
Creating Value in the Circular Economy: A Structured Multiple-Case Analysis of Business Models

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Abstract:

The circular economy (CE) has gained traction as a pathway towards more sustainable economic growth. The main actions leading towards a CE have been identified as the 3R principles of reduce, reuse, and recycle. However, understanding is lacking regarding how the adoption of CE using the 3R principles generates value and revenue in a business context. Thus, this study structurally examines business models used by CE-driven firms utilizing the fundamental business model components of value proposition, value creation/delivery, and value capture. By developing a detailed framework of business model components, acknowledging the particular features of CE implementation, and conducting a multiple-case study combining the business model approach with the 3R principles, this study analyzes feasible CE business models from multiple industries in Europe, the US, and China. The following five research propositions are derived from the findings of the explorative case analysis: 1) the cost-efficiency of circular operations is the key proponent to successful CE business, 2) take-back services enable the acquisition of particular wastes as resources, but they need to be incentivized through reductions in customers' total waste management costs, 3) circular business models require the focal firm to separately manage multiple positions in the value chain, 4) the take-back system for gaining value through CE can be implemented successfully in multiple ways, and 5) recycling is easier to implement than reducing or reusing due to a smaller impact on the business. These propositions contribute to the circular business model literature by showing how economic value is generated by CE initiatives and providing foundations for theory-testing future research. The propositions also provide guidance for policymakers and managers on supporting and implementing circular business.

Keywords: Business model; Circular economy; 3R principles; Value proposition; Value capture; Value creation

Ranta, V., Aarikka-Stenroos, L., & Mäkinen, S. J. (2018). Creating value in the circular economy: A structured multiple-case analysis of business models. *Journal of cleaner production*, 201, 988-1000.

Highlights:

- Analytical framework combining the business model and 3R-principles is developed.
- Business model cases from China, the EU, the US, and Finland are analyzed.
- Five propositions for implementing circular business are derived.
- The economic value of circular business appears to rely on recycling.

1. Introduction

Today's dominant economic development model—the so-called “take, make, and dispose” model—is currently being challenged. More sustainable methods of consuming and managing materials and natural resources are becoming increasingly vital, on both the regional and global scales. From the perspective of resource intake, the current model relies on doing business based on the use of virgin material resources (Yuan et al., 2006). Yet, as many natural resources are limited in quantity, there is an urgent need to create new methods for harnessing and using resources (Mathews and Tan, 2011). In this challenging context, the circular economy (CE) provides an alternative model for analyzing and understanding consumption. In a CE, products and materials continue to circulate in so-called “loops” for as long as they can provide value, while simultaneously promoting activities that reduce the need for the material per unit of value produced. These activities include, for example, service-based offerings such as rental services, the creation of more durable and/or leaner products, and increasing the use of recycled materials (Zhu et al., 2010). Due to its potential for concurrent economic value creation and sustainable development, the CE is increasingly receiving attention on a global scale among businesses (MacArthur, 2013) and policymakers (European Commission, 2015; Jiao and Boons, 2017).

Yet, for the CE to truly emerge as the new growth model it must be able to deliver on its promises to provide economic growth along with sustainability. If CE businesses are unable to compete economically with the current linear model of “take, make, and dispose,” CE implementation will be an uphill battle (Charonis, 2012). Here, the business model concept can provide a critical foundation for discussing economic value generation in a business by linking the value proposition, value creation, and delivery mechanisms, along with ways of capturing value for a firm (Osterwalder et al., 2005; Richardson, 2008). Studying business models in a CE is thus vital to determine the actual economic benefits that can result from embracing CE practices at the company level.

Previous studies focusing on the CE from a business model perspective have consistently employed the sustainable business model approach (Lewandowski, 2016; Linder and Williander, 2015; Rizos et al., 2016; Weissbrod and Bocken, 2016), which combines environmental, societal, and economic value (Bocken et al., 2014). Hence, there is a gap in the scholarly literature examining business models for CE predominantly from the economic value perspective. CE-oriented studies outside of business-model research have typically focused on circulating material flows and advancing the 3R principles of reduce, reuse, and recycle (Ghisellini et al., 2016) in CE initiatives such as industrial symbioses (Mathews and Tan, 2011) and increased waste recycling activities (Zhu et al., 2010). These studies however remain silent on how CE creates economic benefits, value, and revenue at

the company level. This perspective is critical because, as Lieder and Rashid (2016) in their comprehensive review of CE in the manufacturing context state, business models, product design, and supply design are eventually determined by the underlying motivation of gaining economic value. Therefore, our research question is as follows: With what kinds of business models do CE-driven business ventures operate in terms of their value proposition, value creation and delivery, and value capture?

This study fills a current research gap by using an economic value perspective to assess business initiatives in the field of CE. To this end, we developed a conceptual component-based business model framework to specifically study CE business models from a review of the business model literature; this is detailed in section 2. In section 3, we describe our explorative multiple-case analysis of different CE business models from a variety of industries and geographical locations. Section 4 outlines the key results of each case and reveals patterns across cases using the framework developed in section 2. In section 5, propositions for circular economy business are developed based on the findings and on earlier literature on business models and circular economy, after which the limitations of the study are discussed. Section 6 concludes the study by pinpointing contributions, implications to research and practice, and areas for future research.

2. Theoretical Background

2.1 The Business Model Approach

The concept of the business model encompasses multiple aspects, ranging from how the firm earns revenue to how it structures its organization (Clauss, 2016; DaSilva and Trkman, 2014). As this multifaceted concept with various definitions has received criticism for its ambiguity and thus its usability as a research concept (Mäkinen and Seppänen, 2007; Massa et al., 2017), reviewing business model approaches is crucial to use this concept to analyze the economic value of CE initiatives. The general view is that the business model bridges the gap between the firm's strategy and its concrete operations by describing the logic it applies to create value to customers and capture economic value for itself (see the full review in Appendix A). Early research tended to describe types of business models almost as formulas to follow (Linder and Cantrell, 2000), but as the field has developed, the typological view has given way to a more flexible approach treating the business model as built of parts that together in interaction describe the way the firm does business (Saebi et al., 2017). The smaller units of the business model represent either defined components that should be considered while developing or analyzing a business model (Osterwalder et al., 2005) or an activity system that depicts the interdependent activities required to create value (Zott and Amit, 2010).

This study adopts the business model component approach, which recent reviews by Clauss (2016) and Foss and Saebi (2016) have identified as the established approach for analyzing business models as they appear at a point in time. Hereafter, the business model concept refers to the set of components in the firm's business venture that connects the customer value of the venture with the firm's ability to generate profit. This definition synthesizes aspects prevalent in existing business model definitions. The business model is not a factor to analyze merely as an afterthought but rather a managerial tool for planning a business venture (Osterwalder et al., 2005) that combines multiple components of the firm's activities, capabilities, and resources into a single concept (Wirtz et al., 2016). This approach is illustrated by the depiction of the business model as a set of components in the

firm's business ventures. However, within the component-based approach, multiple approaches to which components and furthermore sub-components constitute the business model exist (DaSilva and Trkman, 2014; Wirtz et al., 2016). Table 1 presents the views of key authors on the components and sub-components of a business model.

