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Green Startups and Innovative Digital Business Models: Toward Sustainable Household Waste Management within the Circular Economy Framework – A Case Study of a Proposed Model "IFRAZ"

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Abstract: This study aimed to highlight the role of digital applications in improving household waste management and promoting environmental sustainability, focusing on artificial intelligence and Internet of Things technologies that support the green and circular economy. The study targeted analyzing the impact of applications like "Eco-Home" and "Ifraz," which enable homemakers to effectively sort waste, organize collection schedules, and link them to recycling initiatives, with financial incentives provided. The results showed that these applications significantly contribute to reducing pollution, enhancing the circular economy, and creating new job opportunities. However, several technical and cultural challenges were identified that hinder the widespread implementation of these systems. The study recommends strengthening digital infrastructure and increasing public awareness about the importance of these applications in improving the environment and achieving sustainable development.

Keywords: Green Startups; Digital Business Models; Circular Economy; Sustainable Waste Management; Environmental Innovation**.**

1. Introduction

The shift towards a green economy is one of the key solutions for achieving sustainable development. The green economy approach aligns with the circular economy concept to promote sustainability and reduce negative environmental impacts. The green economy focuses on adopting environmentally friendly technologies, such as renewable energy and sustainable agriculture, to reduce emissions and enhance resource efficiency. In contrast, the circular economy emphasizes waste reduction, reuse, and recycling, contributing to the conservation of natural resources. By integrating both models, more sustainable economic systems can be established, fostering innovation, creating new job opportunities, and supporting the transition towards responsible production and consumption. According to United Nations reports, this integrated approach can contribute to achieving global climate goals, reducing poverty, and enhancing economic resilience against environmental and economic challenges.

The digital transformation has led to the emergence of green startups as key players in promoting sustainable development and the circular economy. Through advanced technologies such as artificial intelligence (AI), the Internet of Things (IoT), and blockchain, these startups can develop innovative solutions to improve resource efficiency and minimize environmental impact. Digital transformation has also facilitated market access for these companies, strengthening circular business models based on recycling, sustainable consumption, and the sharing economy. Additionally, digitalization has accelerated research and development processes and improved access to green financing and global markets, enhancing the competitiveness of green startups. According to reports from the World Economic Forum, the combination of digitalization and sustainability creates new economic opportunities and reduces environmental impact, making green startups a fundamental pillar in the transition to a more sustainable economy.

Innovative digital business models in this field play a crucial role in promoting the circular economy through sustainable household waste management. Digital transformation has led to the emergence of smart platforms that leverage big data and IoT to facilitate waste sorting, enhance recycling efficiency, and reduce waste. For instance, digital applications provide interactive solutions for consumers to help them correctly classify waste, while startups use AI to analyze consumption patterns and propose more efficient resource management strategies.

Moreover, blockchain technology has improved transparency in recycling operations, enabling the tracking of waste from its source to its reuse and ensuring companies' compliance with sustainability standards. According to reports from the United Nations Environment Programme, these digital innovations not only enhance waste management efficiency but also create new economic opportunities by converting waste into reusable resources, supporting the transition to a more sustainable circular economy.

This is evident in the emergence of digital applications designed to support stay-at-home women. Digital transformation has led to the development of smart platforms that help households, particularly homemakers, to sort waste more efficiently, provide practical recycling solutions, and encourage them to adopt sustainable environmental practices.

These applications offer interactive guidance on waste classification, notifications for collecting recyclable materials, and connections to local initiatives that utilize organic waste for composting or recycle plastic and paper. Some platforms also promote the circular economy by offering rewards or discounts on eco-friendly products in exchange for active participation in recycling programs. According to reports from the United Nations Environment Programme, these digital solutions not only enhance environmental awareness within households but also contribute to waste reduction and its transformation into valuable resources, supporting the transition towards a more sustainable lifestyle.

