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# Adaptation of the business model canvas template to develop business models for the circular economy

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## Abstract

The Business Model Canvas as a template for strategic management serves the development of new or the documentation of existing linear business models. However, the change towards a Circular Economy requires new value creation structures and thus changed business models. To develop business models for circular economies, it is necessary to adapt the existing template, since the actors involved along the value chain take on changed roles. In the context of this paper, a template is presented, based on the existing Business Model Canvas, which allows to develop and document business models for a Circular Economy.

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## 1. Introduction

The consequences of accelerating global warming, resource depletion and the increasing destruction of entire ecosystems are increasingly becoming the focus of top management at many companies. For a long time, the disciplines business administration and management practice neglected the negative effects of entrepreneurial activity on the environment. The responsibility for solutions to the resulting problems is transferred to political or social actors. However, the growing awareness of consumers and the population, alerting price fluctuations and scarcity problems in the procurement of raw materials, as well as adapting laws, are putting companies and their value chains under increasing pressure. In this context, corporate sustainability offers a strategic competitive advantage and spectacular development potential. Nature-compatible economic forms, such as the circular economy, combine ecological and economic potential benefits. Circular business models that break away from linear consumption and follow the paradigm of sustainably decoupling economic growth from resource consumption are

fundamental for a development towards a circular economy. This transformation is accompanied with economic interests being connected with ecological forms of economy as a prerequisite for initiating a corporate rethinking. In the literature, there is a multitude of approaches to innovate circular business models considering sustainability aspects. Despite these numerous considerations, the transformation to a circular economy is implemented very hesitantly with isolated initiatives. Previous approaches have largely neglected the importance of horizontal integration and cross-company collaborations to realize valuable synergy and symbiosis effects independent of the industry to secure competitive advantages along value chains. In particular, the consideration of new technologies and forms of organization, such as digital ecosystems, must be incorporated into future considerations and approaches. This paper presents a template for the development of circular business models that incorporates the value creation perspective across company boundaries. The generation of industry-independent synergy and symbiosis effects embedded in a digital ecosystem is included as an enabler to overcome previous limits and barriers to the

establishment of circular value networks. The aim of the presented template in this paper is to create application-oriented modules with which the industry can design business models for an economy that is holistically renewable and regenerative and keep products, components and materials at their maximum utility and value at all times [1].

## 2. Circular Business Model Approaches

The transition towards a circular economy needs innovative business models, which either replace existing ones or grab new opportunities and is considered as one of the main challenges for successful implementation of circular economy [2]. Renswoude et al. analysed six possibilities of circular value creation: short cycle, long cycle, cascades, pure circles, dematerialised services and produce on demand. Based on these possibilities, nineteen circular business models are categorised. These circular business models are covered most of the sustainable business model archetypes and support that circular business models enhance sustainability [3]. Most of existing tools supporting the development of circular economy business models based on the established business model canvas [4], which is mainly focused on linear economy. Lewandowski developed the circular business model canvas by applying circular economy principles to the grids of the business model canvas and extended the existing approach by the two grids “Take-Back-System” and “Adoption Factor” [5]. The Sustainable Business Canvas adapt and extend the Business Model Canvas to 10 elements [6]. The main difference to the existing canvas approach is the consideration of organizational effectiveness and efficiency, drivers of productivity and external effects. The approach includes a solid collection of relevant suggestions for companies looking to improve their service model. The Circular Business Model Planning Tool build on more generic types of business model canvas –following Osterwalder and Pigneur [4] - as part of the tool [7]. The structured canvas tool supports the user in generating ideas and designing circular value-added structures. It also supports the evaluation and improvement of processes. The structured canvas tool supports the user in generating ideas and designing circular value-added structures. It also supports the evaluation and improvement of processes. The Business Model Navigator is a comprehensive, process-oriented methodology for developing business models in four phases (initiation, idea generation, integration, and implementation) and with the help of special techniques. The procedure is based on an empirical study by the University of St. Gallen, which found that 90% of all new business models consist of existing models or recombination of existing models. In the process, 55 different business model patterns were identified, showing how the four most important components of a business model can be designed [8]. The Business Model Navigator is not specifically designed for the development of circular value creation systems. The questions raised in this survey are relevant for circular business models but are insufficient reflecting the interaction of partners in circular value creation networks regarding the complexity of bi-directional material and information flows and the considerable larger number of

participants. Konietzko et al. develop a tool and approach to analyse, ideate, and develop the circularity potential of innovation ecosystems. The tool based on a literature and practice review of recent circular economy strategies and principles [9]. The developed Circularity Deck considers numerous aspects of a circular economy and addresses symbioses along value chains as well the ecosystem perspective. The tool is easy to use for entrepreneurs, innovation managers, business managers and designers.

