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CORE COMPETENCES AND CORE RESOURCES AS CATALYSTS FOR THE DESIGN OF CIRCULAR BUSINESS MODELS

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Introduction

The circular economy (CE) is an industrial approach that aims to substitute the linear 'take, make, dispose' model of business (Ellen MacArthur Foundation, 2015), recognising that resources are neither abundant nor easily accessible to satisfy a growing demand for new products and services (McDowall et al., 2017; Zhu et al., 2011). A CE view of business can lead the economy to a new sustainable pattern of growth (Antikainen & Valkokari, 2016) and motivate society at large to adopt more sustainable behaviours (Haas et al., 2015; Miliute-Plepiene & Plepys, 2015).

In existing research, the CE approach is analysed through three main perspectives and units of analysis: the macro-perspective (e.g., regional, national), the meso-perspective (e.g., business network, supply chain), and the micro-perspective (e.g., single company) (Khitous et al., 2020; Ranta et al., 2020). At the macro-perspective level, research focuses on the overall context within which CE initiatives take place between different stakeholders and especially on the formulation of policies to guide governments towards decisions that are beneficial to society (Kirchherr et al., 2018; Murray et al., 2015). At the meso-perspective level, research focuses on business ecosystems and supply chains within which the focal company operates (Wen & Meng, 2015). At the micro-perspective level, scholars focus on how companies design a circular business model by significantly rethinking the anatomy of their (linear) business model and strategic positioning (Urbinati et al., 2021). Accordingly, the concept of circular business models has recently emerged in studies, investigating, from a strategic management perspective, how companies (re)design their business model to become more sustainable and conform to the principles of CE (Bocken & Short, 2020).

Research on circular business models highlights, in particular, how the design of a circular business model requires companies to adopt certain managerial practices (Urbinati et al., 2017). For example, companies are encouraged to make more effective use not only of energy, materials, and resources, but also data and information (Acerbi & Taisch, 2020), and to contextually reduce their environmental waste by adding value along the supply chain (De Angelis et al., 2018). Again, manufacturing companies are called on to develop, distribute, and retrieve products while maintaining product ownership (Tukker, 2015; Tukker & Tischner, 2006). This system is aimed at extending the responsibility of the producer, who maintains ownership of the product while

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allowing the customer to act as a user in the market and no longer as a buyer. The ownership of products implies a shift from product selling to a product-service system (PSS), which is based on the product-as-a-service principle. A PSS can take place through pay-per-use (e.g., leasing or renting) or pay-per-performance (Bocken & Ritala, 2021), and by developing reverse logistics and take-back systems, which are usually designed to take the product back from the customers (Ranta et al., 2018; Engez et al., 2021). Although it is not the only option for circular business models, the product-as-a-service principle is indeed one of the key pillars of the CE (Lacy & Rutqvist, 2015).

However, existing literature in this research area argues that there are no one-size-fits-all practices for circular business models (Palmié et al., 2021), as each company should (re)design its own circular business model by exploiting at best the particular contextual conditions, both internal (such as strategic orientation, company's age and size, etc.) and external (such as geography, level of market competition, etc.) characterising the market where it operates (Ünal et al., 2019; Henry et al., 2020; Zucchella & Urban, 2019).

In recent decades, scholars have predominately neglected the resource-based view of companies in CE studies, although this is among the main theoretical lenses in strategic management studies. The resource-based view of companies aims at addressing the question of how some companies persistently outperform others through leveraging on their core competences and resources (Barney, 2001). Very few studies analyse the relationship between circular business models and the resource-based view of companies (Nandi et al., 2020). For example, Jabbour et al. (2019) highlight a set of core resources, such as input materials, parts, finished goods/services, machinery, facilities, and infrastructure, which may support cascading circular strategies across supply chains. Core resources can also be represented by digital technologies, such as cyber-physical systems, smart sensors, machine-human interactions, big data, and blockchain-based data transparency systems, which may support design-for-remanufacturing capabilities and resource efficiency in (circular) supply chains (Rosa et al., 2020; Bag et al., 2019, 2020). In addition, Blomsma et al. (2019) emphasise the role of knowledge, skills, and applicability of business processes as core competences that allow companies to plan, lead, organise, and control CE configurations. These competences are at the core of several companies and may enable the design and transformation of their circular business model (Kaipainen & Aarikka-Stenroos, 2021; Re & Magnani, 2022). Core competences and resources are not necessarily already owned by the companies but may depend on external actors. In this case, the company must evaluate the risk of dependency on the value network for these competences and resources (Blomsma et al., 2019; Franco, 2017).

