needs, which align with people's lives. This definition is characterized by extending Frugality beyond issues of price and functionality to emphasize human-centric design, such as valuing usability rooted in people's lives and intuitive design (Basu and Sweeney, 2013).

On the other hand, Hossain (2018) positions Frugal Innovation as a response to social challenges under resource constraints. Moreover, he suggests its potential for social inclusion and contribution to sustainable development, quoting examples such as bringing low-income groups into the mainstream market through affordable products and providing new access opportunities, especially for women and residents of remote areas (Hossain, 2018, pp. 933–934).

Hence, the work of Basu, Hossain, and others reinterprets Frugality not by rejecting the initial product-centric discourse but by extending its scope to encompass social and institutional dimensions.

3.1.3 The Institutional and Operational Perspective

Discussions on Frugal Innovation (FI) are also being reexamined from more fundamental levels, such as institutional design and operational mechanisms. Chakravarty and Gómez (2023) distinguish FI into "innovation for resource constraints" and "innovation under resource constraints." They define the former as the design of products and services accessible to low-income groups, and the latter as the process through which firms, regions, or institutions cultivate new capabilities under constraints. This distinction offers a theoretical perspective that conceptualizes Frugality not merely as a characteristic of products or services but as a dynamic process of learning, adaptation, and capability (Chakravarty and Gómez, 2023). Such a view is significant in that it deepens the understanding of Frugal Innovation beyond the realms of product development and business models, highlighting the creativity grounded in locally cultivated resources, knowledge, and networks.

3.2 Contextual and Social Understanding of Frugal Innovation

Leliveld and Knorringa (2018) point out that Frugal Innovation (FI) research has been biased toward a corporate-led, technology-centric framework, and propose the need to reconsider its social aspects from the perspective of development studies. According to them, FI should be given equal importance as a social and institutional practice formed within the development process, similar to a low-cost product development strategy for emerging markets (Leliveld and Knorringa, 2018, p. 7). From this perspective, FI is viewed as a social process constructed through interaction with local communities and the institutional environment. Pulling on Bernstein's (2010) mentions, "who owns what, who does what, who gets what, and what do they do with it?"—they position socio-structural elements such as power structures, resource allocation, and institutional constraints as essential perspectives in FI analysis (Leliveld and Knorringa, 2018, p. 9).

On the other hand, Frugal Innovation (FI) is sometimes uncertain about how to identify it, as well as what Frugality entails. Addressing this ambiguity, Pineda-Escobar (2025) shows that FI must be understood as a relative and context-dependent concept. According to her, what FI signifies within a specific context and why it is deemed frugal are determined by its

relationship to social and institutional conditions. Labeling something as frugal without specifying a comparative benchmark is theoretically insufficient (Pineda-Escobar, 2025).

Building on this critical perspective, Pineda-Escobar points out that much existing research has implicitly evaluated Frugality against a "mainstream benchmark". She proposes the necessity for assessing Frugality through relative comparison within its own context. That is, Frugality is not measured solely by absolute criteria such as being cheap, simple, or sufficiently functional. Instead, it can be seen as a phenomenon that should be evaluated through comparison with local mainstream benchmarks within each region or field. Frugality is thus redefined not as an inherent attribute of products or technologies but as a concept constituted within specific social and institutional contexts (Pineda-Escobar, 2025). Furthermore, Pineda-Escobar (2025) presents a Framework for the Identification of Frugal Innovation to operationalize this relative understanding. This framework evaluates Frugality in a qualitative way from the following three perspectives:

1. **Affordability and Cost Minimization:** Contextually assesses the extent to which the product or service reduces costs from both consumer and producer perspectives.
2. **Optimal Design, Function, and Performance:** Examines whether adequate implementation is achieved within the given context while eliminating excessive features.
3. **Focus on a Resource-Constrained Context:** Explicitly demonstrates how specific needs are met within the economic, technical, and social constraints.

Evaluating these elements through comparison with local mainstream standards within regional and institutional conditions enables a relative judgment of the likelihood of Frugality. Therefore, Pineda-Escobar's (2025) argument repositions Frugal Innovation by extending its interpretation beyond technical and economic rationality and viewing it as a process relatively shaped within social practice. This perspective builds upon Leliveld and Knorringa's (2018) understanding of how Frugality formed within social relations and institutional structures, theoretically developing Frugality into a context-dependent yet comparatively analyzable concept.

This context-dependent approach proves remarkably effective in understanding how Frugality is reconfigured within the mechanisms of use, maintenance, payment, and sharing, even when the product itself, as in the solar lantern rental business examined in this case, is designed and manufactured outside the subject local area. The following section presents a theoretical framework for empirically analyzing Frugality based on this position.

3.3 Theoretical and Analytical Framework

3.3.1 Theoretical Position

This study focuses on Frugality within the processes of access and operation, moreover, on how Frugality is generated and sustained through the surrounding practices of using, maintaining, sharing, and collaborating around the product, solar-lantern services. This stance draws on the concept of context-dependent Frugality proposed by Pineda-Escobar (2025). From her perspective, which highlights the importance of understanding of FI through comparison with the local situation, Frugality is not an inherent attribute of a product but a phenomenon constructed relatively within specific social and institutional contexts. Accordingly, this study does not seek to disbelieve the theoretical contributions of existing FI research. However, it aims to complement that body of work by observing Frugal Innovation as a socially embedded practice.

3.3.2 Framework for Analysis

As stated in the previous section, this study does not reduce Frugality solely to the design characteristics of products or technologies. It also attends to the process through which Frugality emerges socially via people's use, operation, and collaboration. For analytical purposes, the dimensions in which Frugality manifests are organized into the following three layers: 1) Frugality in Access and Use, 2) Frugality in Operation, and 3) Frugality in Collaborative Diffusion.

1) Frugality in Access and Use

The formation of Frugality first becomes visible at the initial stage: who can access and begin using a product or service, and under what conditions. Pricing, payment methods, and access mechanisms are particularly crucial in environments marked by significant resource or institutional constraints. Frugality here is not just about being cheap, but also manifests in the relationships and mechanisms that people devise and adjust to make access feasible within the institutional and economic conditions of their local communities.

2) Frugality in Operation

Frugality also takes on distinct forms during the stages of use, maintenance, and management after a product or service has been introduced. Within limited resources and institutional constraints, people sustain services through repair, reuse, payment adjustments, and operational originality. For instance, mechanisms that kindly understand payment delays through mutual

trust represent creative adaptations to technical and economic constraints. Such practices allow us to view Frugality not merely as an outcome of low cost but as an ongoing process of adjustment within social practice.

3) Frugality in Collaborative Diffusion

Frugality extends beyond individual user practices, being collaboratively shared and diffused within local communities. Implemented Rogers's (1995) Diffusion of Innovations, which is understood as a social process involving collaboration and sharing, and analyzed how this solar lantern product emerges within the community. Methods of dissemination within communities, the sharing of repair knowledge, and learning through word of mouth all contribute to the reproduction of Frugality. The diffusion of Frugality, therefore, is not simply an increase in users but a process through which Frugality is re-semanticized within social relations of mutual learning and support.

This research focuses on how the Frugality take process generates insights based on the field of practice and its resulting social impact, aiming to gain a deeper understanding of this matter, both theoretically and practically.

Chapter 4 Methodology

4.1 Research Design and Method

This study is grounded in a qualitative research approach and is positioned as a single-case study. Fieldwork was conducted locally to gather detailed data. The three methodological pillars of this study are outlined below.

Qualitative Research Approach: To capture the process-oriented and relational aspects of how FI services are used, repaired, shared, and maintained within daily life. Qualitative research is well-suited for revealing how Frugality is formed while adapting to social contexts, primarily through the observation of users' narratives and practices.

Case Study: This study was conducted as a single-case study focusing on an off-grid solar lantern rental business operating in Uganda. This case is particularly appropriate for deepening an understanding of Frugal Innovation. While Frugality is not explicitly visible in the product design itself (not in general, but in this case), Frugal characteristics are socially constructed within practices such as use, repair, sharing, and payment. An examination of a single case study allows for a detailed analysis of how FI-related practices unfold in the field and how they are sustained through interactions with relationships and institutions. Furthermore, collaboration with the organization enabled the collection of multi-layered data through field observations, interviews, and document analysis. The rationale for case selection and details of the research process are elaborated in the following chapter, Case Selection.

