Guiding startups towards Circular Business Models: A multi-criteria evaluation tool

Dorleta Ibarra[1,*] Ane Arregui[1], Juan Ignacio Igartua[1], Jabier Retegi[1], Joan Manuel F. Mendoza[1,2]

[1]Mondragon Unibertsitatea, Faculty of Engineering, Mechanics and Industrial Production, Loramendi 4, Mondragon 20500 Gipuzkoa, Spain; [2]IKERBASQUE, Basque Foundation for Science, Plaza Euskadi 5, 48009 Bilbao, Spain

*Corresponding author dibarra@mondragon.edu

Extended abstract

Circular economy is considered one of the main paradigms for sustainable transition (Kanda et al., 2024). It entails transforming the current linear economic model based on "take-make-waste" into a circular model, stimulating economic growth and job creation while using material and energy resources more effectively (Mendoza and Ibarra, 2023).

Companies are increasingly motivated to adopt circular business models (CBM) (Geissdoerfer et al., 2020; Lindgren et al., 2021). But moving from conventional to CBM means that organisations have to rethink their resource flows, supply chains, and how they create, deliver, and capture value (Marrucci et al., 2022).

This transition poses complex organisational challenges (Geissdoerfer et al., 2022; Lindgren et al., 2021) and can be especially tough for startups trying to develop from scratch with CBM. In this sense, new ventures must confront the same challenges associated with CBMs as other companies (e.g. market, institutional, financial, and knowledge-related challenges), while overcoming disadvantages related to novelty and small size (Kanda et al., 2024). Moreover, for entrepreneurs to promote sustainable development through their CBMs, it is essential to understand the scope and nature of the sustainability impacts.

Another critical aspect to consider is that CBMs do not necessarily have to be green (with a positive environmental impact, or at least, not negative) when measured based on real-time environmental indicators (Marrucci et al., 2022). Furthermore, Kirchherr et al. (2017) demonstrate how some companies committed to the circular economy primarily prioritise

economic savings, while environmental quality and, in some cases, social equality take a back seat. On the other hand, deceptive advertising strategies known as *greenwashing* that seek to divert attention from the real environmental impact of the business model (Kopnina, 2019) or *circular washing* that focus on claiming that circular solutions are always the best solution (Marrucci et al., 2022) can slow down sustainable transition. In this context, the development of data-driven tools to help organisations evaluate their CBMs is essential to avoid the development of practices that may have a negative effect (Bocken, Boons, et al., 2019; Marrucci et al., 2022).

This aspect is particularly critical in the context of startups since their business models are constantly evolving in their early years, resulting in a lack of historical data that can be used to assess their sustainable impact (Horne et al., 2020). Additionally, new ventures often lack resources to collect and communicate data (Horne et al., 2020). Consequently, several authors suggest that ex-ante assessment tools are required in such organizations, rather than retrospective evaluation approaches as is commonly done in the case of larger established companies (Fichter et al., 2023; Trautwein, 2021). However, the development of tools for evaluating the sustainability impact of CBM is an emerging field and currently, most of the CBM innovation tools are still (semi-) qualitative in nature and focus on the ideation and design phase (Bocken, Strupeit, et al., 2019).

In this context, multi-criteria decision-making (MCDM) tools play a crucial role in assisting companies to evaluate business models across various dimensions including economic viability, material selection, social responsibility, and technical feasibility (Husain et al., 2021). These tools can be applied for the assessment and selection of the most suitable business model for adopting the circular economy, enabling startups to make more informed and sustainable strategic decisions when moving from linear to CBMs.

This paper is part of the ongoing research project NEBER funded by the Provincial Council of Gipuzkoa (Nº EZAGUTZA-14-2023). The project aims to develop a structured decision-making tool to guide startups in evaluating and prioritising circular business models based on multiple criteria and indicators of circularity and sustainability. Following a MCDM approach, the purpose of the research is to support new ventures in the ex-ante evaluation of different alternatives of circular business models based on empirical data, which will help them reduce uncertainty and make better decisions before investing significant resources in the circular business models innovation process.

The adopted methodology consists of three steps: 1) Systematic literature review, 2) Development of the approach, 3) Validation of the approach.

The first step aims to review the literature in three areas. Firstly, literature regarding the use of MCDM in the context of (circular) business models will be reviewed. Considering that there are about 60 MCDM methods available (Barretta et al., 2023), this task will be focus on exploring the different existing approaches and selecting the one that best fits the

research objective. Simultaneously, literature on circular business model typologies will be reviewed to select a set of patterns covering different circular economy strategies. Finally, literature related to sustainability and circularity criteria and indicators (both qualitative and quantitative) will be reviewed to establish evaluation criteria for the previously identified circular business models that are compatible with the selected MCDM method.

The second step involves the development of the MCDM tool for the evaluation and prioritisation of CBMs. This method will be developed based on the results of the review in step one, integrating the selected MCDM approach, the set of circular business models patterns, and the circularity and sustainability indicators for business model assessment.

