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Circular business models in biological cycles: The case of an Italian spin-off

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1. Introduction

Circular economy (CE hereafter) thinking and principles, although not entirely new, have increasingly become the subject of academic research, national and supranational policies, and have also attracted the interest of business leaders (Hazen *et al.*, 2017). This interest in CE has arisen because it aims to decouple economic growth from the consumption of finite natural resources and negative environmental impacts (Brears, 2018), whilst offering opportunities for innovation and enhanced competitiveness (Lacy and Rutqvist, 2015).

As witnessed in the number of initiatives across different sectors that are proliferating around the CE, momentum is building for a transition to a more resource-efficient economy. However, at the *World Economic Forum* in 2019, despite the compelling business-society-nature case offered by the CE such as reduced pressure on natural resources, mitigation of climate change, enhanced customer values and value capture opportunities, it emerged that greater leadership, collaboration, innovation and commitment are required to break the deeply entrenched linear locks-in and move towards a real CE (Gawel, 2019). Consequently, it is important to examine the players which can create a leading role in bringing the CE to scale and enabling it to achieve its full potential.

The achievement of a CE is a complex transformation requiring the enactment of multiple societal levers including but not limited to policy, education, business, markets and culture. As a result, in order for a CE to succeed, concerted actions involving simultaneous innovations at different levels are needed, namely co-evolution in system innovation (Geels, 2005). Current literature examines the role of institutional drivers in supporting the transition towards a CE (de Jesus and Mendonça, 2018), business model innovation (Linder and Williander, 2017), skills and capabilities in product design (De los Rios and Charnley, 2017), consumption habits (Mylan *et al.*, 2016) and education (Kopnina, 2018), among others. Amid these enablers, we concentrate on business model innovation for circularity for two reasons. Firstly, since the concept of the business model (BM hereafter) refers to the way in which companies create, deliver and capture value (Osterwalder and Pigneur, 2010; Richardson, 2008), it is clear that new BMs are necessary for a CE to develop and reach scale (Geissdoerfer *et al.*, 2018; Nußholz, 2018). Secondly, although BMs have become the subject of an increasing number of academic publications, BMs for circularity have yet to become an established research field (Diaz Lopez *et al.*, 2019). Indeed, as noted in this journal by Chiappetta-Jabbour *et al.* (2019a), Merli *et al.* (2018) and Pieroni *et al.* (2019), there is a dearth of studies which investigate CE implementation at the company level.

Current CE research has mostly focussed on examples pertinent to the ‘technical cycle’ at the expenses of the ‘biological cycle’. Leipold and Petit-Boix (2018) underline that “most authors leave out the bio-based sector and focus on the circularity of plastics, minerals, metals, or construction waste” (p. 1126). Yet in a CE, materials and components flow in ‘technical’ and ‘biological’ cycles (EMF and McKinsey, 2012). Technical nutrients, namely synthetic, mineral materials, are employed through multiple cycles of reuse, remanufacturing and

recycling with no loss of quality in order to enhance resource longevity and productivity (*ibid.*). Biological nutrients, i.e. bio-based, organic materials, are cascaded across different usages before returning to nature at the end of their life cycle when no additional biological feedstock can be recovered (*ibid.*). Additionally, the literature on circular business models (CBMs hereafter) in the bio-economy is fragmented and lacks focus on both the BM aspect and practical implementation (Reim *et al.*, 2019). This article therefore aims to contribute to the academic literature by casting light on the characteristics of CBMs in the ‘biological cycle’ of the CE. Particularly, it asks: *how are circular economy principles translated into activities and business models in a bio-based industrial setting?*

To substantiate our argument, a case study is used of an innovative, Italian spin-off manufacturing an ecologically friendly paint from agri-food by-products. We believe the choice of the Italian geographic context is pertinent to highlight best practices since Italy ranks amongst other European countries with the highest level of secondary raw materials used in the manufacturing sector (Enel and Symbola, 2018). This article has the following structure. Section two briefly summarises CE principles and how these can be translated in concrete business actions. Next, section three explains the research strategy and methods. Section four introduces the case study, whilst section five describes in detail how CE principles are operationalised in the context of the case study and the form of its CBM in terms of value proposition, value creation, and delivery and value capture. Finally, section six and seven synthesise the research findings and contributions and highlight implications for further research and practice.