Fieldwork: Data collection was conducted through fieldwork centered in Kampala, the capital of Uganda. The subjects of investigation are three tiers: 1) Local Staff (service provider), 2) Local Agents (Kiosks), and 3) End Users. This approach enabled a comprehensive understanding of fundamental information, such as service design itself, as well as dissemination and usage processes, incorporating the differing viewpoints of each stakeholder. The primary research method employed was semi-structured interviews, supplemented by observational insights gained through field research. Interviews were conducted primarily in English, with some facilitated through Luganda (local language) interpreters.

4.2 Case Selection

This section shows how to select this case, the off-grid solar lantern rental business in Uganda, as the most appropriate subject as follows:

1. Frugal Innovation characteristics are observable within its social practices
2. Processes of community utilization and collaboration can be observed, and
3. Access to primary data is feasible.

4.2.1 Selection Criteria

Initially, the following overarching criteria were established as a framework for case selection.

1. Private company leadership

This study focuses on the intersection of profitability and public benefit, exploring how to balance these two within the given context. Furthermore, privately led cases, developed based on their own business models, were considered more likely to demonstrate improvement activities aimed at achieving FI sustainability and monetization.

2. Implementation in resource-constrained environments

As FI inherently involves creative adaptation within constraints, cases must be deployed in resource-constrained environments lacking adequate power or financial infrastructure.

3. ICT-related nature

This study focuses on how some ICT characteristics contribute to improving livelihoods and creating public value. Candidate cases were therefore narrowed to services mediated by ICT. Here, ICT is treated as a broad concept encompassing not only communication technology but also services directly impacting daily life, such as mobile money, digital management of off-grid power, and digital tools for education and learning.

4. Access to data

Cooperation from companies and field sites is essential for conducting field surveys and interviews. Therefore, researchers must be guaranteed a certain level of access to the actual site.

4.2.2 Candidate List Creation and Scoring

Based on the selection criteria outlined above (Section 4.2.1), a total of nine potential cases were identified that met the basic requirements. These cases contain organizations and services across four main categories: 1) Mobile Money/Digital Finance, 2) Off-Grid Power, 3) Digital Technology-Enabled Education, and 4) E-Commerce and Technology Distribution.

To systematically and theoretically compare these candidates, Pineda-Escobar's (2025) "Framework for the Identification of Frugal Innovation" was applied. This framework evaluates cases across four dimensions: affordability, core functionality, contextual adaptability, and collaboration. Each case was reviewed through literature and publicly available documents, then scored relatively based on achievement across each dimension. The strength of each case's FI (Frugal Innovation) characteristics was subsequently confirmed through relative evaluation against these elements. As a result, among the nine cases, three organizations in particular demonstrated strong FI characteristics.

FI Feature	Criteria	1	2	Solar Lantern	4	5	6	7	8	9
Affordability and cost minimization	Cost reduction from a user or producer perspective	1	1	1	1	1	1	1	1	1
	Inexpensive / reasonably priced as compared to benchmark	0.5	1	1	0.5	0.5	1	0.5	1	0.5
	Ease of financial accessibility to the end user	1	1	1	0	0	1	0.5	1	0.5
	Minimization of resource use	0.5	1	1	1	0.5	0.5	0.5	0.5	1
Multiple actors and motivations Optimal design, function, and performance	Adequate quality for intended purpose	1	1	1	1	1	1	1	1	0.5
	Simplicity, Elimination of unnecessary features	1	1	1	0.5	0.5	1	1	1	1
	Ease of use throughout service life	0.5	0.5	1	0.5	0.5	1	0.5	0.5	0.5
	Sufficient functionality for intended purpose	1	0.5	1	1	0.5	1	1	1	1
Focus on a resource-constrained context.	Adapted by the producer to the contextual conditions of under(served) users	1	1	1	1	1	1	1	1	0.5
	Appropriate to the local context	1	1	1	1	1	1	1	1	0
	Available in the local market	0.5	1	1	0	0.5	0.5	0.5	0.5	0
	Acceptable by the intended users	1	1	1	0.5	0.5	1	1	1	1
Total		High: 10	High: 11	High: 11	Med: 8	Med: 7.5	High: 11	Med: 9.5	High: 10.5	Med: 7.5

Source: How to identify frugal innovation (Pineda-Escobar, 2025)

Figure 6 - Framework to compare nice cases (based on Pineda Escoba, 2025)

4.2.3 Negotiation

Following the scoring process using the FI evaluation framework, negotiations were conducted with the three organizations selected as final candidates to confirm the feasibility of research collaboration. Negotiations focused on the following points: 1) possibility of research collaboration, 2) access to research subjects, 3) feasibility of conducting interviews and observations, and 4) on-site fieldwork.

The responses from each organization revealed apparent differences. The first organization, which had been regarded as likely to possess FI characteristics during the literature review phase, was found to focus primarily on technical and software aspects such as programming and software development. It became apparent that conducting field surveys within the local community and accessing user groups would be challenging. The second organization demonstrated some willingness to cooperate with the research. Obtaining approval to conduct interviews with local agents and end-users proved challenging, leading to the conclusion that sufficient primary data collection would not be feasible. Finally, an organization operating a solar lantern rental business in Uganda formally agreed to cooperate after understanding the research objectives. This organization ensured access across multiple layers of Stakeholders, including business staff, local agents (kiosks), and end-users. It proved cooperative in facilitating local arrangements for the investigation, while also addressing ethical considerations. Given these conditions, it was eventually determined that fieldwork in Uganda would enable a multifaceted understanding of the formation and maintenance of Frugality. Consequently, this organization was selected as the case study.

4.3 Data Collections

4.3.1 Fieldwork Overview

Survey Period: August 11–31, 2025

Survey Base: Kampala, Uganda (capital city)

Overall Survey Design and Preparatory Work:

- Target identification and listing
- Alignment of research objectives and confirmation of the feasibility scope
- Development of interview guide (finalizing questions and obtaining prior approval)

4.3.2 Research Subjects

1. Service Providers

Table 2 - List of Interview Participants (Service Providers)

ID	Position / Role (anonymized)	Main Responsibilities (summary)
Staff-01	Hardware / Technology Engineer	Maintenance and repair of lanterns; management of return/repair flow; quality assurance.
Staff-02	HR Manager	HR policy coordination across African offices; recruitment systems; performance management.
Staff-03	Global (Africa) Management	Oversees (Africa) multi-country operations; bridges African country offices and HQ; strategic development.

Staff-04	Operations Manager	Supervises regional leaders, customer care, and supply chain; responsible for daily operations.
Staff-05	Customer Support Team Leader	Manages call center; supports agents; collects field feedback; addresses technical and business issues.
Staff-06	Supply Chain Leader	Import, storage, and distribution of lanterns; inventory control; coordination with repair teams.
Staff-07	Regional Leader (Central / Kampala/ Field Operations)	Manages Local Agents, monitors utilization; organizes local promotions.
Staff-08	Accountant	Bookkeeping, bank and sales reconciliation, tax and audit preparation.
Staff-09	Corporate / Administration Manager	Oversees finance, HR, administration; contributes to policy and compliance.
Staff-10	General Manager (Uganda)	Overall responsibility for Uganda operations and performance.
Staff-11	Regional Leader (Northern Region/ Field Operations)	Manages Local Agents in Northern Uganda; addresses contextual challenges.
Staff-12	Regional Leader (Nile / West Nile Region/ Field Operations)	Manages Local Agents in Nile area; coordinates seasonal use (e.g., white ants, farming).
Staff-13	Regional Leader (Western Region/ Field Operations)	Supervises Western region; monitors sales, supports agents, handles logistics.