1.1. Research Problematic

With the rapid digital transformation, innovation in digital business models has become an effective tool for promoting sustainability, particularly in the field of circular economy and household waste management. The emergence of smart applications has created new opportunities to empower stay-at-home women to adopt sustainable practices that reduce waste and enhance recycling.

In this context, a proposed digital application, "IFRAZ", could provide interactive guidelines for waste sorting, schedule the collection of recyclable waste, and connect users with local recycling initiatives. However, the key question remains:

what extent can applications like "IFRAZ" play an active role in promoting sustainable household waste management? What are the challenges and opportunities associated with expanding their use to achieve a more efficient circular economy?

1.2. Research Hypotheses

Based on the research problem, the following hypotheses can be formulated to study the role

of digital applications in promoting sustainable household waste management within the framework of the circular economy:

Main Hypothesis: The use of innovative digital applications contributes to improving household waste management practices and reducing waste, thereby enhancing the transition to a circular economy.

Sub-Hypotheses:

- Innovative business models can offer practical and effective solutions to empower stay-at-home women in waste sorting and redirection for recycling, thereby increasing environmental awareness.
- Incentivizing users through digital rewards and discounts on sustainable products positively impacts participation rates in recycling initiatives.
- Digital applications face technical and cultural challenges that may hinder their widespread adoption and effectiveness in achieving sustainable waste management.
- The integration of digital applications with local recycling initiatives enhances the efficiency of the circular economy and reduces environmental costs.

1.3. Research objectives

This study aims to analyze the role of innovative digital applications in promoting sustainable household waste management, with a focus on empowering stay-at-home women through technological solutions that support the circular economy. The main objectives include:

- Analyzing the impact of digital transformation on the emergence of green startups and innovative digital business models in household waste management.
- Evaluating the effectiveness of digital applications in improving household waste sorting and recycling practices while providing income opportunities for stay-at-home women.
- Exploring the role of stay-at-home women in promoting sustainability through the use of digital applications for waste management and waste reduction.
- Identifying the challenges that digital applications face in achieving circular economy goals, whether technical, social, or cultural.
- Proposing solutions and recommendations to enhance the use of digital applications in household waste management, contributing to the acceleration of the transition to a more sustainable economy.

1.4.Scientific Methodology Adopted in This Study

This study relies on the descriptive-analytical approach, as it is the most suitable for examining the role of innovative digital applications in promoting sustainable household waste management within the framework of the circular economy. The descriptive method is employed to present the studied phenomenon by reviewing key concepts related to digital transformation, the circular economy, and household waste management, in addition to analyzing innovative digital business models in this field. Meanwhile, the analytical method is used to assess the impact of digital applications on improving waste management practices within households, with a particular focus on the role of stay-at-home women. Furthermore, data from previous studies and international reports on the relationship between digitization and sustainability will be analyzed

2. Theoretical Frame Work

2.1. Green Startups

The process of establishing green startups always leads to the development of new products or services in a highly innovative manner. This vision reflects the desire of innovative entrepreneurs, particularly in the field of digital innovations, to improve quality of life or bring about technological change. This not only contributes to the environmental, social, or economic development of a country but also includes creating new job opportunities and introducing new forms of employment.

2.1.1. Startups: Definition and Growth Stages: Startups are organizations designed to create new products or services under conditions of extreme uncertainty (ries, september 2011, p. 54). Startups are established with the goal of finding scalable and repeatable business models (blank & dorf, 2012, p. 76).

