

Circular Strategies in the Swedish Furniture Industry – A Business Modelling Approach

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Abstract. The interest in circularity and circular strategies is increasing in the furniture industry. Wood is a climate-smart and sustainable material, partly because it has many environmental advantages compared to other materials such as plastic or metal, partly because it is a highly renewable material. Today, the technical lifespan of wood products such as furniture is not fully utilized. Today, the technical lifespan of wood products such as furniture is not fully utilized, which could be explored through circular strategies. By extending the life of products, components, and materials, the environmental impact could be significantly reduced. However, several challenges have been identified that hinder the establishment of circular strategies. Inconsistent policies and obstructive legislation, high initial costs and long payback periods, low consumer awareness, and lack of collaboration in the value chain are examples of main challenges. The research question addressed in this paper is How to facilitate the circular development of the Swedish furniture industry by promoting circular business models? This paper discusses the barriers and drivers of circularity with specific focus on the characteristics of the furniture industry in the Swedish context. A conceptual approach for establishing circular strategies in the furniture industry based on the 10R model, the business model canvas, and the product-service system approach is proposed. The approach facilitates the identification of relevant circular strategies that can be developed into circular business models. The paper concludes that circular strategies and business models entail positive economic, environmental, and social sustainability impacts for customers, companies, as well as on the society, but to achieve the benefits, organizational and technical solutions addressing the barriers on organizational, industry, and societal level must be developed. Circular business models are a way to overcome several of the barriers while promoting industrial and value chain collaboration.

Keywords. Furniture industry, 10R, circular strategies, product-service systems, circular business models

1. Introduction

The Swedish furniture industry is facing various economic, environmental, and regulatory challenges in the present-day business environment. In the international

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market the furniture industry faces pressure due to increased international manufacturing growth, reduced tariffs, and improved logistics practices. At the European level, the European Furniture Industries Confederation and the European Environmental Bureau are examples of organizations promoting circularity in the wood products industry. Minimized resource consumption, value recovery, economic growth, and job creation are some of the drivers for circularity [1, 2]. Within the domestic market, industry encounters challengers due to demand for low-cost items as the businesses struggle to manufacture products with extended lifespan with quality. Furthermore, the cost of raw materials, labor, and energy is a challenge to businesses. To address these challenges, the industry must adapt new strategies to thrive in the business [1, 2]. Circular economy (CE) provides promising solutions for businesses by retaining value through efficient use of resources, energy and labor which bring value to the consumer and profitable to the businesses [3].

It is identified from the literature that industry faces structural, market, cultural and technological related CE barriers [4]. For the furniture industry, the most prominent CE barriers are of structural, market, and cultural type [2, 5, 6], while technology is mainly seen as a driver [1]. The structural barriers comprise of limited collection and reverse logistics infrastructure, inconsistent policies and obstructive legislation, no collaboration in the value chain – poor demand for remanufactured materials, and weak overarching policies [6]. Literature demonstrates inconsistencies in policy as mainly occurred barrier [4]. The heterogeneity in policies is visible by the limitation of chemical content in UK as the inconsistency in flame retardant limitation serving to impede the trade of used furniture between UK and EU [2]. The market barriers comprise of high cost of repair and refurbishment, limited funding for circular business models, limited infrastructure for reverse logistics, high initial costs, and long payback periods [2, 5, 6]. Grafström and Aasma [4] argues since market barriers and technological barriers related to other barriers, eliminating one of them could lead to unraveling. Many cultural barriers relate in low consumer enthusiasm such as weak demand for second-hand furniture and due to poor consumer information and linear lock-in incorporating lower quality materials, poor design, availability of spares, and poor demand for remanufactured materials [2, 4, 6, 7].

