
INNOVATION IN THE CIRCULAR ECONOMY IN SUSTAINABLE MANUFACTURING: A CASE STUDY ON ALTRNTV

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Abstract

The growing consumption trend is misaligned with sustainability, making the circular economy crucial for reducing waste, optimizing resource use, and promoting zero waste, with the EU taking key steps towards achieving carbon neutrality and circularity by 2050. The textile and apparel industry is recognized as a major polluter, requiring a shift in consumption and production, with consumer engagement and behavior being key to a successful circular economy. Various research propose strategies to align economic policies with circular economy principles, including improving raw material recycling, promoting repair and remanufacturing, and introducing product labeling schemes to guide sustainable consumer choices. This paper aims to explore the characteristics of a circular economy business in Romania, specifically a startup in sustainable manufacturing and distribution, based on the Circular Economy Monitoring Framework and ISO 14024:2018 ecolabeling features. This research uses a descriptive case study approach to explore ALTRNTV, a Bucharest-based startup promoting sustainable manufacturing and distribution, employing multiple data collection methods to analyze its business model and impact on local vulnerable communities. This research explores how a circular economy business aligns with the Circular Economy Monitoring Framework and ISO 14024:2018 ecolabeling features, highlighting its practices and societal impact. The study provides insights for policymakers and entrepreneurs while acknowledging its limitations, such as the lack of third-party evaluation for the ecolabel and the exclusion of additional assessment indicators.

Keywords: *circular economy, textile sector, ecolabel, sustainable manufacturing, social enterprise.*

JEL Classification: L31, L60, L67, M21, O31.

Introduction

Nowadays, the growing trend of consumption is no longer aligned with sustainability, making the circular economy a key approach to addressing this challenge [1-5, 45]. The need for change is underscored by Danu and Nedeff [6], who emphasize that each EU citizen generates over 4.5 tons of waste annually, highlighting the necessity to adopt more environmentally responsible practices. In addition, the need for clear circular economy policies is shaped by the fact that people annually use 60% more resources than what the Earth can regenerate, with forecasts warning that until 2050 sustainability could be severely threatened by increased population and growing consumption behavior [7]. In the circular economy, since products and materials are reused and cycled indefinitely the notion of waste no longer exists [3-5], and features the optimization of

resource usage optimization, the protection of sustainable development requirements, and the goal of zero waste by employing closed-loop models [8-9], replicating the structure of natural ecosystems [10].

Important actions towards circularity have been initiated by the European Union, with an ambitious target until 2030 to reduce greenhouse gas emissions by 55%, while the pursuit of carbon neutrality is expected by 2050 [11-12]. In line with these objectives, action plans have been formulated [13]: the European Green Deal [14], the European Circular Economy Action Plan [15-18], the Thematic Strategy on the Sustainable Use of Natural Resources, the Roadmap to a Resource Efficient Europe [19], the Ecodesign Working Plan, and the Raw Materials Scoreboard [20]. Moreover, research acknowledges the commitment of governments, organizations, and civil society groups to achieving the Sustainable Development Goals [17-18, 21].

A variety of tools and methods are now available to support the transition from linear to circular practices, given the vital role of design in the circular economy [22]. Recommendations for aligning an economy with circular economy practices [22 -23] include: improving the purity of raw materials for easier recycling, encouraging repair and remanufacturing, developing a supportive fiscal framework towards adopting circular economy practices and consumption of less polluting products, developing local ecolabel, and creating an online research community for stakeholders in the circular economy [24]. New business models that directly address sustainability concerns are emerging [2, 25]. In line with this context, the aim of this research is to illustrate how a Bucharest-based startup in manufacturing and distribution of sustainable items employs circular economy practices and which ones.