Starting from the premise mentioned previously, the presence of core competences and resources may play a determining role in the way companies design a circular business model, and more interestingly in the way they may remain competitive in the long term once their transition towards CE has taken place (Santa-Maria et al., 2021). Core competences and resources can act as catalyzing factors to drive the transition of companies' business models towards a CE and enable CE implementation in business (Sarja et al., 2021). In the current research literature, however, there are only a very few studies on catalysts for CE and business models, and these are mostly aimed at contributing to the existing research on CE implementation in business organisations by providing understanding of the role of these factors in enabling the transition (Ranta et al., 2021). Further research is needed on this topic.

This chapter examines the relationships between core competences and resources and the concept of circular business model design and develops insights that advance the boundaries of the resource-based view of companies in the studies of CE and circular business models.

Conceptual development

Circular business models

A circular business model can be defined as a business model that is "sustainable only if value can be economically recovered from the product. It might be realised through reusing the product, thereby extending the value of the materials and energy put into the manufacturing process, or by breaking it down into components or raw materials to be recycled for some other use" (Atasu & Van Wassenhove, 2021).

To the best of our knowledge, in the current research on CE there are only a few attempts to analyse the characteristics of circular business models. Some authors provide conceptual taxonomies and focus on the concepts of take-back systems and recycling (Ranta et al., 2018). Other studies propose archetypes of sustainable business models and emphasise the creation of value from waste (Bocken et al., 2014). Further research develops frameworks of business model innovation in a CE, by focusing attention on the efficient use of resources (Planing, 2015). Complementary to these studies, a few scholars have tried to provide a comprehensive set of actions for circular business model design (Urbinati et al., 2017).

Recent research highlights how companies purposively adopt particular managerial practices to (re)design the business model to become more sustainable and conform to the principles of the CE (Ferasso et al., 2020). Managerial practices can be recognised as the actions that top management adopts to allow for the transition from a linear to a circular business model (Del Vecchio et al., 2022). The adoption of these managerial practices can take place within three main dimensions of a business model: value creation, value transfer, and value capture (Centobelli et al., 2020). For example, value creation occurs by adopting Design for X practices (Sassanelli et al., 2020), such as design for remanufacturing or reuse, design for assembly and disassembly, and design for recycling (Vermeulen, 2015); value transfer consists in leveraging multi-channels of communications with clients or exploiting digitally enabled technologies and businesses, such as sharing platforms (Henry et al., 2020); and value capture takes place through the adoption of new revenue stream mechanisms, such as take-back and/or PSSs (Khitous et al., 2022). A recent review conducted by Franzò et al. (2021) provides a summary of relevant managerial practices that companies can adopt in relation with each business model dimension to design a circular business model.

More recent research addressing the micro-perspective of the CE highlights additional company-specific conditions, such as the commitment of managers and the presence of enabling digital technologies, which can support the design of circular business models (Centobelli et al., 2020). For example, research has pointed out that companies can adopt digital technologies, such as big data, cyber-physical systems, and simulation as enablers of circular business models (Pagoropoulos et al., 2017; Rosa et al., 2020; Uçar et al., 2020). For example, big data can be used to assess potential pathways for secondary materials (Davis et al., 2017; Jose & Ramakrishna, 2018), or industrial symbiosis (Song et al., 2017), while cyber-physical systems may enable the life cycle management of products (Caggiano, 2018). Simulation systems can allow for optimising the performance of supply chains and modelling material flows (Schäfers & Walther, 2017). Table 14.1 summarises the presented discussion on managerial practices for circular business model design.

Despite the emerging stream of literature on the topic of circular business models, we believe there is still a lack of understanding within the micro-perspective of CE about the micro-foundations for the adoption of the managerial practices described previously. We thus posit that a powerful, and yet overlooked, theoretical lens for investigating these micro-foundations is the resource-based view of companies.

Table 14.1 Managerial practices for circular business model design

Business Model Dimensions		
Value Creation	*Value Transfer*	*Value Capture*
• Design for X practices. • Resource efficiency measures (REMs) or practices on the supply side, demand side, and life cycle to reduce the resources needed for goods or services, redesign of processes, life cycle assessment (LCA) techniques. • Selection of partners along the supply chain and development of a suitable ecosystem of several stakeholders. • Energy efficiency, use of renewable energy sources, and exploitation of waste as a resource. • Adoption of digital technologies.	• Commercial and promotion initiatives. • Communication of circularity through all channels. • Offering the right value to the right customers. • Management of changes in customer habits (or even changes in customers) due to selling circular products or services. • Adoption of digital technologies.	• Shift from product selling to the product-service system (PSS). • Extension of the product life cycle through collaborative consumption and virtualisation of services. • Building and maintenance of relationships with customers (to achieve waste elimination and closing loops, e.g., incentives and benefits offered to customers for taking back used products). • Adoption of digital technologies.