The final step consists of tool validation. A pilot test will be conducted with the industrial startup dedicated to the manufacture of curved fiberglass profiles. This startup arises from the collaboration between an industrial company and the Faculty of Engineering of Mondragon University. Thus, the proximity with the startup's promoters may facilitate the collection of sensitive data as well as the management of data confidentiality if necessary. The objective of this task is therefore to test the developed method through a workshop where the members of Robtrusion will apply the tool to evaluate different alternatives of circular business models and prioritise the one(s) that best fits their strategy based on the selected circularity and sustainability criteria.

The research results aim to contribute to the field of circular business model innovation tools and sustainable business models assessment. It is expected to develop an accessible tool for startups and SMEs to support complex decision-making regarding business model innovation within the circular economy. The findings will help identify indicators that assist in evaluating and comparing business model alternatives using empirical data (both qualitative and quantitative). The developed CBM innovation tool can be of great assistance to both new ventures and SMEs that lack resources or historical data to assess the circular and sustainable impact of their business models.

Keywords

Sustainability performance, multi-criteria decision-making, sustainable business models, entrepreneurship, circular business model innovation tools

References

Barretta R, Taherdoost H and Madanchian M (2023) Multi-Criteria Decision Making (MCDM) Methods and Concepts. *Encyclopedia 2023, Vol. 3, Pages 77-87* 3(1). Multidisciplinary Digital Publishing Institute: 77–87. DOI: 10.3390/ENCYCLOPEDIA3010006.

Bocken N, Strupeit L, Whalen K, et al. (2019) A review and evaluation of circular business model innovation tools. *Sustainability* 11(8). Multidisciplinary Digital Publishing Institute: 2210. DOI: 10.3390/su11082210.

Bocken N, Boons F and Baldassarre B (2019) Sustainable business model experimentation by understanding ecologies of business models. *Journal of Cleaner Production* 208. Elsevier: 1498–1512. DOI: 10.1016/j.jclepro.2018.10.159.

Fichter K, Lüdeke-Freund F, Schaltegger S, et al. (2023) Sustainability impact assessment of new ventures: An emerging field of research. *Journal of Cleaner Production* 384. DOI: 10.1016/j.jclepro.2022.135452.

Geissdoerfer M, Pieroni MPP, Pigosso DCA, et al. (2020) Circular business models: A review. *Journal of Cleaner Production* 277. DOI: 10.1016/j.jclepro.2020.123741.

Geissdoerfer M, Santa-Maria T, Kirchherr J, et al. (2022) Drivers and barriers for circular business model innovation. *Business Strategy and the Environment*. DOI: 10.1002/bse.3339.

Horne J, Recker M, Michelfelder I, et al. (2020) Exploring entrepreneurship related to the sustainable development goals - mapping new venture activities with semi-automated content analysis. *JOURNAL OF CLEANER PRODUCTION* 242. THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, OXON, ENGLAND: ELSEVIER SCI LTD. DOI: 10.1016/j.jclepro.2019.118052.

Husain Z, Maqbool A, Haleem A, et al. (2021) Analyzing the business models for circular economy implementation: a fuzzy TOPSIS approach. *Operations Management Research* 14(3–4). Springer: 256–271. DOI: 10.1007/S12063-021-00197-W.

Kanda W, Klofsten M, Bienkowska D, et al. (2024) Challenges of circular new ventures: An empirical analysis of 70 cases. *Journal of Cleaner Production* 442: 141103. DOI: 10.1016/J.JCLEPRO.2024.141103.

Kirchherr J, Reike D and Hekkert M (2017) Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling* 127. Elsevier: 221–232. DOI: 10.1016/J.RESCONREC.2017.09.005.

Kopnina H (2019) Green-washing or best case practices? Using circular economy and Cradle to Cradle case studies in business education. *Journal of Cleaner Production* 219. Elsevier: 613–621. DOI: 10.1016/J.JCLEPRO.2019.02.005.

Lindgren P, Knoth NSH, Sureshkumar S, et al. (2021) " Green Multi Business Models" How to Measure Green Business Models and Green Business Model Innovation? *Wireless Personal Communications* 121. Springer: 1303–1323.

Marrucci L, Corcelli F, Daddi T, et al. (2022) Using a life cycle assessment to identify the risk of "circular washing" in the leather industry. *Resources, Conservation and Recycling* 185. Elsevier B.V. DOI: 10.1016/J.RESCONREC.2022.106466.

Mendoza JMF and Ibarra D (2023) Technology-enabled circular business models for the hybridisation of wind farms: Integrated wind and solar energy, power-to-gas and

power-to-liquid systems. *Sustainable Production and Consumption*. Elsevier.

Trautwein C (2021) Sustainability impact assessment of start-ups – Key insights on relevant assessment challenges and approaches based on an inclusive, systematic literature review. *Journal of Cleaner Production* 281. Elsevier Ltd. DOI: 10.1016/j.jclepro.2020.125330.