When launching any business, there is a lifecycle that the company goes through, starting from the ideation phase, followed by the growth phase, and reaching maturity. According to Petch (2016), the startup lifecycle consists of five stages:

- Seed and Development Phase
- Startup Phase
- Growth and Establishment Phase
- Expansion Phase
- Maturity and Possible Exit Phase

Achieving commercial success is the primary objective when building a startup. According to Jaya et al. (2017), several factors determine the success of a startup, including:

- Timing
- Team
- Ideas
- Business Models
- Funding

2.1.2. Green Startups and Their Role in the Green Economy: Green startups are emerging companies that offer products and services with a positive environmental impact, contributing to the environmental goals of the green economy (oki, 2021, p. 108)

Green startups function as platforms that can develop and implement products or services that support green economy objectives, such as: (Clausen & Fichter, 2013, p. 37)

- Reducing greenhouse gas emissions,
- Increasing energy efficiency,
- Adopting circular economy principles,
- And other environmental initiatives

startups must meet three fundamental criteria to be considered green startups: (fichter & clausen, 2016, p. 39)

1. Products: The offered products or services must be environmentally sustainable and contribute to reducing negative environmental impacts.

2. Entrepreneurship: The business model should be based on sustainable entrepreneurship principles, considering environmental, social, and economic dimensions.

3. Strategy: The company should adopt a green business strategy aligned with environmental goals, ensuring sustainability at all stages of production and operations.

One of these characteristics may be a primary priority or may be linked to the others. This is consistent with a study that confirmed that green startup types can be categorized according to product, entrepreneurial, and strategic characteristics, but these characteristics can be interconnected. (Linda & Fichter, 2015, p. 124)

2.2. The concept of digital business models

Digitization is the process of transforming information and business processes into electronic form using information and communication technologies (ICTs), such as big data, cloud computing, mobile computing, the Internet of Things (IoT), and social software (Bharadwaj, El Sawy, & Pavlou, 2013, p. 473)

Digitization is not limited to converting data into digital format; it also involves reshaping business processes and value chains in more efficient and innovative ways (Kalle, Ola, & Yoo, 2010, p. 732)

Before defining the two popular terms "digital business model" and "digital business process," it is first necessary to understand the essence of the term "digitization."

With the ongoing transformation of digital technologies, digitization refers to the intelligent process of creating business value using ICTs, such as big data, cloud computing, mobile computing, the Internet of Things (IoT), and social software. (Kalle, Ola, & Yoo, 2010, p. 733)

As a result, digitization does not simply mean providing information, but also includes representing value creation processes in electronic form. (Kalle, Ola, & Yoo, 2010, p. 733)

2.2.1. Distinguishing between the digital business model and the digital business process: To understand the difference between a "Digital Business Model" and a "Digital Business Process", it is first necessary to define each concept:

Business Model: It is ″a description of the means and methods a company uses to generate the expected revenue according to its plans". (David, 2010, p. 177)

Business Process: It is ″an interconnected sequence of subprocesses designed to achieve a specific objective. It is triggered by a defined event, whereby inputs are transformed into outputs using tangible and intangible resources, while considering internal and external rules and factors″. (David, 2010, p. 178)

Based on these definitions, one of the key issues with digital business models and digital processes is that companies cannot simply "digitize traditional business models and business processes directly" (Amy, 2020, p. 12). Instead, a digital business model refers to *"transactions conducted using digital technologies"*, and can be described according to six fundamental components.

The concept of digital business models has been interpreted in various ways by researchers. Some define it as a method for generating revenue from different websites, while others view it as a form of value creation based on maximizing the value delivered to the customer.

Veit et al. defined a business model as "digital" if changes in digital technologies lead to fundamental changes in the way business is conducted and revenue is generated. (Remane, Bgorn, & Hanelt, 2016).

