

Challenges and barriers in transition to circular economy business models

*Badri Gechbaia*¹, *Teona Maisuradze*^{2*}, *Nino Paresashvili*³, *Ketevan Goletiani*¹, and *Levan Gvarishvili*⁴

¹Batumi Shota Rustaveli State University, 6000 Batumi, Georgia

²Georgian National University, 0144 Tbilisi, Georgia

³Iv. Javakhsishvili Tbilisi State University, 0186 Tbilisi, Georgia

⁴Batumi Navigation Teaching University, 6000 Batumi, Georgia

Abstract. Circular Economy (EC) is a term that has not been studied fully yet and is attracting the growing interest of scholars. It is vital for our planet and each of our lives to take care of EC principles. In this process, the business sector plays a leading role. This process is challenging and requires understanding circular economy principles first, after analyzing linear business models and comparing them to the CBM (Circular Economy Business Model). Based on these, it will be easier for businesses to adopt any of them. The aim of the paper is to discuss these and give recommendations based on the literature, research papers, and publications available at this moment. Key Findings: The barriers to moving from BM to CBM are still strong, but business behavior shows that there are already some signs of a circular economy, which can be considered an important step for the planet and people's lives; recommendations are given on how to help businesses to overcome obstacles on this difficult path.

1 Introduction

Observation of the environmental changes due to the people's actions gained importance with the developing of production and increasing activities number which has some outcomes as these outcomes can cause damage both to work and living places. The popularity of managing these outcomes originated with the terms circular economy, shared economy, waste management, sustainable development and etc. Common sense is to extend the product lifecycle as long as possible. A circular economy as the term it is today has appeared in different sources since 1960 [1]. Many businesses are interested in this idea because they recognize the financial advantages of using it to successfully address sustainability issues, improve performance and competitiveness, foster innovation, and promote economic growth and development [3]. By incorporating various tactics to produce, provide, or collect value into their business models, businesses may pursue circular aims, such as reuse, repair, and recycling, at any level which product goes on its lifetime.

* Corresponding author: t.maisuradze1@seu.edu.ge

Each step of the lifecycle includes distinct players operating in it, and each has a different importance for the many cyclical goals. Circular objectives to be sought throughout the usage phase are frequently connected to "longer use," "repair," or "reuse" [2]. Geissdoerfer et al. [5] sum up 114 different definitions of circular economy and developed one, which sounds following: "an economic system in which resource input and waste, emission, and energy leakages are minimized by cycling, extending intensifying, and dematerializing material and energy loops than can be achieved through digitalization, servitization, sharing solutions, long-lasting product design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling".

2 Business models in the context of the circular economy

The business model concept is used in research to identify processes properly and make analyses. One of the most common business models is the linear business model. Before discussing the circular business model, we will briefly review it in the current economy. The linear consumption model is a well-known model in the global economy. It involves the process by which goods produced from raw materials are disposed of as waste after being used or sold. The linear economy approach is founded on receiving the planet's natural resources and creating products [5].

Circular economy concepts can be successfully used in Business but for organizations, it can be challenging. To take these challenges and use them for decreasing expenses by extending the product lifecycle is beneficial for all the stakeholders. For analyzing these, it is significant to discuss business models in a circular economy and evaluate their advantages and disadvantages from an organizational perspective.

Geissdoerfer et al. [5] define business models as models that are "cycling, extending, intensifying, and/or dematerializing material and energy loops to reduce the resource inputs into and the waste and emission leakage out of an organizational system. This comprises recycling measures (cycling), use phase extensions (extending), a more intense use phase (intensifying), and the substitution of products by service and software solutions (dematerializing)" [5]. Gerholdt [4] has submitted her paper on innovative business models in the circular economy. The first model was related to the supply chain, which has been developing faster in the last few years and has the potential to be used for circular aims. The second one touches on the problematic issue of implementing product recovery and making recycling maximal. With these two models and additionally another attempt at product life extension with additional platform sharing, we can achieve goals to live in a better future with the circular economy. His one more model is related to the use of a product as a "service" which, from our point of view, can be considered an additional tool on the way to a "circular future".