Pieroni et al. provides a detailed literature review in the field of circular business model development [10]. The article systematically identifies and compares 92 approaches for a sustainable and circular development of business model innovations. The analysis identified further research needs in the following areas:

- Consideration of the interdependencies of a business model as a holistic system.
- Development of practicable approaches and methods for the systematic analysis of material flows across company boundaries.
- Incorporation of human-behaviour aspects.

Bocken et al. suggested several avenues for future research to support the operationalization and mainstreaming of Circular Business Models. As a conclusion of this contribution, future research should contribute to the trailing of new circular business models to find the most suitable ones for business as well as supporting the organizational changes dynamics of transforming businesses dominant business models for a Circular Economy [11].

The derived research needs of current literature research are very similar and illustrate the current research gap in the areas of integration of circular business collaborations for the connected use of synergy and symbiosis effects as well as the increased networking of ecological and economic benefit potentials. In addition, it is necessary to investigate how innovative technologies and digital ecosystems enable circular and thus nature-compatible forms of economy. However, shifting form a traditional business model to digital ecosystems with circular business models is challenging for businesses and current strategy templates are of little help.

## 3. Preliminary Considerations

With our current linear economy, we run the risk of causing irreparable damage to our natural ecosystem and people are becoming increasingly aware of these facts. Therefor the template aims to transform doing business and consider changing consumer behaviour and regulations, reduce the resource dependency, and secures competitive advantages. For this purpose, we developed a template to initiate change from a systemic perspective, which enables the innovation of individual circular business models and embeds them in an aligned ecosystem.

3.1. Digital Ecosystem Perspective as an Enabler for Circular Business Models

Taking an ecosystem perspective is valuable because it allows a shift to a new structure of economic collaborations [12] - shed light on the interdependencies between activities and technologies of different business, where innovation becomes the unit of interest [13]. For the development of circular business models, it is important to change the perspective from a micro view of supply chains to an integrated macro view that focuses on the value creation of different stakeholders of an ecosystem [13]. Therefore, companies must be able to widen their perspective and understand that products and services have an impact on the business throughout their entire life cycle. In a digital ecosystem, companies and individuals cooperate with each other who are independent but who expect synergy and symbiosis effects from the collaboration. At the heart of a digital ecosystem is a digital platform that supports these collaborations particularly well. The digital platform enables many partners to interact within a network and to align their activities for the benefit of all participants. The high complexity of bi-directional material and information flows, the increased number of partners involved along a circular economy, but also the cross-company and cross-industry collaboration require such digital ecosystems as enablers for circular business models. Digital ecosystems can synchronize the interdependencies of activities and applied technologies and allow for completely new ideas and approaches in the development of circular value networks. However, digital ecosystems can not only enable the implementation and processing of circular business models, but also play a crucial role in their development and evolution. Through the digital platform, different stakeholders, such as suppliers, customers, but also value creation partners or social actors, can be involved already during the development process of circular business processes - for example with crowd founding areas.

4. Template to develop Business Models for Circular Economy

The development of the template is based on the original Business Model Canvas [4] and extends it by circular value creation structures on different levels of value creation, independent of company and industry and with integration of the ecosystem idea as enabler. The template support to disconnect the relation between sales and raw material extraction that predominates in the linear economy [14,15]. To identify the potential of circular value creation mechanism, the ideas can be clustered into five modules. Figure 1 shows in different colours which areas of the Business Model Canvas are affected by the individual recovery levels. In the case of direct reuse, the design of the revenue streams must be considered in addition to other patterns of customer relations. The cascade refurbishment and remanufacturing require an adjustment of the pattern value proposition and customer patterns in the circular value creation process. If different companies are involved in the circular value creation, it is also necessary to define how the interactions of the partners

involved are designed for the remanufacturing and refurbishment processes. The lowest level of circular value creation is the recycling of materials into secondary raw materials. This substitution of primary raw materials by secondary raw materials affects the patterns on the supplier side and primarily influences the cost structure.