2. Circular economy and circular business models

In the wake of the mounting interest in the concept and principles of the CE, several different conceptualisations of the CE have emerged (Prieto-Sandoval *et al.*, 2018). Kirchherr *et al.* (2017) claim to have identified 114 definitions of the CE. However, the definition first proposed by the EMF is most commonly used and has influenced subsequent understanding of the CE. Accordingly, the CE is described as “an industrial system that is restorative or regenerative by intention and design [that] replaces the end-of life concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impairs reuse and aims for the elimination of waste through the superior design of materials, products, systems, and within this, business models” (EMF and McKinsey, 2012, p. 7). The EMF (see EMF *et al.*, 2015) has also identified three main principles through which CE thinking can be summarised as outlined below.

a) *Preserve and enhance natural capital*: in a CE, natural capital is preserved from further damage and is restored. This is at the very heart of the CE concept which seeks to recouple economy with ecology. Specifically, it means delivering utility virtually and, when this is not possible, privileging renewable and not-toxic materials in the manufacturing process so that they can be safely returned to nature at the end of their life cycle to restore and rebuild natural capital.

b) *Optimise resource yields*: in a CE, the productivity and longevity of resources are maximised. This is obtained by circulating materials and components within ‘technical’ and ‘biological’ cycles. Indeed, technical nutrients go through multiple cycles of reuse, remanufacturing, refurbishing and recycling; biological nutrients are cascaded across other applications as a source of valuable feedstocks, eventually returning to nature for decomposition to restore and build new natural capital.

c) *Foster system effectiveness*: a CE pursues not only increased resources efficiency but also the elimination of negative environmental externalities by intentionally designing out multiple contaminations in air, water, soil, and harmful health consequences deriving from resource use.

The question as to how these principles can be translated into successful BMs has stimulated increasing levels of interest in the academic community. However, CBMs are seldom defined (Frishammar and Parida, 2019) and just like parent BM studies, the literature concerning CBMs is often fragmented and confounded by divergent constructs (such as elements, archetypes, strategies and canvasses), offering a means of classifying/categorising BMs for circularity (Pieroni *et al.*, 2019). While perfect convergence is difficult to achieve, particularly in the developmental stage of a research field, current emphasis on the functional forms of CBMs runs the risk of missing fundamental principles of the CE and how these principles can be operationalised in the corporate context. Here we share the same line of argument as Foss and Saebi (2018), who, lamenting the lack of construct clarity in BM literature, argue that “if our constructs are unclear and possibly overlapping, we will also likely get causality and mechanisms wrong. Empirics will also suffer from this” (p. 10). Pieroni *et al.* (2019) add that “the existence of different propositions of archetypes for CE-oriented BMs without a consensus might hinder the knowledge consolidation in the field” (p. 210) together with practical implementation (Reike *et al.*, 2018). It follows that we need to explore how CE principles can be understood more clearly and effectively in order to implement them through innovative BMs. In this article, we argue that this process comprises two steps.

Firstly, an appropriate approach to guide our understanding of how CE principles can be implemented in a corporate context is to make use of practitioners’ CE literature. Specifically, we focus on the work conducted by the EMF - the leading CE private organisation - whose

initiatives have helped bring the concept of the CE to the attention of corporate leaders and policy makers worldwide (Hopkinson and Harvey, 2019). Particularly, the ReSOLVE framework (EMF *et al.*, 2015), which comprises a set of six actions that any business or government can pursue to move towards a CE, is a simple, intuitive, but effective framework which illustrates how circular principles can be applied in practice, as it outlines a balance between simplicity and completeness. Not surprisingly, the ReSOLVE framework appears to be the most used tool in the implementation of CBMs in a real context (Mendoza *et al.*, 2017). Our line of enquiry is also grounded in recently published CE literature in which the ReSOLVE framework is viewed as a tool for developing BMs based on CE principles (Chiappetta Jabbour *et al.*, 2019b; Manninen *et al.*, 2018). Indeed, Chiappetta Jabbour *et al.* (2019b) make a strong case for its use, arguing that “the CE will only be possible when new business models, based on the ReSOLVE model, become a reality” (p. 549).

Based on the CE principles identified above, the ReSOLVE framework suggests six measures which companies can use to align their BMs with CE thinking: *Regenerate*, *Share*, *Optimise*, *Loop*, *Virtualise* and *Exchange*. Overall, these measures increase resource productivity, extend resource value and encourage the shift from finite to renewable resources. They can be applied in isolation or simultaneously, and in the latter case, they have a stronger, cumulative effect across the whole system. Table 1 illustrates the overarching aim of each of these measures and the levers that can be used to implement them.