For implementation and upscale circular business models, it is required to have goals aligned with the circular aims. Such aims can be: to use used products; to repair all that is possible to repair; and to recycle materials that can be recycled. It should be emphasized that it will be impossible without policymakers' joint decisions. Additionally, organizations have to participate in this process and develop new business models using innovations [6]. This process is known as business model innovation. And the most significant condition is that business model innovation cannot be considered separately. Moreover, it must be combined with technological, social, or similar types of innovation in organizations and society [2]. The World Economic Forum defines five business models of the circular economy using which organizations can gain a competitive advantage [6].

The first model is circular inputs, where inputs that are recyclable, renewable, or highly recyclable are utilized in industrial processes in a circular economy, allowing for the partial

or complete reduction of waste and pollution. Instead of being a burden for which you must pay to rid yourself, waste is turned into a resource. The second model is based on sharing.

It means maximizing the consumption of unused assets within a society, which gives clients low-cost, accessible access to goods and services. Industrial assets such as conveyor belts, forklifts, machinery, and warehouses can also be shared. Next can be product as a service, which aims for the consumer to pay for a service for a set period, but the owner keeps ownership of the product and receives payment for ongoing upkeep, durability, updates, and treatment when the usage life of it comes to an end. The fourth model means products are designed for repair ability, upgradeability, reusability, simplicity of disassembly, reconditioning, and recycling. And the last one: the goal of resource recovery is to salvage embedded materials, energy, and resources from goods that cannot be useful anymore for their intended purpose [6].

Kirchherr, Reike, and Hekkert have adopted [7] table which shows the strategies how to move from a linear economy to the different and innovative one which at this stage can be a circular economy (Fig. 1) [8].

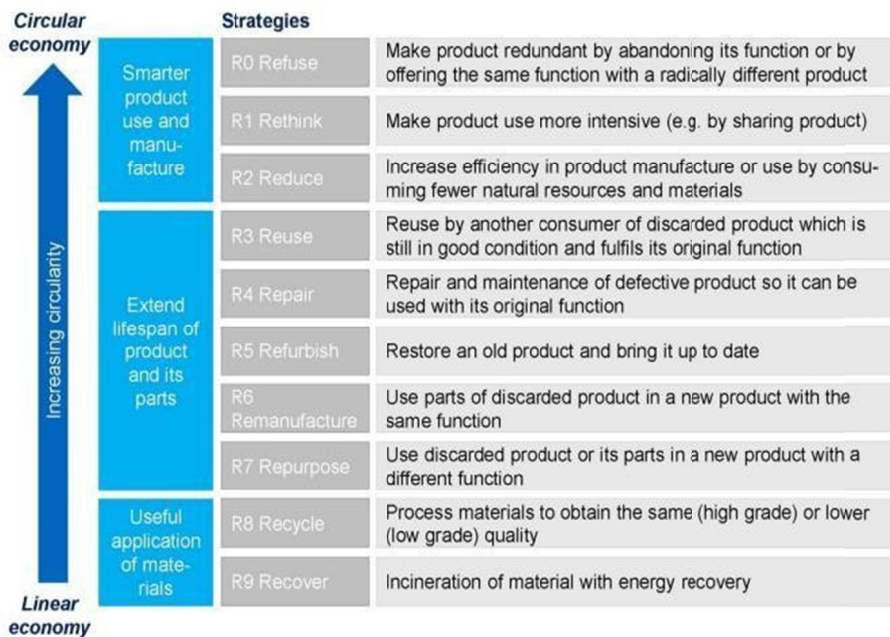


Fig. 1. 9R framework [8].

Atasu, Dumas, and Wassenhove [9] have developed three strategies for how it is possible to move toward circularity:

1. "Retain product ownership (RPO)," whereby instead of selling a product, the producer rents or leases it to the buyer in the basic version of this strategy. As a result, after customers have finished using a product, the producer is responsible for it.

2. "Product life extension (PLE)": companies that follow this strategy focus on making things that survive longer, which might open up new markets for old products.

3. "Design for recycling (DFR)": This strategy requires companies to adapt their goods and production processes in order to optimize the recoverability of the materials used in new products [9].

