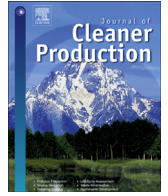


Contents lists available at [ScienceDirect](#)

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Sustainable business models as boundary-spanning systems of value transfers

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ARTICLE INFO

Article history:

Received 1 October 2016

Received in revised form

18 October 2017

Accepted 11 November 2017

Available online xxx

Keywords:

Environmental and social sustainability

Business model structure

Business model architecture

Value creation and capture

Value network

Multi-sided platform

ABSTRACT

Sustainable innovation requires collaboration across organizational boundaries, hence in this research, we take a boundary-spanning perspective on the business model. This perspective focuses on how value is created and captured across organizational boundaries, by investigating the value transfers between the focal organization and the external network of business model actors. We analyze the business models of 64 innovative sustainable organizations from The Netherlands in terms of how environmental and social sustainability is manifested in the content, structure, and governance of their business models. We find that environmental sustainability is mainly represented in value creation content, whereas social sustainability is achieved by serving underprivileged user groups and mainly is reflected in value capture content. We observe that social sustainability in both for-profit and non-profit organizations is often achieved by having an imbalance in value exchanges that is compensated elsewhere in the business model. In terms of business model structure we show that sustainable organizations use the same underlying business model structures as can be found in conventional firms. All in all, we demonstrate that analyzing the environmental and social sustainability of organizations using the boundary-spanning perspective on business models provides complementary insights to the traditional component-based view of the business model.

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1. Introduction

Sustainable development is one of the key challenges of the twenty-first century. As the core source of value creation in society, a prominent part of achieving higher levels of sustainability should be accomplished by organizations (e.g., [Nidumolu et al., 2009](#); [Porter and Van der Linde, 1995](#)). Still, hardly any organization is sustainable in each and every aspect of its operations, nor is there just one way of incorporating sustainability into an organization. For one, there are different kinds of sustainability to be achieved. Besides financial sustainability (i.e., ‘profit’) of the organization, social sustainability (i.e., ‘people’) and environmental/ecological sustainability (i.e., ‘planet’) should also be taken into account, as

postulated in the triple bottom line of sustainability ([Elkington, 1997](#)). Moreover, in order to achieve environmental and/or social sustainability, we not only need more environmentally friendly product innovations ([De Medeiros et al., 2014](#)), but also more transparent ([O'Rourke, 2014](#)) and sustainable supply chains ([Linton et al., 2007](#)), as well as new business models ([Boons and Lüdeke-Freund, 2013](#); [Lewandowski, 2016](#)).

In this study, we focus on the latter, since sustainability efforts in many cases cannot be realized with a product-focused approach alone, but often need an additional boost in the form of business model innovation ([Bocken et al., 2016](#); [Huijben et al., 2016](#); [Lovins et al., 1999](#)). We therefore explore how sustainability is reflected in the business models (henceforth ‘BM’) of organizations by answering the question:

“How is environmental and social sustainability manifested in the content, structure, and governance of business models of sustainable organizations?”

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As neither environmental nor social innovations can be realized by isolated firms (Boons and Lüdeke-Freund, 2013; Fadeeva, 2005), we choose to analyze sustainable organizations using a boundary-spanning perspective on BMs, focusing on the value transfers (i.e., value exchanges) between the focal organization and its external network of BM actors and customers. We conduct a cross-industry investigation of BMs of 64 innovative environmentally and socially sustainable organizations.

All in all, we make the following five main contributions to the sustainability literature. First, our findings suggest that in terms of the *content* of the BM, environmental and social sustainability manifest themselves in different ways. Namely, environmental sustainability is in most cases reflected in non-financial value transfers and more environmentally friendly production processes, whereas social sustainability is often associated with financial value transfers, meaningful social interaction and in employing or supporting underprivileged user groups. Second, organizations can create an imbalance in value exchanges in one part of the business model that is compensated for somewhere else to support underprivileged user groups. This can be both downstream of the focal organization, by providing access to goods and services people could otherwise not afford, as well as upstream by paying fair prices throughout the supply chain. Third, we find that sustainable organizations use the same underlying BM *structures* as conventional firms. They are ‘make-sell’, ‘resell’, ‘license’, ‘symmetric multi-sided platform’ and ‘asymmetric multi-sided platform’. At the same time, we identify a unique sub-class of BMs with distinct properties, namely those where for-profit and non-profit focal organizations are combined. Fourth, environmental and social organizations can empower other actors in the BM to make choices that normally are in the reign of the focal organization, thereby achieving sustainability by positioning the locus of control outside the focal organization. For example, a restaurant can let its visitors choose themselves what they wish to pay for the meal based on what they can afford. Finally, we demonstrate that using a boundary-spanning perspective on BMs is complementary to the often applied component-based perspective on BMs (Bocken et al., 2014; Bohnsack et al., 2014; Morris et al., 2005; Osterwalder and Pigneur, 2010; Rosca et al., 2016). It specifically appears viable for mapping environmental and social sustainability within BMs, as well as for benchmarking and identifying possible areas for improvement.

2. Sustainable organizations and business models

2.1. Environmentally and socially sustainable organizations

In recent decades, a whole class of organizations has emerged that refers to themselves as sustainable organizations. These organizations distinguish themselves from purely profit-seeking initiatives by desiring environmental and/or social sustainability in addition to, or in place of, financial sustainability (Elkington, 1997), which has been the standard basis of performance in industry thus far. In this study, we focus on sustainable organizations and seek to understand how exactly environmental and/or social sustainability is created and captured in their BMs.

We define *environmentally sustainable organizations* as those that create and capture value, while protecting the natural environment and reducing environmental pollution, and thus increase energy, material, and/or water efficiency *relatively more than* their peer organizations (Aragón-Correa and Sharma, 2003; Basal and Kendall, 2000; Bocken et al., 2016; Dangelico and Pontrandolfo, 2015, 2010; Linder and Williander, 2015; O'Rourke, 2014; Russo and Fouts, 1997; Sharma, 2000; Sharma and Vredenburg, 1998; Starik and Rands, 1995; Whiteman et al., 2013). Prior studies have

specified several ways for organizations to reduce their environmental impact both on the product and the process level. These include avoiding the usage of substances that are toxic, reducing the emission of pollutants, increasing energy and material efficiency, using energy from renewable sources, and using environmentally friendly materials (Dangelico and Pontrandolfo, 2015, 2010; Luttrupp and Lagerstedt, 2006). Examples of environmentally sustainable organizations include the office chair manufacturer Herman Miller, carpet firm Interface Inc. and Humble Brush for its bamboo toothbrushes.

Social sustainability in organizations has received less attention and research lacks a unified definition of what a social organization is (Choi and Majumdar, 2014). In line with our definition of environmental sustainability, we define *socially sustainable organizations* as those that create and capture value, while increasing social wealth *relatively more than* their peer organizations. Social wealth can be increased by creating social equality, providing access to education and healthcare, fair and safe working conditions, freedom of speech and access to information, peace and security, and increasing social inclusion *relatively more than* their peer organizations (Bacq and Janssen, 2011; Choi and Majumdar, 2014; Hutchins and Sutherland, 2008; Kroeger and Weber, 2015; Whiteman et al., 2013; Zahra et al., 2009). Examples of socially sustainable organizations are the shoes, bags and glasses firm Toms and Humble Brush for its ‘buy one - give one’ initiative.

To analyze the environmental and social sustainability of organizations, we use the BM concept. This is described in more detail in the next section.

2.2. The business model

The BM reflects how an organization creates and captures value, thereby describing the underlying logic of the organization (Chesbrough and Rosenbloom, 2002; Magretta, 2002; Massa et al., 2017; Shafer et al., 2005; Teece, 2010; Zott et al., 2011). To be able to compare how sustainable value is created and captured in different sustainable organizations, we choose a boundary-spanning perspective on the BM that focuses on value transfers (i.e., transactions) between the focal organization and the external actors in its value network (Amit and Zott, 2001; Zott et al., 2011; Zott and Amit, 2008, 2007). Sustainability efforts require substantial cooperation between different actors (Boons and Lüdeke-Freund, 2013) and a boundary-spanning perspective on the business model provides analytical power to investigate such interaction (Zott et al., 2011). This perspective is in line with what is called the BM architecture, which is considered an under-researched but a critical area of inquiry in understanding BMs (Baden-Fuller and Mangematin, 2013; Baden-Fuller and Morgan, 2010; Foss and Saebi, 2017). More specifically, a boundary-spanning perspective allows us to explicate: (1) where in the BM environmental and social value is created and captured; (2) how value is transferred between the focal organization and its up- and downstream actors; and (3) how environmentally and socially sustainable the focal organization, its BM actors as well as customers are in their key activities and value proposition. This helps to make transparent which benefits reach beyond the focal organization to the environment and/or society at large.

