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Short Communication

The Circular Economy Business Model of Algoland

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ABSTRACT

In the Algoland project, microalgae are used to clean water and air from industry. This is built on a long standing collaboration between research, industry and society. In this way Algoland supports the transition to a circular economy by turning pollution into biomass and potential products. This paper evaluates the potential for microalgae as an ecosystem service in industries from a circular economy perspective. The business model canvas was used in a workshop with stakeholders and researchers to discuss the challenges and opportunities for an industrial platform. Results showed that the established canvas model needs to be complemented by circular models; in order to be able to include ecosystem services. In this paper a circular canvas model is developed to be used in similar approaches.

INTRODUCTION

Algoland is a collaborative project between ecology and industry which has been able to show the potential for microalgae to clean air and water from industry. One part of the project consists of an algae farm situated at a cement plant in southeast Sweden. The flue gas has been shown to be nontoxic to the microalgae which consist of natural Baltic Sea communities. Further, the algae has a potential as a valuable biomass consisting of lipids, proteins and carbohydrates [1]. As such the research team has started to review the possibility of bringing this concept to other industries that need to reduce their CO_2 emissions.

There are many potential opportunities for commercialisation of microalgae [2] and possible products include high value products such as cosmetics and health supplements [3]. Further, there are also lower value products as animal feed or nutrients for human consumption. These include dry products high in vitamins and compounds extracted from the algae. The market potential is restricted by high production costs and in small scale. EU companies contributes to 5% of the world market for these products [4]. Biofuels have also been explored as a low value product that have future potential when competing fuels become expensive [5].

All the products above struggle with competitors that is more cost effective. The ecosystem services of algae are less explored; however, regarding their potential is to clean air and water. This requires the introduction of circular economy thinking to the business model, where biological and technological loops are represented. In the ideal circular economy nothing should go to waste - or at least return as nutrients to the natural environment [6]. The challenge here is to formulate the value proposition for ecosystem services and its potential combination with products from the biomass. The aim of this paper is to evaluate and improve upon the business model canvas in terms of circularity and ecosystem services.

CIRCULAR BUSINESS MODELS

The business model is a story that describes the way an organisation creates, delivers and captures values [7]. While this has been mostly used for economic values; the attention has extended to social and environmental values in later on years [8, 9]. Starting out with an established business model canvas can be a starting point for a company transitioning towards more sustainability.

Strongly sustainable business models build on inclusion of other measures than monetary success. A broadened ontology for business models builds on the inclusion of several stakeholders with the same aim and world view. The traditional focus on monetary value can restrict developments for other forms of sustainability [10]. A suggested triple layered business model canvas aid in understanding the economic, environmental and social impacts of business models [8].

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Selected paper from Eco-Tech 2018

To be circular the business model need to close the biological and technical loops, or partner up with businesses that aids the organisation in closing the loops. One suggestion is to work with traditional business modelling and consider the business ecosystem, business and sustainability levels. Compared to traditional business modelling this emphasises a system perspective [9]. Starting out with an established business model canvas can be a starting point for a company transitioning towards more sustainability. A suggested triple layered business model canvas can aid companies in understanding the environmental and social impacts of their business model [8]. Size, industry, geography and age of companies are of less importance for adopting circular business models [11]. Another study used the traditional business model canvas and implemented circular economy characteristics on this framework as shown in Figure 1 [12].

Further, a circular business model should include a take-back system and adoption factors. Adoption factors regard internal factors of adopting a circular economy including organisational capabilities (motivation, culture, knowledge, transition procedures). External factors include technological, political, sociocultural and economic issues. Further challenges to adopt circular business model include the fit between: value proposition and customer segments, between cost structure and revenue streams and between changes to circular business model and adoption factors [12]. Other recognised challenges include the required expertise, considering return flows and operational risks and keeping partners interested [13]. The ReSOLVE framework provides six actions companies can undertake to move towards circularity: regenerate, share, optimise, loop, virtualise and exchange. These present business opportunities in different ways as many established and successful companies showed examples of the presented model [14].

One of the core aspects of the business model canvas is

that all parts are connected. The business model canvas does not however encompass the circular approach sufficiently as the "closing the loop" approach is difficult to comprehend from this. A triple layered business model canvas does encompass societal and environmental costs and benefits [8]; but does not give an overview of the circularity in these concepts. While previous attempts have been made to show circularity in the business model canvas these are not well adjusted to capture the technical and biological loops present in an ecosystem service.

