Closing the Loop: Alisea's Evolution Through Circularity and Business Model Innovation

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Abstract. The growing importance of concepts as circular economy and industrial symbiosis paved the way for setting up a tighter set of interconnections between different sectors and collaborations within different companies belonging to different sectors. The purpose of this work is to examine how collaboration within small and big companies can influence business model innovation, including industrial symbiosis and circular practices within them.

The company that was chosen for this investigation is situated in the Veneto region, Italy. This case study involves a manufacturer of recycled graphite pencils Alisea s.r.l which represents an important example of collaboration between companies of different sizes and encourages sustainable practices. In this context, the work attempted to analyze how strong specialization of the sector and collaboration between companies and how sustainability, implemented through the reduction of waste production and the use of by-products has influenced the business model innovation of the company.

Keywords: Business Model Innovation · Circular Economy · Alisea

1 Introduction

Economic processes have been defined by sustainable development, moving from a linear to a circular structure. This change occurred because nowadays there is a need to manage and quantify the waste and waste generated, prioritising production processes, employment, value creation, distribution and sale of products. The circular economy (CE) approach leads to the attempt to minimise the negative externalities generated by production and the consequent reduction of impacts on the environment. To do this, it is useful to implement industrial symbiosis (IS) strategies that aim to optimise the use of resources while minimising waste through collaboration and the creation of synergies between different sectors [1]. Consequently, a sustainable production/economic system where resources are kept in use as long as possible, waste is minimized, natural systems are restored, and materials are regenerated at the end of their life cycle [2] can be developed and maintained through the integration of IS and CE concepts. Thus, these phenomena are associated with circular practices [3].

The sharing of ideas, skills, and resources is the primary feature of industrial districts, which are groups of companies located within a given territory. Over the years, they

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have evolved into clusters, characterized by strong specialization in a given sector and strong collaboration between companies. Both industrial districts and clusters promote innovation and business competitiveness through a wider network of stakeholders [4–6].

For this, it is also necessary to refer to the business model (BM) of a company, which constitutes the way in which it distributes and incorporates value. In order to adapt to market changes or gain a competitive advantage, companies must renew this model through business model innovation, which allows the introduction of new logics, products or services. In this context, we can refer to an innovative ecosystem, a complex network of players who interact and co-create value. Circular innovation is key to their success, as it encourages collaboration among various stakeholders and the development of solutions aimed at minimizing environmental impacts [7].

In particular the question was on how the latter can benefit from the innovation coming from the smaller ones, while these can, by means of the relationship with the bigger ones, benefit of reaching broader markets.

Consequently, concepts such as the diffusion of innovation, the circular economy and industrial symbiosis are strongly linked to the concepts of location and spatial proximity. These have always had, and continue to have today, a great influence on the economic and social development of countries and also on the competitiveness of companies. (Murray A. T., 2009 [8]. It is therefore necessary for strong relationships and collaboration between universities, businesses and governments to develop in order to create innovation ecosystems [9, 10].

The promotion of innovation is facilitated by industrial clusters, which foster the exchange of skills and knowledge, thereby engendering an environment conducive to creativity and innovation. This environment is identified as a pivotal catalyst for the implementation of EC and IS strategies [10].

In addition, with regard to business model innovation from a circular perspective, the product lifecycle is of particular significance, given that the combination of the different phases is crucial for the promotion of IS between companies of different sizes and from different fields, leading to the achievement of a competitive advantage [11].

Consequently, the governance of innovation ecosystems assumes a pivotal role, emphasising a non-hierarchical yet collaborative approach [12]. In contrast to conventional supply chains, innovative circular ecosystems empower actors with greater autonomy. The establishment of rules and standards is a function that can be performed by government agencies or negotiated by the orchestrator. In this context, the government plays a crucial role in environmental regulation [13, 14].

2 Methods, the Case Study, Data

2.1 Methods

The methodology of this research was based on the search for a qualitative case of a company which realized products using recycled and/or reused materials, in order to obtain a case study that could include a circular business model, thanks especially to the collaboration with the different stakeholders. After numerous interviews, Alisea s.r.l was identified, through semi-structured interviews, which also involved the CEO of the company.