2.3. Sustainable business models

Corresponding with the argument that BMs provide an analytical lens to understanding how organizations achieve sustainability (Massa et al., 2017), several industry-specific studies have been conducted on sustainable BMs (henceforth ‘SBM’), for example in the food (Jolink and Niesten, 2015), mobility (Bohnsack et al., 2014;

Cohen and Kietzmann, 2014), and energy industry (Huijben and Verbong, 2013; Shomali and Pinkse, 2016). Another research stream focuses specifically on Product Service Systems (PSS) as a more environmentally friendly alternative to the conventional way of developing products that are then being sold (i.e., make-and-sell BM) (Barquet et al., 2013; Beuren et al., 2013; Vezzoli et al., 2012), including studies about how to design BMs for a new PSS (Barquet et al., 2013). Other research has investigated the strategies for circular BMs (Bocken et al., 2016), considering also the ways an organization can adopt circular BMs, and the barriers to doing so (Linder and Williander, 2015). Another lens specifies the inquiry into sustainability in BMs by considering the base of the pyramid as the research context (Khavul, 2010; Khavul and Bruton, 2013).

As a result, the role of BM innovation in support of sustainability is increasingly well grounded, providing opportunities for developing more subtle categories of SBMs. Correspondingly, a study by Bocken et al. (2014) has proposed SBM archetypes based on how the focal organization adds sustainable value. Research has also been conducted on the exact opposite, namely the value that is being destroyed and missed (Bocken et al., 2015), as well as the overarching construct of value that is uncaptured in BMs (Yang et al., 2017) as a driver for SBM innovation.

However, prior research has mainly relied on a given set of internally-oriented components of BMs, while only implicitly investigating what value is being transferred from one BM actor to another (Jolink and Niesten, 2015; Richter, 2013). Thereby it has largely neglected how financial sustainability (i.e., value capture) is balanced with the environmental and social components of the triple bottom line within the BM. Yet, extant studies have stressed that collaboration with a diverse set of actors is crucial for the success of sustainability efforts (Boons and Lüdeke-Freund, 2013; Fadeeva, 2005). Against this background, we therefore investigate how environmental and social sustainability are manifested in the *content*, *structure*, and *governance* of the BMs of innovative sustainable organizations by focusing on the boundary-spanning value transfers of the focal organization (Amit and Zott, 2001; Zott et al., 2011; Zott and Amit, 2008, 2007).

The next section describes how we collected data and describes the method by which the BMs were mapped (section 3.1), as well as the coding and analysis procedures (section 3.2).

3. Research method

3.1. Sample and data sources

To analyze the BMs of environmentally and/or socially sustainable organizations, we used an exploratory case study approach (Eisenhardt, 1989; Eisenhardt and Graebner, 2007; Yin, 2009). During a three-year period (2013–2016) we collected data on 64 BMs of innovative sustainable organizations in the Netherlands. In order to be selected, the organization had to be either environmentally and/or socially sustainable, and preferably have an innovative BM. The latter was necessary to ensure diversity of BMs in the sample and limit the dominance of the often technology-driven, product-based make-and-sell BM. We sampled the set from among organizations that were distinguished for their sustainable innovation efforts to ensure external validity (Gibbert et al., 2008) through: (1) awards, for example nominations to the Accenture Innovation Award in the categories of sustainability, energy and circular economy (e.g., Accenture Nederland, 2012); (2) inclusion in sustainable innovation rankings (Jonker, 2013); or through (3) receiving extensive media attention for their innovative BM, value proposition, product or service. To ensure viability of the BM over time, only organizations that were still operational at the beginning of 2016 were included in the sample, thus fulfilling the

financial sustainability requirement of the triple bottom line. This does not imply that the organizations had to be profit seeking but merely that they were able to sustain their operations. The selection resulted in a dataset of 64 innovative sustainable organizations, from eight industries, with eight cases each (see Table 5).

For each organization, a case report of at least 15 pages was written, including a description of the organization, its history, its market and competitor information, positive and negative incentives for the organization, the legislative environment, performance and growth data over the past three years (if available), the BM components (Osterwalder and Pigneur, 2010) as well as a detailed description of the organization's environmental and social sustainability. This was done by research assistants who were trained and whose work received repeated quality control by two of the authors. The case reports were composed using archival data, the websites of the organizations, the Lexis Nexis database, information from the Dutch Chamber of Commerce, publications and books by and about the organizations, and, if necessary, interviews with employees and/or clients of the organizations to ensure completeness. A total of 37 (telephone) interviews were carried out.

Each BM was coded first on several general elements, including the overall '*content* of value creation', the '*content* of value capture' (i.e., revenue model) and whether they operate business-to-business, business-to-consumer, or peer-to-peer (see Appendix A: Overall business model coding for the coding scheme). In the next step, the underlying BM *structure* of value creation and capture for each case was mapped, visualizing the value transfers between the focal organization and its partners, suppliers and customers (collectively: 'BM actors'). This was done using the Business Model Connect methodology (BM connect, 2017). To construct the BM *structures*, the BM actors were visually positioned up and downstream of the focal organization in accordance with their position in the supply chain. Possible BM actors include: for-profit organization, non-profit organization, supplier, reseller, carrier, government, consumer (both paying customers and non-paying users) and community. Thereafter, we mapped the key value transfers in the BM (i.e., value exchanges) between the BM actors by drawing arrows between the actors depending on which actor is transferring value to another. Subsequently, for each value transfer, the type of value was defined as being either credits, data, design/plan, energy, experience, expertise, license, module/part, money, privacy, product, reputation, service, social contact, storage, time, or waste, that is being transferred. Figs. 1 and 2 are examples of the BM value transfer *structure* mapping. All depictions of BMs in this paper have been simplified for representational purposes. After all BMs were mapped, we proceeded with analyzing them in terms of environmental and social sustainability. This is described in the next section.

3.2. Analysis

To analyze how the organizations achieve sustainability, we investigated their BMs in terms of environmental and social sustainability (see section 2.1 for the respective definitions). In line with Zott and Amit, we distinguish the following properties of the BM: *content*, *structure*, and *governance* (Amit and Zott, 2001; Zott et al., 2011; Zott and Amit, 2010, 2008, 2007). Table 1 provides a summary of the definition for each of these three characteristics.

The first step of our data analysis consisted of visually coding in each BM which *content* is environmentally sustainable (green lines) and/or socially sustainable (red lines). This could be either: (1) the value proposition and/or key activities of each individual BM actor; or (2) the value *content* that is being transferred between them. In a random subset of 25% of the cases, we numbered each coded value transfer (1, 2, n) and each coded BM actor (A, B, n), as well as

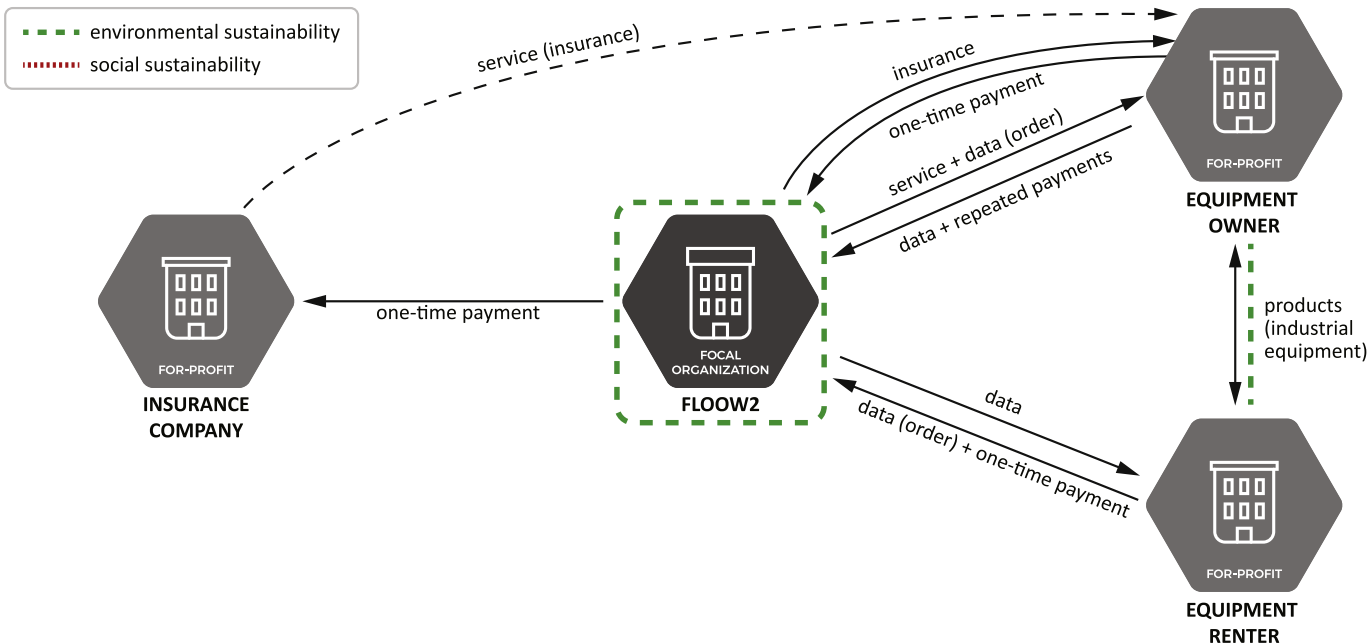


Fig. 1. BM with few sustainability codes, FLOW2.