METHOD

The authors used interactive research to capture the process [15]. In this approach knowledge is created jointly between researchers and participants. While the researchers facilitate the process; this also recognises input from other participants. To do this the authors arranged a one day conference focusing on constructing business models using the Algoland concept. The participants included researchers in the Algoland project and representatives from municipality, consultancy firms, regional council, waste management association, energy agency, Energy Company, industry, Science Park and a mussel farm.

20 participants in total were divided in four groups whom cooperated with each other to examine the potential for Algoland as a business model. The groups started from a value proposition and then worked together to fill in a business model canvas. The suggested business model were then pitched and discussed. The presentations were recorded and transcribed.

The analysed materials consisted of the canvases, the transcribed pitches during the workshop and notes from meetings before and after the workshop. In this way, this took
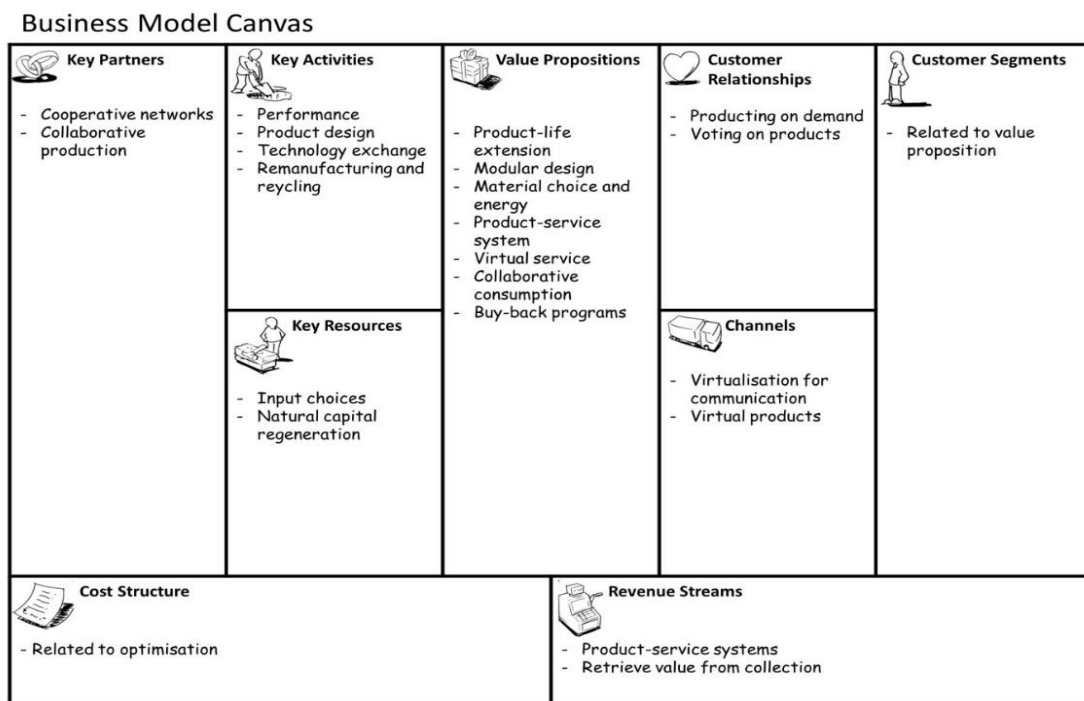

Figure 1. Circular economy applied to a business model canvas [12]

the form of a process study [16]. The material was analysed using theoretical coding based on the idea of the business model canvas [17]. Early results from this were presented and discussed with stakeholders during a meeting with the Science Park and Innovation office of university. This grounded the results further in practice.

BUSINESS MODEL CANVAS WORKSHOP

The conference resulted in four business model canvases for which each groups performed a short pitch. Each group was assigned different colour for the purpose of separating them. The first pitch and business model considered using the biomass as a physical product in its value proposition. However, the important product was the ecosystem service for the industry to clean its air and water:

Blue: We also try to have a broad concept. The circular and sustainable was more important than a product so it is an ecosystem service and a product. Here the product is a locally produced fodder for fish and chickens. The big product is ecosystem service for the industry to clean industrial waste, rather than a product. We want to emphasise that the whole society benefits form a cleaner coastal environment.

The second group recognised global challenges as a motivation for their model. This was fulfilled by setting the biomass as food at the centre of the value business model:

Red: We are quite broad in our business idea. Algoland still needs to be connected to the university. The value proposition is the global challenge of feeding 10 billion people in 50 years. Food and fodder is our main product. The consumers can eat the product and the animals get fodder from algae. In fact, that is the value proposition.