A qualitative approach was employed to investigate how a small business can incorporate circular elements into the business model of a large company.

To select the appropriate case study, we performed different steps. A literature review coupled with a desk research was performed, together with an analysis over selected companies on issues related to CE and IS, before reaching what was thought as the most relevant case study, as that of Alisea company, a small company that uses recycled graphite to insert it into paints, pencils, fashion, and lighting.

The case study method applied in this research represents a strategy that supported the understanding of the dynamics among actors within a specific context [15].

Summarizing, the methodology followed the following steps:

- Literature review - desk research;
- Qualitative analysis - structured / unstructured questionnaires and interviews on ad-hoc stakeholders;
- Case study analysis- structured interviews with Alisea personnel and analysis of the case study

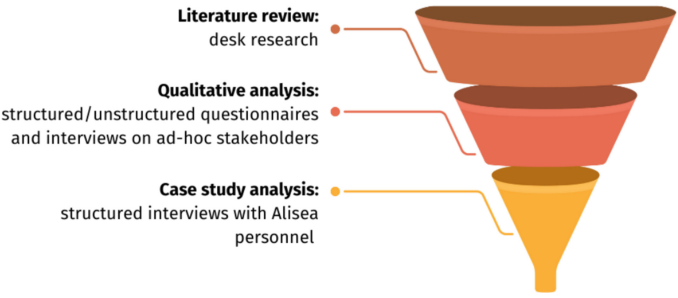

Fig. 1. Research methods (Personal elaboration, 2024)

A qualitative exploratory approach is typically chosen to examine singular cases and specific situations [16] through an analysis of the case study. We collected data by means of qualitative methods, by means of semi-structured interviews to key actors from companies active in CE activities, as well as in innovative operations (Fig. 1).

The interviewees were selected through an inverted chain technique – snowball sampling [17]. The use of semi-structured interviews allowed addressing open-ended questions to foster dialogue between participants and improve the quality of data gathered in an exploratory context [17]. In the specific case study, they followed two different steps.

A first step required focusing on a set of stakeholders, selected among innovative enterprises, either active in the CE business, or in the innovation sector. These companies were selected after surveying companies active in the business in Italy and particularly Northeastern Italy, holding tight relationships with the innovation framework of the Trieste system environment - University of Trieste, AREA Science park, etc.

The companies vary in size and belong to different sectors. They were selected because they have different revenues and operate in various sectors, but they are all

companies with a very high rate of innovation. In fact, the sample consists of spin-off companies from the University of Trieste, as well as other companies that manage their business in an innovative way, also in collaboration with the University of Trieste.

These incorporated entrepreneurs, CEOs, and managers and, among these, companies holding important relationships with Alisea.

Such a wide range of interviews was performed to analyze the perception of the CE within local companies during the analysis. The objective was to determine whether these companies were genuinely working on projects related to the CE and IS or implementing sustainable practices in that direction. Through our interactions with different actors in the industry, we have been able to narrow down the research field and focus on the company we are studying.

A second step involved interviews with selected stakeholders gradually delving into Alisea's chief executive officer (CEO), who was interviewed several times to track the development of the company's partnerships.

Qualitative methodologies, including semi-structured interviews were then targeted to Alisea company and its network of partners, as subcontractors, material suppliers, clients, non-profit organizations, public sector bodies, and other external subjects. The interviews were based on a guide structured around four key areas: sustainability-driven innovation, business models in the CE, partnerships and networks, and Alisea's role within these collaborations. The interview framework was adapted according to the key informant's position within Alisea's complex network. The interviews aimed to enhance the knowledge on the characters of existing relationships established between Alisea and its partners. Furthermore, the aim was to understand the diffusion process, the critical factors affecting this transfer and the evolution of the sustainable business model (SBM).

In addition to interviews, the company provided multiple annual reports and videos about its various collaboration lines, which allowed for clear elaboration and interpretation of the information. Triangulating collected data and validating information that emerged during interviews was made possible by the solid empirical basis provided by the literature review.