<i>Author, Year</i>	<i>Components</i>	<i>Sub-components</i>
Linder and Cantrell, 2000	Value proposition Value delivery Financial structure	Value proposition: customer, customer needs, products, services and experiences, channels, pricing Value delivery: execution, distinct capabilities Financial structure: distinct financial structure
Morris et al., 2005	Offering Market Internal capabilities Competitive strategy	Offering: product/service type, value creation and delivery Market: type of organization, geographical market size, customer position in the value chain, market segment, transactional/relational market Internal capabilities (one or more of the following): production/operating systems, selling/marketing, information management/mining/packaging, technology/R&D/intellectual/creative or innovative capability, financial transactions/arbitrage, supply chain management, networking/resource leveraging Competitive strategy (one or more of the following): image of operations, product, or service, quality/selection/features/availability/innovation leadership
Osterwalder et al., 2005	Product Customer interface Infrastructure management Financial aspects	Product: value proposition Customer interface: target customer, distribution channel, relationship Infrastructure management: value configuration, core competency, partner network Financial aspects: cost structure, revenue model
Richardson, 2008	Value proposition Value creation & delivery system Value capture	Value proposition: offering, target customer, basic strategy to win customers and gain competitive advantage Value creation & delivery system: resources and capabilities, value chain, activity system, business processes, links to suppliers, partners and customers Value capture: revenue sources, economics of the business
Bocken et al., 2014	Value proposition Value creation and	Value proposition: offering, customer segments and relationships

	delivery	Value creation and delivery: key activities, resources and capabilities, channels, partners, technology
	Value capture	Value capture: cost structure, revenue streams
Clauss, 2016	Value proposition	Value proposition: offering, customers and markets, channels, customer relationships
	Value creation	Value creation: capabilities, technology/equipment, partnerships, processes
	Value capture	Value capture: Revenue model, cost structure

Table 1 Views on business model components and corresponding sub-components.

Our definition also reflects the view that the business model depicts a single business venture or offering and does not necessarily reflect the components of an entire firm (Chesbrough and Rosenbloom, 2002). Another aspect of the business model, illustrated by this definition, is the need to view a venture’s value from two perspectives. The venture needs to create value for the customer while also generating profit for the firm (Saebi et al., 2017; Teece, 2010). The business model serves the important role of bridging these two types of value creation within a single concept.

2.2 Circular Economy: Objectives and Principles

The concept of the circular economy (CE) proposes new ways for firms to create previously unattained value for both customers and the firm itself (MacArthur, 2013). This concept suggests the simultaneous creation of environmental and economic benefits and has the potential to generate employment opportunities in an emerging industry (European Commission, 2015). However, in order to analyze where the economic value of CE is expected to come from in practice, it is valuable to discuss the overall objectives of the circular economy and, especially, to identify how CE implementation is to have an economic value-generating effect on a business.

The main actions through which the CE is realized are the 3R principles—reduce, reuse, and recycle—that focus on the circulation of materials in the system (Ghisellini et al., 2016). *The reduce principle* calls for *minimizing the overall amount of materials and energy used and waste generated in the system by increasing efficiency in both production and consumption* through, for instance, improving technologies, simplifying packaging, and using more power-efficient appliances (Feng and Yan, 2007; Su et al., 2013). The reduce principle has the most diverse practical implementations because it aims to eliminate the need to reuse or recycle materials. In one example, the zero-waste strategy aims to maximize value produced while minimizing waste and environmental impact (Figge et al., 2014). Unilever (2016) adopted this strategy and eliminated nonhazardous waste to landfills at more than 600 facilities by February 2016.

The reuse principle holds that “*products or components that are not waste are used again for the same purpose for which they were conceived*” (The European Parliament and the Council of the European Union, 2008, p. 10). Reusing products and components requires fewer resources and less energy and labor than producing new ones from virgin materials or even recycling and disposing of products (Castellani et al., 2015). Reuse thus has the potential to increase overall resource efficiency and to produce additional revenue from

multiple use cycles. This principle is central in use-oriented product-service systems, where the firm does not sell its product but offers it as a service (Tukker, 2015), and in the emerging sharing economy, where people with surplus resources rent them to those who need them (Belk, 2014) often through platforms, such as Airbnb, which allows people to rent their unused rooms as accommodations.

The recycle principle refers to “any recovery operation by which waste materials are reprocessed into products, materials, or substances whether for the original or other purposes” (The European Parliament and the Council of the European Union, 2008, p. 10). In recycling, products and components are always transformed back into materials. The recycling principle also supports using recycled and recyclable materials; as in the case of Swedish outdoor equipment brand Fjällräven that manufactures a backpack made of 95% recycled polyester (Fjällräven, 2016). Recycling is often treated as synonymous with the CE, and waste policies have had a strong focus on increasing recycling rates (Kirchherr et al., 2017). However, when considering resource efficiency and the ability to maintain the value of materials in circulation, recycling might be the least sustainable solution of the 3R principles because it is limited by the natural law of entropy, complexity of materials, and potential for abuse (Stahel, 2013). The 3R principles are the tangible methods to influence material use in the CE (Ghisellini et al., 2016), so their implementation should contribute to economic value when firms adopt CE business models (Urbinati et al., 2017). To analyze the economic viability of the CE in business, therefore, it is important to examine all three principles using the business model approach.

2.3 Towards a Conceptual Framework to Analyze Business Models in the CE Field

Various forms of the business model concept have been recently applied to the circular economy. Scheepens et al. (2016) discuss the importance of creating both economic and environmental value in circular business models and apply an innovative Life Cycle Assessment (LCA)-based eco-costs value ratio approach that focuses on customers’ willingness to pay. While the approach is very promising in that it tests both the environmental and economic effects of a circular business model, it does not help to identify how economic value is generated in a circular economy on the firm or systemic level. Rizos et al. (2016) studied the barriers to and enablers of circular business model implementation in small and medium-sized businesses (SMEs). Although they highlight the reasons why SMEs implement circular business models, the authors do not explore whether these models generate concrete economic value. Research by Lewandowski (2016) has been the most focused on identifying value creation methods through an analysis of the business model canvas (Osterwalder et al., 2005) in regard to CE literature.