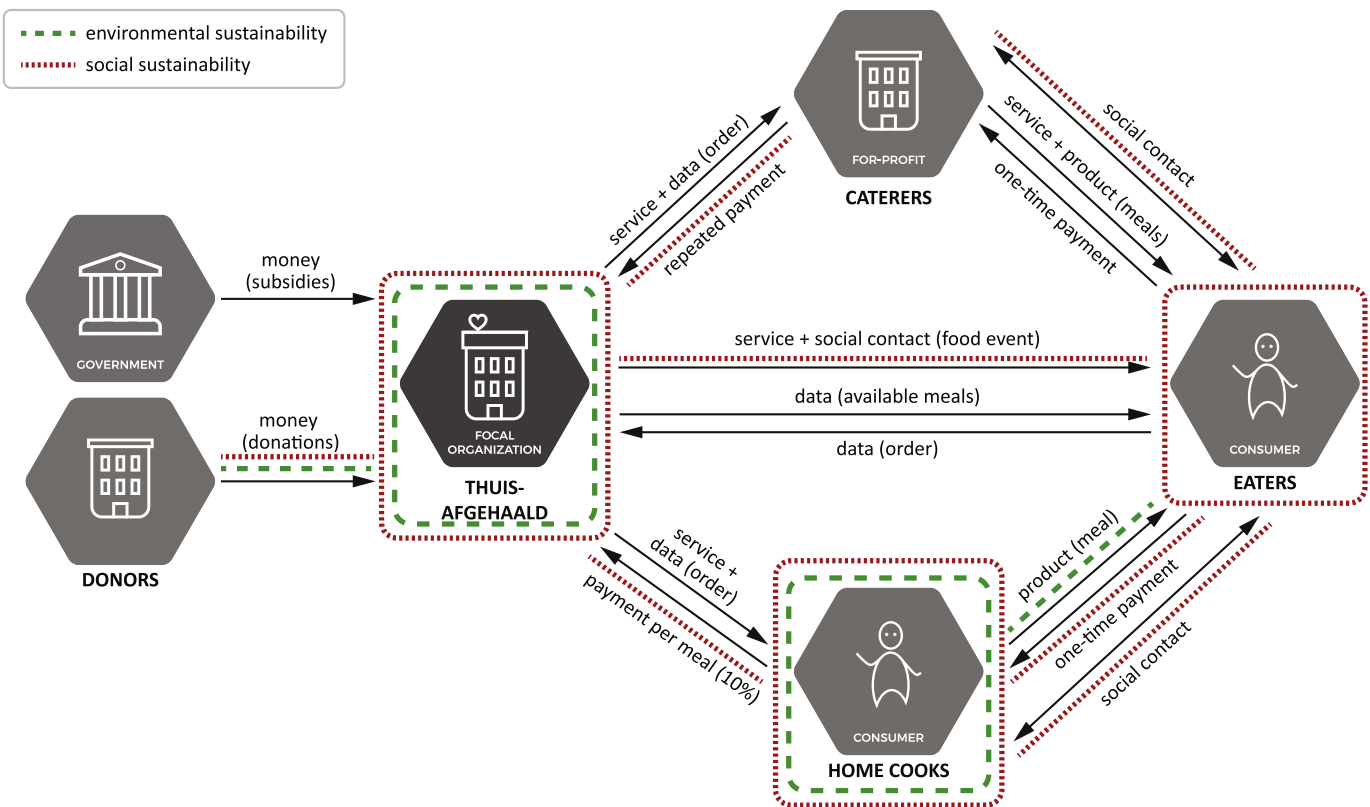


Fig. 2. BM with many sustainability codes, Thuisafgehaald.

provided underlying argumentation for providing the label environmentally and/or socially sustainable. A detailed example of the mapping technique that we used for exploratory purposes can be found in Appendix B. This was the basis for two of the authors to jointly develop the rules for coding all the cases with regard to the activities and value transfers that are considered environmentally/

socially sustainable. This was done iteratively until full agreement was reached. Fig. 1 is an example of a case with few sustainability codes and Fig. 2 of one with many sustainability codes. The first order categories and second order themes for the BM content coding can be found in Table 2. The coding rules for environmental and social sustainability can be found in Appendix C.

Table 1
Definition of the BM content, structure, and governance (Amit and Zott, 2001).

Content	Structure	Governance
Value that is being transferred (e.g., product, service, money) Activities and resources of the BM actors that are necessary to conduct the value transfers	The ways in which the BM actors are linked by value transfers	Legal form of the focal organization Locus of control over information, resources, and goods

Table 2
Coding scheme for BM content.

Second order themes	First order categories	Description
Value transfers	Type of value transfer	Product, module/part, design/plan, license, service, knowledge, waste, energy, storage, data, social contact, reputation, privacy, cloud, time, credits, free, money, less money, more money
BM actors & activities	Type of BM actors	Focal organization, For-profit organization, non-profit organization, supplier, reseller, carrier, government, consumer, community
	Actor activities	Key activities performed by the focal organization and BM actors to be able to deliver their value propositions (for example: Product development, manufacturing, platform maintenance, recycling)

In the second step, the underlying BM structure was coded. We chose a random sample of 20 cases (31% of our cases) that visually looked different. We analyzed them by trying to deduct generic BM structures that, by themselves or in combination, could describe the underlying logic of the BMs of our sustainable organizations. This

resulted in five generic BM structure patterns. When comparing and naming them, we concluded that these basic BM structure patterns resemble the BMs known from conventional for-profit firms. In line with this, we named them: ‘make-sell’, ‘resell’, ‘license’, ‘symmetric multi-sided platform’, and ‘asymmetric multi-sided platform’. A

Table 3
Coding scheme for BM structure.

Second order themes	First order categories	Description	Example (outside the study context)
BM structure	<p>MAKE-SELL</p>	In the ‘make-sell’ BM (i.e., design-sell) the focal organization designs the value content that is part of the offering, which may or may not be produced in-house. The value content can be either products, services or a combination of both.	Solarcity, Toms, Tesla Model S
	<p>RESELL</p>	In the ‘resell’ BM the value content that is being delivered to the customer is not developed in-house but sourced from somewhere else. This means that no value is added to the value content that is part of the offering, instead, the added-value is in the service that is provided by giving access to the value content.	Walmart, Amazon webshop
	<p>LICENSE</p>	In the ‘license’ BM the focal organization distributes licenses to other organizations that thereby obtain the right to develop, produce and/or sell certain value content. This can be either under the brand of the focal organization or not. This is thus a fundamental delegation of activities by the focal organization through licenses.	McDonalds franchise, licensees producing accessories for the Apple iPod
	<p>SYMMETRIC MULTI-SIDED</p>	In the ‘Symmetric multi-sided platform’ BM the focal organization mediates an exchange of value content between at least two different customer/user groups, and thus connects market parties to allow exchange. It thus does not create the value content itself, but the added-value is in the brokering service it provides. Both/all sides of the platform derive value from the other side(s), hence the name: symmetric. E.g. people renting a house benefit from more houses on the platform, while house owners benefit from more renters using the site.	Ebay, Uber, Airbnb, Booking.com
	<p>ASYMMETRIC MULTI-SIDED</p>	In the ‘asymmetric multi-sided platform’ BM the focal organization caters two or more distinct customers/user groups that are provided with different products/services. One customer/user group (paying or non-paying) or value content derived from them is used as the source of revenue the other customer/user group pays for. There is thus no direct connection or interaction between the distinct customer group as part of the focal organization’s BM. All customer/user group interact with the central platform (product/service)/organization, however, only one customer/user group (i.e., one side) of the platform derives value from the other side(s) of the platform, hence the name: asymmetric. E.g. advertisers placing their ads in the newspaper benefit from more readers, however, readers do not get any extra value from more advertisers in the newspaper.	Google ad service, Metro newspaper, Waze navigation

Table 4
Coding scheme for BM governance.