2. Problem statement

With a clear focus solely on the textile and apparel industry, in 2018, Staicu and Pop [26] recognize this sector as one of the heavily polluting industries where consumption trends contribute to waste creation, and demand redesigning consumption and production. Therefore, consumers engagement, directly connected with the adaptation of their conduct is key to a working circular economy [25,27-29], through consumers' behavior and role in this sector are scarcely researched [30]. In 2018, the Circular Economy Monitoring Framework was initiated by the European Commission [31], designed on five pillars as seen in Table 1. In 2023, a new dimension was added to the framework: Global Sustainability and Resilience. This new area focuses on assessing how well the circular economy helps production and consumption systems remain within planetary limits of extraction, while the Resilience aspect addresses the security of raw material supplies, focusing on critical ones [32].

Table 1. The Circular economy Monitoring Framework

Production and Consumption	Waste management/recycling rate of	Secondary raw materials	Competitiveness and innovation	Global sustainability and resilience
Material footprint	municipal waste	Usage rate of circular materials	Private investments	Consumption footprint
The productivity of resources	waste, not including major mineral waste	Input rates for end-of-life recycling (aluminum)	Employed individuals	GHG emissions from activities of production
Green public procurement	overall packaging	Imports from countries outside the EU	Gross value added	The reliance on material import
Total production of waste	plastic packaging	Exports to countries outside the EU	Patents pertaining to management and recycling of waste	The self-sufficiency of the EU for aluminum raw materials
Waste production not including major mineral waste	WEEE that are separately collected	Intra EU trade		
Production municipal waste				
Food waste	-			
Production of packaging waste				

Source: European Environment Agency, 2024.

As mentioned by Piciu [33] and Guarnieri et al. [34], the transition towards a circular economy involves also barriers: change opposition, absence of infrastructure, poor performance indicators, an absence of measurement scales and standardized metrics and access to financing, whereas some incentives are the presence of innovation and networks, and the creation of industry partnerships. To enhance the potential of setting up social enterprises in the circular economy sector, incentives and education initiatives need to be created [35] such as developing abilities for financing, project management, business plan creation and promotion, adding practices and partnerships in circular economy. In Romania, [25], the efforts towards implementing circular economy practices in manufacturing are connected to a few platforms and plans dedicated to circular economy (Table 2).

Table 2. CE strategies for sustainable manufacturing in Romania

Organization	Document description
The Romanian Government, Department of Sustainable Development	The Romanian Strategy for the Circular Economy is a roadmap for accelerating Romania's transition from a linear to a circular economic model. The strategy gives an overview of the 14 economic sectors and identifies the following as having the greatest circular potential: agriculture and forestry, automotive sector, construction, consumer goods (food and beverages), packaging, textiles, electrical and electronic equipment.
Employers' Confederation Concordia	The "Circular Economy in Romanian Business" guide presents circular economy programs initiated by organizations belonging to various fields e.g. hospitality, retail, banking.
European Commission	Circular economy action plan: The European Commission adopted the new circular economy action plan in March 2020. It is focusing on focus on the sectors that use most resources and where the potential for circularity is high such as: electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, food, water and nutrients.
Directorate-General for Research and Innovation	"Made in Europe" report: The future of European manufacturing?" reflects the inputs made by around one hundred manufacturing experts participating in a workshop organised in Brussels on 15 Oct. 2019 on the rationale for a new Partnership, 'Made in Europe'. Innovative manufacturing technologies are needed to ensure the partnership's contribution towards sustainable prosperity for all with reinforced strategic advantages in terms of increased productivity, enhanced job quality and reduced carbon footprint.
European CE Stakeholder Platform	A platform which gathers good practices, strategies knowledge, and players in the circular economy at European level.

Source: author's own processing.

Basarabă and Cojocaru [24] suggest several strategies for aligning a country's economic policies with circular economy principles. These strategies range from improving raw material purity to facilitate recycling, promoting repair and remanufacturing to create jobs, establishing an incentivizing economic framework through fiscal measures, and introducing the Romanian ecolabel along with an online research hub for universities and other stakeholders in the circular economy sector. It is recommended to implement product labeling schemes that highlight characteristics such as reusability, reparability, and recyclability to help consumers make informed decisions about sustainable usage and encourage responsible production practices [36-37]. According to the Ecolabelindex (2024), in countries like Germany, 103 labels are available compared to Romania with twenty-eight ecolabels. Only three (Table 3) are related to manufacturing of textiles, and accessories.