Source: Adapted from Franzò et al., 2021.

The resource-based view of companies

The broader resource-based view of companies starts from the assumption that competences and resources may be heterogeneously distributed across companies and that these differences may be long-lasting (Barney, 2001). Thus, the resource-based view of companies incorporates traditional strategy insights concerning a company's distinctive and heterogeneous competences and resources (Grant, 1991; Mahoney & Pandian, 1992). This view integrates three different resource-based theories of competitive advantage, which, despite sharing the emphasis on understanding why some companies can consistently outperform others, also show some differences, which need to be emphasised:

- Structure-Conduct-Performance theory of competitive advantage (Porter, 1991).
- Neo-classical microeconomics theory (Ricardo, 2005).
- Evolutionary economics theory (Nelson & Winter, 2002).

The Structure-Conduct-Performance theory adopts the assumption that the company's performance in the market depends critically on the characteristics of the industry in which it competes, as in the structure (Porter, 1991). In addition, this theory argues that some competences and resources can only be developed over long periods of time (i.e., path dependence), being characterised by both a causal ambiguity. This means that it may not always be clear how to develop them in the short to medium term, and as a social complexity, as some competences and resources cannot be bought and sold, at least some of them may be inelastic in supply (Dierickx & Cool, 1989). Supply inelasticity implies that companies that possess these kinds of competences and resources may be able to generate above normal profits and protect themselves from competitors, whose ability to supply the same competences and resources is then prevented. Thus, these kinds of

competences and resources can become a source of competitive advantage (Peteraf, 1993). This theory can be especially used by scholars for studying the specific sources of sustained competitive advantage for a company (Barney, 2001).

The neo-classical microeconomics theory adopts the assumption that, in general, competences and resources (called 'factors of production' by neo-classical microeconomists) are elastic in supply. This elasticity means that when demand for a particular competence or resource increases, the price of acquiring either the one or the other will also increase, and the total amount of either made available to the market will also increase. This theory can be used especially by scholars for studying yields generated by the differential ability of companies to develop new competences and resources as the environment changes (Barney, 2001).

The evolutionary economics theory adopts routines – as an example of a company's competences and resources – as the fundamental unit of analysis, and companies vary in the routines they have developed to run their business. According to this theory, some routines may provide more sustainable competitive advantage than others and the performance that a routine generates ensures the survival of the company. This theory can be used especially by scholars when interested in studying how competences and resources evolve over time (Barney, 2001).

In this chapter, we take the perspective of the Structure-Conduct-Performance theory of competitive advantage, as we are mainly interested in studying whether and how companies leveraging on core competences and resources in designing their circular business models have opportunities to succeed in their transition towards, or adoption from scratch of, a CE.

A resource-based view of circular business models

Building on the previous two sections, we argue that the resource-based view of companies can act as a theoretical lens for understanding why companies, in designing their circular business model, adopt a specific managerial practice among those theoretically available. By leveraging on this conceptual development, we maintain that a resource-based view of companies is a necessary antecedent to be addressed in studies about CE catalysts. We take stock of research on the micro-foundations for the design of circular business models, through the resource-based view of companies, and depict the conceptual framework reported in Figure 14.1. According to the proposed framework, core competences and resources may act as catalysts in the design process of circular business models.

The resource-based view of companies focuses on core competences and resources controlled by companies, which can represent a competitive advantage (Barney, 1991). According to Barney (1991), companies may own core competences and resources that cannot be found in others. It is worth mentioning that in relation to core competences, Teece et al. (1997) present

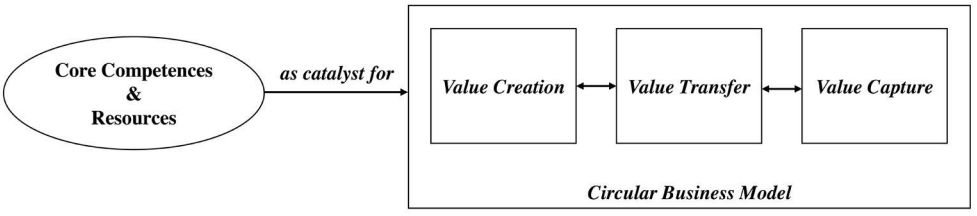

Figure 14.1 Conceptual framework of the resource-based view of companies for the design of circular business models.