Second order themes	First order categories	Description	Example
Legal form	For-profit	An organization which main goal is to generate income for the owner and its employees by selling a product or service. Profits can be distributed among the owners, employees, shareholders, and organization.	Apple, Tesla
	Non-profit	An organization, without shareholders, which is run by a board that performs activities to serve a societal or environmental goal. Any profits that are made are reinvested in the organization and its goal	Doctors Without Borders, WWF
	Hybrid	Hybrid organizations combine for-profit and non-profit legal forms in their organization	WakaWaka
Locus of control	BM actors	With whom lies the locus of control	Is it the focal organization or another BM actor who has the locus of control
	BM content	The locus of control over which BM content	The control over value transfer content, or over the key activities

description of the five generic BM *structure* patterns, which we then used for coding the rest of our cases, can be found in Table 3. In our entire sample, we did not have any cases that could not be explained by one of the five basic BM *structure* patterns, or a combination thereof. The results of this coding can be found in the case overview in Appendix D.

In the third step, the BM *governance* of the sustainable organizations was coded in terms of: (1) the legal form of the organization; (2) with which actor the locus of control lies; and (3) over which BM *content* the locus of control is. The coding scheme for governance is provided in Table 4.

In the final step, the BM *content*, *structures*, and *governance* were compared across cases. The results are reported in the next section.

4. Findings

Following our coding scheme, we differentiate between the results related to BM *content*, *structure*, and *governance*. The findings are discussed in sections 4.1, 4.2, and 4.3 respectively.

4.1. Business model content

4.1.1. Business model content of sustainable organizations

We find that there is a difference in the spread of sustainability aspects in the BMs. Thirty-three of the organizations that have socially sustainable BM *content* also are environmentally sustainable somewhere in the *content*, whereas 24 organizations feature environmentally sustainable *content* but no socially sustainable *content*. Only 7 of the organizations have solely socially sustainable *content*. Some organizations are environmentally sustainable in one

Table 5
Cases per industry and generic BM structure pattern.

Industry	Total amount of cases	Make-sell	Resell	License	Symmetric multi-sided platform	Asymmetric multi-sided platform
Agriculture	8	7	1	0	0	1
Building	8	7	3	0	1	0
Business services	8	5	1	0	4	0
Consumer products/services	8	4	1	1	3	0
Energy	8	6	6	0	2	1
Food	8	5	3	2	1	0
Mobility	8	5	3	0	2	0
Recycling/waste	8	5	2	0	2	2
Total	64	44	20	3	15	4

value transfer only (e.g., FLOW2 (Fig. 1), while others have incorporated environmental and social sustainability throughout many key activities and value transfers in their BM (e.g., Refil, Repair Café (Appendix D), Thuisafgehaald (Fig. 2), WakaWaka).

Most BM value transfer *content* is transferred uni-directionally (e.g., the value transfer goes from one BM actor to another) but in some cases, such as product access (e.g., Car2Go, Peerby, etc.), the same value transfer *content* is later transferred back. Moreover, we find that when the value transfer *content* is environmentally or socially sustainable, it does not automatically mean that the counterparty of that value transfer is also environmentally and/or socially sustainable. For example, Stichting Merkartikel Bio+, a reseller of organic and partially fair-trade food products, uses supermarkets as a channel for their products to reach the market. The products themselves are sustainable, but the supermarkets that sell them not necessarily are. Namely, with the exception of organic supermarkets, most supermarkets obtain the majority of their revenue from selling non-sustainable products, while also being hardly sustainable in their key activities. Selling a few sustainable products (a small percentage of all the products they offer) does not make the supermarket itself sustainable.

4.1.2. Environmental sustainability embedded in the business model content

We find a large variety of environmentally sustainable value transfer *contents*. Aside traditional value transfer *content* such as green products, services, and raw materials, we also find waste (e.g., Refil, Roetz, Plastic Whale (Fig. 6), stocks (e.g., FRES), data and knowledge about green aspects (e.g., Trueprice), and green product options (e.g., WoonConnect). Meanwhile, the only monetary value transfers that are intrinsically environmentally sustainable are subsidies that are obtained for an environmentally sustainable value proposition and/or goal.

A special case of embedding environmental sustainability into the core offering is represented by organizations that use waste as a resource and turn it into something useful. Thirteen of our cases (e.g., Refil, Recover-e, see also Section 4.2.2) were able to build a business based on collecting and/or upcycling waste streams of other organizations or society into new products, thereby closing material loops others left unattended. Because these organizations add value to waste, they can be labeled as BMs for the circular economy.

4.1.3. Social sustainability embedded in the business model content

Value transfers are typically paired, being, in fact, an exchange: something is being delivered and something is obtained in return. This can happen both directly or indirectly, e.g. when mediated by a

different BM actor. We observe that one major characteristic of socially sustainable value transfers is that these exchanges are imbalanced. We find that socially sustainable value transfer *content* always constitutes a leak in value capture that is compensated by a different value transfer somewhere else in the BM. In most cases, the compensation is financial. This happens in one of five ways: (1) the core offering is offered at reduced price to make it affordable to those who cannot afford it otherwise, by over-charging another actor who can afford it for the offering (e.g., *GEEF-café*). The amount of value capturing *content*, i.e. (financial) compensation, is thus based on what the customer can afford and/or what he is willing to pay based on what he thinks the value creating *content* is worth. The latter point often results in a pricing strategy that deviates from market norms. An extreme case is the 'buy one, give one' principle where one group is charged a premium price, thereby 'paying' for two while only receiving one themselves, while a same/similar offering is provided for free to a second group who needs it, but cannot afford it (e.g., *WakaWaka*); (2) the core offering is over-priced, in comparison to similar offerings of other organizations, to be able to provide fair payment throughout the supply chain (e.g., *Tony's Cholonely*); (3) volunteers are deployed by the core organization or its partners/suppliers to bring down costs (e.g., *SWOP*) (see Fig. 4); (4) instead of financial payment people can choose to pay by offering their time and/or expertise, i.e. volunteering (e.g., *GEEF-café*); and/or (5) the loss in value capture is compensated through donations and/or subsidies (e.g., any model using social work facilities, which in The Netherlands are financially supported by the state and without which they would otherwise often be uncompetitive). The choice to deploy any one of these five strategies is a *governance* choice which is made during BM design. The choice to create an imbalance of value exchanges in one section of the BM that then has to be compensated somewhere else in the BM is a powerful principle to serve underprivileged user groups, who would otherwise not be able to afford or gain access to a certain product or service.

One transfer *content* which is always coded social is 'social contact' and this is only included in the BM mapping in case meaningful social interaction happens and social inclusion is thus increased. Several of the organizations (e.g., *Buurtleren*, *Peerby*) deliberately aim to increase social wealth by stimulating social interaction of individuals who are lonely and isolated. We find that not all their customers are isolated, nor do they only target isolated individuals, but by creating a platform that allows users to easily connect with others, the barrier to meeting new people is lowered (e.g., *Noppes*, *Repair Café*).

Another alternative way to increase social wealth is to use a social work force in the key activity *content* to make or provide parts of the products/services. For example, *Taxi electric* employs drivers over the age of 50, who otherwise would have difficulties finding a job. *Greenfox* uses social work facilities to refurbish office lighting to LED-based technologies. Both thus employ people that normally have difficulties finding work, thereby increasing social wealth.

Another typical reflection of social sustainability is featured by organizations that support fair trade, local products, and/or ensure that fair prices are paid to all employees upstream in the supply chain, including those in countries where fair wages are not the standard. By doing so, they increase the social wealth of the employees of suppliers by providing them with a fair income. In addition, some organizations deploy better working conditions for farmers (e.g., *Tony's Cholonely*) or support women at the bottom of the pyramid (e.g., *Women On Wings*). The next section describes our findings on the BM structures of sustainable organizations.

4.2. Business model structures

4.2.1. Business model structures of sustainable organizations

We find that in all of the cases the underlying BM structures of sustainable organizations rely on the same generic *structure patterns* that are known from conventional for-profit firms. This is in line with the findings of Rauter et al. (2015) on SBMs. In our sample, we find that sustainable organizations have adopted the BM structure patterns: 'make-sell', 'resell', 'license', 'symmetric multi-sided platform', or 'asymmetric multi-sided platform' or combinations thereof. Table 5 provides an overview of the frequency of the different BM structure patterns in our sample. Nineteen of our case organizations have adopted more than one BM structure pattern, and these cases have been counted for each structure pattern.

To gain a better understanding of the differences between the five BM structure patterns, we explain findings on each of them individually in the following paragraphs.

First, many sustainable organizations have adopted a 'make-sell' BM or an adaptation thereof (Teece, 2010). Several of the sustainable organizations have adopted a classical combination of a 'make-sell' BM structure and a product as value creating *content*, and produce sustainable products (e.g., *Dacom* (Fig. 3), *Greenes*, *Refil*, *Roetz bikes*, *ThermIQ*, *Tony's Cholonely*). Besides the fact that they produce a sustainable good, from a structure perspective, their BMs do not differ much from conventional manufacturers, following the same 'make-sell' logic. Those organizations that combine the 'make-sell' BM structure with offering a service or PSS were generally found to score higher on environmental sustainability throughout their BM structures. However, also here we find a difference in the degree of environmental sustainability. For example, when comparing *Car2Go*, a service which aims to achieve highly efficient use of the core resource (electric cars), to *Bundles*, a service that leases washing machines and dryers to single households and wants to stimulate more sustainable washing, we found that the latter does not create shared/communal usage of the key resource. Instead, it merely promotes a marginally more environmentally sustainable product handling. Because there is no sharing of the core product in the case of *Bundles*, this BM does not lead to a decrease in product demand and results thus in only minor material and energy saving, therefore being sub-optimal in terms of sustainability.