However, each of the recent contributions to the field have approached CE from the perspective of sustainable business models. In the sustainable business model approach, the value centrality of the business model is extended to include societal and environmental values, as well as economic value (Dentchev et al., 2018). This extension follows the suggestion that environmental sustainability could provide a competitive edge to companies as customers and other stakeholders such as legislators become increasingly aware of environmental risks (Bocken et al., 2014). While the sustainable business model concept drives its adopters to create more sustainable businesses, it simultaneously muddles aspects relevant to economic value generation, thus reducing its applicability as an analytical tool for assessing this type of value generation, which is the ultimate driver of decision making in business (Lieder and Rashid, 2016).

Based on the business model literature reviewed, we developed a component-based framework that enables the analysis of specific cases in a structured, in-depth manner. We acknowledge the frameworks presented in previous business model literature and adopt the general business model framework by Richardson (2008). Thus, we use value proposition, value creation and delivery, and value capture as our main components. The same general framework has emerged as a leading high-level framework for business model components (Clauss, 2016), and has already been used in the sustainable business model field (Bocken et al., 2014). Furthermore, because the business model concept has received criticism for its ambiguity (Chesbrough and Rosenbloom, 2002; Magretta, 2002; Zott et al., 2011), we enhance the level of detail by adding sub-components, which, as portrayed in Table 1, is an established way of concretizing the business model concept. This approach is similar to that of Lewandowski (2016); however, we decided not to extend the business model components to include CE-specific components such as take-back programs as those could be seen as parts of CE business model archetypes and thus limit the usability of the framework. Rather, our approach was to include components in the business model concept that can identify the variety of CE approaches during analysis.

To assess value proposition, we selected offering and target customer as sub-components because they can include, e.g., servitization aspects (Tukker, 2015) or emerging customer segments (e.g., Chertow, 2007). Resources and capabilities, organization, and position in the value network represent the sub-components of value creation and delivery in our model; these can capture, e.g., take-back programs (Lewandowski, 2016) without the need for additional sub-components. For value capture, revenues streams and the economics of the business were selected as sub-components because, regardless of the addition of CE aspects, a firm will capture value through added revenue or realized benefits to the economics of the venture. The complete conceptual framework developed for our case analysis is shown in Figure 1. In addition to the business model layer, a separate CE-specific layer of 3R principles was included to improve and ensure the identification of CE aspects during case analysis. As stated by Ghisellini et al. (2016), the 3R principles convey the main “actions” through which the CE concept is put in practice according to CE research (Ranta et al., 2017; Su et al., 2013). However, directly embedding the 3R principles amongst the business model components would clutter the framework, as they could potentially emerge in any of the sub-components depending on one’s perspective. Thus, rather than embedding the 3R principles in the business model framework, they were analyzed separately whilst their connections to the business model framework emerged.

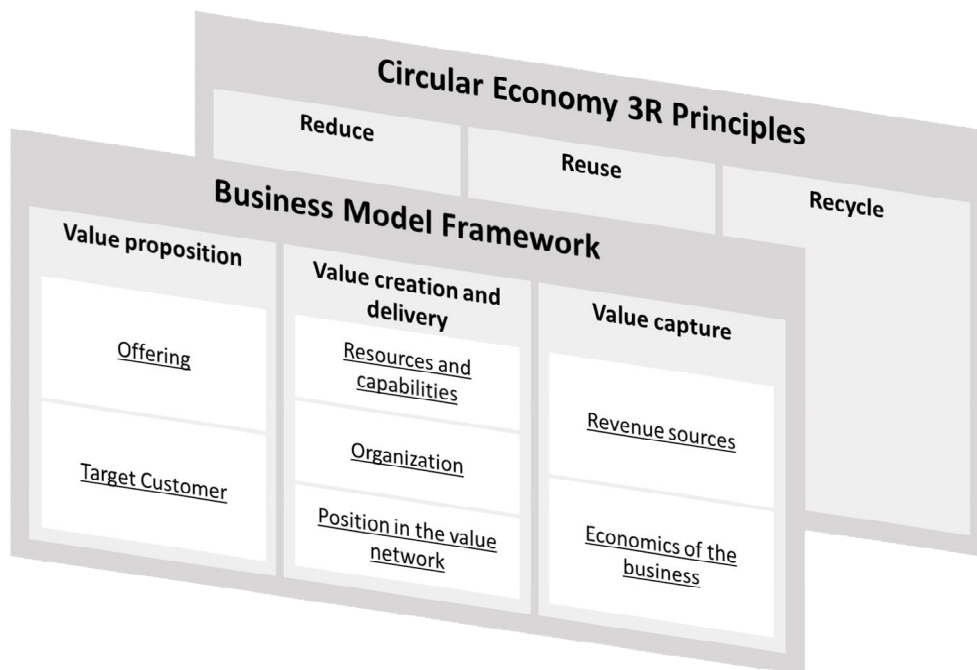


Figure 1 The developed conceptual framework for analyzing business models in the CE field.

3. Research Methodology

3.1 Research Design

An explorative, multiple-case strategy (see e.g. Eisenhardt, 1989; Miles and Huberman, 1994) was used to examine business models in the field of CE for several reasons. First, the lack of literature combining the business model perspective and the CE concept signals a lack of understanding regarding the business potential of CE initiatives (see, e.g., Lieder and Rashid, 2016) and thus highlights the need to explore CE in a structured way. Second, as relevant studies to date have been mainly conceptual, a multiple-case strategy allowed us to empirically analyze the business model components of several cases in a fine-grained, in-depth, and contextualized way, as well as compare cases and map emerging patterns between them that represent different types of CE initiatives in different global markets.

Four cases from different geographic locations and employing different types of CE initiatives were chosen. A purposive sampling strategy was applied, as it is an established method in case studies (Eisenhardt, 1989, p. 537). We followed several purposeful sampling principles (see Patton 1990, p. 177) to improve the external validity of the analysis of our sample (Eisenhardt, 1989). Firstly, we employed maximum variation sampling based on geographical region, enabling the identification of common patterns cutting across varying regional legislation (European Commission, 2015; Jiao and Boons, 2017). Second, following extreme case strategy we picked notably functional cases, beyond mere pilot cases, identified in collaboration with experts in the field. Third, to capture different types of initiatives, we used theoretical sampling, which allowed us to include both main types of CE initiatives driven by businesses on the micro-level: production (e.g.,

eco-design, cleaner production) and waste management (e.g., “scavengers” and “decomposer”) (Ghisellini et al., 2016, p. 19).

Case sampling proceeded through two phases. First, through a preliminary search of CE-related publications, reading previous CE case studies, and discussions with experts from business and academia, we identified nine potential cases. Second, we selected a final set of four functional cases representing different global locations and CE initiatives for detailed structured analysis, as shown in Table 2.