Measures		Overarching aim	Actionable levers
Regenerate	Re	To prevent further damages to the eco-system and to build natural capital.	<ul style="list-style-type: none"> ▪ Shift to renewable energy and materials; ▪ Reclaim, retain, and regenerate health of ecosystems; ▪ Return recovered biological resources to the biosphere.
Share	S	To go beyond just sharing in its meaning to cover other approaches that achieve higher resource utilisation within a product form.	<ul style="list-style-type: none"> ▪ Share assets; ▪ Reuse/second-hand; ▪ Prolong life through maintenance, design for durability, upgradability, etc.
Optimise	O	To leverage on the use of new technologies to enhance product and process efficiency.	<ul style="list-style-type: none"> ▪ Increase performance/efficiency of product; ▪ Remove waste in production and supply chain; ▪ Leverage big data, automation, remote sensing and steering.
Loop	L	To circulate resources in technical and biological cycles to prevent value destruction and enhance opportunities for value creation, retention and capture.	<ul style="list-style-type: none"> ▪ Remanufacture products or components; ▪ Recycle materials; ▪ Digest anaerobic; ▪ Extract biochemicals from organic waste.

Virtualise	V	To draw on digital technologies to provide utility without physical products.	<ul style="list-style-type: none"> ▪ Dematerialise products.
Exchange	E	To move from old and non-renewable materials to advanced and renewable ones alongside applying new, resource-saving technologies.	<ul style="list-style-type: none"> ▪ Replace old with advanced materials; ▪ Apply new technologies; ▪ Choose new product/service.

Table 1: The ReSOLVE Framework

Source: Based on EMF *et al.* (2015)

Having analysed how circular actions can function using the ReSOLVE framework, it is important to understand the concept of the BM in order to implement a CBM. A BM is generally understood as “the rationale of how an organization creates, delivers and captures value” (Osterwalder and Pigneur, 2010, p. 14). However, five different perspectives pertaining to the BM term can be identified in the current literature: BM as a set of activities, BM as a logic, BM as archetypes, BM as elements and BM as alignment (Ritter and Lettl, 2018). Whilst these perspectives can co-exist as they complement one other (*ibid.*), for the purpose of this research we espouse the components/elements approach to the BM, and particularly Richardson’s (2008) ontology based on value proposition, value creation and delivery and value capture, which is also adopted in current CBMs literature (e.g., Lüdeke-Freund *et al.*, 2019; Ranta *et al.*, 2018).

Drawing on these arguments, we use an academic and practitioner-based conceptual framework to illustrate how the circular activities and the BM of a company are designed and

implemented in the biological paint market in Italy. This enables us to highlight how value is created, retained and captured in practice in a circular setting; this has been explored only marginally to date (Hopkinson *et al.*, 2018; Merli *et al.*, 2018), particularly in the bio-based sector (Leipold and Petit-Boix, 2018). Our theoretical framework, which bridges two different literature fields, responds to the call for more integration between scholars and practitioners' efforts to enable the CE to achieve its full potential (Esposito *et al.*, 2018). It also contributes to the cross-fertilisation of two research streams that have mostly developed separately, signalling “the lack of understanding regarding the business potential of CE initiatives” (Ranta *et al.*, 2018, p. 991).

The following section outlines the research strategy and methods used for data collection and analysis before presenting the case study subject of this investigation.

3. Research strategy and methods

This article uses a single, exploratory, qualitative case study as a research strategy (Eisenhardt, 1989; Yin, 2014). A case study strategy is appropriate when “a how or why question is being asked about a contemporary set of events over which a researcher has little or no control” (Yin, 2014, p. 14), which is pertinent in this research context. A purposive logic has been applied to select the case study (Miles and Huberman, 1994), i.e. the case has been chosen because it is relevant to this study following a ‘reputational case selection approach’ (LeCompte *et al.*, 1993). *Naturalmente Colore*, the case object of this investigation, is one of the companies figuring in the 2017’s *Atlas of the Italian Circular Economy Champions*, compiled by Legambiente, the most widespread Italian environmental organisation, formally recognised by the Italian Minister for the Environment.