Second, organizations with a 'resell' BM sell products and services developed and manufactured by other organizations to their customers (Rappa, 2004). We find that resellers can be sustainable in three ways: (1) the goods they sell are either socially and/or environmentally sustainable (e.g., *Boxbites*, *Fastned*, *Switch My Light*, *de Windcentrale*, *Wat Mooi*); (2) they sell local goods and thus feature short transport routes (environmentally sustainable) and support to the local community (socially sustainable) (e.g., *Rechtstreef* (see Fig. 5); or (3) they sell the goods for fair prices and are thus socially sustainable (e.g., *SWOP*, see Fig. 4).

Third, three of the organizations have adopted a 'license' BM structure, by using franchises to organize their operations (Chesbrough and Rosenbloom, 2002). In particular, *Repair Café* (see Appendix B) has developed a franchise network of local communities for repairing products. The local franchises are established through a one-time payment for a starting kit and for being included as a local Repair Café on the website of *Repair Café*. In the case of *Repair Café*, environmental sustainability is improved by offering a repair service, and social sustainability is increased by creating local communities (the franchises) and by offering voluntary payment for the repair service (i.e., donation). *Rechtstreef* (see Fig. 5) uses local pick-up points for online local grocery shopping. Each local pick-up point holds the license to be the

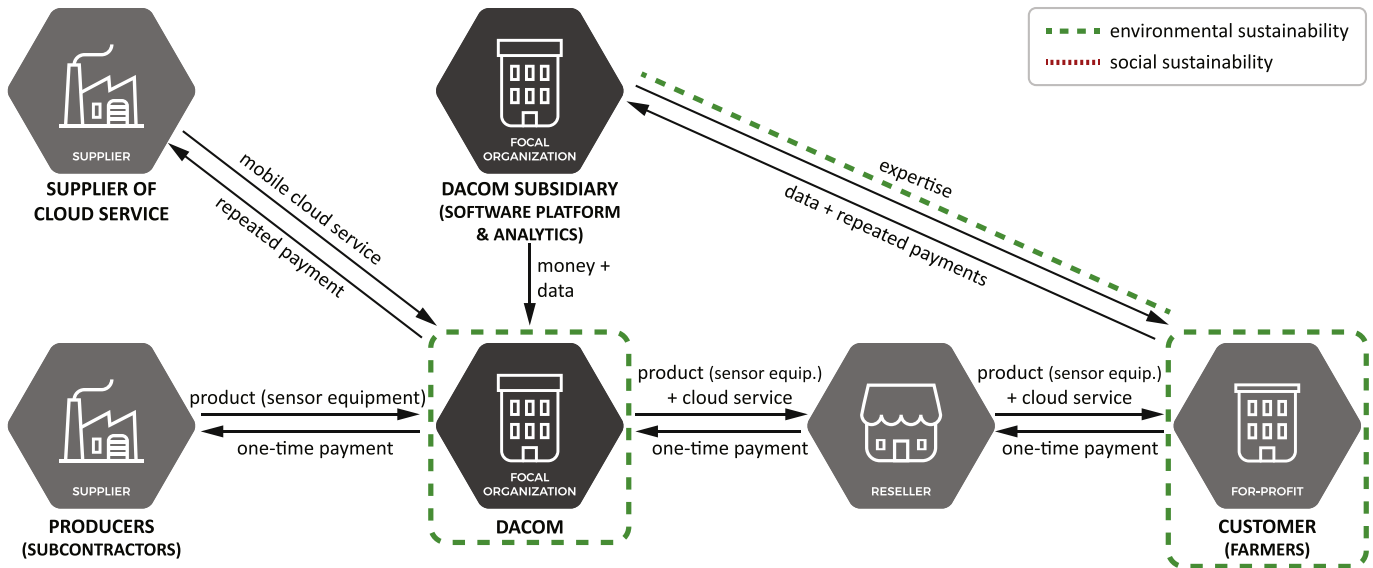


Fig. 3. Dacom.

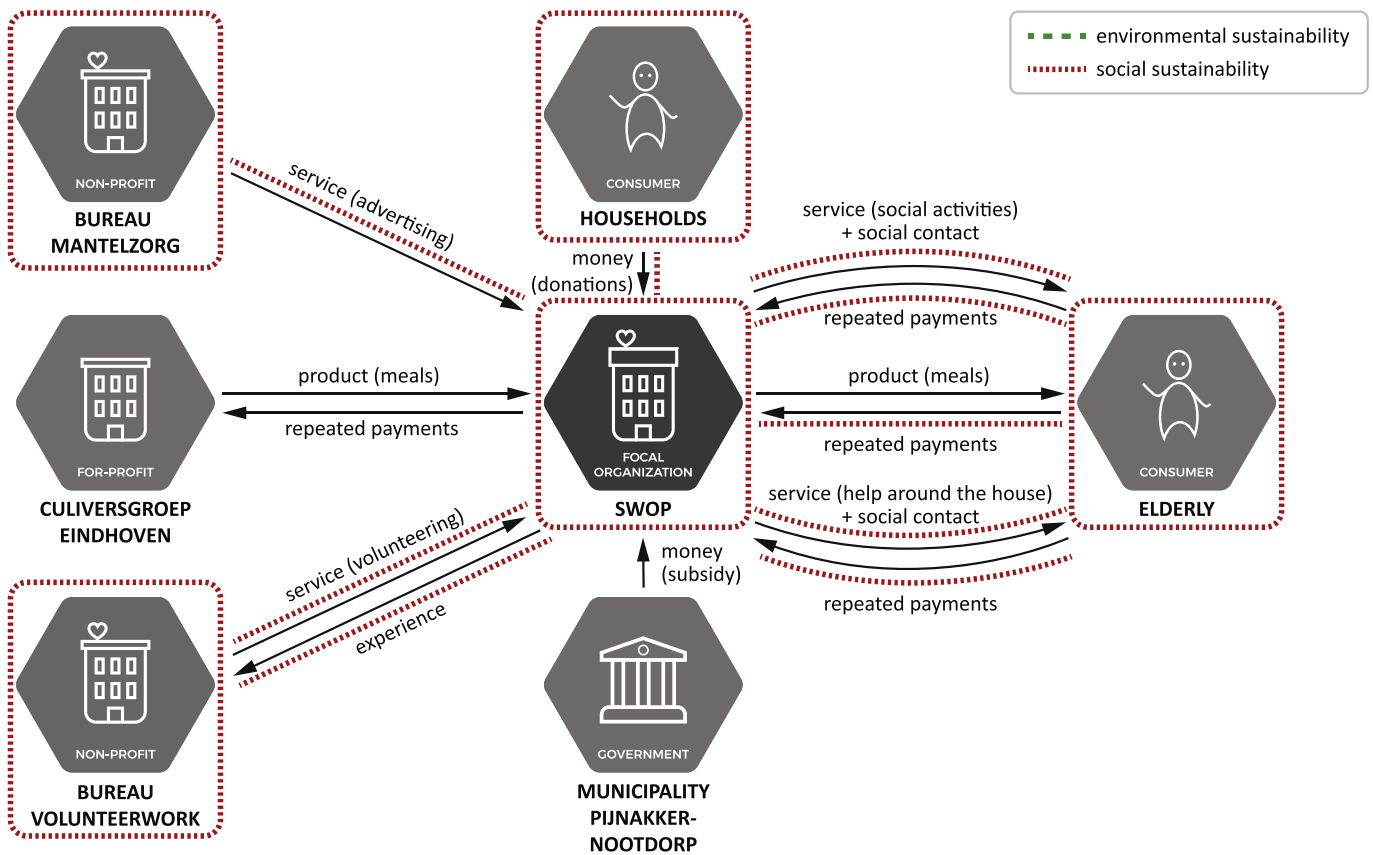


Fig. 4. SWOP.

'neighborhood pick-up' and can do this from their home, shop, or school. *Rechtstreex* is both environmentally and socially sustainable by only selling products from local farmers who in return receive a fair price for their products. This example demonstrates that choosing a franchising structure with local manufacturers is a good option for acting sustainably as an organization. The third case, *Beebox*, works with local entrepreneurs to distribute their

mealboxes and to provide customer care for the local market segment.