Table 3. Manufacturing of textiles ecolabels in Romania

Ecolabel name	Description
<i>Fairtrade</i>	Fairtrade is an ethical trade system that puts people first. Fairtrade offers farmers and workers in developing countries a better deal, and the opportunity to improve their lives and invest in their future. Fairtrade gives consumers the opportunity to help reduce poverty and instigate change through everyday shopping.
<i>EU Ecolabel</i>	A voluntary scheme designed to encourage businesses to market products and services that are kinder to the environment and for European consumers - including public and private purchasers - to easily identify them.
<i>Natrue-Label</i>	The Natrue-Label is a guarantee for cosmetic products. Their goal is to promote and protect natural beauty and skin care products. Any product with the Natrue label is intended to be as natural as possible, using natural and organic ingredients, soft manufacturing processes and environmentally friendly practices.

Source: author's own processing.

An increasing concern has been shown for the circular economy in Romania in the last years [9], however, the successful examples in this domain are scarce: Employers' Confederation Concordia with the the publication of the "Circular Economy in Romanian Business" guide that conducts a presentation of circular economy programs initiated by non-profit and for profit organisations fields e.g. retail, hospitality, banking; Ateliere Fără Frontiere tackles the social exclusion of vulnerable groups and advocating for employment integration; Viitor Plus runs circular economy programs: the Recycling Map, and Recicleta; Green Group conducts the production of synthetic polyester fibers in Romania, based on 100 % recycled PET flakes and the collection, processing and recycling of EEE; Ecoteca maps urban areas consumption, waste production and management; bonapp.eco connects food suppliers and consumers to minimize waste; Precious circuit is engaged in jewelry production where the raw material is electrical and electronic equipment [38].

Within this context, in Romania, social enterprises are dominant actors who create new social innovation models in a need to replace the traditional ones [39]. For companies aiming to develop circular business models for their products, the

optimal approach may involve up to three strategies [40]: retaining product ownership (RPO), extending product life (PLE), and designing for recycling (DFR) in figure 1.

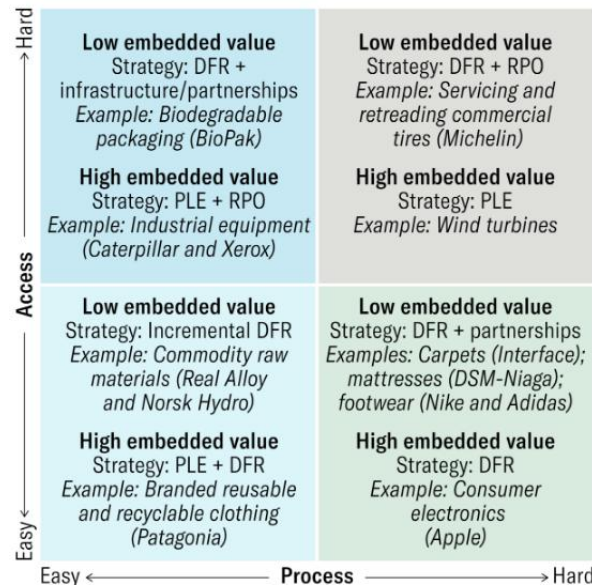


Fig. 1 The Circularity Matrix

However, for the clothing manufacturing sector, examples in the literature of successful businesses are lacking, and it is not clear what sustainable manufacturing features are and how they align to circular economy practices [25].

3. Research question

The paper's objective is informed by the observations of Mocanu et al. [41] and Crisan [42] who point out that the circular economy in Romania is still in its early stages. Building on the insights from the literature review in chapter 2, this paper seeks to address the following research question: "What characteristics of a circular economy business meets a Romanian circular economy startup in manufacturing and distribution of sustainable items?". The research question is constructed in line with the Circular Economy Monitoring Framework indicators and the ecolabeling features as aligned to ISO 14024:2018.