Multiple qualitative methods have been employed for data collection. Specifically, this article is based on secondary data, consisting of both publicly available information (e.g., customers' ratings, social media pages and videos, broadcast episode on the principal Italian television channel, report on Italian Circular Economy Champions) and corporate documents made available (e.g., research notes, brochures, leaflets and slides), and primary data. The latter were acquired in subsequent stages. Firstly, one of these authors has had a direct and strong interaction with the entrepreneurial team during the phase of definition and design of the BM. *Naturalmente Colore's* entrepreneurial project and BM have been analysed and explored through the involvement of the entrepreneurial team in an educational project (*Laboratory of Business Model Development*) financed by the 'Regione Campania' (Italy) and managed by the Department of Management Science and Innovation Systems at the University of Salerno (Italy). The objective of the *Lab* was to explore and fully understand the vision and thinking of the entrepreneurial team and then support the team in the design of the BM in order to increase the success of the entrepreneurial project. The *Lab* worked over a period of about four months (from November 2015 to February 2016) through the following phases:

- preparatory phase: classroom presentation of the main models of analysis and definition of the BM;
- first meeting with the entrepreneur: presentation by the entrepreneur of the idea and the actual BM of the project;
- group work and tutoring: the classroom was divided into groups. Each of them analysed the current BM, highlighting strengths and weaknesses and then formulated a proposal to modify and revise the model. These group works were assisted with tutoring activities during which LISA Lab research fellows (including one of the authors of this article) supported the individual groups in the process of re-design of the BM;

- meetings with the entrepreneurial team: at this stage the Laboratory lecturer and tutors interacted with the entrepreneurial team face-to-face and remotely to develop a clearer understanding of the entrepreneurial vision and attitude in the implementation of the project;
- final phase: each group in the classroom presented and discussed the revised BM in the presence of the entrepreneur and investors (e.g., venture capital/business angels) in order to assist the process of BM design and implementation.

Secondly, in order to further increase both the validity and the robustness of the findings (Tellis, 1997), one of these authors conducted a face-to-face, semi-structured interview with a key informant, i.e. the spin-off's head of research team, which lasted for 50 minutes. Both authors attended the interview and a visit to the spin-off laboratory, where some of the applications of the ecological paint and some samples of forthcoming products were displayed.

The interview and the visit took place in September 2018. The interview was informed by the CE and BMs literature. Particularly, the interviewee was asked to report on the company's value proposition, value creation in economic, environmental and social terms, value delivery and capture. The interview questions are available in Appendix A. The interview has been digitally recorded, transcribed verbatim and translated from Italian to English by one of the authors of this paper. After the interview, a contact summary sheet was compiled to take notes of some key points and observations by one of these authors. These additional data were used to enhance data triangulation. Table 2 in Appendix A summarises the data collected and used in this research.

Data were analysed qualitatively using a narrative approach to textual analysis (Langley, 1999; Saunders *et al.*, 2009). Narrative analysis enables understanding of the phenomenon studied in its complexity (Langley, 1999) and offers a very close representation of the processes studied (Pentland, 1999). To mitigate the limitations arising from having just one interview, the information contained in the interview transcript was triangulated with internal documents and publicly available data. All analysis and interpretation are entirely ours and in the responsibility of these authors and, thus, they do not represent the position of the company. The approach we took to theorising is based on abduction, which is embraced in current CBMs literature (e.g., Zucchella and Previtali, 2018). This means to follow a process of “systematic combining” (Dubois and Gadde, 2002, p. 555) which involves to move constantly between the existing literature and the empirical findings. Particularly, to illustrate how *Naturalmente Colore*’s activities match with CE thinking and its BM we employed the ReSOLVE framework (EMF *et al.*, 2015) and Richardson’s (2008) articulation of the BM concept in value proposition, value creation and delivery and value capture, and we combined our theoretical anchoring with data.

4. Naturalmente Colore

‘Naturalmente Colore’ is a spin-off of the Department of Pharmacy at the University of Salerno (Italy). It produces colouring pigments using mostly locally sourced by-products from crop harvesting and processing (e.g. onions peels, artichoke leaves, walnut hulls, and chestnut barks and husks), but also spontaneous Mediterranean plants (e.g., *Myrtus communis* L., *Olea europaea* L., *Rubia peregrina* L.), which are carefully selected and processed. Initially applied in the textile industry, *Naturalmente Colore*’s pigments then found use in the furniture market but also in more sophisticated applications such as papier-mâché jewels and sculptures. Their