A digital business model is the method used to generate revenue from a website or mobile application, and it typically relies on an advertising revenue model.. (chaffey, 2020)

A digital business model is a form of value creation that focuses on maximizing customer benefits through the use of digital technologies. The goal of a digital solution is to create significant value that customers are willing to pay for (Thomas, 2020)

A digital business model can be defined as a model that leverages digital technologies to enhance various aspects of the organization, starting from how the company acquires customers to the product or service it offers. The digital business model emerges from the support provided by digital technology in strengthening its value proposition .(Gennaro, 2020)

A digital business model involves the integrated use of smart digital products, smart digital services, digitization of internal processes, operation within the ecosystem, access to the platform, and the use of data analytics .(Ahmad, Botzkowski, Klotzer, & Papert, 2020, pp. 45-53)

2.2.2. The Importance of Digital Business Models: Technology is no longer viewed merely as a tool to simplify daily life; today, it has become the heart and center of every business strategy. Companies can now leverage data to produce, store, and analyze information to achieve a competitive advantage over their rivals (Westerman, Didier, & Andrew, 2014, p. 147).

- Digital business introduces new ways to communicate, collaborate, conduct business, and build bridges between people by integrating with business technology (Bharadwaj, El Sawy, & Pavlou, 2013).

- Digital business models impact the fundamental operations of businesses and define the way business is conducted today.

- The attention to digital business models grew significantly after Nigel Fenwick's 2013 article titled *"The Digital Business World,"* where he examined the evolution of social business and suggested that it would continue to progress and develop into the future (Nigel, 2025).

There is no denying that companies must evolve to cope with the shifting business landscape. The future of business software is undoubtedly tied to digital business (didiet, Michael , Nina , & Michael , 2014, p. 07).

2.3. The Circular Economy

The circular economy is a transformative and alternative approach to production and consumption. It challenges the traditional "linear" economic model based on the “take–make–consume–dispose” paradigm, which assumes that resources are abundant, accessible, and inexpensive to discard (MacArthur, 2013).

The concept of the circular economy represents an evolutionary leap that reconsiders how production and consumption are organized, especially in relation to the concept of waste. The linear model, historically dominant, relied on the widespread availability of resources and energy, leading to serious environmental consequences such as resource depletion and massive waste accumulation (Geissdoerfer, Savaget, & Hultink , 2017).

In contrast, the circular economy proposes an innovative mindset that seeks to retain the value of products, materials, and resources for as long as possible. It emphasizes slowing, closing, and narrowing material and energy loops (Bocken, Pauw, Bakker, & Grinten, 2016).

This approach involves new methods of resource management, such as sharing, leasing, reusing, repairing, refurbishing, and recycling—ultimately extending the life cycle of products and reducing pressure on natural resources (Kirchherr, Reike, & Hekkert, 2017).

Historically, the 3R framework—Reduce, Reuse, and Recycle—emerged as the foundation of circular economy thinking. Over time, this has evolved into broader frameworks with up to 10 R’s (e.g., Refuse, Rethink, Repair, Refurbish, Remanufacture, etc.), depending on the analytical lens or implementation model used (Potting, Hekkert, Worrell, & Hanemaaijer, 2017).

The circular economy is an economic model that aims to minimize waste, maximize resource use, and promote recycling to achieve sustainable economic growth without depleting natural resources. This model relies on reusing materials and products for as long as possible, as opposed to the traditional linear approach based on "take, make, use, and dispose," known as the linear economy (MacArthur, 2013).

2.3.1. Principles of the Circular Economy: According to the Ellen MacArthur Foundation (2013) and the World Bank (2021), the circular economy is based on the following principles:

- Design for sustainability: Developing products in ways that facilitate reuse, repair, or recycling.
- Product life extension: Enhancing product quality to ensure a longer lifespan through maintenance, upgrades, and remanufacturing.
- Recycling and repeated use: Converting waste into new resources rather than disposing of it.
- Resource consumption efficiency: Reducing the use of raw materials and energy by recycling and utilizing industrial and agricultural waste.
- Adoption of a closed-loop economic model: Recovering raw materials and used products within the economic system for repeated use (Lieder & Rashid, march 2016).

2.3.2. Benefits of the Circular Economy for Startups: There are numerous benefits that startups can gain by adopting the principles and practices of the circular economy. The literature on this subject highlights the following advantages:

- Cost savings: By embracing circular practices, startups can reduce resource consumption, leading to lower operational costs. Efficient use of materials and energy, along with the ability to reuse waste, can result in significant savings and increased profitability.