Fourth, we found two types of 'multi-sided platforms' (Baden-Fuller and Mangematin, 2013), namely 'symmetric multi-sided platform' and 'asymmetric multi-sided platform'. A 'symmetric multi-sided platform' BM (also known as 'broker') mediates the exchange of value content between users (user groups), and thus

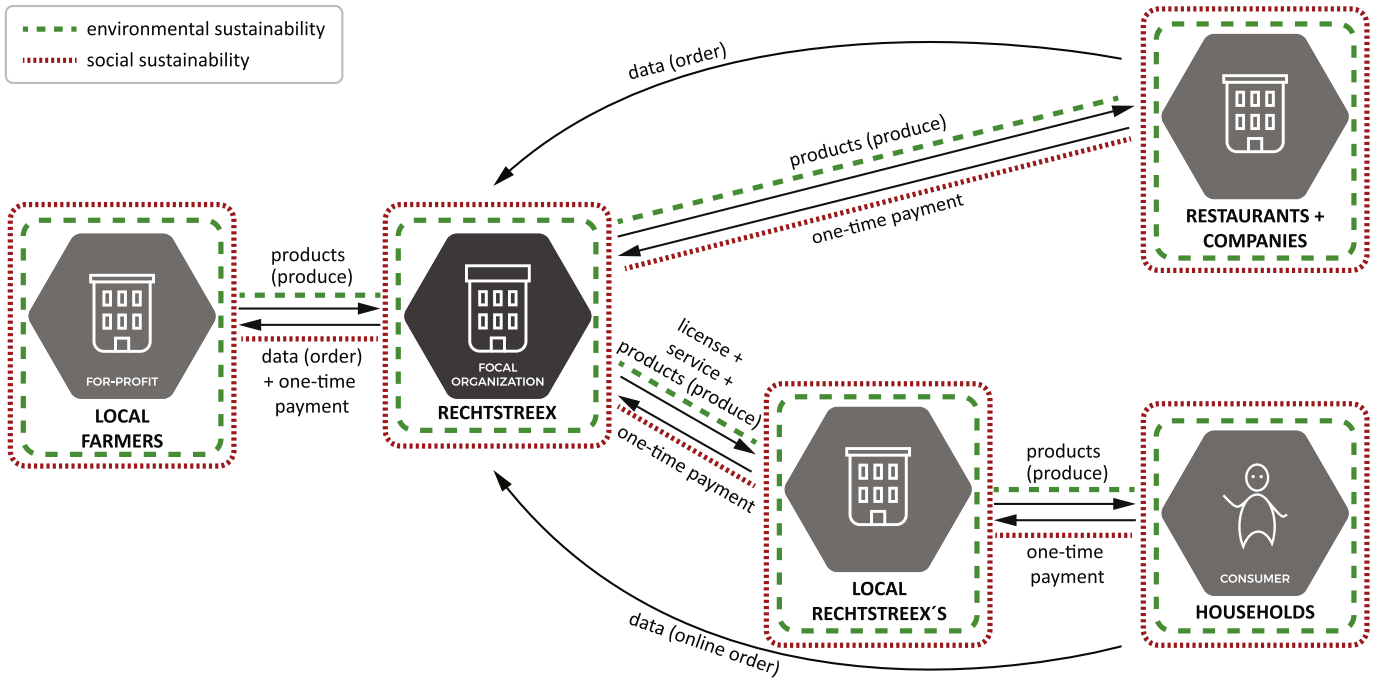


Fig. 5. RechtstreeX.

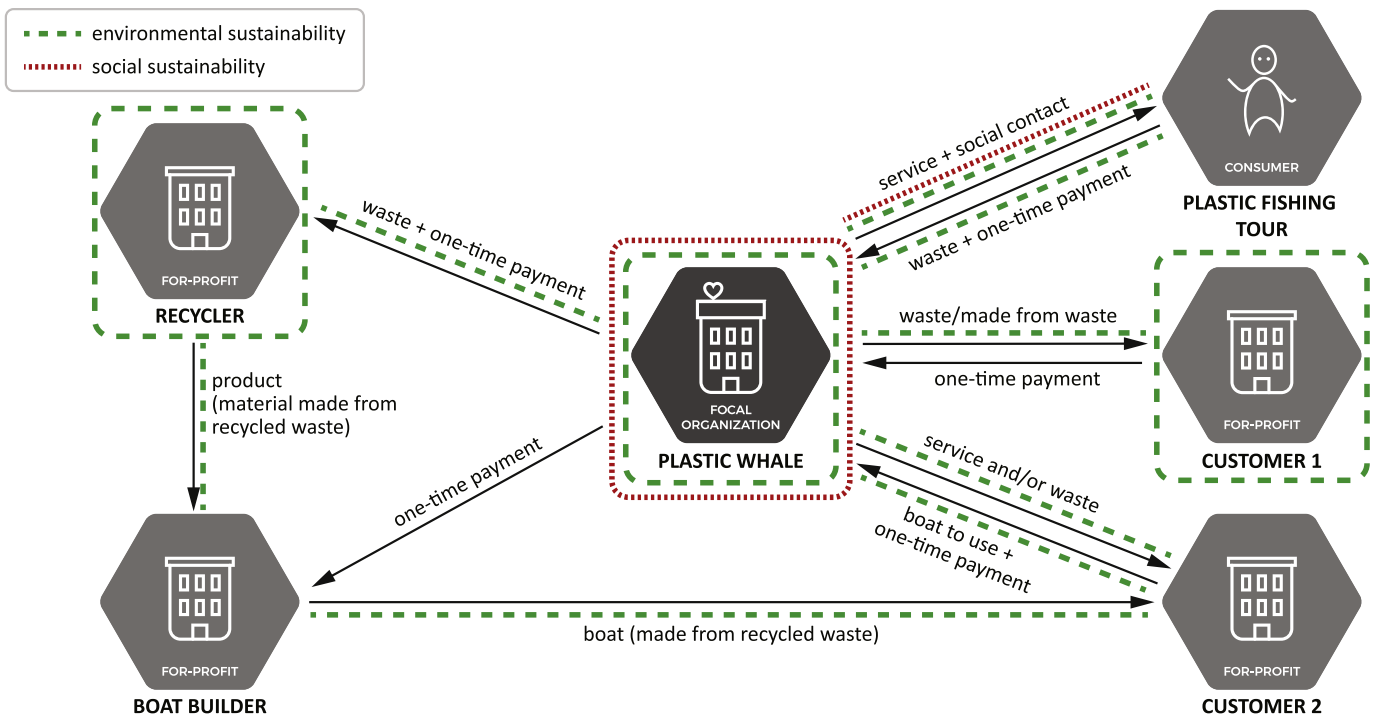


Fig. 6. Plastic Whale.

provides the service of connecting market parties to allow direct exchange (Magretta, 2002; Rappa, 2004). All sides of the platform derive value from the other side(s), hence the name: symmetric. We distinguish two different types of 'symmetric multi-sided platforms'. In the first type, the ownership may remain with the original owner if the object is leased or borrowed to another user for a certain period of time, or be transferred to another user in exchange for a compensation. This BM structure exists in a B2B (e.g.,

Tradeqoin, FLOW2 (Fig. 1), B2C (e.g., the caterers of *Thuisafgehaald* (Fig. 2) as well as in a P2P (e.g., *Peerby*, the home cooks of *Thuisafgehaald* (Fig. 2) setting. As long as non-new durables are being mediated, this model is intrinsically environmentally sustainable, because the process of sharing increases product use efficiency and provides a longer (or a second) product life. However, in case of a consumable product, such intrinsic sustainability might not be present and the model is only sustainable if the consumables that

are being transferred are inherently sustainable (e.g., green energy), a by-product of another process, or a reuse of waste. This is the case for *De Klik*, which mediates biomass.

The second type of 'symmetric multi-sided platform' does not mediate products, but instead mediates services, knowledge or time (e.g., *Buurterlen*, *Thuisafgehaald* (Fig. 2), *Women on Wings*). These BMs are not intrinsically environmentally sustainable. Their degree of sustainability depends on what the value proposition is, i.e. what value transfer *content* they mediate between parties (service, knowledge, etc.), and for what purpose. For example, *Buurterlen* is socially sustainable by providing users the chance to offer courses to other users in the neighborhood. This can be anything from language lessons to dance classes.

Finally, in an 'asymmetric multi-sided platform' two or more distinct customers/user groups are provided with different services and there is no value exchange facilitated between them by the core organization. One customer/user group (paying or non-paying) is used as the source of revenue for the other customer group (Casadesus-Masanell and Ricart, 2010). All user groups interact with the central platform (product/service)/organization, however, only one user group (one side) of the platform derives value from the other side(s), hence the name: asymmetric. In our sample, we have four asymmetric multi-sided platforms (e.g., *De Hagert*, *Plastic Whale*, *WakaWaka*, and *Shop&Drop* is planning to become one). For example, *Plastic Whale* (see Fig. 6) uses their waste fishing tour service to gather plastic waste, which it then uses to make boats, which they sell to firms. These firms buy the boats as part of their corporate social responsibility activities and/or for advertising use, often giving them back to *Plastic Whale* for them to use in the waste fishing tours. *Shop & Drop*, on the other hand, has a different approach and uses an app to connect people with waste to local shops where they can hand it in. At the moment of analysis, *Shop & Drop* was still building up a user base which would enable them to gather and sell user data.