pigments have also been used for colouring ‘Amalfi’s paper’, an ancient and sophisticated paper prepared with special ingredients (cotton and mountain water). Lately, this company has ventured into the production of an eco-paint for internal walls and ceilings as an alternative to conventional synthetic paints. Prepared by adding colouring pigments to natural bases made of eggs, milk and lime, *Naturalmente Colore*’s paint has exceptional attributes: a) it is safe to use indoors (with no unpleasant chemical odours); b) it lasts as long as synthetic paint; c) it is offered in a variety of unique colours on account of the high diversity of local plant species and continuous research investigating the suitability of other plants for colouring; d) it has a minimal impact on the environment throughout its entire life cycle; e) it is available in a range of finishes (paint, plaster, Venetian ‘marmorini’ plaster); f) it is easy to apply; and g) it is customisable: clients can select the plant(s) used for pigmentation in the decoration of their homes. In its commitment to turn the core principles of the CE into practice, *Naturalmente Colore* is represented in the aforementioned 2017’s *Atlas of the Italian Circular Economy Champions*. Today, *Naturalmente Colore*, is exploring further applications for its eco-friendly colouring pigments such as nail polish and ink.

5. *Naturalmente Colore* and the circular economy

This section is structured into two parts. The first illustrates how *Naturalmente Colore*’s core business activities follow CE thinking by matching these activities against the ReSOLVE framework (EMF *et al.*, 2015). The second part explores the distinctive features of *Naturalmente Colore*’s BM.

5.1 Naturalmente Colore’s circular activities

Driven by a strong environmental ethos and willingness to use locally available biological resources, *Naturalmente Colore*'s circular production strategy enables the recovery, as opposed to the disposal, of additional value from agri-food by-products. This, in turn, ensures that the embedded value of by-products is retained. For this reason, it can be said that the company fully espouses one of the sources of value creation in a CE, which is the "power of cascading use" (EMF and McKinsey, 2012). Indeed, biological materials approaching the end of their life cycle can provide an additional source of value creation if cascaded across other applications (*ibid.*). The following exemplifies the amount of waste that can result from food processing, and yet the company successfully manages to transform this waste into an input in its production process.

When artichokes are processed in making oil-preserved artichokes, about 80-85% of the raw artichokes end up as production waste (...). We have worked a lot with artichokes, first to extract colouring pigments for textiles and then for paints in collaboration with the Pertosa Mida Foundation which wanted to valorise the Pertosa's white artichoke, a Slow Food presidium (Interview excerpt).

In addition to offering a unique value proposition to its customers thanks to the characteristics of the raw materials used, *Naturalmente Colore* also captures value in terms of reduced production costs. This is achieved through the cost-effective sourcing of by-products of crop harvesting and processing, together with the reduced transportation costs of locally sourced raw materials. *Naturalmente Colore* also pursues reduction of energy consumption in its manufacturing strategy and, as part of this approach, raw materials are naturally dried whenever possible. In addition, no solvents are used in the manufacturing process so there are no disposal issues and all raw materials are sourced either locally or within the same region. Furthermore, waste from the production process is mostly plant by-products which is composted, and the paint used for trials and practical demonstrations is further recycled on these occasions. Customers are also given the opportunity to return the packaging (the buckets containing the paint). This option is beneficial to the customer since it eliminates disposal

issues (buckets are collected by the company itself) and to *Naturalmente Colore*, as the buckets are reused for packaging the paint.

As shown above, *Naturalmente Colore*'s activities meet the ReSOLVE framework criteria of *Regenerate* (biological inputs in the production process are used and plant waste is composted); *Share* (materials and resources are reused: e.g., buckets are collected back and re-used); *Optimise* (production process waste is minimal); and *Loop* (the production process runs on biological sources extracted from agri-food by-products).

5.2 *Naturalmente Colore*'s BM

Here the features of *Naturalmente Colore*'s BM are presented and framed around the key components of the BM concept identified by Richardson (2008), namely value proposition, value creation, and delivery and value capture.

5.2.1 *Value proposition*

This includes the description of the company's offering and target customers. *Naturalmente Colore*'s value proposition can be described in the following terms: an eco-friendly paint for interior walls and ceilings, with a minimal environmental impact, safe to use in terms of indoor air quality, available in a variety of unique colours and finishes, customisable, easy to apply with a strong local connotation, and a durability compared with that of existing paints. In terms of its target customers, these are: public institutions (foundations, museums), private companies and environmentally conscious customers.

5.2.2 *Value creation and delivery* (most salient aspects)

This section includes the description of the key resources, partnerships and the distribution channels and multiple value creation mechanisms.