The reason for choosing this approach is that it allows for a thorough analysis of the company's dynamics (both internal and external), with the aim of analyzing in depth the strategies adopted by the company.

2.2 A Company Case Study: Alisea

Alisea s.r.l is located in the industrial district of Veneto. The emblem of the company is the production of the "matita perpetua", a product that shows how the company integrates the principles of IS and CE within its production processes. Alisea Recycled and Reused Objects Design, based in Northern Italy, provides B2B gadgets and promotional items. Founded in 1994 by Susanna Martucci, Alisea emphasizes environmental sustainability, aiming to transform waste into valuable products. Martucci's vision was to focus on the value represented by recycled materials rather than just the products themselves.

The aim was to investigate different areas such as the company's circular business model implemented and their different networks of collaboration. Thanks to these interviews, it was also possible to retrieve numerous additional materials such as annual reports written by the company and videos in which were narrate the company's projects

in progress, improving the understanding of the case study and the connections in which it is embedded.

Moreover, industrial clusters are a characteristic of the region where it is located, where companies collaborate and share resources, skills, and knowledge to enhance efficiency and innovation. Alisea benefited from this collaborative environment because it collaborates with several local companies to procure recycled materials that would otherwise be considered as waste. As an example, the "matita perpetua" is made with graphite powders from industrial processing waste that are recovered and reused. Such process allows the minimization of waste and lowering of raw material supply costs. Moreover, this strategy allows the company to transform production waste into valuable resources, thus promoting a more sustainable production cycle. In accordance with CE principles, extending the useful life of materials and minimizing waste, it is a good example of how businesses can thrive in a sustainable way, contributing to the well-being of the entire local community.

2.3 The Data

The analysis on the case study was performed using a different dataset. Results from questionnaires and interviews were vital in focusing on the main topics and focal points of the company in tackling CE and IS in particular.

This was realized thanks to a set of contacts had with companies active in innovation in Northeastern Italy. In particular, interviews with ITS - International Talent Support led to focusing on Alisea company as a virtuous example of IS. A set of contacts and interviews were therefore realized with the founder & CEO (Table 1).

Table 1. Record of interviews

Interview organization	Interviewed Role	Interview Date
International Talent Support (ITS)	Founder	06/05/2024
		11/06/2024
Alisea s.r.l	Founder & CEO	24/06/2024
		28/06/2024
		16/07/2024
		25/07/2024

Over than interviews, ALISEA provided company's relevant information and documents, as well as contacts with the other players in the circularity business. Different datasets were therefore used to obtain the useful information for reconstructing the circular, symbiothical business model (Table 2).

From the analysis performed on the different datasets (company information, business data, interviews' outcomes) an interesting framework of CE and IS emerges.

Table 2. Recurrent questions during the interviews

Recurring Questions during the interviews
How important is it to collaborate with a large company?
To what extent does a large company seek to play the role of orchestrator, and to what extent is there a risk that it might appropriate the innovation?
How crucial is it to invest in innovation?

3 Results

3.1 The Perpetua Graphite Pencil as a Cornerstone of Circular Economy

In 2012, Alisea created the 'Perpetua' pencil in response to a customer request to use graphite powder waste from electrode production. Finding no Italian pencil manufacturers, Alisea became the first by introducing this innovative product. Named 'Perpetua' after a character in Alessandro Manzoni's novel, it symbolizes longevity compared to traditional pencils. Made of 80% recycled graphite and non-toxic materials, Perpetua pioneered "self-cycling"—each pencil consumes 15 g of recycled graphite. Perpetua pencils, accompanied by a history-telling cardboard, are custom-made for major brands like Star Wars, Audi, and the Taormina G7 meeting (Fig. 2).

The pencil's environmental sustainability is matched by economic benefits. Using recycled graphite lowers production costs, unlike expensive virgin materials. The electrode producer, Tecno EDM, also saves on waste disposal costs. Initially skeptical, Tecno EDM was impressed by the successful creation of Perpetua, which turned waste into a globally recognized product, fostering a strong partnership based on transparency, reciprocity, and trust.