Today, one more popular model is value strategies used in business models based on recycling and upcycling (Fig. 2).

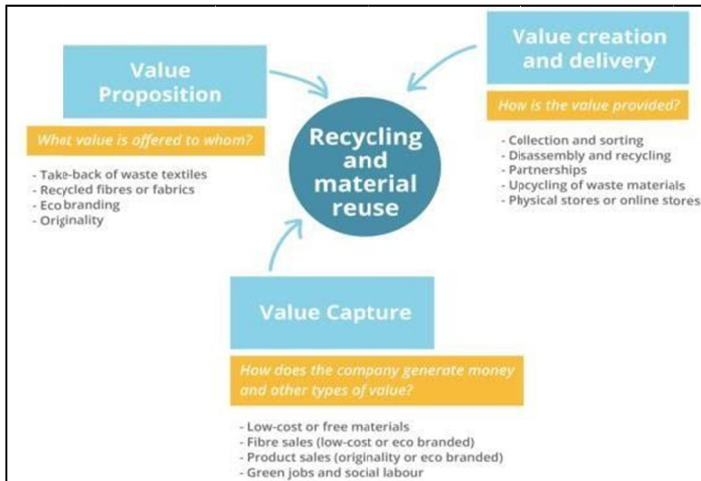


Fig. 2. Value strategies used for recycling and upcycling business model [10].

Bocken and Ritala [11] offer six ways how to create a business model in their paper. These ways are:

1. “Closed-narrowing”, which means saving costs and resources inside the organization.
2. “Open-narrowing: collaborative efficiency”;
3. “Closed-slowng”: live with less, which means continuing use for a much more period of a time”;
4. “Open-slowng: collaborative product stewardship”;
5. “Closed-closing: continuous material reuse”;
6. “Open-closing”: use the ecosystem integration and try to reduce the maximum amount of waste” (Fig. 3) [11].

		Resource strategy		
		Narrowing loops	Slowing loops	Closing loops
Innovation strategy	Open	<p><i>Open-narrowing</i></p> <p>Value proposition (example): Reduce waste and resources in design and production processes</p> <p>Value creation and delivery: Reduce cost and negative impact through new technologies and processes in collaboration with suppliers, customers and others</p> <p>Value capture logic: Save cost and resources</p> <p>Case examples: industry collaboration on cleaner refrigeration technology; Sony and Samsung collaboration on LCD efficiency</p>	<p><i>Open-slowng</i></p> <p>Value proposition (example): Reuse resources to broaden the offerings to the customer (e.g. vintage, second-hand)</p> <p>Value creation and delivery: Create value by connecting internal and external resource flows via generative models</p> <p>Value capture logic: Increase the number of transactions in an ecosystem via reuse of products</p> <p>Case examples: H&M – Selby collaboration in second-hand clothes market; iFixit repair platform; ResQ Club excess food sales model</p>	<p><i>Open-closing</i></p> <p>Value proposition (example): A circular offering which involves lower environmental footprint and resource burden</p> <p>Value creation and delivery: Combine resource flows from external ecosystem into customer offerings</p> <p>Value capture logic: Lower the cost of resources used in customer offerings, improve brand and corporate image</p> <p>Case examples: Interface Networks for ‘circular carpets’ with ZSL, Aquafil and fishery communities; JLR and Novelis closing the aluminum loop</p>
	Closed	<p><i>Closed-narrowing</i></p> <p>Value proposition (example): Reduce waste and resources in design and production processes</p> <p>Value creation and delivery : Reduce cost and negative impact through internal technology, process and design innovations</p> <p>Value capture logic: Save cost and resources</p> <p>Case examples: Companies like Apple minimising packaging and using recycled materials; McDonald’s “fried for fuel”</p>	<p><i>Closed-slowng</i></p> <p>Value proposition (example): High quality products with high customer value</p> <p>Value creation and delivery : Long lasting design, repair services; Create more value from less resources</p> <p>Value capture logic: Price premium through achieving quality leadership and customer loyalty; create value from same product multiple times</p> <p>Case examples: Long-life warranties; hotel linen rental services focused on product longevity</p>	<p><i>Closed-closing</i></p> <p>Value proposition (example): Connect with customers by using, recovering, and maintaining post-consumer materials</p> <p>Value creation and delivery : Increase customer retention and repurchases via take-back plans</p> <p>Value capture logic: Resource efficiency, improve brand and reputation, reduce cost for materials</p> <p>Case example: Take-back, rental and lease models to recover the company’s own materials such as MUD Jeans Lease and Philips pay per lux</p>

Fig. 3. Strategy framework for CBM [11].

