Check for updates

Received: 23 September 2021 | Revised: 23 January 2022 | Accepted: 9 February 2022

DOI: 10.1002/bse.3019

RESEARCH ARTICLE

Business Strategy and the Environment WILEY

Circular economy business models as resilient complex adaptive systems

Roberta De Angelis

Department of Marketing and Strategy, Cardiff Business School, Cardiff, UK

Correspondence
Roberta De Angelis, Department of Marketing and Strategy, Cardiff Business School, Aberconway Building, Colum Drive, CF10 3EU Cardiff, UK.
Email: deangelisr@cardiff.ac.uk

Abstract

Broad consensus seems to have emerged on the circular economy as a plausible and desirable solution to build prosperity while respecting ecological boundaries. However, its implementation in industry is slow paced. Whilst the systemic nature of the innovation required and barriers to implementation in complex sustainability transitions partially explain why this is the case, reflecting on the contribution of the growing scholarly literature on circular business models to orient management practice is also relevant. In fact, despite the existence of a fairly voluminous scholarly literature on the subject, practitioners are either uncertain or struggling about how to implement circular economy strategies and models. Using an integrative research approach to theory building and drawing on systems theory, this article proposes a resilient complex adaptive system view of circular business models. The resulting framework is a stepping-stone to overcoming conceptual ambiguities and construct fallacies in the way circular business models are typified.

KEYWORDS
business model, circular economy, clarity, systems theory

1 | INTRODUCTION

Our economy is wasteful: we use the equivalent of 1.6 planet Earths to attain the resources we need and absorb our waste, meaning that we consume natural resources by a measure that exceeds what Earth can regenerate each year (Global Footprint Network, 2020). Broad consensus seems to have emerged as never before on what might be the path towards prosperity within ecological boundaries: the circular economy (CE).

Since 2012, CE thinking—which is anchored in the functioning principles of nature—has been advocated in policy, business and academic forums to address environmental sustainability concerns including wasteful production and consumption systems. By encouraging a more efficient and effective use of resources, the CE paradigm is emerging as the frontrunner in the Kuhnian scientific knowledge and practice development process. In fact, it is viewed as a 'promising idea and ideal that has much to bring towards addressing challenges of the Anthropocene' (Friant et al., 2020, p. 1), as a 'key principle for reaching sustainable development goals (…). It is complementary to other strategies, but also necessary on its own' (Brandão et al., 2020, p. 505), and as a 'key strategy to achieve corporate sustainability' (Khan et al., 2020, p. 1479).

However, despite the burgeoning interest it has attracted and its potential to decouple economic growth from consumption of finite resources, progress towards CE implementation in industry is slow paced (Panwar & Niesten, 2020; Parida et al., 2019). Practitioners are either uncertain or struggling about how to implement CE strategies and models (Galvão et al., 2020; Urbinati et al., 2019), and this is somewhat disappointing considering the existence of a fairly voluminous scholarly literature on the subject (more than 1500 articles in 2019 only according to the study by Camón Luis & Celma, 2020). Consequently, it is vital to reflect on the scholarly literature

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.
© 2022 The Author. Business Strategy and The Environment published by ERP Environment and John Wiley & Sons Ltd.

contribution to orient management practice. Are scholars' efforts supportive enough to equip management practitioners with the appropriate tools for the job to be done?

Both CE and circular business models (CBMs) are conceptualised and structured in different ways leading to increasing divergence. This growing semantic dissonance is not advantageous to the implementation of CE principles. Kirchherr et al. (2017) argue that 'a concept with various understandings may ultimately collapse or remain in a deadlock due to permanent conceptual contention' (Kirchherr et al., 2017, p. 221). Similarly, Pieroni et al. (2019) maintain that 'the existence of different propositions of archetypes for CE-oriented BMs without a consensus might hinder the knowledge consolidation in the field. Establishing common discourse/language to facilitate the dissemination and adoption of circular objectives collaboratively at an inter-organizational or societal level is fundamental' (p. 210). Conceptual and dimensional ambiguities are coupled with construct fallacies. Together, they raise two sets of equally relevant problems requiring business and management scholars' attention: firstly, the literature is producing CBMs constructs that have yet to fully incorporate CE thinking, and secondly, confusion about what constitutes a CBM hinders the process of theory building and does not assist in practical implementation.

To contribute to conceptual clarity this article asks: *how can a more comprehensive yet simplified business model framework for a CE be built*? To answer to this question, this article uses an integrative research approach to knowledge building (Snyder, 2019; Torraco, 2005) and draws on the parent business model (BM) literature and, more specifically, on the resilient complex adaptive system view of BMs (Liu et al., 2021). Borrowing from the BM literature is deemed an appropriate approach to develop the CBMs field (Santa-Maria et al., 2020), and building on systems theory responds to the call to advance understanding of CBMs from a systemic logic (Fehrer & Wieland, 2020), which is relevant given that CE principles are based on complexity and systems thinking. Insights from systems theory, particularly from complex adaptive systems, have been used in the literature on sustainable BMs (e.g. Dentoni et al., 2021; Inigo & Albareda, 2016) but not in the CBMs literature to the best of this author's knowledge.

The remainder of this article is organised in the following way. Next, the research method is illustrated (Section 2). Subsequently, the fundamental principles underlying CE thinking and its recent developments in the business, policy and academic arenas are presented along with a review of the BMs and CBMs literature highlighting conceptual and dimensional ambiguities (Sections 3, 4 and 5). Next, the resilient complex adaptive systems perspective of BMs is introduced and applied to CBMs illustrating why it is useful to address current limitations in CBMs literature (Sections 6 and 7). Finally, Section 8 summarises the research contributions and proposes further avenues of study for scholars in the business and management field.

2 | RESEARCH APPROACH

A variety of perspectives about how CBMs are conceptualised and illustrated exists in the academic literature. To come up with a coherent CBM framework and bring about clarity, this article uses an integrative research approach to knowledge building.

Contrarily to systematic and semi-systematic literature reviews—which aim at comparing and synthesising all the available scientific evidence on a specific topic—the purpose of an integrative approach is to assess as well as critiquing and bridging perspectives from different fields to promote knowledge building or new theoretical frameworks (Snyder, 2019; Torraco, 2005).

Integration across communities is the primary goal of an integrative review, and the selection of the relevant literature is grounded in the researcher's own discretion rather than in the use of a more systematic protocol (Cronin & George, 2020). Integrative reviews can be applied to both emerging and more mature research fields, and although they constitute a pertinent approach in business research, application is still limited (Snyder, 2019). Additionally, 'the integrative review is best used when different communities of practice seem to be working in parallel and where research therein could be improved if their findings were synthesized' (Cronin & George, 2020, p. 19).

The current status of CBMs literature lends itself to this approach. Although publications on the subject are growing, CBMs research is still a relatively young field (Salvador et al., 2020; Santa-Maria et al., 2020), and contributions come from a variety of different disciplines (Ferasso et al., 2020) including industrial ecology, engineering and management studies. This 'complexity creates a need for a unified understanding of current and emerging topics' (Ferasso et al., 2020, p. 3). To synthesise the current state of knowledge, this article relies on the use of key academic sources that have already reviewed research in the BMs and CBMs fields.

To fulfil its aims, this research is anchored in the parent BM literature. This is consistent with calls demanding a closer integration between the BMs and CBMs fields to cross develop each other (Santa-Maria et al., 2020). Particularly, this article builds on the resilient complex adaptive system view of BMs (Liu et al., 2021). This approach is in line with theory borrowing, which is quite common in management and business research, according to which 'coherent and fully formed ideas that explain a phenomenon (or phenomena) [are brought into a field] (...) from outside the discipline' (Oswick et al., 2011, p. 319). In the following sections, CE, BMs and CBMs literature are examined to highlight perspectives and lay the foundations for the development of a new CBMs framework.