Case	Location	Company employees	Company revenue (MEUR** 2015)	Industry	Background
Suzhou	China	Thousands in the informal sector*	Not available	Waste Management	Municipal waste management, “scavenger” case
Dell	the U.S.	101 000	51 700	IT	End-of-life IT equipment circulation
UPM	EU	19 600	10 100	Forest Industry, Energy	Process industry eco-design product
Ekokem	Finland	680	260	Waste Management	Source separated and special waste management, “decomposer” case

*Based on Fei et al. (2016, p. 76)

**Million Euros.

Table 2 Selected cases and relevant background information

3.2 Data Gathering

We aimed to gather extensive data to uncover the business model elements of the cases and applied a LexisNexis search to collect a multi-source dataset of versatile, publicly available documents. LexisNexis was used to improve the quality and reliability of the data, as it is an established source of archived document data (e.g., Adams et al., 2009; Tankard, 2001). Between July and September 2016, searches were conducted for each case in LexisNexis using search terms derived from preliminary information about each case. For example, for the Dell case, searches were conducted using search terms such “Dell Optiplex” and “Dell Reconnect,” as those were central components of the case. In general, the data collected covers 2006-2016, but cases allocated differently within the timeframe and are not simultaneous. In total, the searches yielded more than 200 media and news articles, press releases, reports, statistics, and studies (including articles in scientific and professional journals) (see Table 3). This method of using multi-sourced public data has been employed before by, e.g., Ansari et al. (2016), who studied TiVo and the television ecosystem in the U.S., and Ritala et al. (2014), who studied the business models of Amazon.com.

In addition, we supplemented this extensive archival dataset by conducting one-to-one interviews with senior executives in the European cases; thematic interviews with company representatives holding key positions in the focal cases were conducted in June 2016. The interviews lasted on average 50 minutes and were recorded and transcribed. Informants were asked to describe the case's business model through questions related to the value proposition (value to the customer), value creation and delivery, and value capture (value to the company). These interviews both complemented and partly validated the archival data, and targeted the same timeframe as the document data collected for each case. Collecting extensive data from multiple sources (e.g., research, media, and company documents) increased data triangulation (Miles and Huberman, 1994) and improved the construct validity of our study (Yin, 1994).

<i>Case</i>	<i>News Articles</i>	<i>Columns</i>	<i>Research Articles</i>	<i>Company Releases</i>	<i>Other Company Material</i>
Suzhou	30	8	8	26	19
Dell	22	12	1	2	12
UPM	12	7		98	27
Ekokem	12	3	1	35	20

Table 3 Data sources collected for each case

3.3 Data Analysis

Data analysis was conducted in two phases. In the first phase, within-case analyses were conducted (Eisenhardt, 1989; Miles and Huberman, 1994). Analysis focused on retracing, identifying, and classifying the business model and 3R principle elements from the vast data collected for each case. In this process, the data was transformed into case study write-ups structured around the business model and 3R principle frameworks (Eisenhardt, 1989, p. 540). Using the business model and 3R principles as the basis for analysis and approaching them from using insights from previous literature improved our method's internal validity (Yin, 1994). First, the data was collected on a centralized Excel spreadsheet, which was used as a supporting tool, not only to manage the data but also to augment the reliability of the findings through cross-examination of multiple sources. When identifying and classifying the components of the conceptual frameworks in each case, the data was manually traced for references to the framework components. For example, when seeking the "offering" component of the business model framework, data referring to a product or service on offer to customers was classified in this category. Similar retracing and categorization was conducted for the CE 3R principles. For example, if data sources mentioned that an initiative recycled materials, those efforts were linked to the framework in the analysis.

The second phase of analysis consisted of cross-case analysis. Because this research was exploratory due to the limited understanding of the phenomena, theory-based pattern matching from categorization or different dimensions would have had limited feasibility.

Thus, we employed the tactic of comparing cases through mapping out their differences and similarities, and identifying the emerging patterns. Together with the rigorous case sampling principles used, the cross-case analysis improved the external validity of our results and enabled us to draw broader conclusions about economic value creation in a CE (Eisenhardt, 1989).

4. Results

The conceptual framework created in section 2 was used to analyze the four cases. The within-case analyses for UPM’s Profi, Ekokem’s Circular Economy Village, the Chinese city of Suzhou, and Dell’s Reconnect service comprise of a description of each initiative using the business model and 3R principle framework. In the last sub-section, the four cases are further compared in a cross-case analysis using the conceptual framework to summarize the results and identify emerging patterns to be developed further into propositions in the discussion section.

4.1 UPM Case Results

This case venture resulted from the identification that a waste stream from the company’s label business could be used as materials for wood-plastic composite (WPC) products called Profi. In the process of selling WPC products, the company is capturing new cycles of value from the same materials it used to manufacture labels that were previously sold to customers. This is especially true when the label waste used is procured from customers through the company’s waste management service. As the interviewed director of strategic partnerships explained, “*We have a contract with the customer so that after the lining from the labels has been used, we collect the waste back—as it is “pure” waste, we know exactly what it contains and can then use it to produce Profi.*”

In this situation, the waste was once a label product for which the company received revenue and is now returned to the company for another round of revenue generation as a WPC product. Potentially, if the waste management service is generating revenue, the same material can then generate a third round of revenue. The case is outlined with the analysis framework in table 4.

<i>Business model component</i>	<i>Reduce</i>	<i>Reuse</i>	<i>Recycle</i>
<i>Offering</i>	RafCycle liner waste management service reduces waste to landfill and the incineration of label waste.	No reuse identified in the case.	Durable high quality, recyclable WPC-products made partly from recycled label waste.
<i>Target Customer</i>	RafLatac label customers and all firms involved in the label value chain.	No reuse identified in the case.	Consumers, architects, and builders.
<i>Resources and Capabilities</i>	Capability to source-separate label waste where label waste is produced.	No reuse identified in the case.	Patented material. Capability to process label waste into ProFi-products using traditional plastics-molding processes.

<i>Organization</i>	UPM Raflatac operates RafCycle, leveraging UPM's paper recycling logistics infrastructure and partner waste management firms.	No reuse identified in the case.	RafCycle delivers label waste to ProFi factories in Germany and Finland. ProFi and UPM Raflatac are in different business units.
<i>Position in the Value Chain</i>	New position in the value chain for UPM: organizing waste management services to label customers.	No reuse identified in the case.	ProFi products are sold to end customers through resellers.
<i>Revenue Sources</i>	Raflatac revenue from label sales.	No reuse identified in the case.	Sales of ProFi.
<i>Economics of the Business</i>	Reduces waste management costs for label customers.	No reuse identified in the case.	Cost-efficient materials from label waste.

Table 4 Relations of 3R principles and business model components in the UPM case.