In the business model of the third group, they set an algae based oil as the value proposition. Environmental awareness and cleaning the air and water from industries was accomplished in connection with the project:

Yellow: A climate smart universal oil called "Regreen oil". We target ecological stores and customers that are aware of the climate and the environment but also the industry. We will use algae farms where carbon dioxide and nutrients from industrial rest products. We will grow the algae and harvest them. Likely to be sent to a company that extracts and refines the oil to produce the desired fuel we demand.

Finally, the fourth group focused on an animal feed. At the same time they emphasized the sustainability aspects and the ecosystem service:

Green: We offer a high qualitative fodder for dogs, cats and horses. This is made through a sustainable production of algae. Algae are produced with sustainable resources and reclaimed carbon dioxide, nitrogen and phosphor from the industry. So the algae have been an ecosystem service as well.

These four approaches to the business model canvas were assessed and compiled into a refined version as shown in Figure 2. One key element in all canvases was to include the ecosystem service as well as the products as the potential increased when using these in combination.

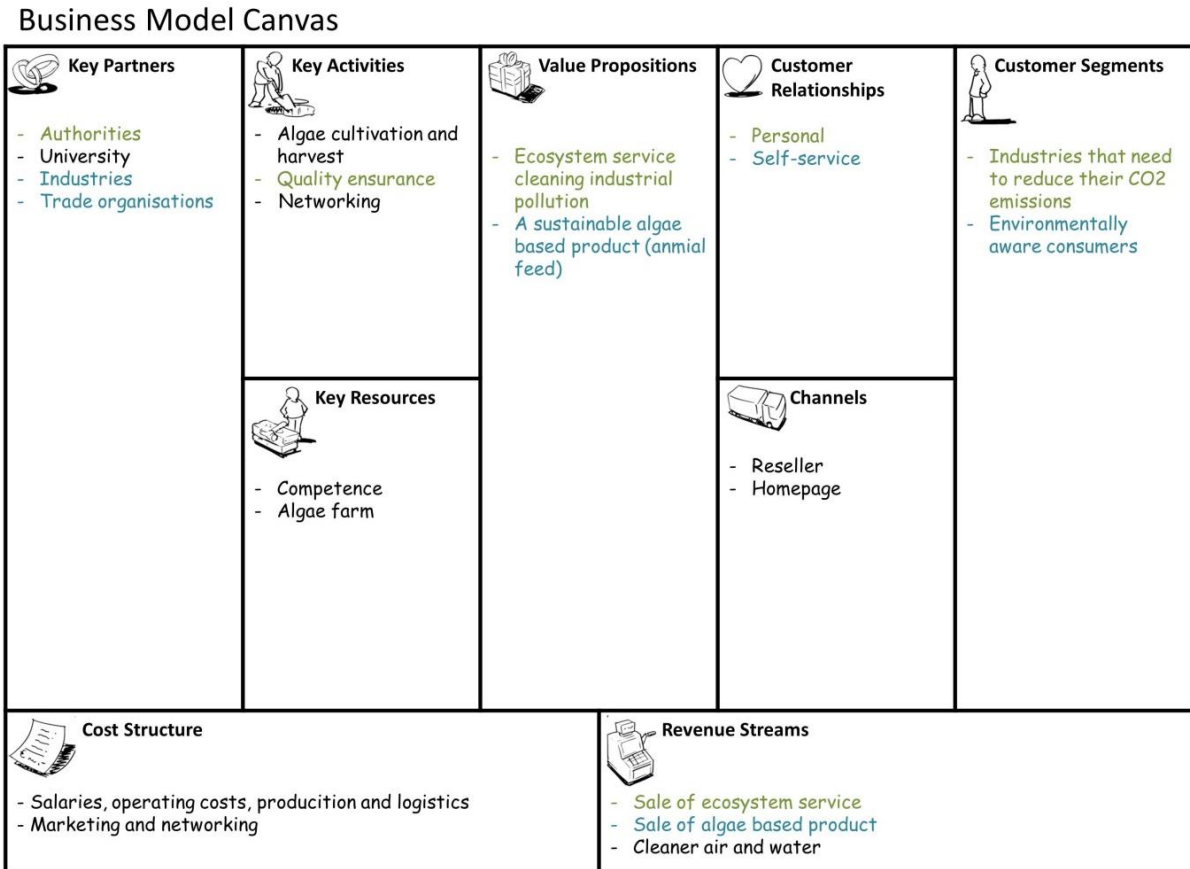In Figure 2, the ecosystem service is shown in green and

Figure 2. Algoland business model

the biomass product is shown in blue. Here we can also see the disadvantage of the business model canvas as it does not show the dependence between the ecosystem service and the product. As such it is in the customer segment were the biomass is produced as these fuel the growth of algae and while providing ecosystem service. This "win win" situation is a competitive advantage for the business model but it is not visible in a business model canvas.

