Chapter 3
Innovation in a Company Committed to Sustainability Culture

M. J. Alvarez, C. Jaca, M. Ormazabal, and J. Rincon

Abstract Sustainability and the circular economy are the answer to today's challenge of resource depletion and waste generation. The transition to circular economy requires technological and process innovations: However, the capacity for innovation has often been a point of difficulty, and the problem is worse in small-sized companies because of the scarcity of resources. Our aim is to show how a company committed to sustainability overcomes the obstacles in the innovation process.

Keywords Sustainability · Circular economy · Eco-innovation · Case study · SME

3.1 Introduction

The increase in the world's population, the expansion of middle-class consumers in developing countries and the growth of urbanized areas are inflating the demand for products and services [20]. These facts make the current production system unsustainable. Therefore, sustainability can no longer be a simple matter of reputation for companies. It is not just a matter of companies. Governments and society must address the big challenge of this millennium. Circular economy (CE), inspired by natural ecosystems, is an alternative to the non-sustainable take-make-waste system that constitutes the linear economy. The need for an alternative system is patent given the fact that a significant proportion of non-renewable resources is diminishing, and natural resource volatility is increasing. In that sense, economic growth should be

M. J. Alvarez (✉) · C. Jaca · M. Ormazabal · J. Rincon
Tecnun, Universidad de Navarra, C/Manuel de Lardizabal, 13, San Sebastián, Spain
e-mail: mjalvarez@tecnun.es

C. Jaca
e-mail: cjaca@tecnun.es

M. Ormazabal
e-mail: mormazabal@tecnun.es

J. Rincon
e-mail: jrincon@tecnun.es

C. Avilés-Palacios and M. Gutierrez (eds.), *Ensuring Sustainability*,
Lecture Notes in Management and Industrial Engineering,
https://doi.org/10.1007/978-3-030-95967-8_3

decoupled from the consumption of natural resources, which is possible with an economic model based on CE principles. CE is "an economic system that represents a change of paradigm in the way that human society is interrelated with nature and aims to prevent the depletion of resources, close energy and materials loops and facilitate sustainable development through its implementation at the micro- (enterprises and consumers), meso- (economic agents integrated in symbiosis) and macro- (city, regions and governments) levels. Attaining this circular model requires cyclical and regenerative environmental innovations in the way society legislates, produces and consumes" [14].

In recent decades, governments have been implementing policies to boost sustainability. Germany led the way with the Waste Disposal Act in 1976 and Japan with the Law for Effective Utilization of Recyclables in 1991 [6]. China was a pioneer in the circular economy with the Circular Promotion Law in 2009 [16]. The European Union's 2008 Directive 2008/98/EC on waste sets the region on the road to the European Green Deal by the end of 2019. At a global level, in 2015, the United Nations proposed 17 Sustainable Development Goals (SDGs), a broad framework for more sustainable production and consumption that is to be achieved by 2030.

3.1.1 Circular Economy and Innovation

Innovation is defined as the "generation, acceptance and implementation of new ideas, processes, products or services" [17]. The term was introduced by Schumpeter in 1939 [15] "as the introduction of new goods, new methods of production, new markets, the conquest of new sources of supply and the carrying out of a new organization of any industry". Nowadays, innovation is important for any business. In fact, it is considered to be a way to obtain competitive advantage. Companies must continually adapt its activity to the needs of their customers. To be competitive, they must discover new products or services or offer them differently. If a company wants to survive, it has to continually adapt, anticipate the needs of the clients and/or discover business models. For that reason, innovation should be present in any organization.

As previously stated, nowadays, we face big challenges such as climate change, pollution and resources depletion. Eco-innovation arises to help to mitigate these problems. The notion of eco-innovation was introduced as a sort of innovation that improves environmental performance. Eco-innovation is defined as a set of technological and non-technological innovations that prevent, mitigate and allow recovery from environmental damage. Today, companies must provide their services or products in response to social demands for sustainability and the environmental challenges and climate change. This implies that the process of innovation must aim at sustainability as one of its goals. It is understandable, then, that many authors have stressed the importance of innovation in achieving the transition toward sustainability [4, 8].