4. Research methods

To achieve the objective, the research employs qualitative research methods, specifically a descriptive case study [43] where the following key attributes of the case study methodology are underlined in Priya [44]: given the comprehensive nature of the study, case study research provides the authors with the flexibility to employ any data collection method that aligns with their objectives. To ensure a thorough, accurate, and impartial analysis of the phenomenon under investigation, multiple data collection techniques were utilized, including in-depth interviews and the examination of internal procedure documents. Moreover, the case study entails an in-depth examination of the specific unit of analysis – one business focused on both manufacturing and distribution, while focusing on the local context. The business under analysis ALTRNTV was opened

in May 2022, and is a Bucharest-based startup, a brick-and-mortar store, to sell not only its own sustainable manufactured products but also handmade clothing, shoes, and belts, home-deco, and beauty products created by 140+ Romanian manufacturers from underserved rural and urban communities.

In addition to helping vulnerable Romanian craftspeople to promote their products and keep their employees, ALTRNTV also offers guidance to designers on transitioning to sustainable packaging and product design and improving their waste recycling processes, fiscal advice for beginners, marketing and branding, product and packaging design, and pilots a mentoring program for Art students specialized in Fashion supporting them to create sustainable products and introduce these to the market. The Shop currently hosts 91 producers of clothing, accessories, beauty-products and home-deco products created from sustainable fabrics and using environmentally friendly techniques, impacting 234 persons (out of which 193 vulnerable women).

The data was gathered as follows:

D1. consultation of internal and public information about ALTRNTV ranging from 2022 to 2024 as follows: 2022: ZIARUL FINANCIAR (2 Articles), REVISTA IGLOO (1 article), RETAIL.RO (1 article), GREEN-REPORT.ro (1 article), THE WOMAN (1 article); 2023: ISO 9001, ISO 14001, ISO 45001 ALTRNTV internal procedures, ZIARUL FINANCIAR (2 Articles), IMPACT HUB BUCHAREST (1 article), REVISTA ATELIERUL (1 article), ROMANIAN GREEN STARTUPS (1 article), Brochure, in English (2 articles); 2024: ISO 9001, ISO 14001, ISO 45001 ALTRNTV internal procedures (updated), ZIARUL FINANCIAR (2 Articles), REVISTA IGLOO (1 article), REVISTA ATELIERUL (1 article), THE WOMAN (1 article), ROMANIAN GREEN STARTUPS (1 article), BANISIAFACERI.RO (1 article), YOUTUBE (2 videos), Brochure about ALTRNTV, in English language (2 articles). Data collection implied reading over 250 pages of internal and external documents.

D2. An in-depth interview addressed to one of the startup's co-founders (Table 4).

Table 4. In-depth list of questions for the interview

What does the startup ALTRNTV do for customers?
Who is behind ALTRNTV and what studies does the team have?
Why is ALTRNTV a startup in the circular economy?
What were the obstacles of opening such a startup?
Who financed this business that supports the circular economy?
How have customers received the circular products that you propose?
And the interior design of the space was made using circular practices. Which are these?
Is the packaging of the products also aligned with circular economy practices?
What are the plans to include other circular practices in the startup's operations?
How do you encourage sustainable product designers to expand their product propositions?
What are the categories of criteria employed in the designers' assessment?
What were the criteria most difficult to assess? Why?
What were the criteria easiest to assess? Why?
How many staff are involved in the assessment?
Has the team noticed any changes in the assessment?
What are the benefits of the ALTRNTV eco label?

Source: Author's own processing.

Additionally, the sub-units examined in this study, the product designers, fall within the second quadrant of the Circularity Matrix and focus on design for recycling (DFR) and product life extension (PLE) (fig. 1).

5. Findings

The research particularly focused on describing features of a circular economy manufacturing and retail business based in Romania and how these features highlight circular economy attributes (Table 5).