The business model reduces the amount of waste by turning a major waste stream into a resource for another, completely recyclable product (Smith, 2008). Over 60% of the raw material for the WPC products can be sourced from label waste which previously could not be recycled and was disposed of through incineration or landfilling (UPM, 2016). Thus, the primary way that the WPC's business model enables CE is by reducing the amount of waste generated through the company's label business. The recycling principle is being embraced in the manufacture of the WPC products, which creates a recycling cycle for previously-difficult-to-recycle label waste (Smith, 2008; UPM, 2013a, 2013b). Comparing the business model in Figure 2 and the 3R principles in Figure 3, the source of value similarly appears to be recycling capability, as it enables the service component of the business model while also contributing to the ability to manufacture WPC products, the primary source of revenue resulting from the initiative.

4.2 Ekokem Case Results

The company behind the CE Village concept is a specialized waste management operator that has recently profiled itself as a CE company. Ekokem's CE Village is the first of its kind in Finland and contributes towards the understanding of what CE means in the country. From the business model perspective, this case is an example of creating value capture mechanisms to support an increase in recycling capability. An important factor is the ability to capture value through both the waste treatment service and the end-products of the CE Village, as the interviewed research & development manager explains the following regarding revenue sources: "We also collect a gate-fee as we accept the waste, in addition to the revenue gained from the sales of the process end-products."

The waste treatment service can be seen as an established source of revenue. The end-products need to compete with commodity prices in the markets and thus are more susceptible to price volatility. Overall, the business model aims to maximize value capture from the mixed-waste stream; thus, this case creates increased economic activity through CE. The case is outlined in the analysis framework in Table 5.

<i>Business model component</i>	<i>Reduce</i>	<i>Reuse</i>	<i>Recycle</i>
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<i>Offering</i>	Waste treatment service that reduces waste incineration and landfilling by increasing recycling rates.	No reuse identified in the case.	Recycled plastics granulates and products.
<i>Target Customer</i>	Industrial and agricultural plastics waste producers, municipal waste management operators, and national plastic waste source-separation program.	No reuse identified in the case.	Plastics industry for granulates; construction industry for ready-made products.
<i>Resources and Capabilities</i>	Waste treatment resources including earlier waste-to-energy and the new recycling system.	No reuse identified in the case.	Combination of an ecorefinery, plastics refinery, and biorefinery enables high recycling rates.
<i>Organization</i>	Waste management operators deliver mixed waste and source-separated plastics to Ekokem for processing.	No reuse identified in the case.	Eco- and plastics refineries operated by Ekokem; biorefinery operated by a partner firm.
<i>Position in the Value Chain</i>	Provider of waste treatment services to waste collectors, agriculture, and industry.	No reuse identified in the case.	New position for Ekokem in selling recycled plastic granulates and products.
<i>Revenue Sources</i>	Gate-fees	No reuse identified in the case.	Sales of recycled plastics granulates and products.
<i>Economics of the Business</i>	Source-separating plastics can lead to lower gate fees for the customer.	No reuse identified in the case.	Recycled plastics are cheaper than virgin plastics.

Table 5 Relations of 3R principles and business model components in the Ekokem case.

From the CE perspective, the main contribution of the case comes from the sales of recycled materials. If virgin materials are substituted with recycled materials, then the CE Village will reduce the amount of virgin materials used in its market. This seems to be the case, as the value proposition of the recycled plastics produced include reducing material costs through the substitution of virgin materials with recycled ones (Ekokem, 2016). No direct reuse was identified in the case, and the reduce principle is not embraced through the direct reduction of material usage but rather through the substitution of virgin materials.

4.3 Suzhou Case Results

China has attempted to build a formal recycling system. For example, in Suzhou, the separation of different sources of household solid waste has been provided by the city's government since 2000 (Zhang and Wen, 2014, p. 6446). Yet, this government program remains largely ineffective because taxes, environmental protection, and other costs have led to the informal system, still formidable in the country and currently outside of governmental control gaining a significant cost advantage. For example, in their analysis of how to integrate the formal and informal sectors, Fei et al. (2016) approximated that over 80% of the cash flow in the recycling system of Suzhou goes through the informal sector, due to the large advantage in the amount of facilities and amount of material recycled. In this case, analysis of the business model with the CE principles was conducted to illustrate

how Suzhou's system of recycling household waste operates. The case is outlined through the analysis framework in Table 6.

<i>Business model component</i>	<i>Reduce</i>	<i>Reuse</i>	<i>Recycle</i>
<i>Offering</i>	Collection of recyclables directly from households. Reduces total household solid waste, which is officially directed to incineration.	No reuse identified in the case.	Cheap recycled materials for manufacturing firms.
<i>Target Customer</i>	Residents.	No reuse identified in the case.	Manufacturing firms.
<i>Resources and Capabilities</i>	Capability to flexibly collect recyclables from residents, often door-to-door.	No reuse identified in the case.	Capability to process recyclables into recycled materials very inexpensively. Low technological resources.
<i>Organization</i>	Individual waste pickers.	No reuse identified in the case.	Formal and informal recycling sites that preprocess waste for processing sites.
<i>Position in the Value Chain</i>	Waste pickers collect recyclables from residents and sell them to recycling sites.	No reuse identified in the case.	Recycling sites buy recyclables from waste pickers and sell preprocessed recyclables to processing sites, which sell recycled materials to manufacturing firms.
<i>Revenue Sources</i>	Sales of recyclables.	No reuse identified in the case.	Sales of recycled materials.
<i>Economics of the Business</i>	Recyclables have economic value right from the beginning.	No reuse identified in the case.	Each actor in the system has to pay for recyclables, and their only source of revenue is sales of recycled materials. Informal sector has a cost advantage, as they do not follow environmental regulations.

Table 6 Relations of 3R principles and business model components in the Suzhou case.

The most notable finding of the business model analysis in the Suzhou case is the single revenue source from the sale of recycled materials. This is because the recyclables are traded as valuables from the beginning, as opposed to for example the waste treatment providers collecting a gate fee like in the case of Ekokem. Informal waste collectors for example, rely—for part of their living—on their ability to sell recyclables to operators who can further process the recyclables into materials (Fei et al., 2016). Because the operators in the recycling system can only acquire revenue from the sale of recycled materials, their business models must focus on providing materials to manufacturers as cost-efficiently as possible. In practice, this results in very low income, on average 1200 RMB per month in 2012 compared to the average of 2770 RMB for citizens, for employees in recycling sites (Fei et al., 2016), and in the use of low-level technology and the reduced ability to compete if environmental rules (that reduce cost efficiency) are complied with.

The main principle through which the CE is advanced and value is generated is through recycling waste into a resource. A good indicator of this is that the entire system is based on collecting waste, separating recyclables from waste, and processing the recyclables into recycled materials. It can be argued that using recycled materials reduces the use of virgin materials. No direct instances of reuse were identified in the analysis.