The adoption of circular economy concepts is a complex problem. It is linked, among other things, to the engagement of frequently substantial resources related to the technical use, such as money or other financial assets, changes in business strategies, or the requirement to acquire competencies. It should be mentioned here that in this process, it is vital to consider personnel involvement in the implementation process [12].

3 Barriers to implementing circular economy business models

At one glance, the circular business model seems admirable for organizations, but there are some significant challenges that needed to deal with. Scholars have developed main barriers and obstacles related to this topic.

Changing the economic model and achieving maximized use of resources is the interest for different category people, such can be not only politicians but also average European citizens [1] and citizens from other countries who are aware of the circular economy concepts.

Hina [14] claimed that barriers to the circular economy can be internal. They arranged these internal barriers into seven groups. First, the sub-category is policies and strategies existing in the company; next are finance-related issues; barriers related to the use of technology in the process; scarcity of resources; collaborations; product design; and internal stakeholders [14].

In study [15] discussed challenges for SMEs to adopt circular economy business models and defined them. The main ideas we share as well is discuss further. First of all, culture is one of the most problematic issue in the process. People have different perception due to it which is strengthen by the experience they have in life and the skills they gained. Additionally, market is changing so fast, that it is hard to predict something. Pandemic was the best example for all to show how unexpected situations can change all. And in this conditions, adaptation is going slowly. We face with the problem of highly qualified employee decrease which can be considered as one of the main barrier. Further, seasonality, especially in an agriculture and related industries is a biggest challenge on the way to the circular business model. Besides, this direction is characterized with low profitability return on investments. The other problem, worth to mention is lack of cooperation between rural SMEs and other sectors. There are states and organizations who support innovations, but they mainly focus on medium and large companies, not SMEs. Thus, they are struggling for funding. This situation is mostly felt by non-agricultural companies. And even when they start the process, administrative bureaucracy in public support programs appears as the next barrier." [15]. If we combine all the above mentioned together, we can see how harder the process is. All what we can do, to realize these and reach the voice to relevant authorities to make the efforts they have to the society.

Brendzel-Skowera [16] makes a conclusion that the biggest obstacle in the transition process is personnel. Nowadays, they don't have an understanding of the circular economy principles. Additionally, they have a shortage of skills required in this process. Thus, they cannot be involved in the process without relevant support from the organizations towards CE at the initiation and implementation phases. Only this way is possible to adopt new business models. This process is even harder for small businesses because they need more financial resources and organizational support. Companies are mostly driven by rationality when they act when taking care of environmental issues [16]. On our point of view, it is normal and corresponds to all the changes organizations are implementing [17].

Last two years, COVID-19 has emphasized the importance of the supply chain and demand network more than ever. This is the aspect that should be considered in any ongoing process in the organization.

In the context of the transition from the linear business model to the circular economy business model, one of the barriers can be directly related to it. From the SMEs he surveyed, more than 50% (54%) said their main problem was the biggest effort to take any help from the network of demand and supply. Namely, the main problem is a deficit of "green" suppliers. [18] On our point of view, these "green" suppliers can be considered SMEs, and finally, we are moving on to the issue that the transition process should be achieved by involving as many economy members as possible.

In the study [19] has discussed some more barriers in the transition process to the circular economy.

The first barrier is related to the state and government. It is well known that taxes, subsidies, and other types of support from the government are directed toward organizations working as per the linear business model. Unfortunately, the situation is the opposite in the case of organizations trying to work with circular economy principles. Thus, their financial competitiveness is low.