3 | CIRCULAR ECONOMY

The advent of the sustainable development concept, 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs', has sparked increased attention towards social and environmental sustainability concerns in the business community (Dillick & Muff, 2016). In fact, as noted by Haigh and Hoffman (2014), corporate sustainability, over time, has moved away from it being positioned as heresy to mainstream dogma. Yet, since the 1970s, humanity has been in ecological overshoot. This means that we consume natural resources by a measure that exceeds

what Earth can regenerate each year: we use the equivalent of 1.6 planet Earths to attain the resources we need and absorb our waste (Global Footprint Network, 2020). The founding father of ecological economics, Herman Daly, rightly affirmed that *the economy is a wholly owned subsidiary of the environment*, *not the reverse*. Unfortunately, as a society, we have turned this 'prosperity law' upside down. As a result, a fundamental rethinking of the logic underlying our production and consumption systems is urgently needed to continue thriving upon planet Earth.

Within this context, the CE has gradually appeared as a desirable and plausible path to build prosperity and thereby catering for growing needs while respecting planetary boundaries. CE thinking draws its principles and foundations from the functioning of the ecosystem, whose most famously epitomised rule is that of 'waste equals food', meaning that in nature, the output of any biological process feeds into other processes. It is through the biological cycles of living, growing, consuming and dying run by Earth's organisms that natural cycles work (Unruh, 2010). *Producers*, the foundations of ecosystems, take up raw materials from water, air and earth to make plants; *consumers* live on *producers*' energy and materials; *decomposers* return the residues of dead plants and animals to earth to nurture the future generations of *producers* (ibid.). 'This system of production, consumption, and decomposition allows life's parsimonious palette to cycle over and over in an ongoing process of evolution' (p. 26). Likewise, the CE eliminates the concept of waste by using materials, products and components in 'technical' and 'biological' cycles. Synthetic, mineral materials (e.g. metals and alloys) flow in technical cycles, meaning that they are conceived to be used in subsequent cycles of production and consumption; biological or renewable materials, instead, return to the natural environment to restore and build natural capital (Ellen MacArthur Foundation [EMF] & McKinsey, 2012; Marucci et al., 2021).

Furthermore, the CE differs from a linear economy, based on the take-make-dispose rationale, because it aims at (a) maintaining value (not creating value added), (b) optimising stock management (not flows), and (c) increasing efficiency of using goods (Stahel, 2019). In a circular industrial economy, the 'Era of R', that is, materials recovery strategies, keep goods and components at their highest utility and value through reuse, repairing, remarketing, remanufacturing, refining and reprogramming (Stahel, 2019). Such strategies are economically profitable (the inner the loop, the more profitable and resource efficient they are), ecologically desirable (because they preserve embedded energy and materials, they consume limited resources and produce little waste), and socially viable (they are labour intensive and foster a culture of care for goods among producers and users) (ibid.). Research has shown that a more circular plastics sector could reduce the annual global volume of plastics entering oceans by over 80%, save USD 200 billion per year, cut greenhouse gas emissions by 25%, and create 700,000 net additional jobs by 2040 (Pew Charitable Trusts & SYSTEMIQ, 2020).

As an economy that is 'restorative and regenerative by intention and design' (EMF & McKinsey, 2012, p. 7), providing multiple forms of value decoupled from the consumption of finite resources (EMF et al., 2015; Ferasso et al., 2020), CE thinking and practices are espoused by policy makers and business leaders around the world as a promising path to attain the UN's sustainable development goals as well as a sustained and sustainable competitive advantage (Fraccascia et al., 2021; Kristoffersen et al., 2020; Lacy et al., 2020). The new *Circular Economy Action Plan*, launched by the European Commission in March 2020, is one of the main blocks of the *European Green Deal*, the EU's new growth strategy seeking to embed circularity across the European economy and making Europe the world's first climate-neutral continent by 2050 (European Commission, 2020). The European Commission states that enhanced circularity 'will ensure a cleaner and more competitive industry by reducing environmental impacts, alleviating competition for scarce resources and reducing production costs. The business case is as strong as the environmental and moral imperative. Applying circular economy principles in all sectors and industries has potential to create 700,000 new jobs across the EU by 2030, many of which in SMEs' (European Commission, 2020, p. 9).

In a 2018 World Business Council on Sustainable Development and the Boston Consulting Group report, 51% of 78 global managers declared that the adoption of CE strategies improved profitability and 97% that the CE improves efficiency and competitiveness (World Business Council for Sustainable Development & Boston Consulting Group, 2018). For *Ikea*, the Swedish home furnishing multinational, 'being circular is both a responsibility and a good business opportunity' (EMF, 2021, p. 1). *Ikea* 'will design all products from the very beginning to be repurposed, repaired, reused, resold, or, as the last step in material recovery, recycled, generating as little waste as possible. It's about seeing IKEA products as material banks for the future' (p. 1). Recently, the outbreak of the COVID-19 pandemic has led many actors including CEOs of major corporations and policymakers to sign '*it's time to step up not step back*', a pledge supporting the transition towards the CE to build a more resilient and sustainable economy (EMF, 2020). Issues of security and resilience have become more urgent as the pandemic highlighted vulnerability in global and complex supply chains (McKinsey & Company, 2021). This is in tune with the shift in perspective towards managing with a greater sense of purpose and societal impact highlighted by the world's largest organisations CEOs (KPMG, 2020).

However, despite the burgeoning interest that the CE has attracted and its potential to decouple economic growth from consumption of finite resource, progress towards CE implementation in industry is slow paced (Panwar & Niesten, 2020; Parida et al., 2019). On one hand, this is not surprising if the systemic nature of the changes that are required for a CE to emerge and the existing barriers to its implementation are considered. Innovative BMs, fit for purpose design strategies as well as reverse logistics networks and enabling system conditions, are the key building blocks of the transition towards the CE (EMF et al., 2015), whose management spans beyond the reach of a single organisation. The complexity in the innovation landscape is coupled with the existence of multiple hurdles that are encountered in implementation. Most notably, regulatory, technological, cultural, market and organisational barriers (Kirchherr et al., 2018; Tura et al., 2019).

On the other hand, whilst it is undeniable that a complex sustainability transition can be accomplished in the long term only, and it is inevitably confronted with many practical challenges, it is disappointing that despite the existence of a fairly voluminous scholarly literature on the subject (more than 1500 articles in 2019 only according to Camón Luis & Celma, 2020), practitioners are either uncertain or struggling about how to implement CE strategies and models (Galvão et al., 2020; Urbinati et al., 2019). Desing et al. (2020) note that despite its popularity, there is 'no consent on what CE actually means and encompasses' (p. 1). Analogously, Schöggl et al. (2020) highlight the concept ambiguity and, thereby, the need for a clear conceptualisation. The growing semantic dissonance in the CE, which is equally developing in the CBMs field, is not advantageous to the implementation of CE principles. Consequently, this article proposes a CBM framework linked to the perspective of BMs based on resilient complex adaptive systems to overcome the lack of conceptual clarity and fragmentation plaguing the CBMs literature (Chen et al., 2020; Geissdoerfer et al., 2020). To come up with such framework, this article reviews first the BMs and CBMs literature.

4 | CONCEPTUAL AMBIGUITIES IN THE BUSINESS MODEL LITERATURE

Business models, a description about how a firm does business (Chesbrough & Rosenbloom, 2002) and 'one of the greatest buzzwords of the Internet' (Magretta, 2002, p. 86), have caught increasing attention of academics and management practitioners alike over time. Although early academic papers on the topic were published in 1957 and 1960 (Osterwalder et al., 2005), the popularity of the BM term exploded in the 1990s, when the emergence of the information and communication technologies pushed many organisations to reconsider or experiment with new forms of value creation. Since then, academic research on the subject has proliferated and the interest of management practitioners has soared. Several articles and reviews have been published in academic journals (e.g. Foss & Saebi, 2017; Wirtz et al., 2016; Zott et al., 2011) and—as source of value creation as well as sustained and sustainable competitive advantage—BMs and BM innovation have entered the agenda of business leaders (Kiron et al., 2013; Wirtz et al., 2016). Clearly, this demonstrates that attention and interest in the BM concept have gone well beyond the 'dot-com bubble'.