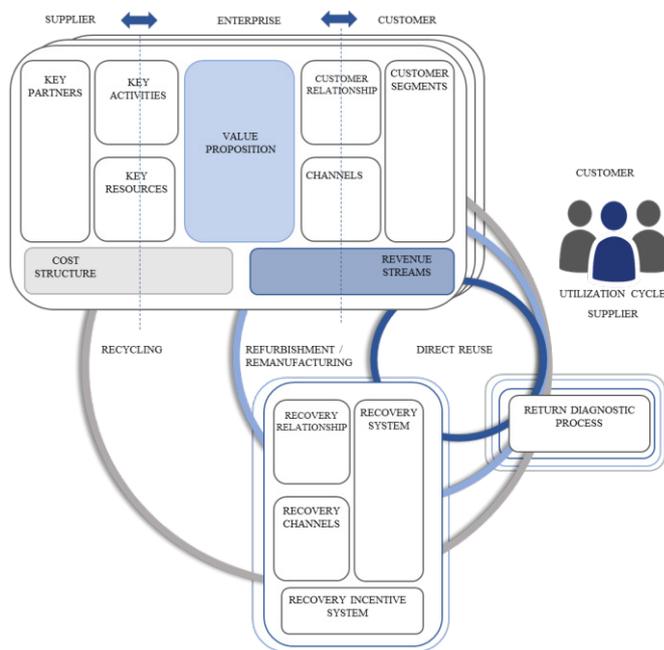


Fig. 1. Template to develop Circular Business Models

4.1. Horizontal- and Cross-Integration of the value streams

In future, business models must be considered in a more integrated way - especially business models that distance themselves from linear consumption. Company or industry boundaries are not permitted to limit new forms of collaboration in circular value creation networks.

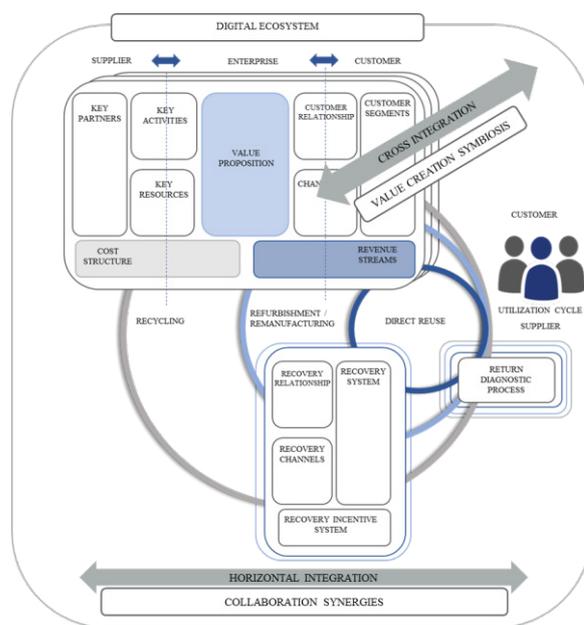


Fig. 2. Digital Ecosystem as an Enabler for the Horizontal- and Cross-integration

Therefore, the template is supplemented by horizontal integration for the generation of synergy effects through collaboration and cross integration for the use of sector-independent symbioses (Fig. 2).

## 5. Modular structure of the template

As known from ecosystem research, these different modules are divisible and enable interdependence [12], what provides the basis to develop horizontal- and cross-integrated circular business models to enhance industrial symbioses and synergies.

In the following, the five patterns that extend the existing Business Model Canvas [4] are discussed. These patterns enable to surrounding the loop in the development of circular business models.

### 5.1. Return Diagnostic Process

When customers become suppliers of used products or secondary materials at the end of the utilization cycle, it is necessary to investigate in advance at which value-added level of their own horizontal supply chain or cross-integrated the return is made. Cascades are distinguished depending on the condition of the used product. In addition to the direct reuse of a product or material, refurbishment or remanufacturing as well as the recycling of secondary raw materials can also take place as a return. The module “return diagnostic process” includes all necessary testing and, if necessary, dismantling processes to assess how the post-use phase of the product or material is most economically and ecologically. From an organizational point of view, this can be carried out at the OEM, as he usually has direct contact with the customer, or via a third service provider. In future, this process will be completely represented or at least supported by digital technologies. As a result, products and materials will be equipped with intelligent components that can provide real-time information about the status. By means of machine learning, it will be possible to assess over the entire product life cycle at which value-added level a product or material can be reintroduced into the economic cycle at the end of its use phase [13].

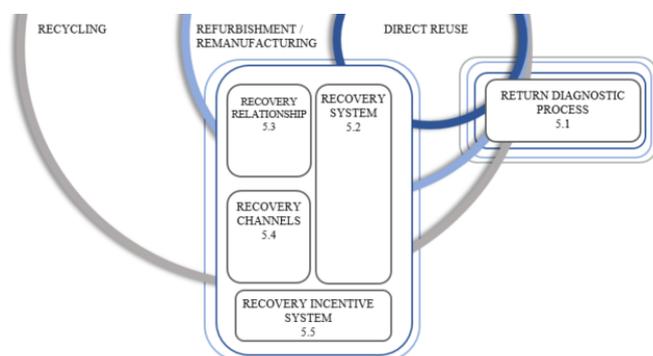


Fig. 3. Recovery modules of the developed template

### 5.2. Recovery System

The "value proposition" module establishes the connection between the individual components of a linear business model - this systemic perspective is to extend to circular business models. Therefore, it is essential to transparently present the systemic connections of the recovery system and the associated generated added value. For this purpose, the "recovery system" module will describe the potential benefits for the partners involved in the development of circular business models.