Several drivers including consumer engagement, institutional regulatory factors, environmental conscious leadership, and internal company culture contribute to the transition towards a CE. Responsible consumers play a vital role in transitioning towards a CE [3]. Especially the eco-concerned consumer groups tend to purchase second-hand furniture to reduce the footprint. Although several studies acknowledge the consumer as a driver, the study by De Vass et al. [7] recognizes the consumer as a barrier rather than a driver. The institutional regulatory factors of implementing concrete regulatory measures and cultural/cognitive pressure within the organization has been recognized as a CE driver [8]. European Union's REACH regulations and other EU regulations assist actors of furniture manufacturers to establish internationally harmonized demand for suppliers within this sector. The CE is significantly influenced by conscious leadership as well as top management within an organization. The daily operations management which incorporates CE business models is an effective CE initiative. Furthermore, the findings from [7] demonstrate that internal company culture leverages the systematic CE adoption through company operations, mission, and strategies.

Several circular strategies and business models exist that could deal with the above-mentioned challenges and barriers and promote CE in the Swedish furniture industry. Consequently, the research question addressed in this paper is *How to facilitate the circular development of the Swedish furniture industry by promoting circular business*

models? Some previous attempts to align CE with business modelling are found. [9], for instance used the Business Model Canvas in a framework aimed at guiding companies in developing product-service systems, while Rosenlund [10] used it in combination with the 10R model for supporting circular business model development. However, a structured approach for developing circular business models is lacking. This paper extends the understanding of circular business model development by synthesizing previous approaches. The main purpose of the paper is to *propose an approach for establishing circular business models*.

2. Research design

The study applies a design research methodology approach, consisting of four main phases: *research clarification (RC)* in which the problem is investigated and goals are set, *descriptive study I (DSI)* in which the current situation is understood, *prescriptive study (PS)* in which a solution is designed for reaching the set goal, and *descriptive study II (DSII)* aiming at evaluating the solution [11]. This paper mainly reports on the outcomes of the prescriptive phase. In the RC, a broad literature review was conducted on the topic of circular economy in the wood and furniture industry. The review included scholarly articles, research reports, and theses. The empirical study conducted during DCI comprised 21 interviews, and a full day workshop, with industry representatives. Parts of the findings from the RC and DSI phases are found in [12]. During the workshop circular business models were mentioned amongst possible solutions, but it was also noted that the knowledge regarding CE and how to establish circular business models was lacking. In the PS an additional literature review was made focusing on circular strategies and business model development using the keyword combinations “circular economy”, “circular strategy”, “business model”, and “business model development”. The review confirmed the lack of models for establishing circular business models, whereby a conceptual approach was developed to address this gap, and to facilitate circular development of the Swedish furniture industry.

3. Theoretical framework

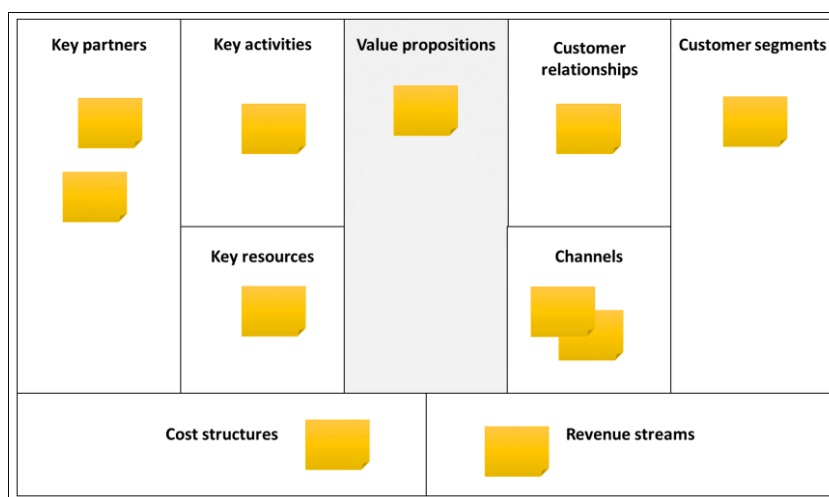
In this section, for the paper central theories regarding business models and circular strategies are presented.

3.1. Business model development and the business model canvas

A business model constitutes a fundamental conceptual framework that highlights the operational dynamics through which a company orchestrates its activities to deliver and capture value within a specified market context. It serves as the fundamental framework upon which business strategies are conceived and executed. A seminal instrument for comprehending and designing business models is the Business Model Canvas (BMC), by Osterwalder and Pigneur [13]. The business model canvas (see Figure 1) is a visual and systemic template, consisting of nine pivotal building blocks (see Table 1).