2. Local Agents (Kiosks)

Table 3 - List of Interview Participants (Local Agents)

#	Name of the Market/Place	Explanation
1	Dungri Rd, Kampala	Located southeast of Kampala's central business district, close to the main arterial road (Jinja Rd). The area is a mixed-use urban zone with residences, small offices, and shops. There is a steady flow of people for commuting and shopping. Traffic congestion with cars and motorcycles is common, making this a typical inner-city living and working environment.
2	Kibuli-Okiling Village	This settlement extends around Kibuli Hill, where mosques and schools are concentrated. It is a long-established residential neighborhood with a strong sense of community. Small shops line the roadside, walking is the dominant mode of movement, and residents' social ties are visible in daily interactions.
3	Kabalagala	One of Kampala's known nightlife hubs, with restaurants, bars, and clubs concentrated along the main roads. During the day, it is a busy commercial corridor, while at night, numerous street vendors appear, selling food and daily necessities. Their locations and stalls are fluid, changing frequently. The roads are paved and constantly crowded with both pedestrians and vehicles, creating a vibrant, energetic atmosphere.
4	Gaba Market	A lakeside market situated on the shores of Lake Victoria. Fresh fish are landed here and traded, attracting not only local residents but also restaurant operators from across the city. The area is busy with trucks and cars entering and leaving, and constant pedestrian movement. The market serves as a vital link between fishing activities and urban consumption.
5	Kireka	A suburban residential area located to the east of the city center. It is remote from the bustle of the main highways, giving parts of it a calm atmosphere. However, informal housing is also present in the surrounding area, and living conditions vary significantly from block to block. Small shops line the main road, which serves as a transport corridor connecting Jinja with Kampala.

6	Kinawataka Rd, Mbuya	Situated along a major road running through the Mbuya hill area. Agent businesses (such as mobile money or telecom outlets) are located here, benefiting from good roadside visibility. Nearby is a small local market, with street vendors extending their stalls along the roadside. Foot traffic is constant, and everyday transactions make this a lively commercial stretch.
7	Banda Market	A major market situated along the arterial road running east from central Kampala. It offers a wide range of products, including vegetables, fruits, and meat, and serves both wholesale and retail functions. The surrounding area contains universities and residential neighborhoods, so the market caters to students as well as local households. Inside, the market is consistently crowded and serves as one of the city's key food supply hubs.
8	Nakawa Market	
9	Kalerwe Market	One of Kampala's largest markets occupies a vast area where produce, grains, meat, and fish are sold. It is an important wholesale point for small and medium traders, thanks to its low prices and bulk availability. The market is directly connected to major roads (Gayaza Rd and the Northern Bypass), giving it accessibility but also causing frequent congestion and heavy traffic. With multiple entrances, different zones within the market are devoted to wholesale and retail activities.
10	Kalerwe Market	



Figure 7 - Map of interview sites and Agent locations

3. End Users

Table 4 - List of Interview Participants (End Users)

User's ID	Gender	Age	Location	Main Activity
User-01	Male	20th	Dungri Rd, Kampala	Street vendor (selling chapati and other snacks on the roadside)
User-02	Male	70th	Dungri Rd, Kampala	Street vendor (selling chapati and other snacks on the roadside)
User-03	Female	10th	Kibuli-Okiling Village	Providing Mobile Money services as an agent (cash-in, cash-out, transfers) through MTN and Airtel
User-04	Female	50th	Kibuli-Okiling Village	Vendor of locally grown agricultural produce
User-05	Male	10~20th	Kabalagala	Charcoal trader (retail/wholesale)
User-06	Male	10th	Kabalagala	Street food seller (chapati, eggs, chicken)
User-07	Male	20th	Kabalagala	Street food vendor (grilled meat)
User-08	Female	60th	Gaba Market	Foodstuff trader (mainly vegetables and rice)
User-09	Male and Female (father and daughter)	-	Gaba Market	Foodstuff trader (mainly vegetables and fruits)
User-10	Female	70th	Kireka	Engaged in tailoring and selling clothes

4.3.3 Interview Format and Method

Semi-structured interviews: Interviews in this study were conducted according to a pre-prepared question guide, with the order of questions and follow-up inquiries adjusted flexibly based on the respondent's narrative, context, and position. This method was adopted to capture subjective experiences, such as the demand for and interpretation of Frugal Innovation, while respecting respondents' free expression and achieving coverage of specific themes, thereby enabling cross-cutting evaluation.

Language: English was used as the primary language of communication. English is widely used as an official language in Uganda, and many people, especially in urban areas, understand and use it daily, regardless of whether they are higher education graduates or professionals. Consequently, communication in English was generally possible not only with the Service Provider but also during interviews with Local Agents and residents. However, during actual

interactions on-site, especially in some resident interviews, situations arose where simpler expressions or rephrasing were requested. Additionally, in a few cases, responses in Luganda were necessary. In such instances, local staff accompanied by interpreters provided simultaneous interpretation to ensure clarity and prevent misunderstandings.

Duration: Interview duration varied by target group. For Provicers, time was secured within the office during work breaks, allowing for approximately 60-minute interviews per person. This format enabled the elicitation of detailed information regarding organizational strategy and operational management, as well as follow-up questions addressing new queries arising from interviewee statements. In contrast, interviews with Local Agents and End Users were primarily conducted in the field at their usual activity locations (like in front of shops, outdoor spaces). As interviewees participated while managing their daily operations, these interviews were conducted within 15 to 25 minutes.

Method: Face-to-face interviews for the primary survey were conducted from a base in Kampala, the capital. For some regions (apart from Kampala), insights were gathered through Service Provider (Regional Leaders), who are primarily responsible for each regional area. The number of interviews conducted was as follows:

- Service Provider: 13
- Local Agents: 10
- End Users: 10

Recording Method: All interviews were recorded using an IC recorder with participants' consent. Following the survey, the recordings were transcribed to reproduce the spoken content as accurately as possible. The transcriptions were organized into Excel and Word files, tagged with a number, date, participant attributes (gender, age, occupation), and location for management purposes.

4.4 Data Processing and Analysis

In this study, interview transcripts were imported into the analysis software ATLAS.ti for systematic analysis. The following sections describe the analytical framework, coding strategy, and systematization of insights derived from the codes.

Analyst tool: The use of ATLAS.TI enabled efficient processing of relatively extensive interview transcripts, facilitating coding, comparison, co-occurrence analysis, and visualization of relationships.

Coding: The coding process employed a combination of deductive and inductive approaches. Deductively, initial codes were established based on the research questions and the Frugal Innovation identification framework, enabling data reading aligned with the theoretical framework. Inductively, newly acquired insights from interviews and field research were extracted, and codes were assigned to themes that did not fit within the existing theoretical framework. This dual strategy enabled not only theoretical validation but also the simultaneous discovery of new insights emerging from the field.

4.5 Ethical Considerations

This research was conducted with careful attention to research ethics. Particular consideration was given to obtaining informed consent (verbally), ensuring anonymity and privacy, and minimizing participant burden.

Informed consent: All interviewees were informed of the study's purpose, assured of anonymity, and informed of the voluntary nature of their participation prior to the interviews. It was clearly communicated that participation, refusal, or withdrawal at any time was entirely voluntary and would not result in any disadvantage. All recordings were conducted only after obtaining prior consent from participants.

Anonymity and privacy: During the transcription stage, information that could enable personal identification (such as names and addresses) was coded to maintain anonymity. Provider staff were assigned anonymous codes, such as Staff A, B, and C; Local Agents were designated as Agent 1, 2, and 3; and End Users Were Labeled as User 1, 2, and 3.

Minimizing participant burden: The survey prioritized minimizing disruption to participants' daily lives and work. For Provider staff, interviews were conducted after securing appointments in advance, ensuring they took place during times that did not interfere with work. Participants were also informed beforehand that they could prioritize work at any time should urgent tasks arise, thereby reducing their burden. For on-site interviews with Local Agents and End Users,

interview schedules were flexibly adjusted to accommodate the flow of their daily work and lives. Interviews were shortened or concluded based on time and circumstances, adapting to local conditions. These considerations allowed natural narratives to be elicited without disrupting business operations or daily activities.