The second barrier is related to the supply chain, which we have discussed above. The authors consider this barrier significant, as in many industries "the supply chain is limited for sustainable material alternatives that can be recovered for remanufacturing and reutilization for another product". The other barrier can be "consumer behavior and perception".

A key component of market behavior is public acceptability, which has the power to persuade businesses to change their operating models from linear to circular. "Infrastructure and institutional support" can also function as barriers because they are necessary for the successful implementation of circular economy principles. And the last one is related to the lack of knowledge and technical expertise mentioned above. Thus, this is one more obstacle small and medium enterprises have in the transition process from linear to circular product life cycles (Fig. 4) [19].

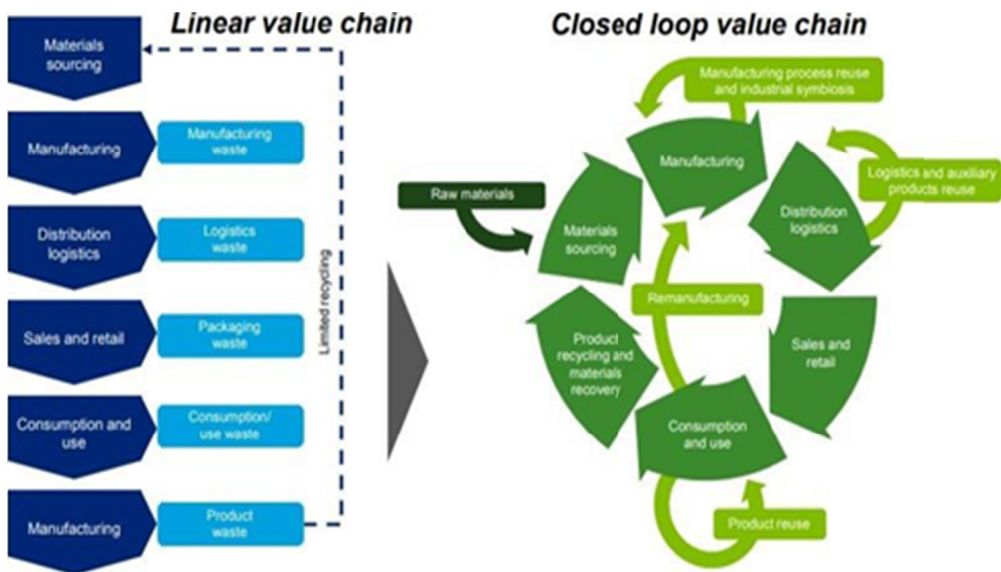


Fig. 4. Linear BM and value chain [20].

Organizations, especially SMEs, should consider all these barriers to do analysis, evaluate potential results and adopt the circular economy model as soon as possible. Time is very important in this case as starting immediately means saving more resources [21-22].

4 Conclusion

Any product or service has a lifecycle that has been desired to be longer. Besides, each activity in business is related to waste. These reflect or will reflect on our people's lives. First of all, what can be done regarding making our lives, work, businesses, and environment better? It is vital to raise awareness about the circular economy and its' use in life. Related to waste management, more or fewer companies try to have less waste, reuse what is possible, or sell it at a low price. At this stage, their aim is to decrease expenses and have higher profits. But if we analyse this process deeply, we can see that some signs of the circular economy already exist in business.

How to do it? The first step can be to organize some workshops for pupils and show them the reuse of unused materials and other small activities. Next, in universities, the circular economy should be an obligatory subject for any business direction students and not only. Other students as citizens of the globe have to know circular economy business models. After raising awareness, Second, all the barriers discussed in the paper should be analysed and relevant circular economy principles should be aligned.

Related other recommendations, we share and agree with the scholars' recommendations: KPIs should be defined in CE way; Encouraging consumers to change their behaviour and consider CE principles; to act as per CBM model in the transition process. To sum up, CE is very important for the future of us and the Earth. Thus, companies should consider all this information and start adopting to CBM immediately.