The scholarly literature on the topic abounds of attempts at clarifying what the BM is. Teece (2018) comments that 'there are almost as many definitions of a business model as there are business models' (p. 41). Similarly, Foss and Saebi (2018) lament that an 'anything goes' approach has been guiding the development of the subject leaving the problem of a missing clear definition of the central construct still unresolved. This is further emphasised by Ritter and Lettl (2018) who argue that 'the business model concept remains ambiguous and clarity is needed in order to move the field forward (…) *[since]* such conceptual ambiguity hinders theoretical development and demands academic attention' (p. 2).

More diverging than converging, a BM is referred to in multiple ways as a *statement*, *description*, *representation*, *architecture*, *conceptual tool or model*, *plan*, *structural template*, *method*, *framework*, *pattern and set* (Zott et al., 2011). Moreover, five distinctive perspectives relating to the BM term, namely, *activity*, *logics*, *archetypes*, *elements* and *alignment*, exist; each of them defines the BM concept in a different way, and it is meaningful on its own (Ritter & Lettl, 2018). The *activity* perspective views the BM as a set of activities to execute a company's intended strategy. The *logics* perspective describes how a company creates value. The *archetypes* perspective introduces modes of value creation and capture. The *elements* perspective highlights the components that make up the BM, and finally, the *alignment* perspective underlines that organisational success relies on both a sound BM, and complementarity, interrelationships, and alignment between BM elements. These perspectives are complementary and can be combined to further the field consolidation and obtain a more complete understanding of the BM concept (ibid.). In fact, *activities* are central to all other perspectives as they are the foundations of the business enterprise; *elements* serve to link *activities* to results; *activities* lead to successful outcomes when they follow a pertinent value creation and capture *logic*; logics can be combined into *archetypes* and the *alignment* of the BM elements is instrumental to BM optimisation and success (ibid.).

Foss and Saebi (2018) urge that 'more consensus on definitional and dimensionalization issues is probably required' (p. 19). This, in turn, would be beneficial to theory building and empirical testing: 'good theorizing is based on the creation of this kind of cognitive order. 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). Encouragingly, some consolidation efforts are emerging. In addition to Ritter and Lettl's (2018) unifying BM perspective, some agreement seems to have developed around viewing the BM as the 'design or architecture of the value creation, delivery, and capture mechanisms' (Teece, 2010, p. 172) of a firm. Furthermore, the literature converges on the components that constitute a BM: value proposition, value creation and delivery structure and value capture mechanisms (Saebi et al., 2017).

5 | CONCEPTUAL AND DIMENSIONAL AMBIGUITIES IN THE CIRCULAR BUSINESS MODEL LITERATURE

One of the earliest definitions of CBMs view them as BMs 'wherein enhanced customers' value is produced as a result of more comprehensive 'circular offerings' (e.g. products as services; greater convenience; dematerialised products; superior product durability and ecological performances; product upgradability; take-back schemes) and 'circular relationships' (access over ownership, e.g. leasing, renting, sharing). In circular business models diffused forms of value are created, local/regional supply chains are implemented, maximisation of resources value across the activity system is pursued, boundaries spanning relational competences for the adaptation or

development of 'circular' resources and capabilities are developed, and idiosyncratic value capture mechanisms are observed' (De Angelis, 2018, p. 65).

Mirroring the parent BMs literature, the CBMs field is a growing yet in need of consolidation and clarity research area. Definitional ambiguity characterises the field (Chen et al., 2020; Fehrer & Wieland, 2020; Ferasso et al., 2020). There is no CBMs agreed definition; instead, many definitions ($n = 16$) have been put forward (Rovanto & Bask, 2020). Furthermore, as pointed by Hopkinson et al. (2020), a proliferation of constructs attempting at classifying/categorising CBMs is observable: archetypes (e.g. Kortmann & Piller, 2016; Moreno et al., 2016); canvasses (e.g. Daou et al., 2020; Lewandowski, 2016); categories (e.g. Lacy & Rutqvist, 2015; Weetman, 2017); definitions (e.g. Frishammar & Parida, 2019; Linder & Williander, 2017); frameworks (e.g. Antikainen & Valkokari, 2016; Ranta et al., 2018); managerial practices for creating and capturing value (Urbinati et al., 2020); mapping tools (e.g. Nußholz, 2018); strategies (e.g. Geissdoerfer et al., 2020; Ünal & Shao, 2019); taxonomies (e.g. Urbinati et al., 2017); typologies (Lüdeke-Freund et al., 2019) and value streams (Galvão et al., 2020). Most of these constructs lack validation in practice (Pieroni et al., 2020) and a comprehensive set of practices guiding BM implementation (Urbinati et al., 2020). Figure 1 highlights these different CBMs constructs.

As early as 2000s, when the BM concept and its popularity started soaring in academic and practitioners' circles, Magretta (2002) emphasised that BMs were one of the most sloppily terms used warning that they were 'often stretched to mean everything-and end up meaning nothing' (p. 92). She added that 'unless we're willing to draw the line somewhere, these concepts will remain confusing and difficult to use. Definition brings clarity. And when it comes to concepts that are so fundamental to performance, no organization can afford fuzzy thinking' (p. 92). Täuscher and Abdelkafi (2017) reinforce her point of view arguing that managers are absorbed by the task of identifying suitable paths to innovate their BMs and so they need some guidance in this process, which, they believe is missing.

Seemingly, the CBMs research is plagued by the same problems. Whilst the variety of perspectives populating the CBMs literature is enriching a young field of research, there is a risk of *missing the wood for the trees* by placing too much emphasis on the functional forms that CBMs take. Consequently, the importance of bringing clarity about the field fundamental nucleus, that is, the CBM concept itself, may be overlooked. As noted by Pieroni et al. (2020), 'building consensus of terminology and archetypes is important to achieve a shared discourse, which is fundamental for the implementation of business models' (p. 1).

6 | SYSTEMS THINKING AS A CONCEPTUAL LENS FOR CIRCULAR BUSINESS MODELS RESEARCH

As it stands, there are some key issues in the CBMs field that need scholars' attention. Firstly, several conceptualisations of CBMs and little evidence of convergence exist. Secondly, a number of constructs have developed to typify CBMs.

Thirdly, as most CBMs design tools are grounded in linear and sequential process steps (e.g. the BM canvas), they are not particularly suited to assist in the process of CBM innovation since the CE, by contrast, draws on complexity and systems thinking (Fehrer & Wieland, 2020). Their ease of use, though appealing, stands as a limitation in terms of richness (ibid.). Similarly, Lauten-Weiss and Ramesohl (2021) argue that a holistic redesign logic for CBMs has yet to emerge. They observe that the BM canvas often used in CBMs research does not account for interactions among its building blocks and portrays a rather static picture, even when additional components reflecting some CE elements are included. The BM concept is influenced by the business strategy literature and particularly is built on Porter's (1985) value chain model (Morris et al., 2005), one of the most influential frameworks in the strategic management literature. The value chain illustrates how competitive advantage can be created through the company activities (primary and support activities) responsible for a