Table 1. Building blocks of the business model canvas according to [13]

Building block	Description
Key Partnerships	External collaborations and strategic partnerships are illuminated to enhance the business's capabilities.
Key Activities	Key operational activities necessary for the execution of the business model are delineated here, encompassing core processes and functions.
Key Resources	Essential assets, infrastructure, and competencies required to underpin the delivery of the value proposition are articulated in this block.
Cost Structures	The cost structure encompasses the full spectrum of expenditures intrinsic to the operation of the business model.
Value Propositions	This block articulates the distinctive value that a product or service offers, designed to address the particular needs, wants, or challenges of the chosen customer segments.
Customer Relationships	Companies are prompted to delineate the nature of relationships they cultivate with their clientele, whether characterized by personalization, self-service options, or other configurations.
Channels	The channels component delineates the multilateral connections through which a company interacts with its customer segments and delivers the value.
Customer segments	This foundational element refers to the identification and segmentation of the specific clienteles or user groups that a business endeavors to serve.
Revenue Streams	This dimension encapsulates mechanisms and strategies employed by a business to realize financial returns from its customer segments.

**Figure 1.** The business model canvas.

3.2. Circular strategies according to the 10R model

The 10R model includes ten circular strategies: recovering and recycling of material, repurposing and remanufacturing of components and products, refurbishment, repair, and reuse of products, and promoting smart production, products, and services by reducing, refusing, and rethinking the purpose of products [3, 14]. The model is displayed in Figure 2.

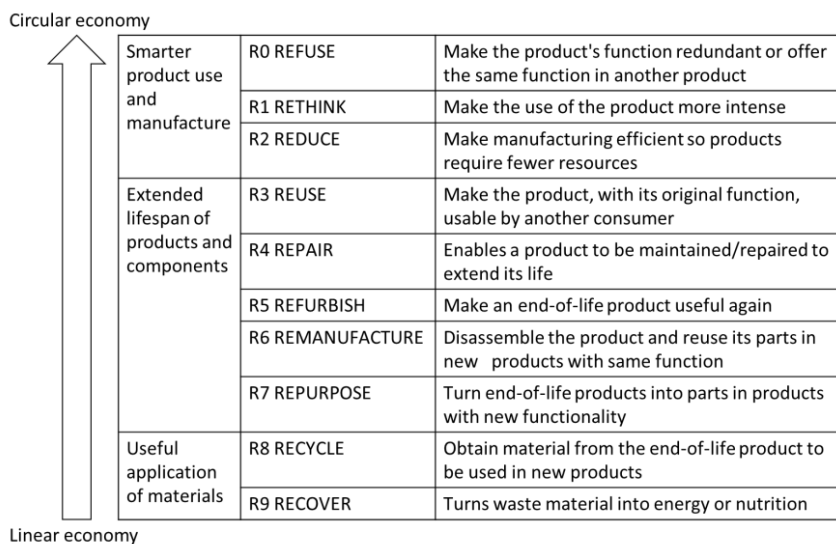


Figure 2. The 10R model.

R0-R3 aim at minimizing the introduction of virgin materials in the value chain by reducing waste in production and maximize product use. In this respect, R0 stand for the highest order of waste reduction, in that the physical product is replaced with other alternative products and/or services. For example, the e-mail is replacing the physical mail, which reduces the need of virgin wood material to produce pulp and paper.

R4-7 aim at extending the lifespan of an existing product. Several options exist for realizing this; the product could be sold on the second-hand market, either by the consumer or through specialized second-hand traders, the product could undergo maintenance performed by the consumer or a maintenance service provider, or it could be returned to the original manufacturer for remanufacturing in an industrial scale. While R4-6 give the product an extended or new life cycle, R7 make use of components or the full product to create new products.

R8-9 aim at salvaging material in the end-of-the-life of a product. If a product cannot be maintained or repurposed, using the material in new products is a good alternative. If this is not possible, the material could be turned into energy or nutrition, for instance using wood products and other biomaterial as fuel in heating plants.