The study incorporated various elements of circularity not included in the Circular Economy Monitoring Framework such as the sustainable regeneration of urban spaces, the integration of eco-design and smart solutions into the shop's design, the creation of social impact, and the promotion of social entrepreneurship.

Table 5. ALTRNTV practices related to circularity

Production and consumption	Waste management	Secondary raw materials	Competitiveness and innovation	Global sustainability and resilience
<p>Material footprint</p> <p>Each manufacturer is required to explain the origin of the material employed.</p> <p>Materials arriving from proximity to Bucharest are preferred.</p> <p>However, no certified scheme for material footprint monitoring is yet employed.</p>	<p>Recycling rate of waste</p> <p>100% of the waste produced is collected selectively and distributed to a waste collector.</p> <p>Recycling rate of overall packaging</p> <p>100% of the overall packaging originated from recycled sources, either is manufactured at ALTRNTV/bought from EU (recycled cardboard/paper)</p> <p>Recycling rate of plastic packaging</p> <p>100% of the plastic collected is distributed to a waste collector, recycled.</p>	<p>Usage rate of circular materials</p> <p>100% of raw materials employed by manufacturers are either recycled, deadstocks, biodegradable, organic (GOTS, OEKO-TEX)</p> <p>Intra EU trade</p> <p>Origin: Germany, Poland</p>	<p>Private investments</p> <p>Investments by private investors (NESsT Foundation) and companies: Banca Comerciala Romana)</p> <p>Employed individuals</p> <p>Collaboration with 140+ manufacturers who employ 360 + people.</p> <p>All offer decent work conditions (ISO 45001).</p>	<p>Consumption footprint</p> <p>By buying circular items from ALTRNTV, the customers diminish their consumption footprint - choice of products with less CO2 footprint.</p> <p>GHG emissions from activities of production</p> <p>ALTRNTV produces its own line of clothing with a diminished CO2 footprint and sells in the store.</p>

Source: Author's own processing.

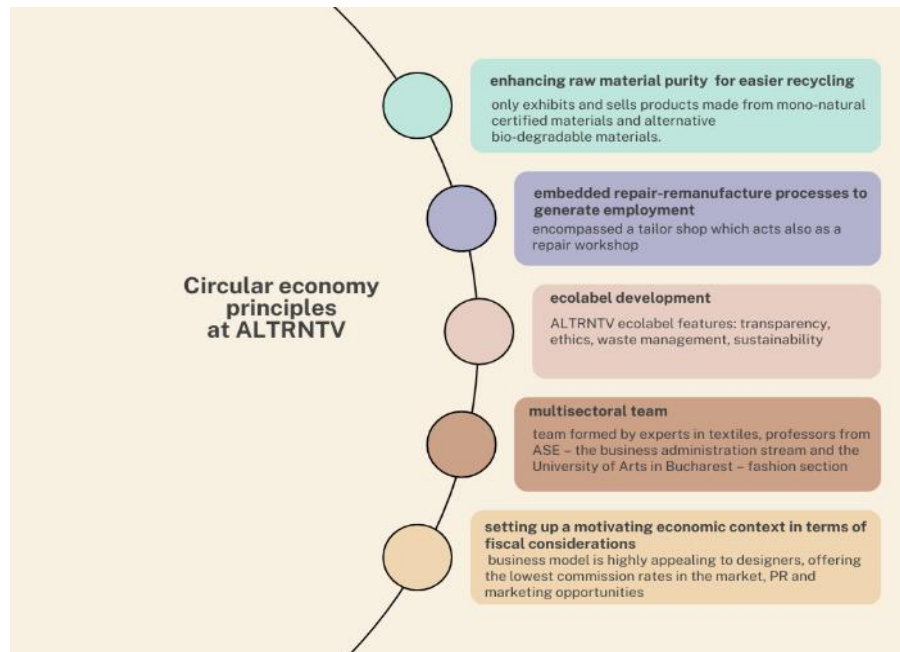


Figure 2 Circular economy principles at ALTRNTV

Source: Author's own processing.