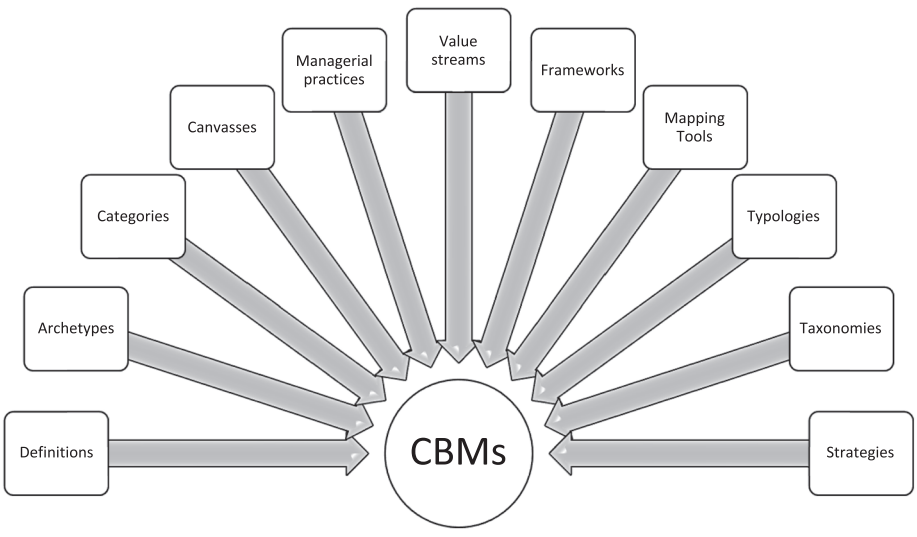

FIGURE 1 CBMs constructs. *Source*: Author's own elaboration

linear process of value creation within a closed economic system. Yet Stead and Stead (2019) argue that Porter's value chain is an 'example of mistaking abstract models for accurate representations of reality' (p. 67). They warn that the value chain is ill-equipped to understand value creation in increasingly open business environments wherein collaboration, interdependence and complexity as well as social and ecological contexts are all central to value creating processes.

Fourthly, whilst it is acknowledged that CE principles draw on systems thinking (EMF & McKinsey, 2012; EMF & McKinsey, 2013), the implications of this from a BM perspective and for CBMs dimensions are currently missing from the CBMs literature to the best of this author's knowledge. Systems thinking in CE and CBMs literature is mostly used to illustrate that such a sustainability transition cannot be accomplished by companies in isolation but it rather requires multiple and simultaneous innovations at societal level involving different actors. Yet systems theory implications are not spelled out despite the fact that CE thinking is based on insights from systems thinking (Webster, 2013).

Systems thinking is a transdisciplinary construct emerged during the mid-twentieth century along with general system theory, complexity theory and quantum physics (Davis & Stroink, 2016). It is considered as a cognitive paradigm according to which phenomena are viewed as a set of interconnected components that make up a dynamic whole (Randle & Stroink, 2018). It is recognised as useful to better understand complex socio-ecological problems (Davis & Stroink, 2016). Systems thinking involves 'thinking in terms of relationships, patterns, and context" (Capra & Jakobsen, 2017, p. 833) and it is relevant to almost every discipline and every human activity; 'whether we talk about economics, the environment, education, healthcare, law, or management, we are dealing with living organisms, social systems, or ecosystems. And consequently, (…) the systemic view of life is relevant to all these areas' (p. 833).

Fifthly, although some authors are emphasising the importance of viewing CBMs within a broader context than that of the firm boundaries in order to capitalise on the opportunities offered by the CE (e.g. Frishammar & Parida, 2019; Ünal et al., 2019) and gain the so-called 'circular advantage' (Lacy & Rutqvist, 2015), CBMs boundaries are typically depicted as if matching firms' boundaries, mirroring the conventional BM literature (Rovanto & Bask, 2020). Not incorporating complexity, systems thinking and a more comprehensive view of boundaries results in some construct fallacies in the way in which the BM is depicted within the CBMs literature.

Overall, conceptual and dimensional ambiguities coupled with construct fallacies determine two key problems: firstly, the literature is producing CBMs constructs that have yet to fully incorporate CE thinking, and secondly, confusion in terms of what is and what constitutes a CBM hinders the processes of theory building as well as making it harder to translate principles into practice. These issues are well summarised by Rovanto and Bask (2020) who argue that the 'connection between the CE concept and a CBM in practice is still rather informal and ill-defined' (p. 5). To strengthen the conceptual and dimensional foundations of CBMs, this article puts forward a framework based on systems theory applied to the BM concept.

A new line of enquiry, which sees the benefits of using systems theory in the context of the BM research, is emerging. Velu (2017) maintains that principles of general systems theory show analogies with BM functioning. Liu et al. (2021) concur with Velu (2017) and argue that systems theory is useful to portray the BM concept more comprehensively. Particularly, they depict the BM as a Resilient Complex Adaptive System (RCAS) maintaining that the properties of complexity, resilience, and adaptation, and so a RCAS view of the BM, represents the BM more accurately than general systems theory. In fact, the properties of resilience and adaptation, albeit mostly overlooked in the literature, are particularly useful in complex business environments wherein adaptation to existing contextual conditions and ability to bounce back from sudden shocks are crucial to organisational survival and attainment of its goals (ibid.).

There are several features characterising systems in systems theory. Elements in a system are interconnected (they influence each other); a collection of elements results in more than the sum of its parts; systems are goal oriented and have boundaries, and relationships in the form of feedback loops, correlations and causality exist among the component parts (Gell-Mann, 1994; Meadows & Wright, 2008; Von Bertalanffy, 1968). Complex adaptive systems (CASs) incorporate 'complexity' in terms of volume of agents and multiple layers of interdependence within a system, and 'adaptation', that is, they are self-organising, evolving with changes in their surrounding conditions (Dentoni et al., 2021). They also have porous boundaries, that is, they are open systems with energy, information and matter exchanged between the system and its environment (Preiser et al., 2018). Although BMs are also conceptualised as systems, for example Zott and Amit (2010) describe the BM as 'a system of interdependent activities that transcends the focal firm and spans its boundaries' (p. 216), a CAS view conceptualises the BM as a subsystem of the socio-ecological system (Dentoni et al., 2021). RCASs incorporate 'resilience', that is, 'the ability to absorb disturbances, reorganize, and retain (…) effective functioning' (Capra & Jakobsen, 2017, p. 838).

As a RCAS, a BM includes all of its fundamental aspects: elements that pursue the system's goals and particularly, *manage value*, *identify value*, *create value*, *convey value*, *deliver value*, *capture value*, *sustain value* (linked to adaptation) and *protect value* (linked to resilience); *goal* (to create and exchange value); *boundaries* (boundaries of a firm); *relationships* (feedback loops that create and manage value exchange: *manage value* is the overarching function coordinating all the other elemental functions; *capture value* funds all the elemental functions; all elemental functions contribute to *protect value* and *sustain value* and *protect value* and *sustain value* support other elemental functions in case of change and disturbance); *structure* (functions connected and organised through a feedback loop); *adaptation* and *resilience* (Liu et al., 2021). A RCAS view of the BM exemplifies 'the fundamental aspects of a business model inclusive of its goal, boundary, structured feedback loop of value exchange, and elemental functions that enable pursuit of the business goal while facilitating homeostasis and adaptation' (Liu et al., 2021, p. 13). Next, the RCAS view of the BM is applied

to the CBM, and the reasons why this is useful to overcome current conceptual ambiguities and construct fallacies are illustrated.

7 | TOWARDS A RESILIENT COMPLEX ADAPTIVE SYSTEM VIEW OF CIRCULAR BUSINESS MODELS

Five of the elemental functions in the RCAS view of the BM (identify, create, convey, deliver and capture value) equal to the three building blocks through which BMs and CBMs are mostly conceptualised, that is, value proposition, value creation and delivery and value capture.