When comparing the underlying BM *structures* of our cases with the environmental/social coding that can be found in them (see Appendix D), we find that within each of the sustainability categories different BMs *structure* patterns are present.

4.2.2. Environmental sustainability embedded in the business model structure

Some organizations are environmentally sustainable solely based on the characteristics of the *structure* of their BM. We identified two main ways they could achieve that: (1) because their clients are simultaneously also their suppliers (e.g., *Plastic Whale* (Fig. 6), *Orgaworld*) or; (2) because they mediate products, waste or services between third parties (e.g., *De Klik*, *Snappcar*, *Peerby*). The latter organizations have a unique quality in the sense that they can use any kind of product that is not new and build an environmentally sustainable BM around it solely by increasing the rate of product usage. Examples include *FLOW2* (Fig. 1), which mediates the leasing of (not necessarily) sustainable industrial equipment among organizations, and *Mywheels*, that maintains a platform for peer-to-peer car sharing.

Thirteen of our cases use waste as a resource. These cases differ from each other based on how the waste 'flows' through the BM *structure* and what it is used for. Except in one case (i.e., *Plastic Whale* (Fig. 6), the loop is not closed within one organization. In most cases the organization either acquires waste from suppliers and local firms and then uses or processes the waste to develop something new or the BM is centralized around collecting (one's own) waste (e.g., *Weelec*). Another differentiation can be made between BMs where the client becomes the supplier, and those

organizations that close the material loops of other organizations. For example, in the case of *Orgaworld*, the organization uses the organic waste of supermarkets to make fertilizer that is then used on the fields where new vegetables for the same supermarket chain are grown. In this case, the supplier thus also becomes a client to some degree.

4.2.3. Social sustainability embedded in the business model structure

Social sustainability is increased by serving a social user group. An example here would be *Sustay* that develops energy efficient housing for people who earn too much to be eligible for social housing but too little to be able to afford sustainable housing.

We also found that organizations either created or engaged local communities as part of their value creation and capturing efforts (e.g., *MyWheels*, *Noppes*, *Peerby*, *Thuisafgehaald*), thereby increasing the social wealth of these communities or population segments by reducing isolation and creating social interaction. In our sample, communities have mostly been created in symmetric multi-sided platform BM *structures*. However, communities can also act as communal buyers of products/services, e.g. in collective buying of PVs.

Besides being manifested in the BM *content* and *structure*, environmental and social sustainability can also be reflected in the BM *governance*. This is described in section 4.3.

4.3. Business model governance

We observe that some organizations have combined both 'for profit' and 'not for profit' operations in their BM to achieve their sustainability goal, thereby increasing their scalability and vitality (financial sustainability). For example, the for-profit *Offgrid Solutions* develops and produces products (i.e. solar powered lamps and battery packs), which it then offers through the non-profit *WakaWaka* under a "buy one, give one" policy in the developed world, with the second item going to someone in a humanitarian crisis area. In another case, the organization itself (e.g., *Thuisafgehaald* (Fig. 2), a portal for sharing home cooked meals) is a non-profit, but some of its users and caterers act as for-profits by asking a premium price (in addition to just the ingredient costs) for their meals.

This example also highlights that both environmental and social organizations can empower other actors in the BM to make decisions on issues that normally are in control of the focal organization, thereby positioning control over value transfer and activity *content* outside the focal organizations. By giving control over product pricing to its users, *Thuisafgehaald* creates flexibility in the entrepreneurial activity towards better utilization of meals in a category that normally encounters waste (leftover food). On the other hand, *Rechtstreex* provides local entrepreneurs the freedom to have a main occupation and related BM of their choice and only add the offering of *Rechtstreex* as an auxiliary activity.

We find that environmental sustainability is mostly reflected in the *governance* choices in the use of environmentally sustainable suppliers and manufacturers, and/or local suppliers with short distance logistics chains, thereby limiting the geographical scope of operations of the focal organization (e.g., *Rechtstreex* uses local farmers (see Fig. 5) and/or environmentally sustainable modes of transport of the value *content* (e.g., *Rotterzwam* uses bicycles to collect coffee waste for mushroom production).

5. Discussion and conclusions

Prior research on the BMs of sustainable organizations has

focused on identifying various sustainability archetypes (Bocken et al., 2014; Bohnsack et al., 2014; Rosca et al., 2016). In this study, we explore the variations in environmental and social sustainability within BMs by applying a boundary-spanning perspective on the BM and using the corresponding BM *content*, *structure*, and *governance* properties to map the BMs of 64 innovative sustainable organizations (Amit and Zott, 2001; Zott et al., 2011). This perspective allowed us to complement previous studies on sustainability archetypes by demonstrating that there is substantial heterogeneity in how exactly the value transfers between the focal organization and the other actors are structured in different sustainability-oriented BMs. Such value transfers are not necessarily symmetric, i.e. a bi-directional exchange is not always taking place. As such, this study makes five key contributions.

First, our inductive coding resulted in five generic BM *structures* that, alone or in combination, are used by sustainable organizations. All of these five BM *structure* patterns can be linked to well-known examples of conventional firms (see Table 3). Hence, we find that the uniqueness of BMs for sustainability has been somewhat exaggerated as all of our cases can be categorized using the generic BM *structure* patterns. Nevertheless, further research is desirable, since our research set-up did not focus on the comparison between sustainable and conventional organizations. Follow-up research could, for example, take paired samples of sustainable and non-sustainable organizations from a set of industries to further verify this finding. Our findings also suggest that these five patterns of BM *structures* are industry-neutral. Moreover, sustainability does not need to be embedded throughout the BM structure. Instead, on many occasions, there are distinct elements, often on the *content* level of the BM that provide the basis for the organization to be sustainable. Nevertheless, the symmetric multi-sided platform *structure* can be a driver of environmental sustainability on its own, even if the *content* and/or *governance* of the BM are not sustainable at all, just by increasing product use efficiency.

Second, our results showed that 'green' value transfer *content* is mostly fueled by value creation, while social value transfer *content* can instead be mostly traced back to value capture. We found that most environmentally sustainable BM *content* is related to developing, producing and delivering environmentally more sustainable goods and services or to reducing pollution in these processes. In addition, our sample included several business models that relied on the sharing of assets, thereby increasing product use efficiency and decreasing the need for new products. Socially sustainable BM *content* in many cases related to fair (financial) compensation throughout the supply chain and to enabling access to goods and services at reduced prices to increase the quality of life of people who would otherwise not be able to afford it. This reduction in price for goods and services is often compensated by other business model actors paying more or providing their services at reduced costs.

Third, we observed an imbalance in value exchanges to support underprivileged user groups in socially sustainable BMs in the agriculture, food, and energy sector. The same can be observed in healthcare (e.g., Aravind) and consumer products (e.g., Toms, Humble Brush), suggesting that this effect is not industry-specific¹. It would be worthwhile for future research to investigate this specific pattern of imbalance in depth.

Fourth, we illustrate how *governance*-related choices for environmental and social businesses seem to go hand in hand. Namely, both environmentally and socially sustainable organizations deploy for-profit, non-profit and hybrid legal forms, while environmentally and socially sustainable *governance* can also be achieved by

positioning the locus of control over value exchanges outside of the focal organization. Finally, it is important to note that while *content* is an individual transfer and actor level characteristic, *structure* is a system-level characteristic of the BM. *Governance* choices, on the other hand, can be present at both individual and system level.

Our findings have two implications for future research on SBMs. First, visualizing the BM, and the sustainable *content* embedded in them, using a boundary-spanning perspective, as represented by the figures in this paper, e.g. Figs. 1 and 2, appears to accurately pinpoint where sustainability is located in a BM, as well as where areas for improvement lie. In comparison, each case was also mapped using the BM canvas, a commonly used component-based depiction of the BM, but this provided less useful insights on how exactly organizations achieve environmental and social sustainability. We believe this is the case because SBMs are inherently dependent on their network environment (Boons and Lüdeke-Freund, 2013), which is underrepresented in the typical component-based view. Comparing both approaches deserves more attention. Furthermore, in this study, we focused on actual value creation and capture which could be extended in future research to include incorporating the sustainable value that is missed, destroyed or uncaptured (Yang et al., 2017) in the mapping.