### 5.3. Recovery Relationship

Surrounding the loop in a Circular Economy requires a rethink from linear value creation to an integrated and systemic ecosystem in which companies and individuals coordinate their circular actions collaborative and align their business processes on a shared value proposition. Products are preferable used if environmentally reasonable, so usually the material cycles close typically after months or years. This highlights the long-time nature of circular business structures and the importance of suitable partners. Designing circular business models, the return of products and materials at the end of their use phase is a key success factor. This also influences the customer-supplier relationship, which is reversed in this phase. The customer becomes the supplier of used products and materials. To succeed this systemic change, recovery relationships must be defined in a circular business model. In some cases, business models that break away from linear consumption already regulate the recovery relationship by ensuring that the ownership of a product or material does not pass to the customer at any time. With all other business models, it is important to ensure that all parties involved benefit from the partnership in the recovery relation.

### 5.4. Recovery Channels

The module “recovery channels” are a critical element by the development of circular business models and describe how a company communicates with and reaches its customer segments, who at the end of the utilization cycle become return suppliers of used products, components and secondary raw materials. Recovery channels can be direct or indirect and include the parts awareness, evaluation, repurchase, reverse logistics and after-recovery services. Smooth communication is an essential success factor for recovery channels. Digital ecosystems are able to control or even optimize these complex information flows in circular business models. For example, algorithms from artificial intelligence make it possible to detect future changes at an early stage and improve the probability of forecasting demand and returns within circular value-added networks.

### 5.5. Recovery Incentive System

The module “recovery incentive system” helps to find innovative ways to capture and capitalize value for the recovery of used products and materials. Incentives for

companies can be improved customer loyalty, lower procurement costs but also increased manufacturer responsibility and thus regulatory requirements and sustainable marketing. The customer can benefit from monetary incentives as an incentive for the return delivery or through use-related payment models as well as reduced waste quantities and associated disposal costs. In this module, it is important to define which partner assumes which share of the return costs or participates in the ecological and economic benefits. Digital calculation algorithms provided via an ecosystem platform can evaluate the complex cost/benefit relationships in circular business models and thus distribute the potential benefits as incentive fairly for all partners involved through industrial synergies and symbioses.

## 6. Critical Reflection

Based on our research, we developed a template that extend the existing Business Model Canvas to develop consistent business model for circular economies. This involves an integrated consideration of digital ecosystems, on the one hand as enablers of complex circular value-added networks and on the other hand to generate innovative ideas for circular business models. During application-oriented research with companies, it became increasingly clear how important incentive systems in form of industrial synergies and symbioses are to accelerate a circular economy. The horizontal as well as the integration of cross industries enables new forms of collaboration and the creation of circular shared value propositions.

### 6.1. Limitations

Currently, OEMs have the power to initiate circular business models because they benefit from the proximity to their customers. However, a company in isolation cannot implement consistent circular business models. Rather, the shared value proposition for the customer and the partners and processes required for this should be the focus of align interest. Therefore, it is important that companies not only develop circular processes for their own business model, but also for the business models of other companies involved in the entire development process of a product or service. For this purpose, forms of organization need to be developed that transcend corporate boundaries and enable the integrated development of circular business models, which are also mapped in digital ecosystems. The developed template enables a structured approach for circular business model development - but there is no selection of suitable processes, technologies, or design guidelines for digital ecosystems. An overview of possible circular business model and ecosystem patterns could help to concretize and implement them. At present, there is a lack of calculation models for describing the potential benefits in comparison to a linear economy. A quantitative representation of the economic benefit potential of circular business models could help to expand circular

value-added networks and inspire the involved partners for sustainable economic forms.

## 7. Conclusion

During the research, it became clear that both the technical prerequisites and logistical structures already exist to replace existing linear economic forms with circular value creation structures. Therefore, it is of great importance to promote a rethinking in the economy, politics, and society. The developed template for the development of circular business models can help to create new circular forms of collaboration enabled by digital ecosystems. The focus of the template is to increase the utilization of valuable synergy and symbiosis effects along the whole life cycle of products, services, and materials, which are given by horizontal and cross-integration. However, currently these effects are far too little recognized and therefore not used as competitive advantages due to isolated considerations of the own value proposition.

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