Perpetua's supply chain includes cross-sector collaborations with social cooperatives such as Agape and Alice. Agape deals with packaging, shipping, and e-commerce, employing people with disabilities, while Alice produces pencil cases employing incarcerated women. These partnerships enhance Perpetua's social and economic sustainability by creating jobs and distributing economic value at market rates. Alisea's entrepreneur promotes these cooperatives, enhancing their visibility and potential for further collaboration.

The relationship with Agape, based on shared values and mutual trust, showcases a commitment to social responsibility. Similarly, the partnership with Alice extends beyond commercial interactions, creating a "dialogue space" where both parties share goals and celebrate mutual successes. This collaboration aims to amplify sustainable practices and inspire new environmental solutions.

Perpetua's social mission includes educational projects for environmental and cultural awareness. Collaborating with Archimedia, Perpetua's story is told through a theatrical show and school workshops, teaching students the importance of environmental care through practical actions. Additionally, Alisea and Perpetua serve as case studies for the CE in universities and professional seminars.



Fig. 2. Perpetua pencil and G_upgrade recycled graphite (Source: Alisea s.r.l) [18]

The Company's Business Model and the Early Stages of a Proficient Network

To counter competition from foreign countries, particularly those located in Southeastern Asia, characterized by lower production costs and a fierce competition over different markets, Alisea chose to produce affordable, high-quality, eco-friendly items characterized by one-of-a-kind green stories. They maintained Italian production, asking partner companies for their waste materials to reduce costs and innovate. This approach led to a CEmodel where production waste from one company becomes raw material for another.

Alisea's SBM involves two types of circular processes:

1. Upcycling: Using virgin materials to produce new products (e.g., vases from wax and tomato peels).
2. Recycling: Transforming waste into brand-new items (e.g., pens from recycled car lights).

Economic sustainability is key; Alisea doesn't purchase waste materials, and benefits are shared within the supply chain. Design and aesthetics are crucial to compete with

new products. The objects retain the memory of their past, emphasizing creativity and sustainability.

The need for diverse products led Alisea to partner with numerous small, artisan firms. These collaborations enhanced Alisea's reputation and expanded its customer base. Not all suppliers accepted this model, resulting in a natural selection of innovative, collaborative partners.

Collaboration in the Network of Firms

Alisea's network strength is attributed to Martucci's motivation and competence. Their continuous innovation attracted major organizations like WWF, New Holland, and Volkswagen. Alisea's staff and suppliers benefited mutually from shared know-how and experimentation with new materials.

An example of effective networking is the project with Banca Popolare di Milano, where Alisea recycled plastic cups into money boxes, involving bank employees and other stakeholders in the recycling process. This project also had an educational component, promoting environmental responsibility.

Alisea's curiosity and willingness to tackle new challenges are fundamental. They collaborate with like-minded suppliers, believing that "nothing is impossible."

The cross-sector collaborations, such as the 'Goodness Minerva' project initiated by Savignano sul Panaro's mayor, exemplify Alisea's SBM. This project involved local schools and families in waste collection, benefiting the municipality, school, and environment.

Alisea's SBM is characterized by innovation, sustainability, and strong collaborative networks, enhancing its market position and driving continuous growth.

4 Discussion

This section details the evolution of Alisea's Sustainable Business Model (SBM) alongside the growth of its partnership network, highlighting three key periods. These phases are not strictly separate, as Alisea's different business activities coexist and mutually support the firm and its collaborative network.

As a result, the data used for research includes both interviews conducted by authors and company documents, which have led to a better understanding of the case study, which provides robustness and validity to the results.