the dynamic capability approach, which warns that companies must renew their sources of competitiveness, especially in environments that change rapidly. According to Teece et al. (1997), companies need to integrate, build, and reconfigure their capabilities to deal with these changes in the environment. The concept of dynamic capability expands the traditional resource-based view of companies into the realm of dynamic environmental contexts, where changes and disruptions are the norm rather than the exception. These changes in the environment, in the context analysed in this study, can properly be represented by the transition of companies to circularity. Therefore, understanding what competences and resources may support a company in the pathway towards a CE can help the same companies be competitive with their circular business model (Seles et al., 2022).

Core competences and resources supporting the adoption of managerial practices in circular business models

In this section, we present the relationship between the core competences and resources and the specific managerial practices enabling the design of a circular business model. When reflecting on CE research, the resource-based view of companies can allow us to investigate the core competences and resources that may support the design of circular business models, with reference to each business model dimension, such as value creation, value transfer, and value capture (Kaipainen & Aarikka-Stenroos, 2022).

In the value creation dimension of a circular business model, core competences and core resources are mostly aimed at contributing to the creation of the value proposition, namely a circular product or a circular service. Core competences may be technical or design-related ones, concerning programs for industrial-technical or for eco-sustainable drawing (Romani et al., 2021), while physical resources may concern laboratories or R&D units where the running of the circular production process and the development of circular products and services take place (Ghisellini & Ulgiati, 2020).

In the value transfer dimension, core competences and core resources must address two main aspects: what the circular value proposition to be communicated to the client is and how to communicate it. Here, core competences may be either hard, meaning technological or innovation-related ones, or they may be soft or communication-related, such as storytelling, persuasion, negotiation. Core resources may be composed of digital assets, such as platforms, or human resource assets, for example, marketing managers (Blasi et al., 2021; Wilson et al., 2021).

In the value capture dimension, core competences and core resources address the way companies generate revenue streams through the adoption of PSSs while taking back the products from customers. In this case, core competences may be soft (or collaboration-related), about supplier involvement and customer requirements, while core resources may concern physical assets, such as take-back systems, reverse logistics, and distribution channels (Uhrenholt et al., 2022).

The following section discusses at length the main core competences and core resources supporting the design of each dimension of a circular business model.

Core competences and resources supporting the adoption of managerial practices in the value creation dimension

Core competences and core resources in the value creation dimension of a circular business model are mostly exploited within the boundary of the company, either at product or process level, as they contribute to the creation of the value proposition, i.e., a circular product or a

circular service. Core competences are mostly defined as being technical or design-related and technological or innovation-related, and they may concern programs for either industrial-technical or eco-sustainable drawing (Romani et al., 2021), and CAD and modelling skills, respectively. Physical resources may concern laboratories or R&D units where innovation designers run the circular production process and the development of circular products and services takes place (Ghisellini & Ulgiati, 2020).

At the product level, core human resources mostly support the Design for X practices that can be specifically applied to the product, such as the design for assembly, the design for disassembly, and the design out waste. Human resources should be able to pay attention to the selection of materials and tools, and to suggest innovative product-based strategies (van Dam et al., 2020). Research suggests that the creation of the internal role of "product designer" should be able to manage the communication flow within the company and the relationships within the upstream partners of the supply chain, such as suppliers or other intermediaries between the supply and the production phases (Sumter et al., 2017). Here, the adoption of some enabling digital technologies, such as 3D printing, could also be useful for supporting companies in the design for assembly and/or disassembly, by producing modular and customised products for customers in places that are located near them, thus exploiting a geographical advantage (Despeisse et al., 2017). Some required competences for the adoption of 3D printing are related to computer-aided design (CAD) and modelling skills, knowledge of additive manufacturing systems and technologies, and knowledge of the characteristics and behaviours of 3D printing materials (Luiz Mattos Nascimento et al., 2019).