An alternative business model canvas should include the interconnectedness inherent in an ecosystem service. This includes a stronger connection between partnerships and customer segments as these can be both. Introducing a circular approach to the business model canvas can help to capture the circularity of such an ecosystem service as Algoland. Based on this, we suggest a model that show the environmental improvement for the customer segment and the key partners. Further, the reduction of CO_2 produces a second value proposition in the form of the biomass. This can be summarised in a cycle: Ecosystem service – environmental improvement – biomass – product.

As shown in Figure 3, these cycles can be integrated in a proposed circular business model canvas. Inspired by previous circular canvases[1], this adds the technical and biological cycles to the original business model canvas. The two cycles also provide revenue and contribute to costs and connects with the inner core circle. For example the biological cycle introduces the biological revenues which can include reduction of CO_2 and the growth of algae which in turn enters the value proposition. Showing the cyclical nature in a business model can thus visualise the return flows and operational risks [13]. It further shows the interconnectedness between partners, in this case customers and key partners which can merge.
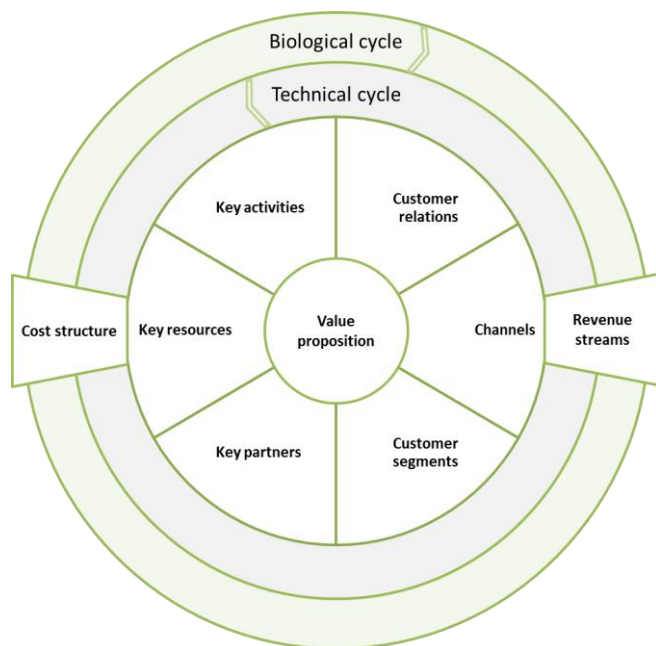

Figure 3. Circular business model canvas

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[1] https://www.socialbusinessmodels.ch/en/content/social-business-models-canvas

CONCLUSIONS

The business canvas model [7] is an established tool for turning ideas into businesses or organizations. It was developed with a linear economy in mind; however and it does not encompass the challenges and possibilities of a more circular model. In the case of Algoland the benefit of a potential model was found in its circular approach and the way it works as an ecosystem service.

This study contributes to practice by providing a way forward for business models built upon a circular connection between technical and biological cycles. A new circular canvas has been proposed as a solution to this concept of bioconversion of waste to wealth. This can be used by itself or as an addition to the original business model canvas when this is found to be limiting. It also paves a way forward to models emphasising environmental benefits. A further development of this should include the social costs and revenues as well.

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Persian Abstract

DOI: 10.5829/ijee.2019.10.01.05

چکیده

در پروژه Algoland، میکروجلبک‌ها برای تمیز کردن آب و هوا در صنعت استفاده می‌شود. این یک همکاری طولانی مدت بین تحقیق، صنعت و جامعه است. به این ترتیب، Algoland با انتقال آلودگی به زیست‌توده و محصولات بالقوه از انتقال به یک اقتصاد بر پایه چرخشی پشتیبانی می‌کند. در این مقاله پتانسیل میکروجلبک‌ها به عنوان یک سرویس اکوسیستمی در صنایع از منظر اقتصاد مدون چرخشی قابل ارزیابی است. بوم مدل کسب و کار در کارگاه با ذی‌نفعان و پژوهشگران برای بحث در مورد چالش‌ها و فرصت‌های یک پلت‌فرم صنعتی مورد استفاده قرار گرفت. نتایج نشان داد که مدل بوم ساخته شده باید با مدل‌های چرخشی تکمیل شود؛ به منظور قادر بودن شامل خدمات اکوسیستمیک باشد. در این مقاله یک مدل بوم چرخشی برای استفاده در رویکردهای مشابه مورد استفاده قرار می‌گیرد.