The functions of *protect value* and *sustain value*, can be considered as very typical and inherent to CBMs. Accordingly, the principles underlying the processes of value creation and capture in a CBM, that is, *preserve and enhance natural capital*, *optimise resources yields* and *foster system effectiveness* (EMF et al., 2015), contribute to its resilience and so to its ability to deal with shocks in the external environment. It is widely acknowledged that salvaging product components/parts/materials through end-of-life recovery strategies, for instance, hedges against supply/price volatility and shortage of natural capital, which can undermine the viability of a BM. Distributed, small and local manufacturing protect from disruption in complex and global supply chains, witnessed in the outbreak of the coronavirus pandemic. As illustrated in recent literature, localisation offers better resilience against vulnerability to global shocks (Nandi et al., 2021) and growing geopolitical uncertainty (Clinton & Hecimovic, 2021). Hence, it comes as no surprise that 93% of supply chain executives has made plans to make their supply chains more resilient through nearshoring and regionalisation (McKinsey & Company, 2020). Effectiveness, the interplay between efficiency and resilience (Fath et al., 2019), is where the concept of the CE sits (Webster & Fromberg, 2020). A CBM also embodies well the *sustain value* function since its underlying principles enable organisations to cope with the rapidly changing competitive, institutional and natural landscapes (e.g. consumers' behaviour moving towards sharing, increasing environmental regulations, depletion of natural capital).

Manage value, the BM function contributing to the smooth operation of all the other elemental functions, in a CBM requires increased coordination/alignment of organisational departments and their goals and incentives as well as cooperation within the value network, which spans the organisational boundaries. As noted by De Angelis (2021), a performing paradox could emerge from competing internal incentive mechanisms, that is, new product sales versus rates of remanufactured/refurbished/re-used products (EMF & McKinsey, 2013). Furthermore, as emphasised by Ünal et al. (2019), 'ensuring balance between internal and external forces is essential for creating value in a circular economy domain' (p. 303).

Goals in CBMs are not limited to the creation and exchange of value in purely commercial terms but also include ecological and social value creation. In this respect, it is useful to recall here Frishammar and Parida's (2019) definition of a CBM: 'we define a circular business model as one in which a focal company, together with partners, uses innovation to create, capture and deliver value to improve resource efficiency by extending the lifespan of products and parts, thereby realizing environmental, social and economic benefits' (p. 6).

Boundaries in CBMs span firms' boundaries including the network of social and economic actors within which companies operate. A CBMs is an open system, that is, open to its immediate network environment and to the natural environment in which it is embedded. *Relationships* exist in the form of feedback loops (enabling and constraining) among CBMs elemental functions and between CBMs and

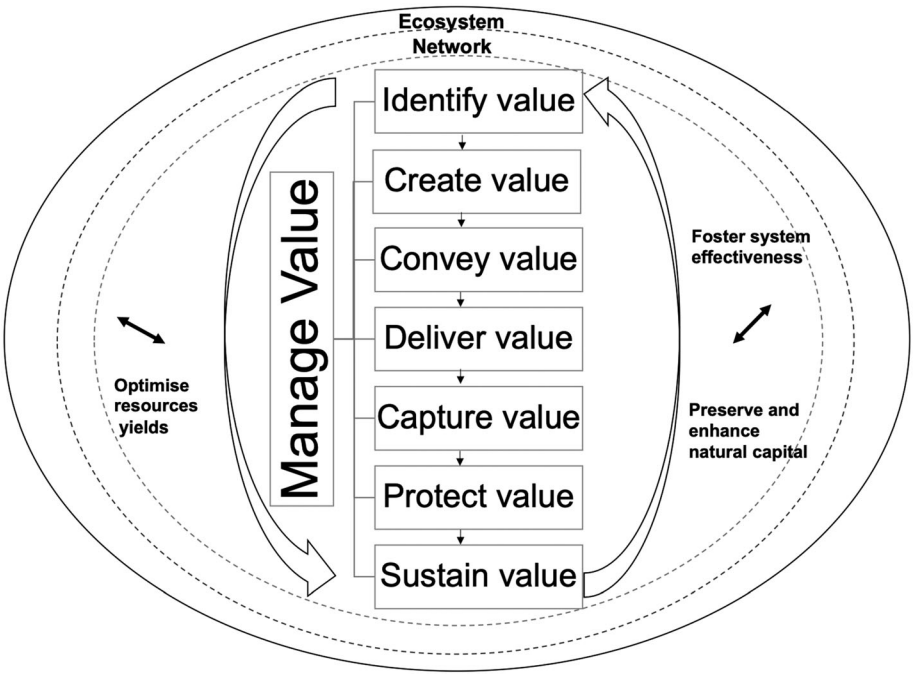

FIGURE 2 A RCAS view of the CBM. *Source*: Author's own elaboration and based on EMF et al. (2015) and Liu et al. (2021)

their environments. *Manage value*, for instance, is responsible for the successful outcomes in the process of value creation and capture. *Value creation* and *capture*, in turn, self-sustain the organisational structures behind the *manage value* function. *Protect* and *sustain value* ensure the viability of the CBM, and, in turn, the process of value creation and capture feeds into the adaptation and resilience of the BM. Furthermore, as noted by Ünal et al. (2019) significant levels of interdependences and interactions with the wider system characterise value creation in a CBM. The *structure* of the CBM is then defined by the relationship across its parts. Figure 2 portrays the CBM framework based on the RCAS view of the BM.

This CBM framework grounded in systems thinking is a stepping-stone to overcoming conceptual and dimensional ambiguities as well as construct fallacies characterising the CBM concept in current literature. Firstly, a 'CAS-based ontology suggests that the relation between social and ecological systems are conceptualized as linked and thus as inseparable ontological entities' (Preiser et al., 2018, p. 10). Hence, BMs are subsystems of the socio-ecological system (Dentoni et al., 2021). This perspective fits well with CE thinking since the CE aims at recoupling economy with ecology (EMF et al., 2015). This means that organisations are not viewed as separate entities from their natural environment but rather as a part of the wider ecological system upon which they depend for their survival. Likewise, a BM based upon CE principles, is a subsystem of the wider socio-ecological system.

Secondly, CBMs as RCASs incorporate systems thinking, which is not reflected in the way in which the CBM is both defined and typified in current literature. Thirdly, complexity, in terms of the number of actors involved in the process of value creation and capture and feedback loops across the BM components and between the BM, its wider value network and the ecosystem, are acknowledged. Finally, CBMs boundaries are permeable and open to the influence of economic, social, and ecological stakeholders. Table 1 summarises and compares the RCAS view of a BM with the RCAS view of a CBM.

TABLE 1 RCAS view of the BM versus RCAS view of the CBM

RCAS view of a BM	RCAS view of a CBM
Elemental functions	**Elemental functions**
Identify value	Identify value
Create value	Create value
Convey value	Convey value
Deliver value	Deliver value
Capture value	Capture value
Sustain value	Sustain value (Inherent to a CBM)
Protect value	Protect value (Inherent to a CBM)
Goal	**Goal**
Create and exchange value	Multiple forms of value creation
Structure	**Structure**
The relationship between elemental functions	Defined by the relationship among its parts
Boundaries	**Boundaries**
BM boundaries coincide with firms' boundaries	Open, that is, porous boundaries. CBMs are open to the influence of the wider environment within which they are embedded
Relationship	**Relationship**
Feedback loops that create and manage value exchange	Feedback loops exist among CBM components and between the CBM and its wider environment, including the natural environment
Resilience	**Resilience**
Related to protect value	Inherent to a CBM
Adaptation	**Adaptation**
Related to sustain value	Inherent to a CBM

Note: Author's own elaboration and based on Liu et al. (2021).

8 | CONCLUSION

Broad consensus has developed on the CE as a plausible and desirable solution to build prosperity within planetary boundaries. However, whilst many initiatives have emerged around the CE vision, progress towards CE implementation in industry is slow paced (Panwar & Niesten, 2020; Parida et al., 2019). Practitioners are either uncertain or struggling about how to implement CE strategies and models (Galvão et al., 2020; Urbinati et al., 2019). Research has attributed to the complexities in the innovation landscape and different barriers the reasons why implementation is slow progressing. Most notably, regulatory, technological, cultural, market and organisational barriers (Kirchherr et al., 2018; Tura et al., 2019).