At the process level, core human resources support the Design for X practices that can be specifically applied to the process, such as the design for remanufacturing, the design for refurbishing, and the design for recycling. Companies' designers and engineers should be able to design circular production processes by paying attention to the product's life cycle. Research suggests also the creation of an internal role acting as 'process designer' able to meet the principles of sustainable production, production processes, and material reuse strategies (Bocken et al., 2016). Also here, the adoption of some enabling digital technologies, such as the Internet of Things (IoT), could be useful for the monitoring, analysis, and control of product data to support the product's life cycle and extend their replacement along the entire supply chain (Wang et al., 2014). Some required competences for the adoption of IoTs are related to embedded hardware and software design, and driver development for the nodes that collect data, as well as skills for developing mobile and cloud applications for the IT side of the system (Bressanelli et al., 2019).

Core competences and resources supporting the adoption of managerial practices in the value transfer dimension

Core competences and core resources in the value transfer dimension of a circular business model must address the following two main aspects: what circular value proposition is to be communicated to the client and how to communicate the proposition. The first aspect is mostly related to the managerial practices of commercial and promotion initiatives and the communication of circularity through all channels, while the second one is mostly related to the managerial practices of the offering of the right value to the right customers and the management of changes in customer habits, or even changes in customers themselves, due to selling circular products or services.

The human component is, of course, a core resource. Company employees, especially those in charge of communicating the circular product or service, should be able to help customers perceive the value of the circular product or service. They must develop a core competence that goes

beyond the traditional communication or promotional ability, which Settembre Blundo (2017) defines as an "evangelization" of customers. Accordingly, those in charge of external customer communication should be able to pay attention to the expectations of clients, understand their needs, be able to resolve their CE-related issues, and persuade them through storytelling and negotiation of the merits of the circular value proposition (Blasi et al., 2021).

The presence of technological or innovation-related competences related to digital technologies are also expected to play a significant role in the circular value proposition. This applies to product-related competences, such as artificial intelligence (AI). Following the definition of the objectives, the phases of an AI project include the collection of the data, their preparation, the choice and optimisation of the model, its testing and training, the fine-tuning of the parameters, its deployment, and subsequent re-editions (versioning of the software). Some required competences for the adoption of AI are, for example, those of data scientists, data analysts, and data engineers to program the AI, for cleaning and preparing the data, and for managing and processing the data, respectively. The presence of competences related to digital technologies is also useful in relation to the way companies interact with their clients in the market, for example, for software pattern recognition, prediction, optimisation, and recommendation generation (Wilson et al., 2021).

The presence of digital assets, especially digital infrastructure, are designed as a virtual place, are able to allow the connection and virtual interaction of multiple users through integrated interfaces, and are mainly managed through applications or websites (De Reuver et al., 2017). They may play a relevant role for enhancing the commercial and promotional initiatives and during the communication of circularity with clients.

Core competences and resources supporting the adoption of managerial practices in the value capture dimension

Core competences and core resources in the value capture dimension of a circular business model address the way companies generate revenue streams through the adoption of PSSs while taking back the products from customers to guarantee the product's life cycle extension and the closure of the materials' loop.

Market-related technological competences about how to design and manage PSSs centres on "tangible products and intangible services, designed and combined so that they jointly are capable of fulfilling specific customer needs" (Tukker, 2004, p. 246), and are of paramount importance for the design of circular business models. In particular, product-oriented PSSs are aimed at supplementing products with additional services such as repair services; use-oriented PSSs are aimed at letting the product remaining under the ownership of the producer, addressing the users through rental or leasing services; result-oriented PSSs are aimed at allowing the producer to sell results rather than products, for example, power by the hour (Khitous et al., 2022).

As highlighted by Isaksson et al. (2009), successfully managing PSSs also requires specific product-related competences, such as "hardware design (including integrated electronics and software), design for manufacturing and assembly, supplier involvement – both component suppliers and sub-system suppliers, and customer requirements on product use (mainly via marketing function)" (p. 340). This claim holds true for the presence of soft skill or collaboration-related competences and the engagement of the other actors of the supply chain, by driving their transition towards the CE (Aarikka-Stenroos et al., 2002; Kaipainen et al., 2022).

Finally, as argued by Uhrenholt et al. (2022), the presence of physical assets constituting an effective take-back system are needed to support "the collection of end-of-life products, transportation,

sorting and disassembly, requalification, and re-engagement of the recovered material, components or products in the forward supply chain" (p. 2). Thus, take-back systems are aimed at recovering value from products to be recycled, remanufactured, or refurbished. These systems are fundamental for the adoption of CE principles applied to reverse logistics and distribution, and represent a core resource for the design of a circular business model (Lewandowski, 2016).