Alisea designs all a set of projects aimed at tackling recycled materials, nonetheless production is entrusted to subcontractors in the Vicenza area. In such a sense, the company and its network of contractors, subcontractors and partner companies are well inserted into the industrial production framework of the Italian industrial districts, that, in the recent past as noticed above, characterized a different way of production based on local knowledge and expertise exploitation and sharing. If we examine the evolution of the business model, we see that Alisea began its business by creating corporate communication gadgets using recycled materials, all in an effort to compete with foreign manufacturers. This continued until a client asked them to dispose of graphite, which was a production waste from electrode manufacturing. From this project, Perpetua was born, a pencil made from recycled graphite. The creation of Perpetua, which accounted for

approximately 50% of Alisea's revenue in 2023, led to further research into the material to understand additional fields of application. The studies revealed that graphite could be applied in the fields of paints, clothing, and lighting. However, in these highly innovative fields, we do not have economic information because the patents were licensed out in 2023.

Alongside the core business of the company, at the current stage, Alisea, in order to provide innovative elements to the business models of larger companies, is fully leveraging the potential of graphite as an innovative direction where development and innovation efforts are oriented. As previously noticed in this paper, the creation of the perpetual pencil is only the first step in using graphite across various fields, ranging from paints and textiles to lighting solutions.

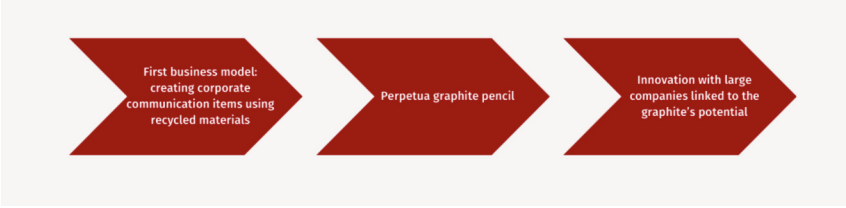

Fig. 3. Alisea's business model evolution over time

In this image (Fig. 3), we see how Alisea's business model has evolved. It transitioned from producing corporate communication items made from recycled materials (as shown in the first step) to designing Perpetua, a recycled graphite pencil for which an iconic design was developed (as depicted in step two). The business model then further evolves into bringing innovation into the business models of large companies by fully leveraging the diverse potential of graphite (step 3).

Table 3. Production value of Alisea S.r.l. and its partner companies between 2021 and 2022

Company name	Company dimension	Production Value 2022	Production Value 2021
Alisea s.r.l	Small-medium	1.436.368	897.233
Margaritelli S.p.A	Big	198.006.930	176.260.559
Arclinea S.p.A	Small-medium	40.482.516	37.444.237
Cosetex s.r.l	Small-medium	5.947.201	6.393.671

As we can see, Alisea actively collaborates with companies of various sizes to create innovative products using graphite. For instance, they work with the Margaritelli SpA group, owner of the Listone Giordano brand, to develop non-toxic graphite-based paints; a similar collaboration takes place with Arcliea. Meanwhile, with Cotex, they collaborate on the creation of fabrics that contain graphite (Table 3).

The collaboration between Alisea and its partners must clearly bring an advantage to all parties involved. To ensure maximum protection of the research results, the parties

that actively participated in the research have decided to patent the outcomes or seek trademark protection. Typically, the collaboration works as follows: Alisea provides the company with its graphite expertise, which is then developed together with the partners according to their needs. For example, in the case of Listone Giordano, a water-based paint was created that, by using the properties of graphite, makes the paint scratch-resistant. As mentioned earlier, once the research is completed, a patent is filed in which each party is credited with their inventive contribution. At this point, if the Margaritelli group uses the patented paint, they must pay royalties to Alisea, turning research and innovation into a true business activity. This type of research conducted with various partners allows Alisea to maintain its independence without being subject to acquisition by a larger entity.

Certainly, collaboration between large and small companies, as just mentioned, also presents some risks. The first, as mentioned earlier, is the loss of autonomy or being acquired when collaborating with a single, much larger entity. Another risk not to be underestimated is that the larger company might attempt to appropriate the intellectual property of the smaller entity. In this case, the only way to avoid the loss of intellectual property is through solid legal counsel from the outset.