- Cost efficiency: Startups can considerably reduce production and waste management expenses by implementing reuse and recycling principles. This approach conserves resources and cuts down costs associated with raw material procurement and waste disposal.

- New revenue opportunities: The circular economy opens up innovative avenues for generating income. Startups can transform what was once considered waste into valuable assets, leading to the creation of new products and services that drive financial growth.

- Brand reputation and sustainability credibility: In a market where consumer awareness of environmental issues is growing, adopting circular economy principles can significantly enhance a brand's image in terms of sustainability. This can serve as a powerful marketing tool, offering a competitive edge and aligning with consumer values.

- Resilience and sustainability: Circular business models often demonstrate greater adaptability to market fluctuations and resource scarcity. By reducing dependence on limited resources, the circular model enables startups to be more resilient in the face of economic and environmental challenges.

Applying Digital Business Models to the Circular Economy and Household Waste Management:

In the context of the circular economy and household waste management, digital business models play a pivotal role in enhancing efficiency and reducing waste. This is achieved by leveraging digital technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), cloud computing, and big data analytics. Below is an overview of how key elements of the digital business model can be applied to household waste management within the circular economy:

- Digital Transactions in Waste Management

Digital platforms facilitate transactions between individuals, recycling companies, and waste management service providers. For instance, smart applications can enable consumers to schedule the collection of recyclable waste, making recycling and reuse processes more accessible and efficient.

- Digital Offering & Demanding Systems

Digital Offering System:
Digital platforms can provide real-time data on the quantities of recyclable waste, allowing recycling facilities to easily identify the supply of secondary raw materials.
Digital Demanding System:
This system enables customers (individuals or businesses) to search for sustainable waste management services, book waste pickup appointments, or request recycled products. Users may earn reward points when they deliver recyclable waste, thereby encouraging environmentally positive behaviors.

- Digital Performance & Counter Performance

Big data analytics can be used to identify patterns in waste generation and optimize recycling strategies accordingly.
Some companies offer financial incentives or loyalty points to consumers in exchange for recycling household waste, thus increasing participation in the circular economy.

- Repeatability of Digital Transactions

Using AI and demand forecasting technologies, waste management operations can be optimized to ensure more efficient collection and recycling processes.
Certain companies offer subscription-based services for household waste management, making the operations continuous and sustainable.

3. Proposed Digital Business Model: "Ifraz"

A Digital Platform for Household Waste Management and Enhancing the Circular Economy for Stay-at-Home Women

3.1. Overview of the Ifraz Digital Business Model

Core Idea
"Ifraz" is an innovative digital application based on the principles of the circular economy, aiming to promote environmental sustainability by empowering stay-at-home women to play a central role in managing household waste. The platform leverages Artificial Intelligence (AI) and the Internet of Things (IoT) to facilitate smart waste sorting, contributing to waste reduction, improved recycling processes, conservation of natural resources, and the minimization of environmental impact.
"Ifraz" also seeks to create economic and social value for stay-at-home women by enabling them to generate additional income through the sale of recyclable materials to relevant companies and recycling facilities. In doing so, the application strengthens women's participation in the national economy and opens new opportunities for engagement in sustainable development efforts through an innovative model that combines economic empowerment with environmental preservation.

A. How the Ifraz Digital System Works

- User Registration: Women register on the Ifraz platform via the app, where they receive detailed instructions on how to correctly sort household waste. The app guides users step-by-step, ensuring that the sorting process is both easy and efficient.

- Waste Sorting: Users categorize household waste into different types such as plastic, glass, paper, metals, and organic waste. The app helps to identify what type of waste can be recycled and how it should be sorted.