4.6 Limitations

Regional research constraints: The research was conducted mainly from a base in the capital, Kampala. Insights regarding regional areas were gathered through the Provider, especially the Regional Leaders responsible for each region. Consequently, the data may reflect certain biases related to Uganda's national diversity and regional-specific circumstances.

Constraints on access to respondents: Interviews were limited to Agents and Users currently utilizing the service of this case. As a result, the perspectives of those who discontinued use (dropouts) or those who never had access to the service from the outset are not reflected. This represents a limitation in understanding patterns of service uptake and sustainability.

Research environment constraints: This study was conducted in highly localized settings within Uganda. Walking through the field often drew some attention from residents, and the presence of outsiders may have influenced participants' statements and the overall research atmosphere.

4.7 Feedback Seminar

A feedback seminar was held within the university to organize insights gained from fieldwork and initial analysis results, and to discuss the research direction. This session included the Supervising Professor, Second Reader, and peer discussants. The seminar yielded constructive comments and advice regarding the fieldwork outcomes, analytical focus, overall thesis structure, and connections to the conceptual framework of Frugality. These discussions provided an opportunity to reexamine the consistency between empirical data and the theoretical framework, also helping to organize and clarify the analytical focus. This process served as an important reflective opportunity to reassess the validity of data interpretation and clarify the overall argument of the research. Specifically, based on suggestions from participants, the theoretical positioning and conceptual interpretation of Frugal Innovation within this study were rearranged. The outcomes of this re-examination have contributed to clarifying the analytical approach and theoretical organization in subsequent chapters.

Chapter 5 Findings

This chapter explores how Frugal Innovation (FI) is interpreted and shaped through everyday practice in Ugandan communities, drawing on insights gained from field research. The solar lantern rental business relies on product development and manufacturing outside Uganda, it has evolved through adjustment to local living conditions. Local Agents and Users sustained the service's ongoing functionality through everyday practices such as adjusting payment methods, conducting repairs, sharing, and reusing products. These observations suggest that, within the scope of this case, Frugality was not confined to a product's origin or design phase. It was possible to understand it as socially reconfigured through processes of use and relationship-building.

In Uganda, I observed large quantities of inexpensive plastic products and daily necessities imported from overseas being circulated throughout the country. It reveals that "being inexpensive" does not necessarily equate to sustainable value anymore. Within these circumstances, however, this case was not merely introducing foreign products; it was incorporating new social value through the practices of local residents' use and management. In other words, Frugality in this case study is gradually constructed within the process of people continuing to use existing systems and products while adapting them. This chapter's analysis is based on 33 semi-structured interviews and field observation data concerning the solar lantern rental business in Uganda. Drawing on these, how Frugality is reconstructed across multiple dimensions, service operation, relational dynamics, and social practices, from the following four perspectives:

5.1 Frugal Innovation within the Service Model

5.2 Social Construction of Affordability

5.3 Everyday Livelihoods in Uganda

5.4 Diffusion

5.1 Frugal Innovation within the Service Model

Figure 8 (Service delivery flow) provides an analytical illustration of the flow from product design and manufacturing to delivery to End Users, reflecting the case study. It also highlights the key actors, relationships, and processes that emerge throughout the process. Examining the entire service scheme reveals that elements of Frugal Innovation (FI) are not uniformly dispersed throughout the system. Importantly, Frugal and non-Frugal elements

interact to shape the overall structure. Green circles in the figure indicate stages where Frugal practices were recognized, while white circles represent non-Frugal elements. This section clarifies how these elements are positioned and how they mutually influence each other, based on the framework presented in Figure 8 below.

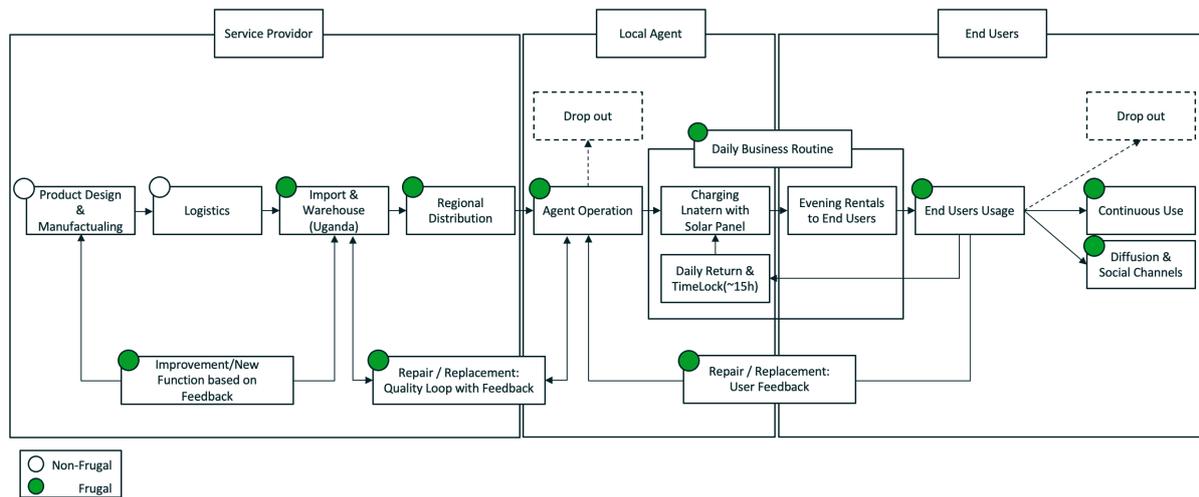


Figure 8 - Service delivery flow of this case study

If the fundamental definition of Frugal Innovation emphasizes that creative innovation should be based on local knowledge, constraints, and resources, this case could potentially fall outside its scope (Chakravarty & Gómez, 2024). However, observations gathered during this field research suggest that the essence of Frugality may not be confined solely to the production site or technological origins. It was also identified within the mechanisms of everyday practices at the community level, such as mutual learning and feedback, repair, and adaptation. Within this service scheme, product refinement and quality improvement are continuously progressed through a cycle of use, repair, and feedback within Uganda. This implies that Frugality in this case can be possibly understood as something that emerges within the processes of operation and improvement. This product is manufactured abroad, but it has the opportunity to acquire Frugal characteristics through local operational practices and relationship building. In this sense, innovation holds the potential to expand from the production site to the operational site. The following section examines this mechanism of Frugality from two aspects:

5.1.1 Resource circulation through local repair and reuse

5.1.2 Knowledge circulation through usage feedback

5.1.1 Resource Circulation through Local Repair and Reuse

This section, as shown in Figure 8, focuses on the domestic processes of repair and redeployment. These locally based mechanisms are essential to maintain the continuous and sustainable service of this lantern business in Uganda. The operation of this project within Uganda, as well as its repair and redeployment mechanisms, play a crucial role in supporting the overall sustainability of the service. Products are manufactured outside Uganda, then imported, registered, and inspected at the headquarters (HQ) in Kampala. They are subsequently distributed to regional warehouses located across approximately ten regions in Uganda, with each warehouse serving as a logistics hub. These regional warehouses perform product inspections, minor repairs, and refurbishment of products.

The Provider supplies lanterns to Local Agents (kiosks), and the Agents lend the lanterns to End-Users as part of their product offerings. If a lantern malfunctions or breaks down, it will be returned to the regional warehouse via the Agent. Regional warehouses perform local repairs, such as battery replacement and socket cleaning. Units requiring more complex repairs are sent to headquarters, where the technical team refurbishes and recalibrates them before returning the repaired units to regional warehouses for redeployment in the field.

"When a lantern breaks, we first take it back to the warehouse. They check if it can be fixed there. If not, it goes to Kampala. We redeploy repaired units quickly—about 800 per month."—
Technical Officer (HQ Kampala)

In addition to this breakdown response, a regular maintenance process is also established. Entire product lots are collected and inspected at regular intervals to verify battery life, brightness, socket condition, and other factors, with parts replacement or readjustment performed as necessary. All these processes are completed within Uganda and handled by the local technical team. This repair and redeployment structure creates a system that enables sustained, long-term use of products. Repaired lanterns are returned to the market and confirmed to be repeatedly used by multiple users in different locations and time periods. This cyclical usage mechanism supports not only cost reduction but also the development of maintenance capabilities by the local technical team and the sustainability of operations at the community level. Furthermore, the insights gained during use and the feedback obtained from users through these mechanisms were utilized not merely as repair information, but as a knowledge resource supporting the improvement of the entire product and service. The

following section focuses on this cycle of knowledge based on usage experience and examines its specific mechanisms.