Table 14.2 aims to open the black box at the intersection between the resource-based view of companies and the design of circular business models, based on the conceptual framework depicted in Figure 14.1. This table provides a summary of the core competences and resources required by companies for the adoption of the managerial practices enabling the design of a circular business model.

Discussion and avenues for future research

Figure 14.2 provides a visual representation of the framework highlighting the different linkages between the core competences and core resources and the managerial practices they enable in the different dimensions of a circular business model.

First, the complexity of these linkages should be noted. To effectively enable a certain managerial practice, the coexistence inside the company of a defined set of core competences and resources is necessary. For example, Design for X practices require the simultaneous presence of adequate human resources, adequate physical assets, and technical, or design-related, competences related to drawing. This is consistent with the literature on the resource-based view, where resource recombination (Burt & Soda, 2021; Galunic & Rodan, 1998) is considered a key process in allowing the company to turn a set of core competences and resources to competitive advantage by either combination (i.e., synthesis-based recombination) or reconfiguration (i.e., reconfiguration-based recombination). Our framework suggests that this recombination can enable companies to adopt a given managerial practice in their circular business models. At the same time, core competences or resources, through different recombinations, allow the company to adopt different practices. For example, product-related competences inform the adoption of several managerial practices, from the adoption of digital technologies to the shift towards PSSs.

Second, when core competences are addressed in particular, it appears clearly that circular business models require the contemporary presence of the ability to design new products and/or services (technical competences), the ability to innovate (technological competences), with a significant role of digital technologies, the way through which products and/or services interact with the customers, and finally the ability to collaborate and communicate in an engaging way (soft skills) with the different actors of the supply chain, in order to connect with the proper ecosystem for the CE.

Moreover, in reading the framework, it is worth remembering that circular business models are purposeful combinations of managerial practices and, in this respect, as clarified also in Franzò et al. (2021), it is not necessary for all the managerial practices to be simultaneously adopted by the company to become circular. Consequently, different companies with different circular business models require a different combination of core competences and resources. This match between a company's internal core competences and resources, and its strategic positioning – its decision about the circular business model – is of paramount importance for defining the enabling role of core competences and resources. The presence of a certain core competence or resource does not mean that the company should pursue the adoption of a certain managerial practice. On the contrary, once the adoption of a certain practice is considered relevant for the company's circular business model, the presence or lack of the related core competences and resources plays

Table 14.2 An overview of the resource-based view of companies for the design of a circular business model and the adoption of managerial practices

Business Model Dimension: Value Creation				*Managerial Practice*
Core competences	Technical competences (design-related)		Industrial-technical or eco-sustainable drawing	Design for X practices (in general) both at product and process level
	Technological competences (innovation-related)	Product-related competences	CAD and modelling skills, knowledge of additive manufacturing systems and technologies, knowledge of the characteristics and behaviours of 3D printing materials	Adoption of digital technologies (such as 3D printing)
		Process-related competences	Embedded hardware and software design, skills for developing mobile and cloud applications for the IT side of the system	Adoption of digital technologies (such as IoTs) Resource efficiency measures (REMs) or practices on the supply side, demand side, and life cycle, redesign of processes, life cycle assessment (LCA) techniques Energy efficiency and use of renewable energy sources, and exploitation of waste as a resource
Core resources	Human resources		Product designers	Design for assembly, design for disassembly, design out waste Selection of partners along the supply chain and development of a suitable ecosystem of several stakeholders
			Process designers	Design for remanufacturing, design for refurbishing, design for recycling Selection of partners along the supply chain and development of a suitable ecosystem of several stakeholders
	Physical assets		Laboratories or R&D Units	Design for X practices (in general) both at product and process level

(*Continued*)

Table 14.2 (Continued)