- AI-Powered Recommendations: The platform uses Artificial Intelligence (AI) to offer tailored suggestions on how to best handle the sorted waste. Whether it's for recycling or converting the waste into other usable products, AI ensures the most environmentally friendly and profitable outcomes.

- Scheduled Waste Collection: Waste is collected at regular intervals according to a pre-established schedule. The app coordinates with recycling companies or local cooperatives to ensure waste is picked up in a timely and efficient manner.

- Points and Monetary Conversion: As users deliver recyclable waste, they accumulate points based on the quantity and type of waste. These points can then be converted into real monetary income or other incentives.

- Incentive and Sustainability Points System: The platform has a rewards system where participants earn sustainability points. These points can be redeemed for financial rewards or eco-friendly household products, further encouraging positive environmental behavior.

3.2. Key Aspects of the Business Model

Table .1. The Operating Mechanism of the Digital Application "Ifriz"

Element	Description
Digital Transaction	all sales and financial transactions are conducted through the app, making it easier to track the income of stay-at-home women.
Digital Offering & Demand	The platform connects women with recycling service providers and buyers of recyclable waste.
Digital Performance	Ifraz relies on Artificial Intelligence (AI) to analyze the collected waste and provide recommendations on how to improve sorting processes.
Repeatability of Transactions	Ifraz offers subscription-based programs to facilitate waste collection scheduling and ensure a sustainable income stream.

3.3. Objectives of the Application

The goals of this application span across environmental, economic, health, and social dimensions, as the waste sorting process carried out by stay-at-home women touches on multiple aspects of society.

3.3.1. Environmental Objectives:

- Achieving sustainable development.
- Reducing and limiting environmental pollution in all its forms.
- Producing organic fertilizers "from and to the environment."
- Reducing landfill usage by utilizing waste as a source of energy, thus preserving land and minimizing pollution.
- Limiting methane gas emissions, a major cause of global warming resulting from the decomposition of organic waste in landfills.
- Conserving natural resources—for example, recycling one ton of paper saves 17 trees and 7,000 gallons of water.

3.3.2. Economic Objectives:

- Contributing to national economic growth and empowering women's role in national production.
- Providing secondary raw materials from waste collection centers, which leads to energy savings.
- Maximizing consumer benefit by offering returns—even small ones—on goods and materials sent back to collection centers.
- Using recycling and domestic waste management as new pillars for economic growth.
- Enhancing the local economy by diversifying national income sources.
- Promoting the circular economy through the Women Stay Home application model.
- Creating job opportunities and reducing unemployment by encouraging entrepreneurship and green projects.
- Reducing imports by extracting raw materials and energy resources from waste collection centers.
- Saving time and effort in the sorting process, as the initial sorting is already done by stay-at-home women.

3.3.3. Health Objectives:

- Reducing and limiting deadly diseases caused by waste accumulation in residential and green areas, as studies show that 92% of diseases stem from environmental pollution, especially household waste.
- Minimizing injuries and work accidents at collection centers, since waste has already been pre-sorted at home.
- Reducing the spread of pests and disease-carrying animals (e.g., stray dogs and cats, rats, and rodents).
- Eliminating harmful habits in the handling of health-threatening waste.

3.3.4. Social and Cultural Objectives:

- Promoting environmental awareness and fostering a culture of environmental responsibility.
- Strengthening recycling culture among youth.
- Increasing the sense of social responsibility towards the environment.
- Reducing social problems by creating new job opportunities through optimal use of resources.
- Adopting an environmentally conscious lifestyle and awareness-driven approach.