5.1.2 Circulation of Knowledge

Among the service schemes shown in Figure 8, the focus is on usage feedback and the learning process, particularly from the ground up. User experiences and product failure reports are treated not simply as usage records but as valuable information for improvement. A system is in place where Local Agents collect customer opinions through daily operations and share them with headquarters (HQ) and suppliers.

"We collect feedback from agents and customers—like complaints about brightness or battery duration—and share this with HQ. Sometimes, improving one aspect can make another worse. For example, if we make the light brighter, the battery lasts for a shorter time. But that helps us balance what users really need."— Supply Chain Manager (Kampala HQ)

This feedback was accumulated not only as numerical data but also as knowledge about field experience and usage contexts. User feedback regarding light intensity, battery life, and usage environments was regularly communicated to HQ, serving as a reference for future design and improvement decisions.

"We do not just repair; we strive to understand the root cause of failures. Sometimes, it is usage issues; other times, it is dust or charging habits. We accumulate these insights before resending."— Technical Officer (Headquarters, Kampala)

Thus, the repair and maintenance process are a mechanism for identifying failure factors and preventing recurrence. Consequently, Frugality in this case study was observed not as a low product cost or simplified technical design but as a characteristic formed through service-based repair, redeployment, and improvement. A key feature of this case is that product value is continuously recreated and updated through local operation, while the entire service dynamically evolves through feedback-driven learning.

The analysis in this section reveals that repair and reuse practices, along with the accumulation of usage feedback, function not merely to extend product lifespan but as a foundation for the learning-based evolution of the entire service. The following section

examines how such Frugality practices are linked to the construction of Affordability and Accessibility within local communities.

5.2 Social Construction of Affordability

Affordability is one of the core concepts constituting Frugal Innovation (FI). Generally, affordability refers to "the state of being cheap enough for people to be able to buy" (Cambridge Dictionary). Within the FI context, affordability has long been discussed primarily from the perspective of cost minimization while maintaining core functionality (Weyrauch & Herstatt, 2016). In these studies, affordability is primarily explained as a result of cost minimization, encompassing both (1) optimizing resource use in product design and manufacturing processes (producer perspective) and (2) setting prices and providing access methods that consumers can afford (user perspective) (Pineda-Escobar, Marchi, and Knorringer, 2023, pp. 376–377). Therefore, affordability can be understood as a concept bridging both production and usage aspects.

However, this reflection focuses specifically on the user-side affordability. Particularly, since the product in this case has its substantive design and manufacturing bases outside Uganda, it is not possible to directly address discussions concerning the production stage, such as manufacturing cost reduction or resource efficiency. Hence, this focuses on how people make payments work within the local economic structure. Field research revealed that affordability in this case is not reducible to the attribute of low price. Instead, within limited resources and unstable incomes, users, agents, and service providers socially create a "state of being able to pay" through mutual understanding and flexible transaction practices. This section recognizes this type of Affordability as a Payment, which is fulfilled through a social process. It analyzes its structure from two aspects: 1) Payment, and 2) Temporal Rhythm & Selective Use (payment rhythm and flexibility). This approach reveals how the sense of "being able to pay" was formed within everyday actions and judgments.

5.2.1 Payment

Among the elements constituting affordability, we first focus on price. This section examines how the rental lantern price was positioned within local living standards, how people perceived it as a payable expense, and how they made that payment feasible within their daily practices. Field research revealed that users prioritized the practical feasibility of aligning payments with their daily income flow over the "cheapness" of the price itself. The rental fee

for a lantern was approximately 600 UGX (about 0.16 EUR) per day, which is the standard price adopted nationwide by the Provider (*note). Interviews revealed that this amount falls within the realistic range, considering the local standard of living and the income structure of small businesses. Many users assessed the price by the relative criterion of whether payment was possible within their daily earnings. The ability to complete payment based on daily sales and avoid carrying debt into the next day was highly valued.

"The price is fine. It is manageable for my business." (User-07)

This perception suggests that the price is understood not merely as a numerical value but as part of a mechanism for maintaining an "affordable state" within daily life. The amount of 600 UGX was naturally accepted as an expense within the range of daily living costs, being lower than the price of a single chapati (approximately 1,000 UGX) or a short-distance Boda Boda ride (approximately 2,000 UGX). Furthermore, the median per capita food expenditure in urban Kampala is approximately 2,500 UGX/day (Hemerijckx et al., 2022, p. 684), suggesting that this price level is realistically acceptable within daily expenditures.

Table 5 - Reference Living Expenses in urban Uganda

Category	Item	Typical Price (UGX)
Transport	Boda Boda (Motorcycle Taxi)	1km = 2,000 UGX
		5km = 10,000 UGX
		10km = 20,000 UGX
	Taxi/Matatu (shared minibus)	1km = 1,000 UGX 5km = 5,000 UGX 10km = 10,000 UGX
Street Food	Chapati	1,000 UGX
	Rolex (Typical Ugandan Street Food, which is chapati with egg)	2,000 – 5,000 UGX
Meal	Lunch / Dinner	10,000 UGX – 15,000 UGX
Water	Bottled Water (500ml)	1,000 UGX
	20L bottled for Drinking Water	48,000 UGX
	Refilling	7,000 UGX
	40L Jerrycan for Domestic Use	500 UGX

The lantern price was set at a level that was manageable within daily earnings, leading to many positive comments about the price during interviews with End-Users. Before the introduction of electricity, many users relied on kerosene lamps or candles as their primary source of lighting. These were recognized as carrying ongoing fuel costs, health hazards from smoke, and fire risks. Indeed, comments such as "Buying kerosene or candles every day is a heavy burden and unsustainable" and "Those types of lightning sources are dangerous" were heard.

In contrast, renting solar lanterns was accepted as an option that provided sufficient brightness for a small daily payment of 600 UGX while reducing concerns about fuel costs and safety. This amount was less burdensome compared to the typical local expenses for kerosene lamps or candles (2,000–6,000 UGX per night), functioning as a price that was "realistically affordable" within daily cash flow.

Table 6 - Comparison of Lighting Options

Type	Average Cost	Duration	Health / Safety Impact
Kerosene Lamp	Lamp: ~1,000 UGX Fuel: ~5,500 UGX/L	About one night (using ~0.5 L)	Emits harmful black smoke; fire hazard
Candle	~500–600 UGX per piece (needed some per night)	Does not last the whole night	Fire hazard; limited light
Solar Lantern	600 UGX per day (rental)	Full night lighting when charged	No smoke or fire risk

"The price is fair. It is affordable." (User-09)

In the context of Frugal Innovation, affordability has often been understood as the "outcome of price reduction" or the "result of cost cutting." However, this study revealed that it functions not merely as a low price itself, but in conjunction with the social and economic conditions that enable payment. That is, affordability in this case can be understood not as "price itself" within FI but as the social relational mechanisms that enable payment through the price as a mediator.

(*note: while 600 UGX was generally used as the standard price, it was sometimes set around 800 UGX depending on the lantern model and regional settings)

5.2.2 Payment Rhythm

Field research observed many individuals living within the so-called daily earning economy, including street vendors, open-air stall sellers, boda boda (motorcycle taxi) drivers, and others. For many, their daily earnings directly funded their daily living expenses, with

income fluctuating based on factors such as weather and market day crowds. Consequently, planning payments based on the assumption of stable monthly income was difficult. In this context, the timing element, when they could pay, determined affordability.