4.4 Dell Case Results

Dell is a leading US-based manufacturer of personal computers (PCs) and computer equipment. It is the third-largest PC manufacturer when measured by units shipped, with shipments of 10.2 million PCs in the fourth quarter of 2015, according to technology analyst Gartner Inc. (Renstrom, 2016). By using recycled materials in its products, Dell saves material costs without altering product performance. Dell says this cost-saving is currently nominal, but the company expects savings to increase as the use of recycled materials and the program are scaled up (Dell, 2016). The *savings from material costs* is, however, a clear, direct value capture mechanism for Dell. The case is outlined in the business model framework in Table 7.

<i>Business model component</i>	<i>Reduce</i>	<i>Reuse</i>	<i>Recycle</i>
<i>Offering</i>	Free take-back service for consumers to reduce incineration and landfilling of e-waste.	Used computers from the Reconnect program through non-profit partner Goodwill.	Closed-loop plastics introduced to existing Dell products, improving their sustainability.
<i>Target Customer</i>	Consumers with unused and end-of life computers.	Consumers.	Current Dell target customers.
<i>Resources and Capabilities</i>	Network of over 2000 free take-back service locations.	Capability to separate computers suitable for reuse. Refurbishing and resale services to consumers. Both by non-profit partner Goodwill.	Manufacturing capability for closed-loop plastics, take-back service, and recycling of materials from used computers.
<i>Organization</i>	Take-back service implemented by the non-profit partner Goodwill.	Refurbishment and sale of used computers is done by the non-profit partner Goodwill.	Closed-loop plastics recycling and processing is performed by Wistron, and the manufacturing of computers occurs in China. Other materials recycled by partner recycling firms.
<i>Position in the Value Chain</i>	Free take-back service diverts used computers from improper disposal and integrates them into the Reconnect program.	Goodwill separates reusable computers from those that need recycling.	The recycling system enables Dell to capture post-consumer plastics cost-efficiently while improving the sustainability of the business.
<i>Revenue Sources</i>	Dell pays Goodwill for accepting, inspecting, and packaging computers for recycling.	Reusable computers are sold by non-profit partner Goodwill.	Sales of Dell products with closed-loop plastics.
<i>Economics of the Business</i>	Take-back service is funded by Dell.	Goodwill is a non-profit organization; a donation of a working computer can equate to 6.8 hours of job training for a Goodwill employee.	Recycled plastics are cheaper, and their prices are more stable than those of virgin plastics.

Table 7 Relations of 3R-principles and business model components in the Dell case.

A major aim of the closed-loop program is to enable recycling of end-of-life computer equipment. Dell focuses on *recycling the plastic content of computers*, which it can efficiently use to manufacture new products, reducing costs. In 2015, Dell reused more than 3.4 million pounds of recycled plastics from old electronics in computers and displays, in addition to 10.7 million pounds of plastics from plastic bottles and other recyclable sources (Dell, 2016; Renstrom, 2016). Dell does not use other materials extracted from e-waste, such as valuable metals, but transfers these to recycling companies contracted to disassemble and separate materials suitable for the closed-loop program (Renstrom, 2016). While this business model captures computers and displays for reuse, Dell itself does not gain any economic value from reuse. Instead, Dell pays its non-profit partner Goodwill to handle the separation and reuse part of the business model (Napsha and Olson, 2009; Negley, 2012; Renstrom, 2016). This suggests that reuse does not create sufficient economic value to merit incorporation in Dell's business model as a source of revenue because it is a cost. Of the 3R principles, therefore, recycling is the primary contributor of economic value.

4.5 Summarizing the Results through a Cross-Case Analysis

The analyzed cases each differ with regard to their business models, industries, and geographical areas, but recurring themes emerge across the cases. Table 8 summarizes all the recurring themes, and those making the greatest contributions will be discussed in more detail.

<i>Business model component</i>	<i>Reduce</i>	<i>Reuse</i>	<i>Recycle</i>
<i>Offering</i>	Reducing mixed waste by increasing source-separation and increasing recycling.	Take-back services and sales of used and refurbished products.	Cheaper materials for manufacturing or sustainable high-quality end products.
<i>Target Customer</i>	New target customers through take-back services.	Used products to consumers.	New target customers for recycled materials.
<i>Resources and Capabilities</i>	Capability to provide take-back services that are accessible to customers.	Capability to separate working products and components from waste and refurbish them for resale.	Capability to capture source-separated waste for efficient recycling.
<i>Organization</i>	Take-back of products and materials operated separately from product manufacturing, either through partners or by other business units.	Separating reusable products from materials and refurbishment organized together.	Use of recycled materials in producing products is based in a separate business unit from the recycling system.
<i>Position in the Value Chain</i>	Diverting waste to recycling in various parts of the value chain.	Early separation of reusable products from waste streams.	New position in the value chain, either in sales of new products from recycled materials or in waste management or take-back services.

<i>Revenue sources</i>		Refurbished reused products.	Sales of recycled materials or products made from recycled materials.
<i>Economics of the Business</i>	Increasing source-separation and thus reducing mixed waste reduces waste management costs.	The sales and refurbishing of used products is subsidized.	Recycled materials cheaper than virgin materials.

Table 8 Recurring themes of the relations of 3R principles and business model components in the analyzed cases.

As the first key theme, in all the cases, the main source of economic value from CE to the focal firm is achieved through recycling. For UPM, recycling label waste results in cost-efficient and sustainable materials for the WPC products. In the Ekokem case, adding recycling capabilities enables the focal firm to capture additional value from the sales of recycled materials in addition to the existing revenue source of gate fees. In Suzhou, sales of recycled materials is the only source of revenue, and in the Dell case, the only part of the Reconnect service that is connected to Dell’s business model is the replacement of virgin sourced plastics by more cost-efficient closed-loop plastics. The way in which recycling generates economic value thus differs based on whether the firm is selling recycled materials or products made from recycled materials, with new revenues streams in the former case and lower material costs in the latter.

The second key theme is that the analyzed business models included a type of take-back system to acquire waste suitable for recycling. Although the take-back system contributed to revenue only in the Ekokem case, establishing such systems in a way that enables separation of recyclables from mixed waste streams is crucial to the success of economic value creation through recycling. However, methods of organizing the take-back system varied widely in the case companies. The system in the UPM case was organized internally, while it was organized through partnerships in the Dell case. In the Ekokem case, it was organized through provision of a waste management service with a gate fee, whereas recyclables were purchased from waste pickers in the Suzhou case.