5.2.2.1 Key resources, partnerships, distribution channels (most salient aspects)

The key resources underlying *Naturalmente Colore*'s production process are: research into the colouring properties of plants; quality control instruments (solidity and resistance of the colour to light); local by-products of crop harvesting and processing; researchers and laboratory equipment. The product is distributed and sold directly by the company. Customers can also collect the paint from the company location. Suppliers are mainly represented by local farmers and food manufacturers, and partnerships have been established with local foundations that have commissioned the study which explores the suitability of local plants for colouring textiles.

5.2.2.2 Multiple value creation

To the customers: *Naturalmente Colore*'s products are healthier than synthetic paints, easier to apply, customisable, and both durable and competitively priced compared to existing ecological and synthetic paints. Extracts from the interview and secondary data support the case for the existence of benefits to customers:

One of our customers, a restaurant owner, has managed to paint the walls of his restaurant on his own and because there are no nasty smells resulting from the application, the paint has been applied when the restaurant was closed, but it has been possible to reopen the restaurant immediately the day after (Interview excerpt).

The healthy side of our paint certainly matters to the customers who choose our product. One of our customers has asked us some paints for children rooms. Our paint could be used for a nursery school, for instance, where it could not only offer a healthy environment but also give teachers the opportunity to tell a story, and so have a cultural positive impact (Interview excerpt).

In the textile industry, for instance, colouring with natural pigments confers uniqueness to the product because natural colours cannot be reproduced exactly. By contrast, this would be considered a manufacturing defect in industrial, standardised production (Internal document excerpt).

To the painter: *Naturalmente Colore's* products are safer to use as there are no unpleasant chemical smells that affect breathability when applying the product. It also equips those applying it with new technical skills, thereby enhancing and furthering their professional abilities and employability:

We would like to run a professional course for painters, to let them know about this type of paint which is similar to others but needs some attention as it gives particular finishes depending on how it is applied (Interview excerpt).

To crop harvesters and processors: *Naturalmente Colore* enhances the environmental sustainability of the local agri-food value chain by using by-products resulting from crop harvesting and processing. It recovers materials that would otherwise have been disposed of, with the additional benefit for suppliers in that they do not incur disposal costs:

Our company philosophy values the recovery of by-products mostly from crop processing in order to reduce our costs and improve the environmental sustainability of the value chain in accordance with circular economy principles (Internal document excerpt).

To society: *Naturalmente Colore* has participated in numerous initiatives about its product involving children, adults and the elderly to raise public awareness about environmental issues such as environmental degradation and waste and to promote of a culture that uses locally-sourced natural, human and cultural resources:

Our activity, which is very small, generates a lot of curiosity and it becomes an occasion to talk about serious concerns. Our activity is valuable for the local context - it gives the opportunity to value all of its resources: natural, cultural, historical, human, agricultural and craftsmanship (Interview excerpt).

To the natural environment: *Naturalmente Colore* supports resource stewardship. Agri-food by-products that would have otherwise been discarded are recovered and used as secondary

raw materials in the manufacturing process. This is of significant environmental relevance given that household and food processing waste account for 72% of EU food waste (FUSIONS, 2016). Minimisation of environmental impact across the product life cycle is also pursued as described in section four above. Additional environmental benefits could be gained from increasing the use of plants for colouring as explained below:

The use of spontaneous plants and by-products from crop harvesting and processing for colouring has additional advantages. These species can be planted to requalify dismissed areas or to consolidate slopes, thereby contributing to preserving biodiversity, landscapes and managing resources in a more environmentally sustainable and multifunctional way (Internal document excerpt).

5.2.3 Value capture

This dimension highlights the costs and revenues structure associated with the company's key product. The by-products from crop harvesting and processing have a minimal cost. Raw secondary materials are locally sourced thereby reducing transportation costs. Recovered buckets also enable cost savings. Although *Naturalmente Colore*'s products are set a premium price compared with other natural wall paints available on the market, this is accepted by environmentally conscious customers. Its unique selling points enable the company to attain a competitive advantage:

Compared to synthetic paints, the cost to the end customer is different, obviously, but it is not very different from similar paints. The higher price is accepted by more aware customers, but in reality this is not a pricey product. When we do an application, the highest expense is incurred for paying the painter and not for the paint itself, and in the case of our products, the expenditure for the paint is more advantageous. These colours are beautifully different and it is less likely to tire of them, so in the end you won't need to change the colour of your walls and you won't incur extra costs (Interview 1 excerpt).