In the daily earning economy, not only is income settled daily, but the very sense of time is restructured on a daily basis. Business operations and payments cycled within the day, from morning to night, embedding the rhythm of economic activity directly into the rhythm of daily life. The rental lantern service in this case operated primarily on a "daily rental" basis, where lanterns were borrowed in the evening and returned the next morning, creating a cycle where payment and use were completed within a single day. The devices required recharging after roughly one night's use, naturally establishing a rhythm where "the day of use = the day of payment" within daily life.

"Some people use it every day, others only a few days a week or when the power goes off."
(Users-02, 08, 09)

Usage frequency varied according to livelihood and daily cycles. Specifically, the following patterns were observed:

- Street vendors who borrowed daily without fail (cases operating nightly as routine)
- About 3 days a week (cases used only on days their own shop was open)
- Only on market days (cases where it was used only on days with expected foot traffic)
- Only during power outages (cases where it was used only during outages, which occur frequently even in areas that usually have access to electricity in urban areas)

These behaviors were not merely differences in usage frequency; they exemplified practices where users selected "days they could afford to pay" based on their income situation and demand. Affordability did not exist as a fixed institutional mechanism, but rather as a dynamic relationship reconstructed daily through the users' own judgments and actions.

"Customers can rent only on the days they need it." (Staff-01)

In other words, this payment structure of the rental functioned as a means for End Users facing income instability to maintain a flexible payment situation. Unstable costs, where expenditure occurs only on days of demand or income, were routinely observed, and avoiding the burden

of fixed costs underpinned the achievement of affordability. However, some Users and Agents also mentioned a desire to purchase (owning a lantern).

"I would like to own a lantern. ... It would be good to have the option to buy." (Users-09)

Ownership was considered, and expectations of stability, independence, and freedom of use. However, through interactions with Agents and Provider, End Users gradually came to understand the rationality of renting. Ownership carries risks such as high initial costs and the burden of repairs when things break. Rental, on the other hand, offers immediate replacements or repairs when things break and the ease of paying just for the day you use it. Hearing these explanations, many users came to agree that renting was a better fit for their lives. In other words, a system synchronized with the rhythm of the day-to-day economy functioned as the foundation for creating a situation where they could "afford" it, day after day.

5.3 Everyday Livelihoods in Uganda

This section clarifies how products incorporating elements of Frugal Innovation (FI) connect with the daily activities and livelihoods of Ugandans. This case is characterized by how products designed abroad are integrated into local life practices. Therefore, this study focuses not on the Frugality of the product itself but on how that product is used, given meaning, and reconstructed within local contexts and life practices. In other words, it examines how FI products are incorporated into people's livelihoods, time, and social relationships, manifesting as part of their daily lives. The analysis is structured around three perspectives:

5.3.1 User attributes and usage patterns within the market

5.3.2 The impact of light on livelihood activities

5.3.3 Diversification of usage and social/cultural expansion

5.3.1 User Attributes and Market Conditions

This section reviews how the product is integrated into local economic activities by analyzing the primary user groups of the lantern and its actual usage patterns in the market. Lantern users in this case are primarily for business use, which accounts for approximately 60%. The primary users are street vendors and small-scale traders operating in night markets, for whom light is an essential resource to sustain their daily operations. Many users visit a nearby Local Agent (kiosk) around 5–6 PM to rent a lantern for nighttime business operations,

returning it the following morning. The usage pattern had become established as a daily cycle: borrow → use → reuse at home → return (in most cases). Field observations revealed that in Kampala's primary markets (such as Kalerwe Market and Nakawa Market), the entire street was surrounded and spread with countless small lights at sunset, with the nighttime economic activity itself shaped by light. Amidst the mingling of people's voices, motorcycle and car engines, and music, the entire market pulsated with the interplay of light and sound. Along the pavement and roads, street vendors lined up, displaying their goods on the ground. Each secured their own "territory" to sell fruits, clothing, food, sundries, and more. Lanterns were used throughout these stalls, positioned by vendors to illuminate their goods. Meanwhile, vendors without lanterns continued selling while holding cell phone lights in one hand. Also, someone has tied small flashlights to their heads with strings. Some vendors operating food stalls had their own power sources, but these were very limited.

This market scene reveals how individual lights, gathering together within fragile urban power infrastructure, collectively form the economic space of the night. In some locations, the headlights of cars and motorcycles traveling along main roads serve as temporary substitutes for lighting. However, under elevated roads or in deep alleyways where external light cannot reach, lanterns become the sole source of illumination. In such a space, the ability to secure light became a decisive factor in retaining customers, continuing sales, and ultimately determining daily income. Besides, interviews with Agents revealed that power outages are the primary factor impacting demand for lanterns. Frequent blackouts occur in many areas, including city centers. During these outages, even households and shops that typically use electricity see an increase in people seeking to borrow lanterns. Consequently, large numbers of users gather at the locations of Local Agents within a short time, causing demand to surge. One Agent stated:



Figure 9 - Local market scenes using lantern (taken by author)

"When power goes off, people come quickly to borrow. Even those who usually have electricity need it for that night." (Agent-03, Kabalagala)

It shows that the lantern functions as a supplementary form of essential infrastructure under unstable power conditions, even in electrified areas. It also illustrates potential characteristics of operational Frugality, demonstrating how a simple device can be integrated into local systems to sustain everyday life under resource constraints.

5.3.2 Time and Income

The introduction of lanterns brought significant changes to people's activity times and income rhythms. For street vendors, who make up the majority of this lantern user, thanks to the lantern, they can expand their operating hours even after sunset, which has a direct impact on their livelihoods. Many vendors share the comment that they can extend operating hours by two to three hours after implementing lanterns, whereas previously they would close at sunset.

"Before, I closed at 7. Now I can stay until 10 because of the light." (End User #05, Street Vendor)



Figure 10 - Local market scenes using lantern (taken by author)

This extended period was associated with increased daily income, which in turn affected the ability to cover daily food expenses and secure funds for restocking. Many vendors paid part of their daily earnings from that day's business as the next day's lantern rental fee, sustaining their livelihoods within this "daily earning cycle." This cycle was not just a payment mechanism; it represented a structure for reproducing livelihoods. Nighttime lighting enabled securing income for that day, and that income enabled operating the next day. Using lanterns extended the hours of nighttime activity, and the resulting income then supported the next day's operation, creating a self-sustaining cycle. Through field research, it was observed that women participate in small-scale commerce in the marketplaces of Uganda. Within the interview, Staff indicate that female workers often participate in the retail trade in markets, occupying a crucial position, particularly in daily commerce, such as selling vegetables and foodstuffs to earn a daily income. For these female

vendors, lanterns served as both a practical tool, enabling them to continue working at night, and a crucial factor affecting their household income. Lantern use functioned not merely as a means to extend working hours but as a mechanism supporting the daily cycle: extended time → increased income → reinvestment the next day. This confirmed how users could sustain their livelihoods within limited resources and unstable income conditions.

5.3.3 Social and Cultural Usage

It was confirmed that lantern usage extends beyond commercial and domestic spheres into social and cultural activities within local communities. There is a comment that lanterns are employed as a lighting source for nighttime events held locally, such as gatherings, funerals, and weddings. According to interviews with the Agent and Provider Staff, during such events, the number of rentals typically increases, sometimes reaching 20 to 30 units at once. In these activities, lighting is an essential condition for people to gather. It was confirmed that lanterns function as social infrastructure supporting collaborative community activities and engagement.

Moreover, practices utilizing light are widely observed in livelihood sectors such as fishing and agriculture. In southern Uganda, where Lake Victoria and other lakes and marshes are abundant, fishing plays a significant role in the local economy. In these areas, traditional fishing methods exist in which fishermen use light at night to gather fish; a common technique involves illuminating the water surface to attract and capture small fish. This use of light develops by combining existing knowledge rooted in the natural environment with lighting technologies that have become more widespread in recent years.

Meanwhile, in Uganda, it has been governmental regulations on light-based fishing methods, with their social and environmental impacts. At the time of the survey, the Provider, considering this situation, was preparing to introduce Fishing Light under government certification that meets environmental and safety standards, as well as alignment with government agencies. This suggests how Frugality may manifest as a practice through coordination with social systems.