3.1.2 The Role of the Small and Medium Enterprises (SMEs)

SMEs are vital to the challenge of achieving a more sustainable production system, as they are an important part of the business network of any society. SMEs represent 98% of the companies in Europe [11] and 99% of all businesses and between 50 and 60% of value-added across the OECD [13]. Therefore, they must take part in this global transformation toward a more sustainable productivity system. However, most of the research on the role of business in advancing the CE has focused on large companies [19]. Besides, small companies face great difficulties into innovate due to their limited resources [12]. SMEs are very limited due to barriers such as the lack of financial and specialized professionals that are needed to be able to innovate. They usually do not have a R&D department, and they lack the required knowledge to innovate successfully. Also, failure of innovation projects may be financially catastrophic for them [2]. One way to overcome these barriers is to collaborate with other companies and organizations. There are many collaboration models: partnerships, networks, strategic alliances, etc. This collaboration aims to achieve complementarity, knowledge sharing and access to financial resources [7]. Collaboration with universities and research institutes has been proved successful [18].

A special category of companies worth paying attention to is start-ups that usually arise from an innovation. Most of them are SMEs. The difficulties that they meet are of such magnitude that the "failure rate among start-ups currently stands at an alarming rate of approximately 90%" [3]. SMEs and large firms innovate differently because they possess different organizational structures [10]. Small companies have the advantage of flexibility, and they can be more dynamic. However, as it has been mentioned above, their difficulties in innovating are quite important.

3.1.3 Sustainability Culture

We understand organizational values as shared and accepted values within the organization [1]. This paper aims how the culture of sustainability within a SME drives the overcoming of difficulties it faces when trying to innovate.

3.2 Methodology

We adopt an explorative case study research strategy to empirically investigate how a sustainable culture influences innovation behavior in companies. More specifically, we chose a SME whose main activity is closing the loop for a material that is problematic from an environmental standpoint: plastics. It is a company with a deep-rooted culture of sustainability. The period covered by the research is from the beginning of 2016 to the end of 2018. We have used a multi-method approach to answer our

research question using data collection techniques such as semi-structured interviews and desk research. A description of the methods used is described below:

1. Semi-structured interviews with the CEO and senior manager of the company. They were conducted to gain information about the experiences of individuals [5].
2. Information available from Web sites, reports and press releases or news items, to triangulate the information and to help ensure that the data the company is answering to this research is consistent with the reports [9].

In accordance with the objective of this paper, the case study aims to verify how the culture of sustainability of this company drives innovation. The results of the following section present innovation projects that have emerged as a result of having a sustainable culture.

3.3 Results

Eko-REC is a small-sized company specialized in the recycling of PET plastic obtained from the municipal garbage collection system (the yellow recycling container in Spain). The company manufactures packaging and products for the automotive and food sectors. It embraces sustainability principles and is a leader in the transition toward the CE. It is the only factory in Europe that uses all the flakes it produces in the manufacture of the final products. In addition, sustainability is a cultural value of the company that is shared by all employees, who are involved in generating strategy and making decisions.

Eko-REC was founded in 2012 as a company whose economic model was based on creating value by reusing assets from a company that went bankrupt. Eko-REC owners saw an opportunity in the ruined company's PET recycling plant. The productive assets acquired by Eko-REC were the ones that the company then used to close the loop for a particular kind of plastic, namely by transforming PET waste into flakes that are then used as raw materials in their own production process.

The idea behind Eko-REC's business came from the fact that companies were looking for ways to make products with less environmental impact, and that those companies were willing to work with a supplier who could offer them recycled and recyclable materials.

The company is experiencing steady growth. During the period under consideration, the number of employees has grown from 100 by the end of 2015 to 115 at the beginning of 2018. Nowadays, they recycle 23,000 tons of plastic per year, which means that 1 out of every 3 bottles that end up on a yellow container in Spain is recycled by Eko-REC.

3.3.1 Manufacturing Processes

There are three types of manufacturing processes in the Eko-REC facilities: PET is recycled into flakes, which are in turn transformed into one of two products, PET sheets or polyester fiber.

Recycling PET into flakes: The raw material (bales of plastic) is bought from separating companies; to start the process first, the bales go through a bale-breaker that further separates the materials, so they are easier to process in the next stages. After that, the broken bale goes through three kinds of sorters, first, a magnet extracts little pieces of metal materials, after that, the remaining unsuitable materials are removed with the help of an automatic optic selector, which also are in charge of separating the remaining PET into a transparent group and a multicolor group, and our last sorter is manual, that is, two workers are in charge of manually sorting the remaining groups with the sole purpose of correcting any mistakes the automatic processes might have made.

