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Classifying circular business models: a practice-based review

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Abstract
Business models have a crucial role to play in the transition to a circular economy. Circular business model innovation provides an arena for studying the creation of such circular business models and enables companies the possibility to identify new value creation opportunities, such as capitalizing on embedded value of products over multiple lifecycles. In comparison with the trajectory of traditional business model innovation literature, circular business model innovation is underdeveloped, and this paper aims to make a contribution to the ongoing theoretical discussion. Through review and categorization of 140 circular business model case examples, this paper makes a first attempt to verify previous literature and unify academic and industry understanding of circular business models. The findings are expected to be useful in advancing the field of circular business model innovation and assisting practitioners in the design and development of new circular business models. While the results suggest convergence around three circular business model types: 'Access/Performance Model', 'Extending Product Value', and 'Extending Resource Value', other previously identified circular business model types should not be discounted.

Introduction

Over the past few decades, resource constraints coupled with increasing consumption have spurred interest in shifting to a more 'circular' economic model. In moving to this circular economy (CE), the maintenance and reutilization of stock is emphasized (Stahel, 2013). Undertaking such activities in practice may, however, be a challenge due to the current linear system that does not emphasize reverse supply chains and other lifecycle management practices necessary to achieve a CE. In addressing this issue, authors have highlighted circular business models as key enablers of CE due to the fact they can help facilitate and enable product life extension and closure of resource loops (Bakker et al., 2014b).

The concept of circular business models is viewed as a key research area in the field of CE (Lieder & Rashid, 2016). However, when compared to traditional management literature, research on circular business model innovation is currently underdeveloped. Traditional business model innovation literature has evolved over the past few decades and with a strong practical focus (Wirtz et al., 2016). Much of the research has centered on utilizing cases from practice to aid in the identification of definitions, ontologies, building blocks, and configurations which help to clarify the business model concept and assist firms in undertaking business model innovation.

In comparison, the term 'circular' has been used to describe a variety of different business models (Lewandowski, 2016) and is widely used in industry as well as academia. While some authors in the field of circular economy have presented conceptual definitions and archetypes of circular business models (i.e. Bakker et al., 2014a; Bocken et al., 2016), literature comparing and contrasting these various viewpoints is limited. Furthermore, and to the best of this author's knowledge, no study has presented a practice-based review of circular business models, although such an approach has previously been useful to unify the different types of (sustainable) business innovation present in both practice and literature (Bocken et al., 2014).

This paper therefore aims to help converge current knowledge on circular business models and facilitate future research on circular business model innovation by exploring conceptualizations of circular business models. First, a brief overview of existing definitions and categorizations from academic literature are presented before a review of business case examples from practice is undertaken. After presenting the results from analyzing 140 circular business model case examples, the paper concludes with a brief discussion about current understandings about circular business models and circular business model classifications schemes. The findings are useful not only for advancing the field of circular business model innovation, but also in assisting practitioners in the design and development of new circular business models.

Circular Business Models Literature

Definitions

Business models are often defined as how organizations create, deliver, and capture value (Osterwalder et al., 2010). In order to provide some clarity to circular business models, the concept of a 'linear' business may be used as a contrast. Linder and Williander (2015) describe such linear business models as where:

> *"the conceptual logic for value creation is based on a material flow where (only) virgin material enters the value chain upstream and all product value except raw material value is added through manufacturing and user behaviour"*

Yet, while use of this conceptualization implies the opposite for circular business models - that value creation in circular business models is based upon 1) many types of material flows (not only virgin materials) and 2) many types of value added activities (not only manufacturing and user behavior) - academic literature on circular economy appears to approach the circular business model topic from multiple perspectives (Lewandowski, 2015).

Linder & Williander (2015), for example, inherently imply circular business models are circular only when products return to producers[1]. While such a definition appears appropriate for their case study investigation into why circular business models, especially remanufacturing and reuse, are not undertaken by original equipment manufacturers, this manufacturer-centered perspective is not present in Bocken et al. (2016)'s explanation of circular business models. Here a systems perspective is implied, describing circular business models as business models that contribute to the "slowing, closing, and narrowing resource loops" (Bocken et al. 2016).

Classification Schemes

In addition to explicit definitions, both academia and practitioners have worked to develop classification schemes for circular business models. While this approach is reflexive of the theoretical development trajectory for traditional business model literature (Osterwalder et al., 2005), the methodological approaches utilized to create such circular business model categorizations are not transparent within existing literature.