The third recurring key theme is that either the take-back service or the sold products made from recycled materials were very closely linked to an existing business, while the new operation was organized separately. For example, in the UPM case, the existing Raflatac business unit started offering the take-back program to its customers, while the WPC product business is arranged as a completely separate enterprise; Raflatac’s RafCycle service operates as an internal supplier for the WPC product business. In Dell’s case, the separation is even clearer, as Dell only organizes the take-back program, which then supplies closed-loop plastics for Dell’s existing products. This allows the original business to run as before while adding circularity to the business. However, this simultaneously alters the focal firm’s position in the value chain, as the firm suddenly finds itself both providing waste management services and selling materials, whereas only one or the other has been the case previously.

Fourth, in the analyzed cases, the reuse principle is underutilized as a source of economic value. Only Dell reuses but, even in this case, Dell does not incorporate reuse into its business model but leaves it to its non-profit partner, Goodwill. Rather than capturing economic value from reuse, Dell pays Goodwill to separate reusable computers and

equipment, so the reuse principle generates costs rather than revenue. The economic value gained from the reuse principle seems small, especially when considering the Ellen MacArthur Foundation (2013) and European Commission's (2015) expectations for major benefits from increased reuse, such as new jobs servicing and refurbishing products.

Finally, while the recycling principle is the main source of economic value to the focal firm in each case and the reuse principle appears to be underutilized, the reduce principle emerges throughout the cases as an incentive for customers to take part in the take-back services. Reducing the amount of waste by taking advantage of the take-back services provides economic value to customers in the UPM, Ekokem, and Dell cases. The reason for this is that in each of these cases, selecting the take-back service instead of the traditional waste management service effectively reduces waste management costs. While the waste management costs in the Suzhou case are not clear, participation in the take-back service is also incentivized since recycling sites pay for the recyclables. Thus, in the Suzhou case, partaking in the take-back service also results in economic gain for the customer.

5. Discussion

Through a structured analysis and multiple-case comparison, we developed an understanding of the kinds of business models—with regard to the components of the business model and 3R principles—that enable CE business operations. In the next section, findings of this theory-developing qualitative multiple case study are developed into circular business model propositions that provide theoretical implications for further circular business model research as well as implications for managers and policymakers for moving towards CE.

5.1 Propositions for CE business models

Based on our explorative case analysis we suggest the following five propositions for implementing CE business models from the perspective of economic value creation and the 3R-principles.

Proposition 1: Cost efficiency of circular operations is the key proponent to successful CE business

In each of the analyzed cases, the main economic value to the focal firm was gained from using recycled materials as cost-efficient alternatives to virgin materials, or from selling recycled materials to manufacturers for this purpose. Thus, from a business model perspective, the improvement to the business model was due to the economics of the business component of the business model. Richardson (2008) describes the economics of a business as the way the firm gains a profit margin through higher revenues or lower costs. In the analyzed cases, leveraging recycling resulted in better cost efficiency through lower overall material costs.

Proposition 2: Take-back services enable the acquisition of particular wastes as resources, but they need to be incentivized through reductions in customers' total waste management costs.

In each case, cost efficiency is driven by a take-back system ensuring that the focal firm can acquire waste suitable for efficient recycling. Lewandowski (2016) has suggested including take-back systems in CE business models, and our findings support that conclusion. However, our findings also provide further insight into customer incentives to use take-back systems. In waste management infrastructures that reliably collect gate fees from waste producers, the ability to reduce waste management costs provides an incentive in the analyzed cases. Take-back services also blur the lines between the 3R principles because the adoption of take-back services reduces the generation of waste for disposal by replacing disposal with either reuse or recycling. Thus, although from the focal firms' value-capture perspective, efficient recycling appears to be the driver of economic value of take-back services, the reduce principle is central in the value-proposition perspective of take-back services.

Proposition 3: Circular business models require the focal firm to separately manage multiple positions in the value chain.

Our analysis also shows that moving to a more circular business model introduces new positions in the value chain for the focal firm. For example, if the original business model's revenue sources were from product sales, the focal firm's position in the value chain diversified due to the introduction of a take-back system, which enabled the materials to loop back and generate value (MacArthur, 2013). An especially interesting aspect of this appearance of multiple positions in the value chain was that these two positions were managed separately. A reason for this could be that, as implied by our second proposition, the take-back system itself should be able to provide value to customers, and thus it should be managed separately as a business model of its own (Chesbrough and Rosenbloom, 2002).

Proposition 4: The take-back system for gaining economic value through CE can be implemented successfully in multiple ways.

The necessity of the take-back system and its enabling of cost-efficient circular operations were central to each of the analyzed cases. However, the organization of the take-back system and thus the way cost-efficiency was achieved could be designed in multiple ways. This suggests that while the take-back of suitable waste is a requirement, there is no single right answer as to how it should be implemented, other than that it should be managed separately. Implementation of the take-back system internally, through partnerships, or through purchasing from markets all appear to be applicable and successful approaches.

Proposition 5: Recycling is easier to implement than reducing or reusing due to its smaller impact on the business model.

The dominance of recycling to obtain economic value from CE business was a surprising finding, especially considering that previous CE literature has highlighted the potential economic value of moving towards reuse since it preserves products at a higher value (MacArthur, 2013; Stahel, 2013). We propose that the dependence on recycling is a result of it being easier to implement into a previously linear business model. Compared to reuse, where new activities such as refurbishment, maintenance, and remanufacturing as well as separate sales of new and used products are required for implementation (Lieder and Rashid, 2016), introducing recycling merely replaces virgin materials with recycled materials, with little effect on the fundamentals of the business model (e.g., target customers or revenue sources). The separation of management of the different positions in

the value chain also supports our fifth proposition that managing CE activities so that they have minimal impact on the original business model is easier than integrating CE directly to the original business model through reduce or reuse.

5.2 Implications to research and practice

The five propositions provide theoretical implications for the academic discussion on the CE and business models. Linking to earlier business-model and CE literature, these propositions explain why recycling is a dominant method of implementing circularity within businesses. *Future research* could test and develop the propositions established in this qualitative explorative study. Quantitative methods are rarely used in CE business model research, and these propositions could serve as initial research questions for quantitative analyses to test theory in this area. In particular, the importance of the take-back system to recycling's ability to generate economic value and the finding on the separate management of diversified positions in the value chain indicate interesting areas for future circular business model research. Reuse is underrepresented in economic value generation, so future studies could also be aimed at providing concrete evidence on how reuse generates economic value in circular business models. Furthermore, although recycling is the dominant source of economic value in the business models, the reduce principle often coincides with recycling as a central contributor to the value proposition for customers in take-back services. Thus, following Kirchherr et al. (2017), we recommend further detailed, structured investigations on the CE implementation methods because the lines between the 3R-principles as the methods of implementing CE can become blurred and co-dependent.