References

1. Nazarko, J., Chodakowska, E., & Nazarko, Ł. (2022). Evaluating the Transition of the European Union member States towards a Circular Economy *Energies* 2022, 15, 3924 <https://doi.org/10.3390/en15113924>
2. EEA. (2021). A framework for enabling circular business models in Europe
3. Uschamberfoudnation. (2015). Achieving A Circular Economy. U.S. Chamber of Commerce Foundation.
4. Uschamberfoudnation. (2015). Innovative Business Models Enabling the Circular Economy. U.S. Chamber of Commerce Foundation.
5. Geissdoerfer, M., Pieroni, M.P., Pigosso, D.C. and Soufani, K., (2020). Circular business models: A review. *Journal of Cleaner Production*, 277, p.123741
6. Jensen, H. H. (2022). 5 circular economy business models that offer a competitive advantage World Economic Forum
7. Potting, J., Hekkert, M., Worrell, E., & Hanemaaijer, A. (2017). Circular Economy: Measuring Innovation in the Product Chain. <http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-016-circular-economy-measuring-innovation-in-product-hains-2544.pdf>
8. Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions *Resources, Conservation & Recycling*, 127, pgs. 221–232
9. Atasu, A., Dumas, C., & Wassenhove, L. N. V. (2021). The Circular Business Model *Harward business review*
10. Dils, E. (2021). ETC/WMGE Report 2/2021: Business Models in a Circular Economy. European Topic Centre Waste and Materials in a Green Economy.

11. Bocken, N., & Ritala, P. (2022). Six ways to build circular business models. *The Journal of Business Strategy*, 43(3), 184–192. <https://doi.org/10.1108/jbs-11-2020-0258>
12. Brendzel-Skowera, K. (2021). Circular Economy Business Models in the SME Sector. *Sustainability* 13, 7059. <https://doi.org/10.3390/su13137059>
13. Kaplan, S. (2016). By 2050, there will be more plastic than fish in the world's oceans, study says. *The Washington Post*. <https://www.washingtonpost.com/news/morning-mix/wp/2016/01/20/by-2050-there-will-be-more-plastic-than-fish-in-the-worlds-oceans-study-says/>
14. Hina, M., Chauhan, C., Kaur, P., Kraus, S., Dhir A. (2022). Drivers and barriers of circular economy business models: Where we are now, and where we are heading, *Journal of Cleaner Production*, 333 (2022) 130049
15. Atstaja D., Cudecka-Purina, N., Hrinchenko, R., Koval, V., Grasis, J., & Vesere, R. (2022). Alignment of circular economy business models for framing national sustainable economic development. *Acta Innovations*. 42, 5-14. <https://doi.org/10.32933/ActaInnovations.42.1>
16. Brendzel-Skowera, K. (2021). Circular Economy Business Models in the SME Sector. *Sustainability*, 13, 7059. <https://doi.org/10.3390/su13137059>
17. Arsawan, I. W. E., Koval, V., Suhartanto, D., Hariyanti, N. K. D., Polishchuk, N., & Bondar, V. (2023). Circular economy practices in SMEs: aligning model of green economic incentives and environmental commitment. *International Journal of Productivity and Performance Management*
18. Rizos, V., Behrens, A., Gaast, W., Hofman, E., Ioannou, A., Kafyeke, T., Flamos, A., Rinaldi, R., Papadelis, S., Hirschnitz-Garbers, M., & Topi, C. (2016). Implementation of Circular Economy Business Models by Small and Medium-Sized Enterprises (SMEs): Barriers and Enablers, *Sustainability* , 8(11), 1212; <https://doi.org/10.3390/su8111212>
19. Melati, K., Nikam, J., & Nguyen, P. (2021). Barriers and drivers for enterprises to transition to circular economy SEI discussion brief
20. Deloitte. (2022). *Circular Economy From theory to practise*.
21. Salvioni, D.M., Bosetti, L., & Fornasari, T. (2022). Implementing and Monitoring Circular Business Models: An Analysis of Italian SMEs. *Sustainability* 2022, 14, 270. <https://doi.org/10.3390/su140102>
22. Jonker, J., Kothman, I., Faber, N., & Navarro, M.N. (2018). *Organising for the Circular Economy A workbook for developing Circular Business Models*. Doetinchem: OCF 2.0 Foundation