Afterward, the 60–70% of material left undergoes further processing: first, grinding process because there are still tags and other materials that will be latter classified as waste. Second, a flotation process, in which the grinded materials are put into a liquid that separates by flotation tags, caps and little residues; the caps are sold to clients (to manufacture other products), and the tags and residue are classified as waste. Third, after eliminating the unwanted materials, the rest undergoes a cleaning and drying process by centrifuge. Finally, an optic control process takes place, and two different products can be differentiated at the end: transparent flakes and multicolored flakes.

Manufacturing PET sheets: In the facility where this process takes place, there are two big production lines plus a smaller line for testing. The process begins with clear flakes as the raw material (obtained in the previous process); first, they are mixed with virgin and recycled flakes provided by suppliers. Second, they go through a simple extrusion process, after which the extruded material gets formed and silicone is added. Then, the material is dried, reeled, weighed, cut and shipped to clients. This process has as a result PET sheets of different colors and thickness; the final product, the reels; sometimes have different measures, because each client usually asks for certain measures to fit their specific production machines.

Manufacturing polyester fiber: In this process, the multicolored flakes obtained in the first process are mixed with other multicolored flakes purchased to suppliers and are transformed into polyester fiber of all kinds of colors. In the facility where this manufacturing process takes place, there is one large production line, a medium size one and a small one for special colors.

First, the flakes are melted in an infrared drier; after, they are mixed with colorant in order to achieve the requested colors by the clients (usually black). Then, the mix is extruded, and strained, using cylinders as strainers. After collecting the threat created by the holes, continuous and straight fiber is obtained; that is, latter passed through thermostable rollers converting it into a wavy fiber. Finally, the fiber is dried, stabilized and cut; ready to be packed in bales for clients. Unlike the final product of

the PET sheet manufacturing process, the final product obtained from this process has standard measures, which means that every client receives the exact same bales in terms of height and weight, being the color the only feature that may change upon request of clients.

Another interesting process that takes place in Eko-REC's facilities is the energy conversion process; in which gas is converted into different types of energy. In the cogeneration plant, natural gas is bought and transformed into two very different things. First is transformed into electric energy that is then sold to the electric network. And, second is converted into thermal energy in the form of hot water, cold water and vapor steam that is used for Eko-REC's own processes and also sold to other companies.

3.3.1.1 Raw Materials and Manufactured Products

To sum up, here is a list of the main raw materials that Eko-REC needs and the products that are manufactured as the result of the processes mentioned above:

1. Raw materials

- PET bottles: They are the main raw material used by the company. Most are provided by Ecoembes (the organization that coordinates the recycling container network in Spain). Other providers are bottle manufacturing companies that produce defective batches.
- Virgin flakes: Food sector regulations require that a thin outer layer of the PET sheet used in packaging not be made of recycled plastic because it will come into contact with the food. Therefore, 10% of the sheets for the food sector must come from virgin flakes.
- Other raw materials: Some of the processes include other materials such as the colorants and additives needed to achieve the required properties of the final products. All of them are recyclables.

2. Manufactured products

- PET sheets: Eko-REC produces sheets of different colors and thicknesses from clear flakes. Clients (usually from the food sector) use them for packaging.
- Flakes: The PET bottles are converted into different colored flakes. These flakes are the raw material for other final products manufactured by Eko-REC.
- Polyester fiber: Eko-REC manufactures polyester fibers of diverse colors using multicolor flakes and colorants. Most of the fiber bales are destined for the automotive industry for car interior elements (carpets and upholsteries).

3.3.2 Projects

As a company, Eko-REC is involved in many different projects that show its commitment to its values and brand. The degree of evolution they have experienced in such a short time is pleasantly surprising, mainly because of the company's size.

In general, in a company's early years, it tends to be more conservative and strategic when it comes to selecting and doing projects. What can be observed in Eko-REC is a refreshing enthusiasm toward new projects. Eko-REC's CEO firmly states that their goal as a company is to have 70% of their billings, in just 10-year time, come from products that they do not currently manufacture. An ambitious goal such as this can only be achieved by a very intense and effective R&D department, whose aim is to find new ways to give waste a second life that is not currently possible, whether is because the technology is not able to accomplish it yet or those ways have not been explored as viable because of their financial risk. Currently, the R&D department is one of the foundations of the company, and it is well known in the sector for the continuous innovative projects it undertakes under its direction.