This startup is committed to minimizing its environmental impact by sourcing materials from nearby locations, to reduce GHG emissions from transportation using electric cars or bikes. Basaraba and Cojocaru [24] proposed six directions for a country's economic policy to converge with circular economy, among which one of these is launching the Romanian ecolabel. As there is no existing Romanian ecolabel for ALTRNTV to align with, this research focuses on explaining how and why a Romanian startup in the circular economy, specifically in the manufacturing sector, developed its own ecolabel. The criteria are structured into four categories: transparency, ethics, waste management and sustainability, and thirteen sub-categories (Table 6).

Table 6. ALTRNTV ecolabel criteria adapted after 14024:2018

Criteria	Transparency	Ethics	Waste management	Sustainability
Sub-categories	Product; manufacturing location	Fair trade; Staff remuneration	Responsible design; Efforts to reduce waste; Program for products lifecycle extension	Objectives; Sustainable development goals
	Fabric: Fabrics employed; origins; certifications; source if no certifications	Work conditions; Decent workplace conditions	Recycle/ reuse production waste; Unsold inventory strategy	Advocacy; Developing sustainability projects for fashion/environment/advocacy campaigns

		Animal welfare; Use of vegan materials; innovative materials	Unsold stock; Strategy for unsold stock	Social impact; What does the brand do to give back to people and planet?
			Packaging; Materials	
			Delivery; Transportation	

Source: Author's own processing.

Finally, ALTRNTV ecolabel is characterized by features compliant with ISO 14024: 2018 (Table 7).

Table 7. ALTRNTV ECOLABEL FEATURES

Features	Details
Champions local products	This scheme evaluates the characteristics of local green products developed in line with producers' capabilities and market demand. For instance, shoes and sunglasses are not yet included in the ALTRNTV ecolabel due to insufficient demand or supply.
Reliable and transparent	The label represents green excellence and professional discipline, upheld by the rigorous criteria aligned with ISO 14024:2018 standards.
Choice of items	Clothing, accessories, cosmetics, books.
Good choice for people and planet	Consumers can trust that labeled goods and services have a reduced environmental footprint, generate less waste and CO2 during production, contain fewer hazardous chemicals, and are designed for greater durability and easier repair.
Strict criteria	Awarded designer products must satisfy stringent criteria to minimize environmental impact throughout their entire lifecycle, from raw material extraction to distribution and disposal. Additionally, they must meet quality standards and often adhere to relevant social criteria.
Measurable and marketable	For brands displaying 'the ALTRNTV logo on their products has a measurable impact on returns, measured in the sales recorded in the online and onsite shop.

Source: Author's own processing.

Moreover, ALTRNTV ecolabel is ISO 14024 compliant criteria which are set with a lifecycle approach through an open, transparent, multi-stakeholder process.

6. Conclusions and recommendations

This research aimed to detail how a circular economy manufacturing and retail business in Bucharest, Romania aligns to the Circular Economy Monitoring Framework indicators and the ecolabeling features as aligned to ISO 14024:2018. This research is, as far as we know, the beginning of research on Romanian based startups in the circular economy, and it showcases how many of the circular economy practices are implemented in the current context in Romania and the criteria employed by the ecolabel created by this business. In this case, the analysis allowed to describe how this startup is supporting the circular economy manufacturing sector and manages to successfully cover all categories of indicators of the Circular Economy Monitoring Framework. Moreover, other significant societal impacts have been discovered and allowed to extend the knowledge about the social impact of a young circular economy business.

The findings can be particularly useful to policy makers in the circular economy sector as well as individuals intending to become entrepreneurs in this field. A research limitation resides in the non-inclusion of other circular economy assessment indicators, which could enrich the research findings, and that the scheme does not have an independent third party or competent body to ensure that products fully comply with the relevant ALTRNTV Ecolabel criteria, the assessment is performed by the startups team. The research aims to fill an existing gap in the studies on the Romanian based startups in the circular economy, illustrating how a local business can create an ecolabel meant to guide the consumer toward more environmentally responsible choices.

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