This article has taken a complementary perspective arguing that it is now high time to reflect upon the contribution of the growing scholarly literature on CE and CBMs to orient management practice. Several authors have highlighted the limitations in the ways in which CBMs are defined and classified pointing to conceptual and dimensional ambiguities (Chen et al., 2020; Ferasso et al., 2020; Pieroni et al., 2020), lack of validation in practice (Pieroni et al., 2020) and guidance about implementation (Urbinati et al., 2020), ill-defined relationship with the CE concept (Rovanto & Bask, 2020), and simplistic, sequential process steps in the way in which they are designed that do not mirror the complexity involved in circular innovations (Fehrer & Wieland, 2020).

In response, this article has suggested a CBM framework based on insights from systems theory and, specifically, on the notion of RCASs, which is relevant in the context of CE research. This research effort can be considered as a stepping-stone to overcoming conceptual and dimensional ambiguities as well as construct fallacies in the way in which CBMs are framed in current literature. It portrays the CBM in a simpler yet more comprehensive way as well as more fully aligned with CE thinking, thereby contributing to clarity, which is necessary to aid the process of knowledge building. The framework here proposed has also relevance for management practice. It illustrates that firms and their BMs are part of a complex whole and so that

taking steps towards CE implementation requires mastering a complementary set of skills in complexity thinking and management of its organisational consequences. It does not constitute another learning burden for management practitioners requiring dexterity in handling complicated constructs but rather it brings them back to the basics yet more important fundamentals pertaining to the CE concept.

A definition of the CBM that would align with the RCAS perspective has not been put forward. Whilst this can constitute a limitation of this study, it is open to question whether another definition would have been useful, given that there are already many different conceptualisations in current literature. Nonetheless, this may be a future research endeavour for other scholars in the business and management literature. A potential research question could be: how can a RCAS perspective of CBMs contribute to a unified conceptualisation? Another limitation of this study is that the framework here proposed has not been tested in empirical settings and thereby, lacks validation in practice. Yet validating this CBM framework would be another relevant future research enquiry, given that firms need methods and approaches to come up with innovative CBMs (Konietzko et al., 2020) and more empirical research needs to be carried out to highlight how CBMs are implemented in practice (Urbinati et al., 2020).

ORCID

Roberta De Angelis https://orcid.org/0000-0002-8324-454X

REFERENCES

Antikainen, M., & Valkokari, K. (2016). A framework for sustainable circular business model innovation. *Technology Innovation Management Review*, *6*, 5–12. https://doi.org/10.22215/timreview/1000

Brandão, M., Lazarevic, D., & Finnveden, G. (2020). *Handbook of the circular economy*. Edward Elgar Publishing Limited. https://doi.org/10.4337/9781788972727

Camón Luis, E., & Celma, D. (2020). Circular economy. *A Review and Bibliometric Analysis. Sustainability*, *12*, 63–81. https://doi.org/10.3390/su12166381

Capra, F., & Jakobsen, O. (2017). A conceptual framework for ecological economics based on systemic principles of life. *International Journal of Social Economics*, *44*, 831–844. https://doi.org/10.1108/IJSE-05-2016-0136

Chen, L.-H., Hung, P., & Ma, H.-W. (2020). Integrating circular business models and development tools in the circular economy transition process: A firm-level framework. *Business Strategy & the Environment*, *29*, 1887–1898. https://doi.org/10.1002/bse.2477

Chesbrough, H., & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: Evidence from Xerox Corporation's technology spin-off companies. *Industrial Corporate Change*, *11*, 529–555. https://doi.org/10.1093/icc/11.3.529

Clinton, F., & Hecimovic, A. (2021). Global supply chains after COVID-19: The end of the road for neoliberal globalisation? *Accounting, Auditing & Accountability Journal*, *34*, 58–84. https://doi.org/10.1108/AAAJ-06-2020-4634

Cronin, M. A., & George, E. (2020). The why and how of the integrative review. *Organizational Research Methods*. https://doi.org/10.1177/1094428120935507

Daou, A., Mallat, C., Chammas, G., Cerantola, N., Kayed, S., & Saliba, N. (2020). The Ecocanvas as a business model canvas for a circular economy. *Journal of Cleaner Production*, *258*, 120938. https://doi.org/10.1016/j.jclepro.2020.120938

Davis, A., & Stroink, M. (2016). The relationship between systems thinking and the new ecological paradigm. *Systems Research and Behavioral Science*, *33*, 575–586. https://doi.org/10.1002/sres.2371

De Angelis, R. (2018). *Business models in the circular economy: Concepts, examples and theory*. Palgrave. https://doi.org/10.1007/978-3-319-75127-6

De Angelis, R. (2021). Circular economy and paradox theory: A business model perspective. *Journal of Cleaner Production*, *285*, 124823. https://doi.org/10.1016/j.jclepro.2020.124823

Dentoni, D., Pinkse, J., & Lubberink, R. (2021). Linking sustainable business models to socio-ecological resilience through cross-sector partnerships: A complex adaptive systems view. *Business & Society*, *60*(2), 1216–1252. https://doi.org/10.1177/0007650320935015

Desing, H., Brunner, D., Takacs, F., Nahrath, S., Frankenberger, K., & Hischier, R. (2020). A circular economy within the planetary boundaries: Towards a resource-based, systemic approach. *Resources, Conservation & Recycling*, *155*, 104673. https://doi.org/10.1016/j.resconrec.2019.104673

Dillick, T., & Muff, K. (2016). Clarifying the meaning of sustainable business: Introducing a typology from business-as-usual to true business sustainability. *Organization & Environment*, *29*, 156–174. https://doi.org/10.1177/1086026615575176

Ellen MacArthur Foundation. (2020). 'It's time to step up, not step back' — more than 50 global leaders pledge to build back better with the circular economy. Retrieved October 2020 from https://www.ellenmacarthurfoundation.org/news/more-than-50-global-leaders-pledge-to-build-back-better-with-the-circular-economy

Ellen MacArthur Foundation. (2021). Inter IKEA Group. Retrieved January 2021 from https://www.ellenmacarthurfoundation.org/our-story/our-network/interviews

Ellen MacArthur Foundation & McKinsey. (2012). Towards the circular economy: Economic and business rationale for an accelerated transition. Retrieved May 2013 from http://www.ellenmacarthurfoundation.org/business/reports

Ellen MacArthur Foundation & McKinsey. (2013). Towards the circular economy: Opportunities for the consumer goods sector. Retrieved November 2013, from http://www.ellen- macarthurfoundation.org/business/reports.

Ellen MacArthur Foundation, McKinsey, & SUN. (2015). Growth within: A circular economy vision for a competitive Europe. Retrieved July 2015 from http://www.ellenmacarthurfoundation.org/books- and-report

European Commission. (2020). A new industrial strategy for Europe. Retrieved January 2021 from https://ec.europa.eu/knowledge4policy/publication/communication-com2020102-new-industrial-strategy-europe_en

Fath, B., Fiscus, D., Goerner, S., Berea, A., & Ulanowicz, R. (2019). Measuring regenerative economics: 10 principles and measures undergirding systemic economic health. *Global Transitions*, *1*, 15–27. https://doi.org/10.1016/j.glt.2019.02.002

Fehrer, J., & Wieland, H. (2020). A systemic logic for circular business models. *Journal of Business Research*, *125*, 609, 620. https://doi.org/10.1016/j.jbusres.2020.02.010

Ferasso, M., Beliaeva, T., & Ribeiro-Soriano, D. (2020). Circular economy business models: The state of research and avenues ahead. *Business Strategy & the Environment*, *29*, 3006–3024. https://doi.org/10.1002/bse.2554

Foss, N., & Saebi, T. (2018). Business models and business model innovation: Between wicked and paradigmatic problems. *Long Range Planning*, *51*, 9–21. https://doi.org/10.1016/j.lrp.2017.07.006

Foss, N. J., & Saebi, T. (2017). Fifteen years of research on business model innovation: How far have we come, and where should we go? *Journal of Management*, *43*, 200–227. https://doi.org/10.1177/0149206316675927

Fraccascia, L., Giannoccaro, I., Agarwal, A., & Hansen, E. (2021). Business models for the circular economy: Empirical advances and future

directions. *Business Strategy and the Environment*, *30*, 2741–2744. https://doi.org/10.1002/bse.2896

Friant, M.-C., Vermeulen, W., & Salomone, R. (2020). A typology of circular economy discourses: Navigating the diverse visions of a contested paradigm. *Resources, Conservation & Recycling*, *161*, 104917.