The propositions also have practical *managerial implications* as they offer concrete guidance on how to gain economic value from CE business. Managers implementing CE business should pay specific attention to the cost-efficiency of circular operations as it is the key proponent to gaining economic value from CE. The need of incentives for the customers of the take-back system, the implication of benefit from managing the take-back system separately from other business, and the notion that no one single implementation for the take-back system is the only way to success are all practical learnings that can be transferred to the design of CE business models. The relative ease of implementing CE through recycling as opposed to reduce or reuse is also an important consideration, allowing firms to embrace CE faster without drastic changes to current business models.

Our findings also suggest *implications and offer guidance for policymakers*. The recycling principle was the dominant source of economic value for the focal firms in our study. From an environmental standpoint, this is concerning, as recycling requires more energy than reusing products or reducing the use of materials and inevitably leads to the loss of some of the original materials as well as some of their properties (Charonis, 2012). Hence, this limits the ability of recycling to close material loops completely. Many of the positive social impacts of CE are also expected from refurbishing, maintaining, and remanufacturing products, none of which are introduced when only recycling is implemented. The incentive of waste management costs was a major enabler of take-back systems for recycling, and thus providing further incentives that directly support reuse—even to the detriment of recycling—could move firms towards implementing reuse in their operations. However, since reusing has a much larger impact on the business model than recycling as it requires the fundamental change of starting to sell used products, the

direction of incentives towards the actual activities required for reuse could be more effective.

5.3 Limitations

This study relied on purposefully chosen cases; therefore, we acknowledge that the case selection posed limitations to the study's external validity, as not all types of CE initiatives could be directly analyzed within the scope of the study. However, we rigorously sampled the case studies based on multiple purposeful sampling criteria to capture a broad set of different CE initiatives and conducted a cross-case comparative analysis. This was intended to improve the study's external validity and enable more generalizable conclusions from the findings (Eisenhardt, 1989).

Subsequent research on the subject should target cases that help explain the relative dominance of recycling as a driver of economic value and should consider expanding the 3R principle framework in the business model context. Although the definitions of the 3R principles are clear from the perspective of a waste management hierarchy, their boundaries can become blurred when analyzing value creation from a business model perspective as they often co-exist. A more holistic categorization acknowledging the connections and interlinkages between the principles could clearly capture the essence of diverse CE business models. For example, in a review of CE conceptualizations, Kirchherr et al. (2017) identified the 3R principles framework as dominant in the CE literature but also found more extensive frameworks that suggest new principles and make their definitions more explicit from a value-creation perspective.

Regarding data collection, the majority of the data came from the four focal case companies, although LexisNexis was used to gather secondary material from reliable news outlets. To address the validity of the media-originated data, we performed triangulation using, for example, company data (see e.g., Ansari et al., 2016). However, media- and company-originated data could have introduced bias into the results, even though triangulation through multi-sourced data was performed in attempt to reduce it. Sampling that is also based on the timeframe of the cases could increase the validity of future multiple-case research by improving the triangulation effect of cross-case analysis (Yin, 1994).

6. Conclusions

In this study, we approached the emerging CE concept from the business model perspective, contributing towards the research gap on the economic value of CE for firms (Lieder and Rashid, 2016). Through linking case analysis to previous literature, we developed five propositions for conducting circular business: 1) the cost efficiency of circular operations is the key proponent to successful CE business, 2) take-back services enable the acquisition of particular wastes as resources, but they need to be incentivized through reductions in customers' total waste management costs, 3) circular business models require the focal firm to separately manage multiple positions in the value chain, 4) the take-back system for gaining economic value through CE can be implemented in multiple ways, and 5) recycling is easier to implement than reducing or reusing due to a smaller impact on the business model. Based on these findings, the "recycle" principle is surprisingly more dominant in economic value creation in CE when compared with the "reduce" and especially "reuse" principles. As recycling has a limited ability to keep materials in circulation (Stahel, 2013), it is important that policymakers find ways to

facilitate value creation through the principles of “reduce” and “reuse” for the CE to reach its full potential.

Acknowledgements

The authors gratefully acknowledge the support of the participants of the ARVI – Material Value Chains research program organized by Clic Innovation and the related research funding from Tekes – the Finnish Funding Agency for Innovation.

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Appendix A: Reviewed business model research and definitions

<i>Author, Year</i>	<i>Research Type</i>	<i>Business Model Definition</i>
Linder and Cantrell, 2000	Typology of business models, based on a practitioner survey	“A business model, strictly speaking, is the organization’s core logic for creating value.” (p. 1)
Amit and Zott, 2001	Analysis of business models in 29 European publicly traded e-businesses	“A business model depicts the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities.” (p. 511)
Chesbrough and Rosenbloom, 2002	Case study of business models for innovations in Xerox’s R&D	“A successful business model creates a heuristic logic that connects technical potential with the realization of economic value.” (p. 529)
Magretta, 2002	Analysis of the relation between strategy and the business model, using case studies	“Business models are, at heart, stories – stories that explain how enterprises work. A good business model answers Peter Drucker’s age-old questions: Who is the customer? And what does the customer value? It also answers the fundamental questions every manager must ask: How do we make money in this business? What is the underlying economic logic that explains how we can deliver value to customers at an appropriate cost?” (p. 4)
Morris et al., 2005	Review of business model literature from an entrepreneurial perspective	“A business model is a concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in defined markets.” (p. 727)
Osterwalder, 2004	Review of business model literature leading to a component-based framework	“A business model is a conceptual tool containing a set of objects, concepts and their relationships with the objective to express the business logic of a specific firm. Therefore, we must consider which concepts and relationships allow a simplified description and representation of what value is provided to customers, how this is done and with which financial consequences.” (p.3)
Richardson, 2008	Review of business model literature from a strategic perspective	“A well-designed business model defines and organizes the activities of the firm to execute the strategy. The activities are chosen and organized to create and deliver the value proposition, i.e., to implement the firm’s theory of how to compete.” (p. 141)
Teece, 2010	Explores the business model concept’s connections with strategy,	“A business model articulates the logic, the data, and other evidence that support a value proposition for the customer, and

	innovation, and economic theory	a viable structure of revenues and costs for the enterprise delivering that value.” (p. 179)
Zott and Amit, 2010	Review of business model literature leading to an activity system perspective to business model design	“The content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities” (p. 219)
Bocken et al., 2014	Review of business model literature and practice to develop archetypes for sustainable business models	“In this paper, a business model is defined by three main elements: the value proposition, value creation and delivery and value capture.” (p. 43)
DaSilva and Trkman, 2014	Conceptual paper discussing the theoretical foundations of the business model approach	“The core of the business model is defined as a combination of resources which through transactions generate value for the company and its customers.” (p. 383)
Clauss, 2016	Review of business model literature to develop a scale to measure business model innovation	“Business models are structural templates of how firms run and develop their business on holistic and system-levels ” (pp. 386-387)