Drawing on Bakker et al. (2014a)'s classification scheme, Bocken et al. (2016) present six classifications, referred to as 'circular business strategies': (1) the access/performance model, in which value is created by providing customers the use or performance of products in lieu of ownership; (2) extending product value, in which value is created by exploiting the residual value of unused, broken, or discarded products; (3) the classic long-life model, in which value is created by delivering customers a durable product; (4) the encourage sufficiency model, in which value is created by reducing end-user consumption; (5) extending resource value, in which value is created by exploiting the residual value of resources; and (6) industrial symbiosis, a process-oriented solution in which value is created by using residual outputs of processes as input for new processes.

In comparison to Bakker et al.'s (2014a) five-type classification scheme, updates by Bocken et al. (2016) include: combining two previously separate models (the 'Access model' and the 'Performance model'); broadening the scope of the so called 'Gap exploiter' model beyond 3rd parties (now referred to as 'Extending resource value'; removing the 'Hybrid model' (where selling durable products is combined with fast-moving consumables to create value); and introducing 'Encourage sufficiency' and 'Industrial symbiosis'.

Circular Business Model Cases

To contribute to the ongoing conceptualization of circular business models and identify how current understandings align with previous classifications, a review of circular business model case examples was conducted. To do so, a

Publication Year	Publications Reviewed
2010	Park et al.
2012	Damen; Ellen MacArthur Foundation; Lee et al.
2013	Evans; Ellen MacArthur Foundation; Schulte; Kok et al.; Joustra et al.
2014	Bakker et al. (a); Bocken et al.; Ellen MacArthur Foundation; Genovese et al.; Lacy et al.; Mentink;
2015	Bocken et al.; De Jong et al.; Ellen MacArthur Foundation (a); Ellen MacArthur Foundation (b); Ellen MacArthur Foundation (c); Florin et al.; ING Economics Department; Kiørboe et al.; Linder & Williander; Murray et al.; Prendeville & Bocken; Roos & Agarwal; van Renswoude et al.; Whalen et al.
2016	Antikainen & Valkokari; Beulque & Aggeri; Bocken et al.; Ellen MacArthur Foundation; Guldmann; Lewandowski; Lieder & Rashid; Ovaska et al.; Scheepens et al.

Table 1. Overview of publications reviewed.

[1] *They write: "a business model in which the conceptual logic for value creation is based on utilizing economic value retained in products after use in the production of new offerings. Thus, a circular business model implies a return flow to the producer from users, though there can be intermediaries between the two parties" (Linder & Williander, 2015).*

Classification Category	No. of cases	Example Cases
Access and Performance Model	48	Amazon 'Textbooks as Service'; Vigga 'baby clothes by subscription'; Zipcar 'car sharing'; Bag, Borrow, or Steal 'handbag rental'
Extending Product Value	56	Brightstar corporation 'buy-back & tradein services for mobile phones'; Agito Medical 'refurbishment of medical equipment'; Godsinlösen 'repair of mobile phones'
Classic Long Life Model	4	Martela Oyj FI Furniture 'long life furniture'; Google data centers 'designed to last'; Techno gym 'design for extended life', Repack 'reusable packaging'
Encourage Sufficiency	1	Martela Oyj FI Furniture 'customers purchase according to needs'
Extending Resource Value	47	Aquafill 'chemical textile recycling'; Worn Again 'textile recycling'; Icelandic Recycling Fund 'recovery and recycling of fishing nets'; Grundfos 'take-back and recycling of pumps'
Industrial Symbiosis	7	Royal DSM 'selling cellulosic bioethanol created from feedstock'; GRO Holland & LaPLace 'coffee residues to grow mushrooms'; Kroger Grocery 'foodwaste into renewable energy'
No Classification	2	Splosh 'cleaning supplies'; Sharetribe 'platform for creating online marketplaces'

Table 2. Results from categorizing cases.

search for literature making use of the term 'circular business model' was performed within academic directories (i.e. Scopus and Science Direct) between August - November 2016. The resulting literature, as well as its references, was scanned for explicit mention of cases studies and examples of circular business models. Due to the limited results, the search was then opened to secondary sources (i.e. grey literature). In total, within 38 references (as shown in Table 1), 207 cases referred to as 'circular business models' were collected for review.

Of these cases, 140 cases examples were determined to be unique (i.e. not repeated in different sources) and described a business model (i.e. details about how the firm creates, delivers, and captures value were provided). As shown in Table 2, the cases were then classified according to the previously presented Bocken et al. (2016) framework. The total number of cases presented in the table exceeds 140 as some cases were classified under more than one category.