Business Model Dimension: Value Transfer				*Managerial Practice*
Core competences	Soft skills (communication-related)		Storytelling, Persuasion, Negotiation	Offering of the right value to the right customers Management of changes in customer habits (or even changes in customers) due to selling circular products or services
	Technological competences (innovation-related)	Product-related competences	Programming the AI, cleaning and preparing the data, managing, and processing the data	Adoption of digital technologies (such as AI)
		Market-related competences	Pattern recognition, prediction, optimisation, and recommendation generation	Adoption of digital technologies (such as PSS) Offering the right value to the right customers Management of changes in customer habits (or even changes in customers) due to selling circular products or services
Core resources	Human resources		"Evangelists" of customers	Communication of circularity through all channels Offering the right value to the right customers
	Digital assets		Digital infrastructure, designed as a virtual place, able to allow the connection and virtual interaction of multiple users	Commercial and promotion initiatives Communication of circularity through all channels
Business Model Dimension: Value Capture				*Managerial Practice*
Core competences	Technological competences (innovation-related)	Product-related competences	Hardware design (including integrated electronics and software), design for manufacturing and assembly	Shift from product selling to the product-service system (PSS) Adoption of digital technologies
		Market-related competences	Use-oriented and result-oriented product-service systems (PSSs)	Extension of the product life cycle through collaborative consumption and virtualisation of services Building and maintenance of relationships with customers (to achieve waste elimination and closing loops, e.g., incentives and benefits offered to customers for taking back used products)
	Soft skills (collaboration-related)		Supplier involvement – both component suppliers and sub-system suppliers, and customer requirements on product use (mainly via the marketing function)	Shift from product selling to the product-service system (PSS)
Core resources	Physical assets		Take-back systems, reverse logistics, and distribution channels	Extension of the product life cycle through collaborative consumption and virtualisation of services

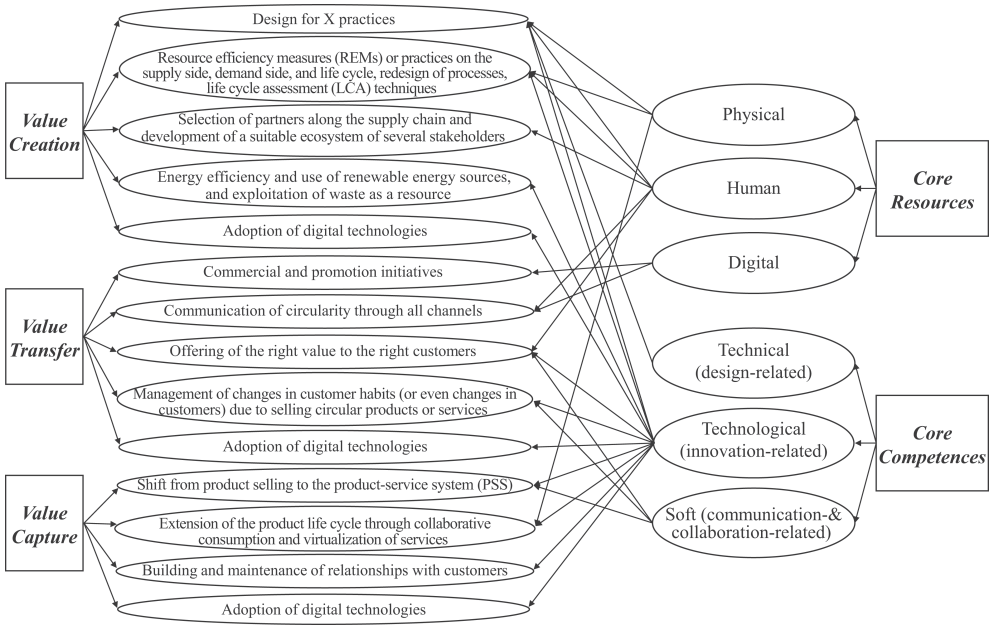

Figure 14.2 Conceptual framework: Visual representation of linkages between managerial practices and core competences and resources.

a fundamental enabling role. This strategic interaction (Seles et al., 2022) is essential, even more so in today's turbulent and dynamic environment, for interpreting the proposed framework by considering both business strategies and company-specific competences and resources.

Finally, an additional lens to put in place in reading the proposed framework is in the nature of the company adopting a circular business model, whether it is a "born circular company" (Zucchella & Urban, 2019) or a "growing circular company" (Chen et al., 2020), where the adoption takes place in this second case through a process of transformation of the existing (linear) business model towards a circular one. In the case of a 'born circular company', the enabling role of the identified core competences and resources for the adoption of a certain managerial practice is even more evident, as it is the lack of these competences and resources in preventing the new company from developing a certain circular business model. In this respect, several contributions (e.g., Razmdoost et al., 2020; Ng et al., 2019) highlight the required combination of ordinary competences and resources with core competences and resources to ensure the successful formation of new ventures in both stable and dynamic environments. Established companies, on the contrary, while embracing a transition towards CE, not only do they need to have the required core competences and core resources for enabling managerial practices, but they must also avoid clashes with other existing core competences and resources tightly related to the existing (linear) business models. For example, the presence of physical assets such as centralised large-scale production plants might prevent the company from embracing a distributed remanufacturing scheme that is more coherent with a CE approach. Or again, the presence of a well-established distribution channel designed for a one-way shipment towards the final customers might prevent the company from putting in place take-back systems. Potential clashes at the level of core competences and resources are already debated in literature, where, for example, Franco (2017) discusses the challenges of incumbents in the textile industry to adopt circularity due to the presence of 'linear'