3.3. Circular business models

A circular business model describes the value generating process of a company with the aim of reducing resource waste throughout its lifetime. Nußholz [15, p. 12] provides the following definition of circular business model: “A circular business model is how a company creates, captures, and delivers value with the value creation logic designed to improve resource efficiency through contributing to extending useful life of products and parts (e.g., through long-life design, repair and remanufacturing) and closing material loops.”

Amongst the first attempts to connect circularity with business models is found in [16], where Tukker evaluates the environmental and economic impact of eight types of

Product Service Systems (PSS): 1) Product oriented (Product related, Advice & consultancy), 2) Use oriented (Product lease, Product renting/sharing, Product pooling), and 3) Result oriented (Activity management/Outsourcing, Pay per service unit, Functional result). The conclusions are rather discouraging; even if Tukker find that the sustainability impact in general increase the more advanced PSS, he also sees problems in realizing true value out of them due to e.g., insufficient performance measures and the reluctance of customers to choose an intangible service instead of a tangible product. Following [16], Meier et al. [17] focus on Industrial Product-Service Systems, which represent an integrated approach where manufacturing and services seamlessly converge to create value for businesses and customers. These systems emphasize customization, extending product lifecycles, and eco-efficiency. In the quest for sustainability, Industrial PSSes align with circular business models, emphasizing the shift from traditional product-centric offerings to holistic service-oriented solutions. Here, companies could tailor products to customer needs, design for longevity, offer a blend of products and services, and prioritize eco-efficiency. These strategies are described to contribute to resource optimization, environmental responsibility, and a more resilient and sustainable industrial landscape.

In [18], circular business models were classified into four generic types: 1) Cycling, 2) Extending, 3) Intensifying, and 4) Dematerialising. In this classification framework, which is based on an extensive literature review, cycling business models covers business models for reuse, remanufacturing, refurbishing, and recycling. Extending business models focus on extending the use phase of the product by design, marketing, maintenance, and repair. Intensifying business models aim at intensifying the use of products by sharing, i.e., the same logic as found in use-oriented PSS, while the product is substituted by services or software in dematerialising business models equivalent to result-oriented PSS. In [19] another classification of circular business models is suggested. Based on 21 existing classifications, seven basic types are suggested: 1) Resource models, 2) Design models, 3) Lifetime extension models, 4) Platform (sharing) models, 5) Product-as-a-service models, 6) End-of-life models, and 7) Lifecycle models. Resource models are used for salvaging materials, components, and products at the end of life. Design models aim at product design for circularity, such as design for repair, design for recovery, and design for lifetime extension. Lifetime extension models aim at extending the use of products by repair and maintenance. Platform models and product as a service models aim at intensifying the use of products by sharing the product or providing access to the function. The end-of-life models focus on the responsibility of the producer to handle the product in a safe and appropriate way at the end of life, while lifecycle models focus on the producer's ownership throughout the entire lifecycle of the product.

4. A conceptual approach for establishing circular business models

This section establishes the relevance of a business modelling approach for dealing with the identified barriers and challenges of the Swedish furniture industry and proposes a conceptual approach for facilitating circular business model development.

4.1. Circular business models as a means to reduce barriers and challenges

Based on [4], the challenges and barriers are summarized into technological, structural, market, and cultural dimensions.

Technological Challenges: The furniture industry grapples with a deficiency in technical knowledge, compounded by the absence of data and information technology systems necessary for measuring and monitoring circular progress. The application of the BMC could aid in the identification of these weaknesses within a company's technological infrastructure. By scrutinizing the *key activities* and *key resources* blocks of the BMC, companies can ascertain the gaps in technical know-how and data management, guiding them to develop new competencies in these areas. Additionally, BMC facilitates internal discussions aimed at rectifying technological deficiencies.

Technology, being a key driver for the promotion of the circular business model, can be utilized to develop channels and key activities within organizations. Leveraging technology can facilitate efficient material tracking, optimize resource utilization, and enhance communication and collaboration across the circular value chain. This, in turn, can catalyze the transition towards a more sustainable and circular approach within the furniture industry.