The attention towards innovation in finding a new life to materials, becoming second raw materials for other production, the continuous research towards new opportunities tailored to fit customers and partners' needs in terms of unique production, led the Alizea company as a case study to implement a business model based on circularity and industrial symbiotical concepts. As it is summarized in Fig. 4 graphite-based products represent the first-of-the-kind family of products representing an innovation on the market, exploiting a brand new production and business model. As the product life cycle - as above presented -generally follows a descending path after reaching maturity, the overall availability of potential second raw materials allows - theoretically - to overcome the declining phase and start again a new production. In such a sense, the potential exist to surfing innovation following in a growing path, allowing the company to remain constantly on a start-up, innovation stage to rapidly adapt to changing market conditions. While there might be concerns about the sustainability of this focus on graphite, a closer analysis reveals that Alisea is not only capitalizing on the capabilities of graphite but is also actively exploring a wide range of other materials. This strategic experimentation positions the company to discover new avenues of innovation, potentially leading to breakthroughs with alternative materials that could complement or even replace graphite in its innovation journey. Below is a list of the materials that Alisea is currently working with (Table 4).

Summarizing, it becomes increasingly evident that by continuing its research and development efforts, Alisea has a truly significant potential for innovation. This potential can be offered to larger companies, which often lack the flexibility to swiftly explore and integrate such a diverse range of materials. Alisea's agility in experimenting with and developing these materials allows it to serve as a valuable partner to these companies, enabling them to benefit from cutting-edge innovations without the need to divert their own resources into areas where they may not have the same level of expertise or adaptability.

Table 4. Materials used by Alisea s.r.l.

Material	Description	Advantages
Paper	Agendas are made from 100% recycled paper, free from chlorine, and printed with eco-friendly soy-based inks	Produced exclusively in print shops powered by state-of-the-art photovoltaic systems, reducing 460,000 kg of CO2 annually. No trees were cut down to produce the paper used for Alisea's Eco-Agendas
Cotton	plant fiber used since ancient times, not only for clothing but also for making lightweight and breathable bags for storing rice, grains, flour, and salt	Today the production of cotton food bags extremely rare
Plastic	From the proper recovery and recycling of plastic bottles comes a pen The recycled PET used is sourced from a circular economy and is 100% recyclable (post-consumer)	AQUA is durable and it comes with a smear-resistant refill available in black or blue. is the collective result of an ethical, 100% Italian supply chain where partners, from transporters to material processors, to producers and distributors, share the same philosophy and mission: environmental and human care for a truly sustainable future
Aluminum	HY-LITE is an innovative composite material made of two thin sheets of aluminum and a white polypropylene core. HY-LITE offers high resistance and flexibility and, thanks to the polypropylene core, can be folded up to 80,000 times	HY-LITE is fully recyclable. Through cryogenic fragmentation, aluminum and polypropylene components separate easily, becoming reusable
	HY-LITE objects can be made in various sizes, shapes, and internal mechanisms according to customer requests (items such as ring binders, clipboards with pen holders and brochure pockets, agendas, address books, CD holders, organizers, and boxes)	

(*continued*)

What emerges, in fact, is that Alisea can serve as an important vehicle for innovation for large companies. Indeed, Alisea's size allows it to focus on research aimed at fostering innovation. As previously mentioned, it is not Alisea itself that directly implements this innovation; rather, as in the case of graphite, it is the large companies that take advantage of it by incorporating elements of circularity into their business models. As noted above, given the variety of materials on which Alisea conducts research, the company possesses a wide set of materials for innovation, which it can then make available to pursue further and future business evolution.