Frishammar, J., & Parida, V. (2019). Circular business model transformation: A roadmap for incumbent firms. *California Management Review*, *61*, 5–29. https://doi.org/10.1177/0008125618811926

Galvão, G., Homrich, A., Geissdoerfer, M., Evans, S., Ferrer, P., & Carvalho, M. (2020). Towards a value stream perspective of circular business models. *Resources, Conservation & Recycling*, *162*, 105060. https://doi.org/10.1016/j.resconrec.2020.105060

Geissdoerfer, M., Pieroni, M., Pigosso, D., & Soufani, K. (2020). Circular business models: A review. *Journal of Cleaner Production*, *277*, 123741. https://doi.org/10.1016/j.jclepro.2020.123741

Gell-Mann, M. (1994). Complex adaptive systems. In *Complexity: Metaphors, models, and reality. Santa Fe Institute Studies in the Sciences of Complexity. No. 19* (pp. 17–45). Addison-Wesley.

Global Footprint Network. (2020). Ecological footprint. Retrieved December 2020 from https://www.footprintnetwork.org/our-work/ecological-footprint/

Haigh, N., & Hoffman, A. (2014). The new heretics: Hybrid organizations and the challenges they present to corporate sustainability. *Organization & Environment*, *27*, 223–241. https://doi.org/10.1177/1086026614545345

Hopkinson, P., De Angelis, R., & Zils, M. (2020). Systemic building blocks for creating and capturing value from circular economy. *Resources, Conservation and Recycling*, *155*, 104672. https://doi.org/10.1016/j.resconrec.2019.104672

Inigo, E., & Albareda, L. (2016). Understanding sustainable innovation as a complex adaptive system: A systemic approach to the firm. *Journal of Cleaner Production*, *126*, 1–20. https://doi.org/10.1016/j.jclepro.2016.03.036

Khan, O., Daddi, T., & Iraldo, F. (2020). Microfoundations of dynamic capabilities: Insights from circular economy business cases. *Business Strategy and the Environment*, *29*, 1479–1493. https://doi.org/10.1002/bse.2447

Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., & Hekkert, M. (2018). Barriers to the circular economy: Evidence from the European Union (EU). *Ecological Economics*, *150*, 264–272. https://doi.org/10.1016/j.ecolecon.2018.04.028

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, *127*, 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005

Kiron, D., Kruschwitz, N., Reeves, M., & Goh, E. (2013). The benefits of sustainability-driven innovation. *MIT Sloan Management Review*, *54*, 69–73.

Kortmann, S., & Piller, F. (2016). Open business models and closed-loop value chains: Redefining the firm-consumer relationship. *California Management Review*, *58*, 88–108. https://doi.org/10.1525/cmr.2016.58.3.88

KPMG. (2020). KPMG 2020 CEO outlook: COVID-19 special edition. Retrieved January 2021 from https://home.kpmg/xx/en/home/insights/2020/09/kpmg-2020-ceo-outlook-covid-19-special-edition.html

Kristoffersen, E., Blomsma, F., Mikalef, P., & Li, J. (2020). The smart circular economy: A digital-enabled circular strategies framework for manufacturing companies. *Journal of Business Research*, *120*, 241–261. https://doi.org/10.1016/j.jbusres.2020.07.044

Lacy, P., Long, J., & Spindler, W. (2020). *The circular economy handbook—Realizing the circular advantage*. Palgrave Macmillan. https://doi.org/10.1057/978-1-349-95968-6

Lacy, P., & Rutqvist, J. (2015). *Waste to wealth: The circular economy advantage*. Palgrave Macmillan.

Lauten-Weiss, J., & Ramesohl, S. (2021). The circular business framework for building, developing and steering businesses in the circular economy. *Sustainability*, *13*, 1–14. https://doi.org/10.3390/su13020963

Lewandowski, M. (2016). Designing the business models for circular economy. *Towards the Conceptual Framework*. *Sustainability*, *8*, 1–28. https://doi.org/10.3390/su8010043

Linder, M., & Williander, M. (2017). Circular business model innovation: Inherent uncertainties. *Business Strategy & the Environment*, *26*, 182–196. https://doi.org/10.1002/bse.1906

Liu, J., Tong, T., & Sinfield, J. (2021). Toward a resilient complex adaptive system view of business models. *Long Range Planning*, *54*, 102030. https://doi.org/10.1016/j.lrp.2020.102030

Lüdeke-Freund, F., Gold, S., & Bocken, N. (2019). A review and typology of circular economy business model patterns. *Journal of Industrial Ecology*, *23*, 36–61. https://doi.org/10.1111/jiec.12763

Magretta, J. (2002). Why business models matter. *Harvard Business Review*, *80*, 86–92.

Marucci, L., Iannone, F., Daddi, T., & Iraldo, F. (2021). Antecedents of absorptive capacity in the development of circular economy business models of small and medium enterprises. *Business Strategy & the Environment*, *31*, 532–544. https://doi.org/10.1002/bse.2908

McKinsey & Company. (2020). Risk, resilience, and rebalancing in global value chains. Retrieved January 2022 from https://www.mckinsey.com/business-functions/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains

McKinsey & Company. (2021). The next normal arrives. Trends that will define 2021 and beyond. Retrieved January 2021 from https://www.mckinsey.com/featured-insights/leadership/the-next-normal-arrives-trends-that-will-define-2021-and-beyond

Meadows, D. H., & Wright, D. (2008). *Thinking in systems: A primer*. Chelsea Green Publishing.

Moreno, M., De los Rios, C., Rowe, Z., & Charnley, F. (2016). A conceptual framework for circular design. *Sustainability*, *8*, 1–15. https://doi.org/10.3390/su8090937

Morris, M., Schindehutte, M., & Allen, J. (2005). The entrepreneur's business model: Toward a unified perspective. *Journal of Business Research*, *58*, 726–735. https://doi.org/10.1016/j.jbusres.2003.11.001

Nandi, S., Sarkis, A., Hervani, A., & Helms, M. (2021). Redesigning supply chains using blockchain-enabled circular economy and COVID-19 experiences. *Sustainable Production and Consumption*, *27*, 10–22. https://doi.org/10.1016/j.spc.2020.10.019

Nußholz, J. (2018). A circular business model mapping tool for creating value from prolonged product lifetime and closed material loops. *Journal of Cleaner Production*, *197*, 185–194. https://doi.org/10.1016/j.jclepro.2018.06.112

Osterwalder, A., Pigneur, Y., & Tucci, L. (2005). Clarifying business models: Origins, present, and future of the concept. *Communications of the Association for Information Systems*, *16*, 1–25. https://doi.org/10.17705/1CAIS.01601

Oswick, C., Fleming, P., & Hanlon, G. (2011). From borrowing to blending: Rethinking the processes of organizational theory building. *Academy of Management Review*, *36*, 318–337.

Panwar, R., & Niesten, E. (2020). Advancing circular economy. In *Special issue call for papers in Business Strategy & the Environment* (Vol. 29, pp. 2890–2892). The special issue is in Business Strategy & the Environment. https://doi.org/10.1002/bse.2602

Parida, V., Burström, T., Visnjic, I., & Wincent, J. (2019). Orchestrating industrial ecosystem in circular economy: A two-stage transformation model for large manufacturing companies. *Journal of Business Research*, *101*, 715–725. https://doi.org/10.1016/j.jbusres.2019.01.006

Pew Charitable Trusts & SYSTEMIQ. (2020). Breaking the plastic wave. Retrieved January 2021 from https://www.pewtrusts.org//media/assets/2020/07/breakingtheplasticwave_report.pdf

Pieroni, M., McAloone, T., & Pigosso, D. (2019). Business model innovation for circular economy and sustainability: A review of approaches.