3.4. Stakeholder Analysis

- Woman (Housewife): Also known as a housewife, she is defined as a woman who specializes in specific household tasks, ranging from organizing and cleaning to caring for family members. Procedurally, she is any woman who stays at home. In terms of application, she is a distinguished and influential stakeholder in the waste sorting process, as the application generally targets this group to achieve environmental, economic, health, social, and cultural goals that benefit the public interest, creating significant societal value for her. On the other hand, she benefits from financial revenues credited to her account under the concept of mutual benefit exchange.
- Government: The entity responsible for decision-making as the regulator of the waste sorting law, Complementary Law 1-19. As a stakeholder, the government greatly benefits from this application, as household waste sorting at home before reaching collection centers reduces the additional burden of waste separation during recycling. Al-Nahar Online recently revealed that billions of dinars are wasted in landfills. This application encourages waste recycling, thereby increasing national income and reducing the use of raw materials.
- Household Waste Collection Engineers (Transporters): These are individuals who transport household waste from homes and buildings to collection or storage centers, where it is processed and sorted using methods such as landfilling (sanitary burial), incineration, organic decomposition, or recycling, in compliance with national laws and regulations. The Woman Stay Home application facilitates the transportation process by enabling prior waste

sorting at home by the stay-at-home woman, determining the appropriate collection time with a button press, providing financial benefits credited to the transporter's account upon subscription and use of the application, and avoiding potential accidents at the transport site, such as injuries from carelessly discarded sharp objects.

- Application Owner(s): The individual or group of partners who conceptualized, designed, and developed the application. They are primary stakeholders, managing the application and coordinating between subscribers during the receipt and delivery processes, as well as distributing financial dues and generating revenues.
- Collection Centers: The final stage in the household waste sorting process, where precise sorting takes place after the initial sorting by the stay-at-home woman. Her contribution facilitates the entire process. The main benefits for collection centers as stakeholders include:
- Simplifying the final waste separation process.
- Streamlining the disposal of non-recyclable waste.
- Financial benefits estimated at 5%.

4. Conclusion

This study highlights the transformative potential of digital applications in promoting sustainable household waste management within the framework of the green and circular economy. By examining platforms like Ifraz, the research demonstrates how the integration of technology, environmental awareness, and economic empowerment—particularly of housewives—can lead to meaningful social and ecological outcomes. Ifraz, in particular, stands out as a pioneering model that not only addresses waste challenges but also empowers women through income-generating and eco-friendly practices. Despite facing technical and cultural barriers, the growing relevance of such applications signals a promising pathway toward inclusive and sustainable development. Strengthening digital infrastructure, fostering awareness, and enacting supportive policies will be essential to unlock the full potential of these innovations and scale their impact across communities.

4.1. Findings

- Impact of Digital Applications: Applications such as *Ifraz* have proven effective in enhancing household waste sorting and scheduling collection, which contributes to pollution reduction and improved recycling processes.
- Ifraz as an Innovative Business Model: *Ifraz* goes beyond being a digital tool; it serves as a pioneering model that combines technology, economic inclusion, and environmental responsibility to advance the circular economy at the community level.
- Women's Empowerment through Sustainability: *Ifraz* plays a key role in enabling housewives to participate in environmentally friendly, income-generating activities, thereby strengthening their contribution to the green economy.
- Barriers to Adoption: Despite their potential, these applications encounter significant technical challenges—such as limited digital infrastructure—and cultural resistance, primarily due to insufficient awareness regarding household waste sorting practices.

4.2. Recommendations

- Scaling Local Innovations: Encourage the expansion of digital solutions like *Ifraz* as community-driven initiatives that emphasize sustainability and the economic empowerment of women.
- Strengthening Digital Infrastructure: Invest in robust internet connectivity and accessible smart devices to facilitate the widespread adoption of green digital applications, particularly in under-served regions.
- Capacity Building and Awareness: Implement targeted educational campaigns and training programs to raise awareness among housewives and communities about the environmental and economic benefits of smart waste management tools.

- Promoting Multi-Sector Partnerships: Support collaboration between public institutions, private green tech startups, and civil society to ensure the financial and operational sustainability of such applications.
- Policy Integration: Advocate for the incorporation of circular economy principles into national and local policy frameworks, with a focus on inclusive practices that empower women and encourage sustainable innovation.

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