The majority of cases were classified into three types: 'Access/Performance', 'Extending Product Value', and 'Extending Resource Value'. The remainder of this section summarizes main findings from analysis of the cases in these three categories. Quantification is denoted by [n=number of cases].

Access/Performance Model

Most firms within this category fell under one of two categories: those who own assets [n=24] and those who do not [n=12]. The value creation and delivery methods for the former focus on distributing said assets multiple times. This lowers the total cost of ownership for customers and leaves the responsibility of maintenance and repair of assets on the firm. Over half of these cases came from the apparel and transportation industries, with dress and handbag hires such as Rent the Runaway and Bag, Borrow or Steal and car hires such as Car2Go and Co-wheels. Value capture methods appear dependent on the number of times and length for which assets are distributed. This, in turn, is dependent on product type and offer

In contrast, firms without their own assets were characterized as facilitators – connecting those who have something (i.e. unused space) with those who desire it. Such examples include Off2Off, a platform that helps firms match supply and demand of goods and resources across their organization, and Lyft, a platform that provides transportation services by targeting drivers with extra seats available. Multiple methods for capturing value were identified including transaction, or service fees, and monthly membership fees.

Extending Product Value

The majority of firms within this category [n=35] were identified as product resellers. These firms rely on creating and delivering value by retrieving used products and capturing value by selling them to other customers. The firms who did not focus on reselling appear to create and deliver value by providing services that extend product life such as repair (i.e. iRepair, a repair shop for electronics) or collecting products for input in new production (i.e. SAB Miller's returnable bottle program).

A variety of value propositions for the return/supply of used goods – ranging from buy back, discounts, and trade-in solutions - were identified in the cases. Walmart and GameStop, for example, both offer a trade-in program for used video games and then resell them.

Extending Resource Value

The majority of cases in this category [n=30] described firms undertaking material recycling activities. While the firm in the identified case was often the party carrying out the recycling, there were some instances where the firm

did not perform the recycling, instead partnering with other firms in order to recover material value.

In addition to recycling, a few cases [n=9] highlighted business models focused on the sourcing of used materials as inputs for new products. Examples include Freitag and Deadwood who 'upcycle' material into apparel and Philips who uses recycled plastic in products to reduce cost. Finally, three cases did not describe business models that enable recycling or the use of previously used material. Instead, these firms capture value by playing a facilitating role in 'linking up' parties with waste to those who desire it.

Discussion & Conclusion

The results provide interesting insight into current understanding of circular business models. As multiple cases were identified to fit with more than one archetype, the review illustrates firms may not only apply one circular business strategy, but instead pursue multiple strategies. For many of the companies, circular business models were also often pursued alongside linear business models.

Considering the majority of cases were classified into three business model archetypes, the results suggest some type of convergence around the circular business models centering on access/performance and those that extend either product or resource value. However, the other three ('Encourage sufficiency', 'Industrial symbiosis', and 'Classic long life') should not be immediately disregarded. Some or all of these three concepts could be underrepresented because of a limited number of cases examples that exist to illustrate these types of models.

Furthermore, for most archetypes there was some challenge in classifying the cases. Potential 'Classic long life' cases were often questioned because it was difficult to discern the accuracy of the claims from marketing language. Interpreting 'long life' was also a challenge. For example, one case (Splosh) ultimately left unclassified - as it did not align with Bocken et al. (2016)'s examples of classic long life - could potentially be viewed as a classic long life model as Splosh's product is designed for reuse and replaces something that is normally discarded after one use[2]. Drawing the line between extending product and resource value was also a challenge in some cases. For example, H&M's garment collection, while classified by Bocken et al. (2016) as 'Extending product value', was classified in this paper as 'Extending resource value' as the majority (if not all) of the returned garments are recycled rather than reused.

Some of the existing archetypes appear to be more suited as subcategories. In classifying the cases, it became apparent that 'Industrial symbiosis' appears to be a subcategory of 'Extending resource value'. While industrial symbiosis may be a 'process oriented solution' it still focuses on the exploitation of otherwise wasted resources. It is therefore proposed 'Extending resource value' and 'Industrial symbiosis' are consolidated, with the latter as a sub-category of the former.

In line with the above recommendation, further in-depth review of the other business model archetypes should be undertaken to create an updated and consolidated typology. Within this adjusted typology, various characteristics - such as the types of collection methods used by firms to extend product value – may be elaborated on to help enable the design and development new circular business models.

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[2] *Interestingly, while this case may not have completely aligned within any of the Bocken et al. (2016) categories, it did fit the 'Hybrid model' identified by Bakker et al. (2014a).*

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