Table 4. (*continued*)

Material	Description	Advantages
Leather	The R|cuoio line uses a material obtained from leather shaving waste, vegetable-tanned with the addition of natural rubber latex. Alisea's collection includes various items, from work folders to bags, clipboards, notebooks, and pen holders	"Choosing an item from Alisea's R|cuoio range means not contributing to the consumption of virgin raw materials, particularly of animal origin".
Rubber	From the recovery and reuse of racing bike tires come Alisea Cycled rubber accessories. Each item is entirely produced in Italy, from raw material collection to packaging	Every year in Italy, about 2 million bicycle tires are discarded, amounting to about 700 tons of waste destined for landfills and incinerators
Fabric	A recent market survey indicates that in Italy in 2012, 99,900 tons of textile waste were collected separately, about 1.6 kg/person annually, equal to 12% of the total recyclable; a figure significantly lower than the European average	Alisea's work can help develop greater awareness of the potential of textiles, which allows great flexibility in transformation and reuse

5 Conclusion

CE and IS have recently become important concepts to be studied and implemented within the firms' business models, with particular reference to how innovation is managed and organized in such contexts. The key aspect analysed in the present research regarded how innovation in CE and particularly in IS can be fostered in the small innovative enterprises' business models and how this can benefit the cooperation among small / medium enterprises and big companies. From such a survey, however, an interesting case study arose, where a small/medium size company (Alisea), focusing on a circular economical business model, developed products based on recycled materials, leveraging synergies with bigger companies in industrial symbiotical collaborations. In particular we have seen how, in order to survive intense competition from Asia, Alisea was compelled to change its business model by shifting its focus to material research, which it then offered to its clients, thereby avoiding price-based competition. This new business philosophy has led Alisea to share its innovations with larger companies that, due to their size and organizational rigidity, struggled to innovate independently their large enterprises.

Following several discussions with the founder appear clear the decision to produce communication items from recycled materials stemmed from the need to differentiate from other producers of corporate communication products and to counter the constant influx of items from developing and newly industrialized countries, as China and all of the other countries, particularly located in South East of Asia, that are fiercing challenging the

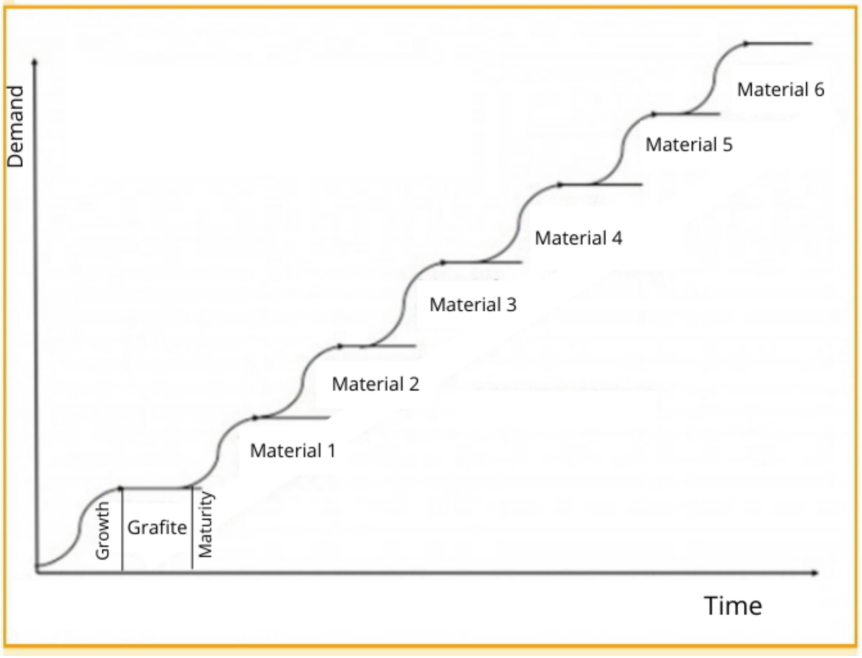

Fig. 4. The product life cycle in a constant innovation path (Personal elaboration, 2024)

Western consolidated markets from. This led to Perpetua which is the only pencil made in Italy from recycled graphite and brought to a series of collaborations with companies such as Listone Giordano (Margaritelli Group) and Arclinea in the field of coatings, and with Cosetex in the field of textiles. Through these types of collaborations, Alisea becomes a driver of innovation, introducing elements of circularity into these large companies. This is an example of how a small company that has invested in innovation, by collaborating with larger companies, can introduce elements of circularity into the business models of larger companies. These models tend to be more rigid from a structural standpoint compared to the business models of smaller companies.

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