As evidence of this, we compiled their numerous projects over the last few years, along with their goals, results and partners.

Table 3.1 shows the projects in which Eko-REC has been involved internally and Table 3.2 in collaboration with other companies. We consider the number and quality of these projects to be an adequate indicator of this company's attitude toward innovation. All of them are related to sustainability. In some cases, the purpose is to take advantage of waste from internal manufacturing processes, and in other cases, it is to make better use of raw materials or even to launch a spin-off company to provide solutions to major environmental problems such as the garbage in the seas. But all in all, the goals of the projects can be categorized into 2 main orientations: The improvement of energy efficiency in production or the search for alternative uses to all the waste that comes out of their PET sheet and polyester fiber manufacturing processes. The number of projects and the ambitions of its goals are surprising considering the size of the company.

Another manifestation of the company's innovative character is the launch of a new brand in 2017 Ekomodo, which offers a new set of products: office accessories. A brand Ekomodo represents a more conscious, responsible and sustainable way of life; making products with functional and esthetic design out of plastic waste. The products and the brand follow a sustainable philosophy and target a new type of customer that feels they have a compromise with social and environmental improvement. This business is completely different from the main activity of the company, and since all products are made from recycled plastic, which is in line with their values, they maintain the culture of sustainability.

Table 3.1 Inner projects (where only Eko-REC participated)

Project	Year	Goal	Key challenges	Results
Particle board	2018	Reduce the generated waste in the processes that are carried out in Eko-REC	Find the machine that would fit the needs of this project	Through the acquisition of a new machine that manages to bind the waste particles and produce PET flakes, they eliminate 500 tons of waste per year and produce 500 tons more of flakes at the same buying cost
Black master batch	2016	Fabricate the colorant (black master batch) in the company	Expand the industrial capacities to coextrude PET pellets with carbon black and fabricate master batch	Fabricating the master batch at Eko-REC had higher costs than buying it; it had a low quality; therefore, the company did not go forward with this project
3D 100% recycled	2016	Prove and demonstrate that it is possible to produce filament with recycled PET plastic, for the 3D impression	Reduce the environmental impact of the growing additive industry by using recycled and recyclable filament	This project proved that it was possible to use a filament made out of recycled PET in the 3D printing industry. However, the quality of this product is still far from the quality of the products made with filament from non-recycled plastic. Therefore, there are no companies interested in this product

Table 3.2 Collaboration projects (where only Eko-REC joins forces with other companies)

Project	Year	Partners	Goal	Results
District heating	2017	Irizar e mobility	Use as much residual heat as possible (obtained from the industrial processes) by designing a heating circuit in order to strengthen the industrial symbiosis of the company and area	The project has become a regular activity between both companies, transporting the energy from Eko-REC's cogeneration plant to Irizar's plant in the most efficient way
Orlegi Sarea	2016	Ihobe & Sea2See	Reduce marine litter, by recycling fishing nets made out of polyamide	It was proven that it is possible to recycle net waste and give them a second life by using this waste to manufacture frames. But, the process had no economic viability due to the nets treatment
Eko-Koopera	2017	Ihobe & Koopera	Reduce textile waste, by recycling synthetic textiles made of polyester transforming them to pellets and using them for car carpets	This project proved that it was possible to transform textile waste into PET sheets. But, the project is industrially and economically unfeasible due to the tedious manufacturing process and the quality of the of the final product proven to be much worse than the one obtained using recycled bottles
Ekotex	2017	European union & other companies	Reduce textile waste by closing the cycle of waste items made out of polyester that cannot be reused or reintroduced in a manufacturing process, through a chemical recycling process for the production of monomers that are fit to use to produce new textile products	It had positive results and reached the goal of fabricating textile products with textile waste. However, Eko-REC's current plans do not include fabricating textile products as something regular. It has been proven that it is feasible. The EU is part of the project, so it will be easier to find a company that is interested in starting this kind of project

3.4 Conclusions

The company engages in innovative behavior, as evidenced by the amount and quality of projects that it has undertaken in a short time. Because most of the projects tackle challenges related to sustainability, it can be deduced that this cultural value of the company acts as a motivation for innovation. The core business of this company is to close the loop for a specific kind of plastic (one of the most polluting materials due to the length of time it takes to degrade). But, it is not only a matter of business, it is a commitment to sustainability by the company and its employees. For that reason, there is great motivation to tackle projects that provide innovative solutions. The fact that projects do not always achieve the objectives (of technical and/or economic viability) does not stop new ideas from emerging or the company from being involved in new projects. These innovation projects help the company to grow and become more sustainable and more competitive.