The company is currently undertaking research into expanding its products portfolio. For instance, *Naturalmente Colore* is experimenting with the production of nail polish, which would have additional environmental benefits and add new sources of revenue:

Whilst with walls we need a product with high resistance and solidity, for nail polish solidity is less important – nobody keeps a nail polish for a very long time – and so we can recover many plants that are not suitable for the building trade but that can work in the cosmetics industry (Interview 1 excerpt).

6. Discussion

The aim of this article was to answer the following question: *how are circular economy principles translated into activities and business models in a bio-based industrial setting?* *Naturalmente Colore*'s engagement with circular principles is fairly comprehensive since it implements almost all the actions in the ReSOLVE framework (*Regenerate, Share, Optimise and Loop*). Its circular performances are consistent with CE implementation surveys, highlighting that the most applied ReSOLVE actions are *Loop, Optimise and Regenerate* respectively (Merli *et al.*, 2018). However, our findings depart from outcomes in recent literature which signal little engagement with innovative CBMs in the bio-based industry in Europe (Leipold and Petit-Boix, 2018). In many ways, *Naturalmente Colore* is an exemplary case of the understanding and application of a number of circular principles, and it is representative of a dynamic and innovative Italian circular, bio-based industry. Indeed, *Naturalmente Colore* is featured in the 2017's *Atlas of the Italian Circular Economy Champions* which identifies, maps and systematises the best practices of Italian companies in the CE according to the features of their value chains, products, processes and comprehensive value creation. This atlas includes several examples from the bio-based industry, whose activities are aligned with the actions included in the ReSOLVE framework (the atlas can be accessed here <http://www.economiacircolare.com>). Among these examples *Orange Fiber* – the winner of the Global Change Award conferred by the *H&M Foundation* in 2016 – produces a cellulose fibre suitable for spinning from orange peel from the Sicilian beverage (orange juice) industry. This innovative manufacturing process has the potential to recover almost 700,000

tonnes of citrus waste that are produced each year in Italy, which has huge disposal costs for the beverage industry as well as environmental impacts. Its innovative yarn also featured in a fashion collection of one of the most prestigious Italian *haute couture* designers, *Salvatore Ferragamo*, in 2017. Another innovative example in the bio-based, circular industry is *Favini*, a leading company in the high-end, ecological, special paper industry, which manufactures biodegradable paper with natural alternatives to cellulose from trees. ‘Shiro Alga Carta’, the first special paper that *Favini* brought to the market, was born using algae that blighted Venice’s lagoon compromising its fragile ecosystem. In a similar line, ‘Crush’ is produced with by-products from the agri-food industry (e.g., olives, citrus, kiwis, cherries coffee and nuts) replacing up to 15% of virgin cellulose.

Naturalmente Colore satisfies customers’ needs for paint in a novel and multi-beneficial way whilst preserving and enhancing natural capital, which is at the heart of CE thinking (EMF *et al.*, 2015), and creating social value. Diffused value creation mechanisms - such as value creation for the environment, customers, suppliers, painters and society at large - are key to this BM. Our results are consistent with the few studies that have focussed on CBMs to date, most notably those whose outcomes see CBMs as means for the creation of multiple forms of value (De Angelis, 2018; Frishammar and Parida, 2019). Furthermore, our findings contribute to enriching our current understanding of CE implementation as previous analyses into the creation of social value in CE are very limited (Merli *et al.*, 2018). Additionally, our results offer a rich opportunity to synthesise the literature on sustainable BMs and the CE. This case study shows that there are several social and environmental benefits resulting from the search for commercial value within CBMs. This establishes links with sustainable BMs as defined by Schaltegger *et al.* (2016), wherein “maintaining or regenerating natural, social, and economic

capital beyond organizational boundaries” (p. 6) is observed in addition to creating and capturing economic value.

In relation to costs and revenues structure, this BM features idiosyncratic value capture mechanisms thanks to a combination of reduced expenditure, on account of the use of secondary raw materials, recovered resources and low transportation costs, and the existence of a premium price and potential additional revenues arising from a new product line. In terms of value capture, the CE can enable a company to either reduce costs or attain new revenues or both.