In northern Uganda, lantern use was observed within specific local cultural practices. According to Staff #12, this region has a culture of consuming termites. During the rainy season (from May to June), traditional nighttime harvesting is conducted using light to attract and collect flying termites. Residents place lanterns over pits dug in the ground or containers filled with Water to capture White Ants attracted by the light. While campfires or small flashlights were traditionally used, reports indicate that introducing lanterns has stabilized illumination and improved work efficiency. This usage demonstrates that the product is not merely a lighting

device but is integrated into local life and customs, used in conjunction with existing knowledge and practices. These observations confirm that Frugality is implemented through the process by which users devise ways to use it within their own life contexts and assign meaning to it.

5.4 Diffusion

This section organizes findings on how the solar rental lanterns in this case were introduced within the local community, the pathways through which they diffused, and the challenges encountered during their operational phase. The "diffusion" discussed here extends beyond the process of a product spreading as a result of sales and technology introduction, as well as its acceptance and sharing within the context of everyday relationships within the local community.

5.4.1 Free Trial

During the initial introduction phase, emphasis was placed on reducing the psychological and financial burden for users accepting the new product. According to local staff testimony, a model was adopted in which the first and second uses were free, with payment required starting from the third use. This mechanism allowed users to test the product in their actual living environment without incurring an initial investment, providing them with an opportunity to verify its convenience.

"At first, they could use it for free twice, just to try it out. Then they started to pay after they saw the benefit."(Staff-04)

5.4.2 Word-of-mouth

Field research confirmed that lantern adoption spread through observation among the community and word of mouth within local social networks, rather than through advertising or large-scale campaigns. In Uganda, street vendors and small business owners gather around agents (kiosks), building mutual trust through daily interactions. These existing local community networks served as intermediaries, facilitating information sharing among users and encouraging trial use of the service.

"When the solar lantern service was first introduced in this area, there was a night promotion. The lanterns were kept by the area chairman, who is a trusted local leader. He explained to

residents that the lanterns were available for hire, so people in the neighborhood started using them” (User-04, Kibuli-Okiling Village)

Users understood the convenience by "seeing others use it" and then took the action to try it themselves. Thus, the product's adoption was supported by individual user experiences and trust built on everyday relationships.

"People see others using it at night and then come to ask for it themselves. It spread by word of mouth." (Agent-06, Kinawataka rd, Mbuya)

On the other hand, this decentralized and flexible system also carried operational challenges and vulnerabilities. Field research revealed reports from management (Staff) that fraudulent activities by agents had occurred in several regions. The most common case cited involved Local Agents charging customers higher amounts than the standard rates set by the Provider, pocketing the difference privately. Since all transactions with End Users occur through Local Agents, the structure appears inherently prone to such fraud. In response, it was reported that Staff deployed in each region monitor transaction status daily and take measures such as contract termination when fraud is confirmed. Local Agent also highlighted operational challenges arising from customer behavior. Specifically, cases were identified in which some users retained lanterns without returning them or returned them late. One Agent stated,

"Sometimes customers keep the lanterns without returning them, which is difficult to handle" (Agent-07),

while another Agent noted, "Late returns impact the next day's rentals" (Agent-04).

Multiple Agents mentioned they could not strongly urge Users to return items promptly. This is because they need to maintain ongoing trust with customers and community connections. In other words, for Agents, prioritizing long-term relationship maintenance often outweighs enforcing short-term discipline. While this supports operational flexibility, it also presents challenges in coordination. These cases arose from the service's structure, in which operations are autonomously managed locally and transactions occur within daily face-to-face relationships. While operational flexibility enables responses tailored to local realities, it also suggests that insufficient information sharing and management systems can create conditions

apt to fraud and disputes. These challenges emerged as another aspect of the mechanism through which the product spreads via networks rooted in local communities.

The above analysis reveals that the introduction and diffusion of solar rental lanterns do not proceed unidirectionally based solely on product characteristics or sales strategies. Instead, they are formed and unfold within relationships rooted in local communities and through everyday practices. The following chapter examines the characteristics and implications of this diffusion process by analyzing it with theoretical frameworks.

Conclusion of Findings

This chapter has revealed how elements of Frugal Innovation are formed within the local operations, usage, and relationships of a solar lantern rental business in Uganda. Through repair and reuse, flexible payment options, integration into daily livelihood activities, and word-of-mouth dissemination, this case offers insight into how Frugality is dynamically constructed within community-based practices.

Chapter 6 Discussion

This chapter discusses how this case generates and functions within Frugality in a social context, connecting Frugal Innovation (FI) with existing theoretical frameworks and building on previous findings. Although the product itself revealed limited Frugal characteristics, this case study observed a process in which people creatively overcame constraints through usage and collaborative practices. Focusing on this dynamic, we examine how Frugality is socially formed within everyday practices from the following four perspectives.

6.1 Reflection of the Research Process: Reflect on the research process to trace how our understanding of Frugal Innovation evolved.

6.2 Diffusion and Local Mediation: Examine how Frugal Innovation diffused through social relations by focusing on the product's dissemination process.

6.3 The Informal Urban Economy and Extension of Work: Clarify how Frugal Innovation contributes to livelihood maintenance and the extension of work within the informal urban economy.

6.4 Gender and Inclusion: explore the social impacts of Frugal Innovation from the perspective of gender inclusion.

6.1 Reflection on the Research Process

When this research began, I believed the essence of Frugal Innovation (FI) lay in the low cost and functionality built into the product itself. My understanding was premised on product-driven innovation, in which inexpensive, simple technologies — such as solar lanterns — improve the quality of life in areas without access to electricity. However, fieldwork in Uganda revealed a different reality: the products under this research, like many contemporary examples, were developed and manufactured outside of Uganda, then entered the domestic market as imports. In other words, while positioned as products possessing Frugal characteristics, their design philosophy and pricing structure did not necessarily arise from the local life context or institutional conditions.

This is precisely why this research needed to focus less on the products themselves and more on how they are grasped and used under the local conditions. Actually, I observed the process by which locals shared products, repaired them, and integrated them into their daily life by continuing to use them. Within this process, we witnessed the rich forms of Frugal practice being discovered. This finding prompted a revision of initial assumptions, which led

to the understanding that Frugality, like in this case, might not be reducible to product attributes or design features alone. However, it could also have the possibility of being found within the everyday practices and social relationships that emerge through these as mediating elements.

This study does not deny the importance of fundamental components of products and design highlighted in existing Frugal Innovation research. Instead, building upon that theoretical basis, it offers a complementary view that clarifies how Frugality is reconfigured through the practices of local people. To achieve that, adopted the concept of context-dependent Frugality proposed by Pineda-Escobar (2025) as a theoretical foundation. This framework proved effective in understanding Frugality not as a universal standard of low cost or simplification but as something relatively formed within each region's institutional and cultural context. Through actual observations in Uganda, it was found that the context-adaptive Frugality takes concrete forms within local life structures and social relationships mentioned in this literature. For example, practices such as repairing and continuing to use lamps, as well as flexible payment arrangements between agents and customers, demonstrated the functioning of informal mutual support networks. These collaborative and non-institutional practices connect that Frugality is dynamically formed through people's interactions, not just brought into context. Therefore, the findings of this study imply the possibility of understanding Frugality both as an adaptive mechanism to context and as a practice co-generated through social relations, complementing Pineda's theory.

6.2 Diffusion and Local Mediation

This section reviews the process of introducing and diffusing solar-powered lanterns, referencing Rogers' (1995) Diffusion of Innovations theory. The diffusion process in this case was not driven by top-down diffusion, such as national institutions or market media. However, it was supported by relationships rooted in the local community and everyday practices. Rogers (1995) illustrates diffusion as the process by which an innovation is transmitted over time through specific channels among members of a social system (p. 5). His five-stage model (knowledge – persuasion – decision – implementation – confirmation) (pp. 20–21) provides a valuable framework for understanding the progression of adoption in this case.