Structural Challenges: The limited collection of recycled materials, components, and products, as well as the absence of a well-established reverse logistics infrastructure, impedes the transition to circularity. Furthermore, inconsistent policies, obstructive legislation, and a dearth of overarching policy drivers create structural obstacles. We propose that the BMC could serve as a diagnostic tool to assess the structural weaknesses within an organization. By examining the *key partnership* and *key activities* components, companies can identify their limitations in material sourcing and logistics, enabling the development of strategies to overcome these barriers.

One prominent structural challenge pertains to the limitations in reverse logistics infrastructure, scarcity of raw materials, regulatory constraints, and the need for robust collaborations within the industry. These barriers can be overcome by identifying key partners such as circular material suppliers, technology sharing platforms, and reverse logistics service, etc., and integrating them into the circular business canvas, thereby enhancing the flow of resources and knowledge.

Market Challenges: CE strategies often entail high initial costs and long payback periods, deterring companies from embracing circular practices. Utilizing BMC, organizations can scrutinize the *revenue streams* and *customer segments* sections, identifying market-related hindrances. This information facilitates discussions within the company to reevaluate pricing structures and revenue sources, making circular solutions more financially viable.

Market barriers, such as the higher costs associated with implementing 10R strategies, can be effectively addressed through the approaches of increased demand for circular strategies through enhanced customer engagement, and reevaluating the cost structure of the circular value propositions. By improving customer relationships and cost structure blocks of the canvas, economic incentives align with sustainable practices. Consumer preferences and demands regarding increased sustainability could also drive change towards more circular business models in the furniture industry [6].

Cultural Challenges: A reluctance to demand circular furniture and insufficient consumer awareness are cultural barriers. Moreover, linear lock-in effects result in lower quality materials, suboptimal designs, and the unavailability of spare parts. The *customer relationships* and *customer segments* aspects of BMC enable organizations to understand

these cultural impediments. By employing BMC, companies can engage in conversations that would transform consumer perceptions and preferences, thereby driving demand for circular furniture. Cultural challenges consist of both internal and external culture, where internal culture is significantly impacted by primary and secondary mechanisms (primary would include leadership, decision-making, and secondary would include formal vision and mission statements). The external culture would include value and preferences in the industrial networks.

To address the cultural barriers, businesses should focus on expanding channels for information flow to customers, raising awareness about circular practices, and developing key resources of the business to increase the availability of recyclable and sustainable materials. A culture shift towards circularity necessitates education and accessibility for all stakeholders involved. Furthermore, the internal company culture with the leadership with conscious decision-making considering circular values is highly necessary to develop circular business models for the organizations.

4.2. Approach development

Banquet et al. [9] presented a structured approach for business model innovation focusing on PSS in three steps: description of the business context using the business model canvas, selection of PSS type for future business models, and characterizing the future PSS using the elements of the business model canvas. The approach for developing circular business models suggested by Rosenlund [10] is based on the same logic: defining current state, identifying future possibilities, and specifying the future business model. Rosenlund also utilizes the business model canvas for defining current context and characterizing possible business models. The selection of future business models is based on the 10R model and not the PSS, though. Our approach is a synthesis of these two approaches, with the difference that the future possibilities are defined first by looking at circular strategies, and thereafter selecting a suitable business model to reach this strategy.

A key feature of the approach is the mapping of circular strategies with respect to business models. For realizing this, mapping business models with respect to circular strategies was necessary. The mapping is based on different classifications of circular business model classifications see e.g., [16, 18, 19]. The result is found in Table 2. For the reducing strategy (R3), a new form of circular business model is proposed, titled “Sustainability as a product” that focuses on marketing sustainable products and production. The more circular the strategy, the more intangible the value proposition becomes; product-oriented PSS are found in R3-R9, while use-oriented and result-oriented PSS support levels R0-2. This implies that focusing on advanced PSS models may yield higher CE opportunities than other business models.