Journal of Cleaner Production, *215*, 198–216. https://doi.org/10.1016/j.jclepro.2019.01.036

Pieroni, M., McAloone, T., & Pigosso, D. (2020). From theory to practice: Systematising and testing business model archetypes for circular economy. *Resources, Conservation & Recycling*, *162*, 105029. https://doi.org/10.1016/j.resconrec.2020.105029

Porter, M. E. (1985). *Competitive advantage*. Free Press.

Preiser, R., Biggs, R., De Vos, A., & Folke, C. (2018). Social-ecological systems as complex adaptive systems: Organizing principles for advancing research methods and approaches. *Ecology and Society*, *23*. https://doi.org/10.5751/ES-10558-230446

Randle, J., & Stroink, M. (2018). The development and initial validation of the paradigm of systems thinking. *Systems Research and Behavioral Science*, *35*, 645–657. https://doi.org/10.1002/sres.2508

Ranta, V., Aarikka-Stenroos, L., & Mäkinen, S. (2018). Creating value in the circular economy: A structured multiple-case analysis of business models. *Journal of Cleaner Production*, *201*, 988–1000. https://doi.org/10.1016/j.jclepro.2018.08.072

Ritter, T., & Lettl, C. (2018). The wider implications of business-model research. *Long Range Planning*, *51*, 1–8. https://doi.org/10.1016/j.lrp.2017.07.005

Rovanto, I., & Bask, A. (2020). Systemic circular business model application at the company, supply chain and society levels—A view into circular economy native and adopter companies. *Business Strategy & the Environment*, *30*, 1153–1173. https://doi.org/10.1002/bse.2677

Saebi, T., Lien, L., & Foss, N. J. (2017). What drives business model adaptation? The impact of opportunities, threats and strategic orientation. *Long Range Planning*, *50*, 567–581. https://doi.org/10.1016/j.lrp.2016.06.006

Salvador, R., Vetroni Barros, M., Mendes da Luz, L., Moro Piekarski, C., & de Francisco, A. (2020). Circular business models: Current aspects that influence implementation and unaddressed subjects. *Journal of Cleaner Production*, *250*, 119555. https://doi.org/10.1016/j.jclepro.2019.119555

Santa-Maria, T., Vermeulen, W., & Baumgartner, R. (2020). Framing and assessing the emergent field of business model innovation for the circular economy: A combined literature review and multiple case study approach. *Sustainable Production and Consumption*, *26*, 872–891. https://doi.org/10.1016/j.spc.2020.12.037

Schöggl, J.-P., Stumpf, L., & Baumgartner, R.-J. (2020). The narrative of sustainability and circular economy—A longitudinal review of two decades of research. *Resources, Conservation & Recycling*, *163*, 105073. https://doi.org/10.1016/j.resconrec.2020.105073

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, *104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Stahel, W. (2019). *The circular economy. A user's guide*. Routledge, Taylor & Francis Group. https://doi.org/10.4324/9780429259203

Stead, J.-G., & Stead, W. E. (2019). Why Porter is not enough: Economic foundations of sustainable strategic management. In T. Wunder (Ed.), *Rethinking strategic management, CSR, sustainability, ethics & governance (pp. 67–85)*. Springer Nature. https://doi.org/10.1007/978-3-030-06014-5_4

Täuscher, K., & Abdelkafi, N. (2017). Visual tools for business model innovation: Recommendations from a cognitive perspective. *Creativity and Innovation Management*, *26*, 160–174. https://doi.org/10.1111/caim.12208

Teece, D. (2018). Business models and dynamic capabilities. *Long Range Planning*, *51*, 40–49. https://doi.org/10.1016/j.lrp.2017.06.007

Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning*, *43*, 172–194. https://doi.org/10.1016/j.lrp.2009.07.003

Torraco, R. J. (2005). Writing integrative literature reviews: Guidelines and examples. *Human Resource Development Review*, *4*, 356–367. https://doi.org/10.1177/1534484305278283

Tura, N., Hanski, J., Ahola, T., Ståhle, M., Piiparinen, S., & Valkokari, P. (2019). Unlocking circular business: A framework of barriers and drivers. *Journal of Cleaner Production*, *212*, 90–98. https://doi.org/10.1016/j.jclepro.2018.11.202

Ünal, E., & Shao, J. (2019). A taxonomy of circular economy implementation strategies for manufacturing firms: Analysis of 391 cradle-to-cradle products. *Journal of Cleaner Production*, *212*, 754–765. https://doi.org/10.1016/j.jclepro.2018.11.291

Ünal, E., Urbinati, A., Chiaroni, D., & Manzini, R. (2019). Value creation in circular business models: The case of a US small medium enterprise in the building sector. *Resources, Conservation & Recycling*, *146*, 291–307. https://doi.org/10.1016/j.resconrec.2018.12.034

Unruh, G. (2010). *Earth, Inc. Using nature's rules to build sustainable profits*. Harvard Business Press.

Urbinati, A., Chiaroni, D., & Chiesa, V. (2017). Towards a new taxonomy of circular economy business models. *Journal of Cleaner Production*, *168*, 487–498. https://doi.org/10.1016/j.jclepro.2017.09.047

Urbinati, A., Chiaroni, D., & Toletti, G. (2019). Managing the introduction of circular products: Evidence from the beverage industry. *Sustainability*, *11*, 3650. https://doi.org/10.3390/su11133650

Urbinati, A., Rosa, P., Sassanelli, C., Chiaroni, D., & Terzi, S. (2020). Circular business models in the European manufacturing industry: A multiple case study analysis. *Journal of Cleaner Production*, *274*, 122964. https://doi.org/10.1016/j.jclepro.2020.122964

Velu, C. (2017). A systems perspective on business model evolution: The case of an agricultural information service provider in India. *Long Range Planning*, *50*, 603–620. https://doi.org/10.1016/j.lrp.2016.10.003

Von Bertalanffy, L. (1968). *General system theory: Foundations, development, application*. George Braziller.

Webster, K. (2013). What might we say about a circular economy? Some temptations to avoid if possible. *World Futures*, *69*, 542–554. https://doi.org/10.1080/02604027.2013.835977

Webster, K., & Fromberg, E. (2020). Lessons from aspects of systems thinking for an effective, cross-scale circular economy. Paper Presented at the International Society for Circular Economy Conference. University of Exeter.

Weetman, C. (2017). *A circular economy handbook for business and supply chains: Repair, remake, redesign, rethink*. Kogan Page.

Wirtz, B. W., Pistoia, A., Ullrich, S., & Göttel, V. (2016). Business models: Origin, development and future research perspectives. *Long Range Planning*, *49*, 36–54. https://doi.org/10.1016/j.lrp.2015.04.001

World Business Council for Sustainable Development & Boston Consulting Group. (2018). The new big circle: Achieving growth and business model innovation through circular economy implementation. Retrieved January 2021 from https://docs.wbcsd.org/2018/01/The_new_big_circle.pdf

Zott, C., & Amit, R. (2010). Business model design: An activity system perspective. *Long Range Planning*, *43*, 216–226. https://doi.org/10.1016/j.lrp.2009.07.004

Zott, C., Amit, R., & Massa, L. (2011). The business model: Recent development and future research. *Journal of Management*, *37*, 1019–1042. https://doi.org/10.1177/0149206311406265

How to cite this article: De Angelis, R. (2022). Circular economy business models as resilient complex adaptive systems. *Business Strategy and the Environment*, 1–11. https://doi.org/10.1002/bse.3019