6.1 Implications for research

There remain multiple aspects surrounding BM innovation for circularity that can form the subject of further enquiries in the scholarly field of cleaner production. In line with Wells (2016), who asserts that “it is unlikely that any one BM is able to capture all the elements of a BM for sustainability” (p. 48), this article recognises that a single BM cannot capture all the elements of circularity. Hence, this study does not claim to offer a definitive stance on the role of CBMs in practice, but encourages other scholars to contribute to the developing research field at the intersection between the CE and BMs. Future studies could compare this BM with others to assess similarities and differences in terms of conceptualisation and, thereby, further contributing to the formation of conceptual clarity. Although the CE literature is in an early stage of development and so openness facilitates dialogue among different community of scholars, establishing conceptual boundaries would facilitate theory building and research progress. Moreover, scholars may want to analyse value creation in CBMs from a broader, network perspective, thereby complementing the narrower focus of a single company in this study.

6.2 Implications for practice

From a practical point of view, we have shown how the ReSOLVE framework can be used in helping to clarify what is needed to align corporate practices to the principles underlying CE thinking. It is down to corporate leaders to implement these actions and make sense of the organisational changes needed for their implementation to succeed. We have also highlighted that innovative circular actions and BMs can be employed by small organisations. Therefore, we hope that other small and medium enterprises are encouraged to experiment with CE principles. However, we recognise that SMEs may perceive the implementation of the CE more challenging due to limited organisational resources.

7. Conclusion

Complex societal transitions do not happen in a vacuum. They occur only when the thinking behind them, and the processes and structures through which they can unfold are fully understood, shared and entrenched in every day socio-economic practices. Arguably, progressing towards the CE is one of these complex societal transitions for moving towards a more ecologically virtuous and prosperous economy. The scholarly community of management has a crucial role in aiding to achieve a fuller understanding of the CE. In this regard, this qualitative, in-depth case study of *Naturalmente Colore* demonstrates how the ReSOLVE framework (EMF *et al.*, 2015) can provide a simple yet effective tool to guide the implementation of CE principles in a practical context, amid the growing complexity of CBM taxonomies and typologies. In addition, drawing on a component-based BM structure, this article analyses a successful example of a CBM in a bio-based business context. As discussed above, CBM literature suffers from a lack of definitional clarity which hinders consistent,

comparable and detailed understanding of its characteristics. Consequently, this study is of academic and practical relevance given both the limited number of empirical studies of CE implementation at the company level, and the importance of clarity in terms of what BM innovation for circularity involves to enable the CE to emerge and reach scale. Thus, in contrast to the diverging categorisation/classification of CBMs, the alignment of our findings with the current conceptualisations of CBMs contribute to building a much needed consolidation within the CE literature.

We acknowledge that the use of a single case study in this research limits the extent to which these research findings are generalisable. Multiple cases may have provided a more comprehensive understanding of the characteristics of CBMs and the strategies put in place to implement them. It is debateable to what extent a single case design is appropriate to the study of BMs. In fact, BMs are recognised as “many and varied and contextualised” (Wells, 2013, pp. 134-135) and given the relatively recent emergence of CE practices within the business community, single case designs are very common in CBM literature (e.g., Bundgaard and Huulgaard, 2019; Ünal *et al.*, 2019a; 2019b). Nonetheless, albeit constrained in its generalisability, this research provides a number of useful insights concerning the design and implementation of circular activities and BMs at company level.

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Appendix A

Interviewee’s questionnaire¹

- 1) Could you tell me why did you enter this industry?
- 2) How did the idea of manufacturing ecological paint come about?
- 3) How does your product compare with similar products in terms of durability?
- 4) What is its environmental impact across its life cycle?
- 5) How would you describe the value offered to the customer?
- 6) Who are your target customers?
- 7) What are the key resources involved in the manufacturing of this product?
- 8) Where does the secondary raw material come from?
- 9) Is there any waste resulting from the manufacturing process? If so, how is it dealt with?
- 10) What types of relationships did you develop to manufacture this product?
- 11) Which environmental and social values are produced?
- 12) Which costs did you incur to manufacture this product?
- 13) Does this product have a premium price?
- 14) Overall, where does the competitive advantage of this product come from?

¹ This is the set of questions asked to the spin off’s head of research team. Follow-up questions were also asked to clarify concepts and themes emerging from responses.

Primary data	Secondary data
Interview held with the company's founder (September 2018).	Customers' ratings.
Visit to the spin-off laboratory (September 2018).	Social media pages and videos.
Laboratory of Business Model Development (November 2015-February 2016).	Atlas of Italian circular economy champions.
	Corporate documents (research notes, brochures, leaflets and slides).
	Broadcast episode on the principal Italian television channel.

Table 2: Summary of the data used in the article