core competences and resources. More recently, Sarja et al. (2021), in their systematic literature review about the transition to CE in business organisations, argue that some competences and resources in an established company may even play an ambivalent role in both supporting and hindering the transition to CE, depending on the situation and circumstances of the company as well as on other contextual factors. Consequently, for established companies, not only must the presence per se of an enabling core competence or resource be verified, but it is also necessary to evaluate that there are no clashes with other existing competences and resources pushing linear business models.

Our framework only touches on all the previous points, which require an in-depth understanding of the phenomenon, thus paving the way for interesting avenues for future research. The opportunity to recombine core competences and resources in an original way might lead to completely new managerial practices. At the same time, investigating the characteristics of knowledge and its social organisation, such as the way competences come to be formed and institutionalised (Galunic & Rodan, 1998), in circular companies might impact the likelihood of such recombination. The role of strategic alignment between circular business models and core competences and resources also requires further investigation, allowing also in this case for the development of completely new typologies of circular business models. Finally, further research is needed to shed light on the ways the proposed framework must be adopted to study incumbent companies versus new ventures, with the interplay of existing competences and resources stemming from linear and circular models deserving a lot of attention.

Conclusions

Our study is based on a conceptual framework at the intersection between the resource-based view of companies and the circular business model literature. We argue that to properly understand the way companies design their business models by adopting some particular managerial practices from among those theoretically available, the presence of specific core competences and resources needs to be investigated. Consequently, core competences and resources can act as catalysts inside the company in enabling the process of circular business model design, guiding managers in the choice of managerial practices regarding CE. At the same time, in line with recent contributions on core competences and resources (Kaipainen & Aarikka-Stenroos, 2022; Sarja et al., 2021; Seles et al., 2022), we argue that a circular business model designed leveraging core competences and resources is more likely to succeed, as to maintain a sustainable competitive advantage over time, in the CE domain.

Therefore, we invite scholars in the field to further investigate the relationships between core competences and core resources and circular business models, as they have the potential to explain, at the micro-level, the decisions taken by companies when adopting managerial practices in their business models.

We are aware of the main limitations of our conceptual study. Besides those already discussed in the previous section, we must admit that having our focus only inside the company is preventing us from considering the potential interplay between internal and external catalysts. Several studies (e.g., Centobelli et al., 2020), for example, have questioned the role of contextual factors, such as the presence of a favourable regulatory framework or of other market-related conditions, in driving the decisions at company level on what managerial practices to be adopted in a CE context. Similarly, the presence of CE catalysts at the meso-level, as in the ones involving the supply chain and the ecosystem of business actors where and with whom the company operates (Kaipainen et al., 2022; Aarikka-Stenroos et al., 2022), should be explored to get the full picture

of the factors limiting, or enabling, the managerial space of decisions addressing the circular business model design. At the same time, the core competences and core resources for circular business models considered here should be seen as an initial, exploratory list, given the novelty of the approach we followed. A further investigation, also including an in-depth empirical analysis of the framework, is certainly needed.

Many avenues for further research are therefore available, stemming from our conceptual work, and we are waiting for scholars to take it forward. Nevertheless, we consider our contribution so far to be of great relevance in supporting managers willing to adopt a CE, by suggesting they must carefully scout inside their company for the presence of the most effective core competences and resources to embrace CE, leveraging on their potential role of catalysts in the circular business model design. At the same time, for those companies that have already taken a step into the CE transition, nurturing and fostering the core competences and resources that are antecedents to CE might result in increasing the chances to sustain their competitive advantage.

Educational content

After being sure the audience is familiar with the resource-based view of companies, a potential use of the conceptual framework in this chapter for running a class on CE could be envisioned, supporting a case-based discussion of a circular business model with the following key questions:

1 Analyse the circular business model, sorting the managerial practices adopted by the company into the three business model dimensions of value creation, value transfer, and value capture.
2 Discuss the presence inside the company of core competences and core resources acting as catalysts for the circular business model design chosen by the company.
3 Evaluate and discuss, based on the previously mentioned points, the likelihood of the company creating a sustainable competitive advantage, suggesting potential actions to nurture and foster the required core competences and core resources.

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