Circular business models invariably entail specific costs associated with materials recovery, recycling, and sustainability certifications and may manifest innovative revenue streams through the extension of product life, remanufacturing, or materials recovery. Notably, in the sphere of circular business models the *value propositions* may accentuate sustainability, longevity, and environmental compatibility [20]. *Key resources* and *key activities* often revolve around eco-efficient production methodologies, materials reuse, and recycling endeavors, such as recycling operations, sustainable sourcing, and eco-design [18]. Resource considerations may focus on eco-efficient production technologies and material reuse capabilities. Moreover, *key partnerships* in circular models frequently encompass a network of stakeholders engaged

in the circular economy, necessitating intricate coordination [21]. These partnerships often entail liaising with recycling facilities, waste management entities, and suppliers of sustainable materials. *Customer segments* may extend beyond end-users to encompass stakeholders engaged in product recycling or refurbishment. *Channels* extend to encompass the complexities of reverse logistics and recycling networks, reflecting the circular nature of the endeavor [22]. Post-sale engagement and education, particularly in the context of sustainable practices, can have increased importance in terms of *Customer Relationships* [15].

Table 2. Mapping of circular strategies towards circular business models

Circular strategy	Circular business model	PSS type
R0 REFUSE	Performance as a service	Mainly use oriented and result oriented PSS
R1 RETHINK	Products as a service, Performance as a service	
R2 REDUCE	Sustainability as a product	
R3 REUSE	Life extension (Second-hand sales)	
R4 REPAIR	Life extension (Maintenance services on site or centralized)	
R5 REFURBISH	Life extension (Maintenance services centralized)	Mainly result oriented PSS
R6 REMANUFACTURE	End-of-life reuse (Remanufacturing)	
R7 REPURPOSE	End-of-life reuse (Repurposing)	
R8 RECYCLE	Waste management, Circular raw materials (Material upcycling & recycling/downcycling)	
R9 RECOVER	Waste management	

These nuanced adaptations serve to underscore the specialized and sustainability-centric nature of circular business models, which are underpinned by principles of resource optimization and environmental consciousness. The BMC remains a structured and indispensable framework for the methodical analysis and design of such models, ensuring their efficacy and alignment with the imperatives of the circular economy, i.e., a Circular Business Model Canvas (CBMC).

4.3. Approach description

Four main steps are included in the conceptual approach, see Figure 3:

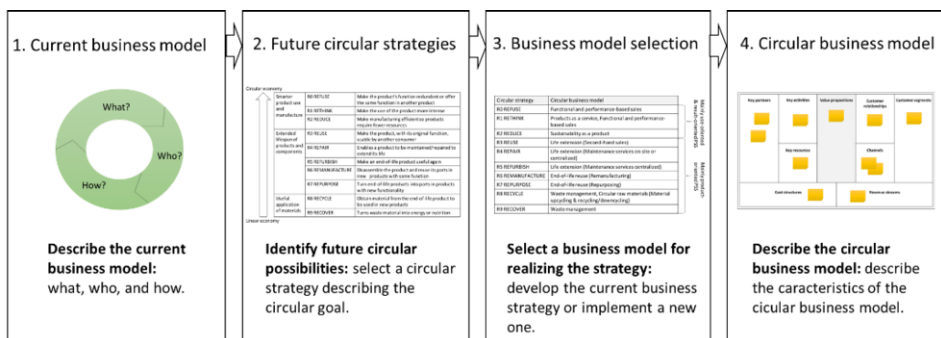


Figure 3. Approach for establishing circular business models.

Step 1: Current business models: Step 1 of the process involves a comprehensive analysis of the “what”, “who”, and “how” aspects of a business, leading to the establishment of its structural foundation. The success of a business's value proposition

relies on its ability to create value from its products and services, quality, and functionality of the product. In the “what” phase, the business defines the role by identifying what values they create, problems addressing, and the contributions they make to the customers while meeting customer requirements. Therefore, this phase addresses the value proposition block of the BMC. The “who” phase focuses on stakeholders, including customers, who generate revenue by engaging with the business's creating. It is essential to identify the customer base, target groups, and engagement strategies. This phase can be mapped for the customer segment, key partners, and customer relationships of the business model canvas. In the “how” phase, businesses must elucidate how the value is created. This involves leveraging various strategies, resources, and competencies to achieve desired outcomes while examining costs, associate with waste, material, and production. This phase further analyzes the important activities and key resources necessary for the business's operations. Therefore, this phase addresses the key resources, key activities, channels, cost structure, and revenue streams from the business model canvas.