The Free Trial system adopted in this case reduced users' suspicion of accepting new technology and provided an opportunity to verify the product's convenience within their actual living environment. This mechanism exemplifies the "trialability" that Rogers (1995) noted, in which the greater the degree to which an innovation can be tried out, the more likely it is to be adopted (p. 15). The natural progression



Figure 11 - Daily activities at Local Agent (kiosk) (taken by author)

users experienced through trial, understanding, acceptance, and adoption aligned with the theoretical process. Foremost to this process were Local Agents (Kiosks), people who operate retail kiosks within the community. They functioned as Rogers's "change agents," intermediaries who guide customers' adoption decisions toward the desired outcome (p. 28). They were not mere transaction intermediaries, but served as local social hubs, mediating trust through explanations of usage and payment assistance. The product's adoption progressed not through advertising or campaigns, but through visible usage and word of mouth. Lanterns glowing in night markets provided others with the opportunity to see for themselves the product's effectiveness, prompting them to consider its use. As one Agent put it:

"People see others using it at night and then come to ask for it themselves." (Agent-01)

This observation tells this phenomenon. As Rogers (1995) states, the more visible the results of an innovation are to others, the more it promotes diffusion (p. 16). This observability supported diffusion by mediating everyday learning and imitation. Therefore, diffusion in this case was not a top-down process via institutional channels, but rather a distributed and relational process through interpersonal channels. This networked diffusion structure illustrates how Frugal Innovation unfolded in this case, rooted in the social context, demonstrating a dynamic process in which Frugality is reconstructed within social relationships.

6.3 The Informal Urban Economy

The informal sector accounts for approximately 80% of Uganda's urban economy (Uganda Bureau of Statistics, 2023), with stable employment opportunities being extremely limited. The unemployment rate is particularly high among young people, despite those under

35 accounting for approximately 80% of the population. The formal sector lacks sufficient capacity to provide job opportunities to them. Even youths with educational attainment struggle to secure stable jobs; therefore, making side hustles a common means of supplementing their livelihoods (Unemployment and the Informal Economy in Uganda). Consequently, many people sustain their lives by combining small-scale, precarious jobs, such as street vending, boda-boda (motorcycle taxi services), and day labor. In this environment, securing sufficient working hours becomes a crucial factor for sustaining livelihoods. According to the Uganda Market Report (2020), while approximately 71% of market users operate into the night and 15% operate 24 hours a day, about 70% reported that lighting is insufficient. Nighttime activities are essential to the urban economy, yet have always carried risks related to safety and hygiene.

The solar lantern rental business introduced under these conditions functioned as a social infrastructure, enabling nighttime economic activity, not just as a technology providing light. Additionally, Interview results delivered multiple testimonies stating that securing lighting allowed them to extend store opening hours and continue working after sunset. This extension of work meant substantial income increases and expanded trading opportunities for those dependent on the daily earning economy. In other words, the introduction of these services functioned not as employment creation driven by higher-level institutions or policies but as a livelihood foundation built through community interactions. Indeed, the entire process of lending, returning, collecting payments, and repairing lanterns involved a diverse range of individuals. These activities went beyond mere consumption, generating small-scale job opportunities and income circulation within the community. For instance, Agents handling lending and collections, Local Vendors extending their business hours using nighttime lighting, and mechanics repairing broken lanterns are all part of the economic roles.

These activities created autonomous livelihood networks within the community, compensating for situations in which state institutions and public services were insufficient. In other words, people filled the institutional gaps by building small economic cycles, leveraging their relationships and limited resources. This process embodies what Pineda-Escobar (2025) termed a context-dependent perspective. Frugality, in this sense, is not only about low cost; it manifests as a social practice in which people create sustainable systems with their own hands within institutional constraints. In this case, Frugal Innovation functioned as a dynamic social system supporting the maintenance of livelihoods and social inclusion within the local community through such creative adaptation.

6.4 Gender and Inclusion

In Uganda's urban markets, women play a crucial role in daily economic activities in street vending and food sales. About 63% of market merchants are women, many of them operate small businesses to earn, especially for household living expenses and children's education costs (Uganda Market Report, 2020). Most of them, women, have both household responsibilities and work daily to sustain their livelihoods, homes, and families. These women's activities can be viewed not only as supplementary labor but as substantive economic actions that support the reproduction of households and communities.



Figure 12 - Street vender, daily activities (taken by author)

Through conducting a field study, solar lanterns were introduced into users' daily lives, functioning as a source to mediate resources and create a secure environment where women could work and support themselves within the night economy. Comments such as, "Having light allows us to spend the night feeling safe, also like after finishing selling at market, when we also go back home " (User-08, Gaba Market) indicate that securing lighting provided women with both psychological reassurance and physical safety. Thus, the introduction of light has expanded opportunities for women's economic participation, which has an impact both on improving work efficiency and broadening the scope of time and space available for work.

The income generated through this activity was not confined to individual benefit but was redistributed to households and local communities. According to The Uganda Market Report (2020), the primary uses of market income include food expenses (34%) and education expenses (30%), suggesting that the additional income generated through the FI-like product contributes to family food security and the continuation of children's education. Moreover, this is regarded as a mediating process that enables women to achieve economic independence and participate in society. It may be generating unique forms of social connection and mutual support through such practices of Frugality, creatively utilizing and redistributing limited resources for the benefit of families and communities. These enable people to build their

livelihoods while supporting each other, even outside institutional frameworks. This perspective resonates with recent discussions that view Frugality as a context-dependent and relative social practice.

Conclusion of Discussion

This chapter's analysis tries to explore the possibility of a perspective in which the characteristics of Frugal Innovation are socially shaped through people's everyday practices and relationships. These findings do not negate the product- and technology-level discussions presented in existing Frugal Innovation research, but also show an equal need to examine its social and contextual meanings in a complementary manner. Through the above analysis, this chapter has demonstrated the potential for understanding Frugal Innovation within the context of people's practices and relationships.

Chapter 7 Conclusion

This research implies social aspects that emerge through people's collaboration, relationships, and everyday practices within resource- and institution-constrained environments that surround Frugal Innovation. Using a solar lantern rental business in Uganda as a case study, this study examined through qualitative fieldwork how Frugality is shaped and maintained in the field. The findings show that Frugality was socially constructed through the everyday practices of use, repair, sharing, and payment that unfolded among users, local agents, and business operators, especially within those mechanisms within communities that functioned as the foundation sustaining the service within resource-constrained environments.

Theoretically, this study presents an understanding of Frugality rooted in social contexts, offering a complementary perspective to the product- and design-centric discussions of Frugal Innovation. By referencing the framework of "context-dependent Frugality" discussed by Pineda-Escobar (2025) and concretizing this concept through field practices, it holds significant value. By clarifying how Frugality is dynamically generated across multiple dimensions, access, operation, and collaboration, this study complements and broadens the theoretical scope of FI research at the ground level.

Increasingly, global technologies and businesses are entering local communities, which sometimes do not fully align with the lives or institutional conditions of these communities and their people. However, the observations from this study suggest that it is precisely within such contexts that the perspective of Frugality becomes crucial. Since it is noted that in this case, the product, a solar lantern, was designed and manufactured overseas and introduced by an operator outside of the country, that is, Frugality is not merely a concept celebrating "creativity under constraints"; it may serve as a useful analytical lens for understanding how externally introduced products and services are reinterpreted within local communities and reconstituted as value through collaboration and practice. This means the concept of Frugality could serve as a practical framework for considering the introduction of technology and business development across more diverse regions, industries, and social domains in the future. Particularly in today's era of advancing global technology and business expansion, the principles of Frugal Innovation warrant reevaluation when considering alignment with local contexts and social inclusion.

However, this study is an exploratory analysis based on a single case, and the generalizability of its findings is limited. Future research should examine the conditions under which Frugality forms and sustains itself through comparative studies across other regions and

industrial sectors. Methodological approaches to grasp the broader social and economic impacts of Frugal Innovation also remain a challenge.

Considering the above, Frugal Innovation can be understood not merely as low-cost products or simple design principles, but as an everyday practice in which people devise solutions and support one another to create value within constraints. This study represents a small attempt, through one case example, to demonstrate the potential for discovering Frugality within social practice.

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