The company overcomes the barrier of its small size (which implies limited resources) by undertaking projects in collaboration with other companies and public institutions, which gives it access to the financial support, knowledge and experience of its partners. This is due, in part, to the company's internal motivation and commitment to its values.

The research presented here has limitations in scope because it is focused on a single company. It would be interesting to extend the study to other SMEs in different industrial sectors.

Compliance with Ethical Standards The results of this work are supported by semi-structured interviews with the CEO and senior manager of the Eko-REC, who voluntarily agreed and gave informed consent to participate in the process and has also give written consent to publish the contents of this chapter regarding the aforementioned interviews. The "Research Ethics Com-mittee of Universidad de Navarra" (Ref. 2021.161) approved the research metho-dology.

References

1. Argandoña A (2003) Fostering values in organizations. J Bus Ethics 45:15–28
2. Bos-Brouwers HEJ (2010) Corporate sustainability and innovation in SMEs: evidence of themes and activities in practice. Bus Strategy Environ 19:417–435
3. Boso N, Adeleye I, Donbesuur F, Gyensare M (2019) Do entrepreneurs always benefit from business failure experience? J Bus Res 98:370–370
4. De Jesus A, Antunes P, Santos R, Mendoca S (2018) Eco-innovation in the transition to a circular economy: an analytical literature review. J Clean Prod 172:2999–3018
5. DiCicco-Bloom B, Crabtree BF (2006) The qualitative research interview. Med Educ 40:314–321
6. Ghisellini P, Cialani C, Ulgiati S (2016) A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. J Clean Prod 114:11–32
7. Iturrioz C, Aragón C, Narvaiza L (2015) How to foster shared innovation within SMEs' networks: social capital and the role of intermediaries. Eur Management J 33(2):104–115
8. Kemp R (2010) Eco-innovation: definition, measurement, and open research issues. Economia Politica 3:397–420

9. Khagram S, Nicholas KA, Bever DM, Warren J (2010) Thinking about knowing: conceptual foundations for interdisciplinary environmental research. Environ Conserv 37:388–397
10. Klewitz J, Hansen EG (2014) Sustainability-oriented innovation of SMEs: a systematic review. J Clean Prod 65:57–75
11. Lukács E (2005). The economic role of SMEs in world economy, especially in Europe. Eur Integr Stud 4(1):3–12
12. Nieto MJ, Santamaria L (2010) Technological collaboration: bridging the innovation gap between small and large firms. J Small Bus Manage 48(1):44–69
13. Organisation for Economic Co-Operation and Development (OECD) (2019) OCDE small and medium enterprise outlook. OECD Publishing, Paris
14. Prieto-Sandoval V, Jaca C, Ormazabal M (2018) Towards a consensus on the circular economy. J Clean Prod 179:605
15. Schumpeter JA (1939) Business cycles. a theoretical, historical, and statistical analysis of the capitalist process. McGraw-Hill, New York
16. Smol M, Kulczycka J, Avdiushchenko A (2017) Circular economy indicators in relation to eco-innovation in European regions. Clean Technol Environ Policy 19:669–678
17. Tarafdar M, Gordon SR (2007) Understanding the influence of information systems competences on process innovation: a resource-based view. J Strateg Inf Syst 16(4):353–392
18. Triguero A, Moreno-Mondejar L, Davia MA (2013) Drivers of different types of eco-innovation in European SMEs. Ecol Econ 92:25–33
19. Veleva V, Bodkin G (2018) Corporate-entrepreneur collaborations to advance a circular economy. J Clean Prod 188:20–37
20. WWF (2018) Living planet report—2018: aiming higher. In: Grooten M, Almond REA (eds). WWF, Gland