Step 2: Future circular strategies: Step 2 of the approach is developed to conduct comprehensive analysis of business strategies in the context of the 10R framework. Within this stage, the organization need to evaluate circular strategies that encompass smarter way of production and manufacturing processes to minimize utilizing virgin raw materials using R0-R3, extension of product and component lifespans by using R4-R7, and the optimization of material utilization to promote efficient resource allocation by considering R8-R9. Our goal in this step is to identify the extant circular strategies within the business and to explore the potential for future circular strategies.

Step 3: Business model selection: In accordance with the prescribed process, step 3 involves aligning circular strategies with the objective of formulating circular business models with integrating PSS. These strategies, encompassing both existing and potential ones, are systematically matched with appropriate business models following the 10R framework. This step critically assesses how the business create value adhering various facets of the circular economy, such as performance as a service, product as a service, life extension, sustainability as a product, end-of-life reuse, waste management, and the utilization of circular raw materials. Each of these facets embodies the principles of a circular business model characterized by intangible service components that effectively address customer needs. Specifically, the strategies from R0 to R2 are associated with use-oriented and result-oriented PSS. Strategies falling within the R3 to R5 are focused on extending the product's lifespan and it is able to integrate with result-oriented PSS. For instance, the R3 strategy of reuse can be implemented through second-hand usage, facilitated by services like rental, leasing, and product pooling. R6 to R9 strategies primarily pertain to product-oriented services within the circular business model paradigm. During this stage the businesses are able to create or improve their circular business models by integrating PSS.

Step 4: Circular business models: The final stage of the approach involves innovating the current business model or developing new possible circular business model or models, according to the blocks of the BMC. In this regard, the value proposition comprises highest significance within this approach, in the form of intangible service for the creation of novel customer value and the generation of profits for the organizations. Consequently, this final stage generates new revenue streams, tailored to the innovative circular business model through extension of life span, remanufacturing, recovery, etc. To operationalize the circular business model, various channels such as reverse logistics, third-party remanufacturers, and recycling networks may be established.

Moreover, customer relationships will be managed with a sustainability aspect, encompassing post-sale engagement and educational initiatives to enhance customer knowledge. The key resources within the CBMC will include the development of novel technologies aimed at enhancing eco-efficiency and material reuse capabilities. As a direct outcome of the progression from stage 3, novel key activities will emerge, encompassing core processes and functions related to recycling operations, sustainability sourcing, and eco-design. Furthermore, strategic partnerships will develop with recycling facilities, waste management entities, and suppliers of circular raw materials. As a result of the final stage the building blocks for a circular business canvas will be constructed.

5. Conclusions

This paper promotes a business modelling approach for facilitating the circular development of the Swedish furniture industry. Such an approach effectively addresses different types of barriers that were identified. A conceptual approach for establishing circular business models is proposed that supports the practical definition of circular business opportunities and the development and concretization of suitable business models. The approach synthesizes available theories and methods into four main logical steps, from analyzing current business models and identifying future possibilities to realizing these in the form of a circular business model. An essential element involves aligning circular strategies with business models. To achieve this alignment, business models were mapped in relation to circular strategies.

The approach is instrumental in addressing pertinent challenges and barriers that have been identified in the context of the furniture industry's transition towards circularity. This approach provides a holistic strategy for overcoming the structural, market, cultural, and technological barriers that impede the transition towards a more sustainable and circular business model. By incorporating the Business Model Canvas into strategic planning, the furniture industry can pinpoint weaknesses and devise strategies to overcome challenges and barriers. The BMC not only serves as a diagnostic tool but also encourages organizational dialogues essential for transitioning towards circular business models that can ultimately shape the future of the Swedish furniture industry. Businesses can effectively address various challenges significant to the furniture industry by leveraging the Circular Business Canvas framework. Future research includes verifying the approach in case studies where the process is used for the development of circular business models in furniture industry companies.

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