Second, we demonstrate that mapping environmental and social sustainability by using the trichotomy of the BM *content*, *structure*, and *governance* appears to give a good representation of how sustainable an organization is. Moreover, because these properties can be mapped as scales (e.g., the *content* can manifest more or less sustainability), in future research they could be used as a basis for calculating BM-based sustainability indices, for benchmarking and assessing performance along the triple bottom line.

Towards managerial practice, the analysis of where exactly sustainability is achieved within the *content*, *structure*, and *governance* of SBMs empowers practitioners in classic for-profit firms to integrate (some of) the sustainable BM principles identified in our research into their BMs, and thus become gradually more sustainable themselves. Our study indicates that analyzing how organizations with similar BM *structures* (potentially operating in different industries) incorporate environmental and social sustainability aspects in their BM could provide good opportunities for organizations to implement sustainable BM principles from others. It also allows organizations to explicitly compare their sustainability efforts to those of competitors and identify areas of improvement. Therefore, in this study, we not only provide insights for the design of new SBMs, but we also provide a way for benchmarking and helping existing organizations 'greening' and 'socializing' their businesses.

Acknowledgements & funding

We would like to thank the three anonymous reviewers and the special issue editors for their valuable comments. This research was conducted as part of the framework of the Erasmus Mundus Joint Doctorate SELECT+ 'Environomical Pathways for Sustainable Energy Systems' and funded with support from the European Commission's Education, Audiovisual, and Culture Executive Agency (EACEA) (Nr 2012-0034). This paper represents the views only of the authors, and the Commission cannot be held accountable for any use of the information contained in this article.

Appendix A. Overall business model coding rules

¹ We thank an anonymous reviewer for this suggestion.

Table A1
General coding categories for BM.

Second order themes	First order categories	Description	Example
<i>Content of value creation</i>	<i>Value proposition</i>	<i>Product:</i> A tangible or intangible good <i>Service:</i> An intangible and immaterial value adding activity	Adobe PDF writer, Coca Cola, Philips hairdryer, in app PokéCoins BCG, Hilton, KLM, Roll Royce engines, toll roads
	<i>Longevity</i>	<i>Consumable:</i> Products and services of which the quantity depletes when it is used <i>Durable:</i> Products and services of which the quantity does not deplete during usage	Coca Cola, in app PokéCoins Philips hairdryer, Adobe PDF writer
	<i>Degree of ownership</i>	<i>Ownership:</i> The ownership of the product/service is transferred together with the product/service	Buying a BMW
		<i>Access:</i> The ownership of the product/service is not transferred together with the product/service but remains with the originator. The receiver of the value transfer gains access and is allowed to use it but does not become the owner	Sixt rent a car
<i>Content of value capture (i.e., revenue model) (the currency can also be non-financial)</i>	<i>Locus of payment</i>	<i>Pay per unit:</i> payment is made for a single unit (e.g., one product, 1 h of service) <i>Pay per bulk:</i> payment is made for several units at once (e.g., a pallet of products, 100 h of service)	One apple, one Philips hairdryer A crate of apples, a pallet of Philips hairdryer
	<i>Recurrence of payment</i>	<i>Free:</i> The value that is being transferred (or parts of it) are temporarily or indefinitely offered for free	60-day free-trial Google Cloud, Facebook
		<i>One-time payment:</i> No commitment over time, the payment is transferred once. The structural relations with the customer are not retained. <i>Repeated payment:</i> Creates a lock-in of repeated value transfer and thereby retains the structure between the focal organization and the individual customer over time. The payments can either be at fixed repeated times or on demand.	BMW car, Ikea products Dropbox subscription, Gillette blades, bank loan

Appendix B. Example of detailed mapping of sustainability in a business model

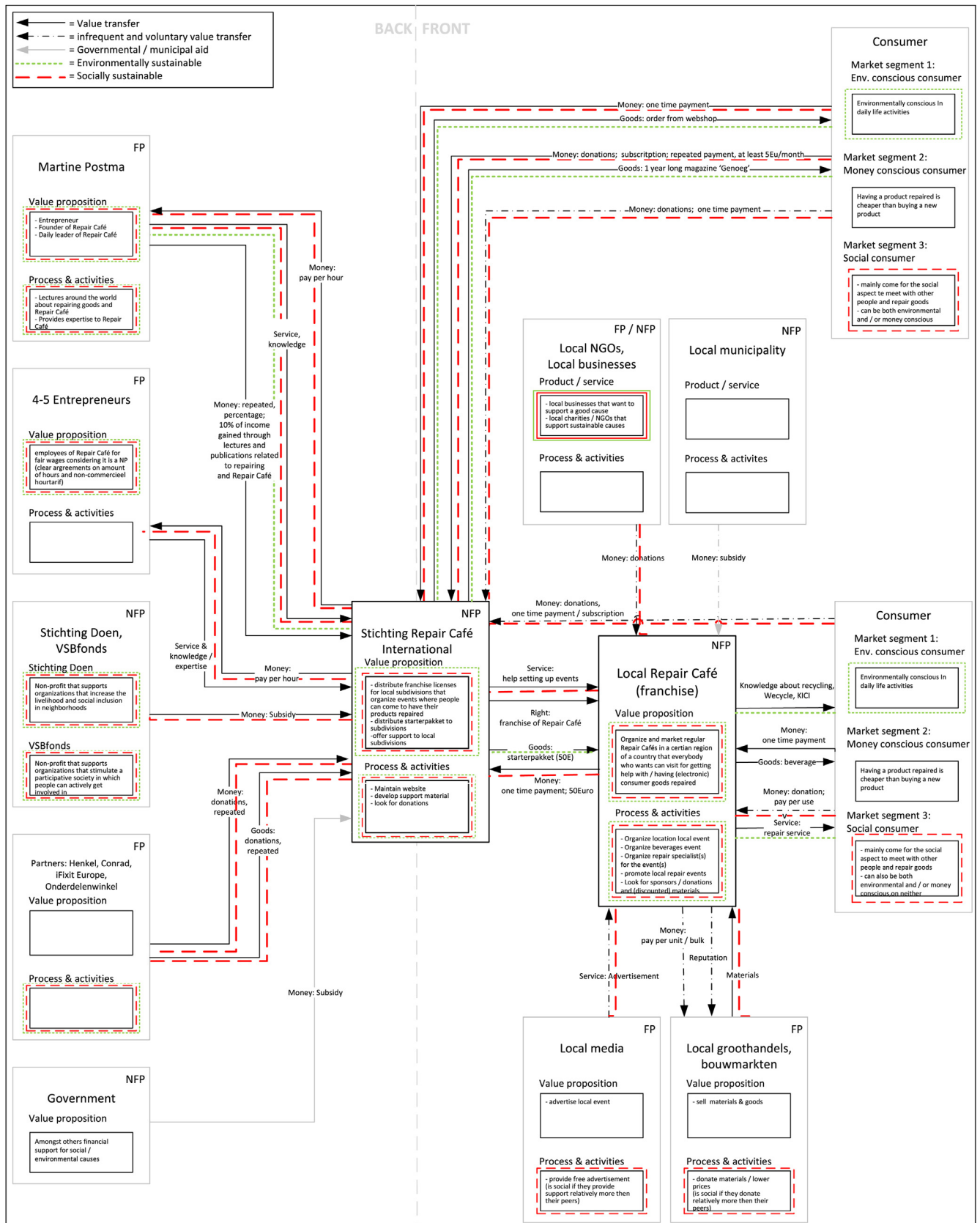


Fig. B.1. : Example of detailed mapping of sustainability in BM, Repair Café

Appendix C. Coding rules for environmental and social sustainability coding.

Table C1 provides the coding scheme for environmental and social sustainability. Coding whether an aspect is *environmentally* or *socially* sustainable was done relative to the sustainability performance of peer organizations in the local or national context, on the given aspect.

Table C1
Coding categories for sustainability coding. Sustainability of BM Actors.

Second order themes	First order categories	Description	Example
Sustainability	<i>Environmental sustainability</i>	Reducing environmental pollution by minimizing the usage of non-renewable raw materials, increasing energy, water and material efficiency (reduce, reuse, recycle, increase use efficiency), reducing the emission of pollutants, avoiding the usage of toxic substances, protecting the natural environment and biodiversity <i>relatively more than</i> their peer organizations (Aragón-Correa and Sharma, 2003; Basal and Kendall, 2000; Bocken et al., 2016; Dangelico and Pontrandolfo, 2015, 2010; Linder and Williander, 2015; O'Rourke, 2014; Russo and Fouts, 1997; Sharma, 2000; Sharma and Vredenburg, 1998; Starik and Rands, 1995; Whiteman et al., 2013)	Herman Miller office chair that are designed for disassembly, Interface Inc. carpet tiles solutions made from recycled material, Humble brush bamboo based toothbrush
	<i>Social sustainability</i>	Increasing social wealth by creating social equality, providing access to education and healthcare, fair and safe working conditions, freedom of speech and access to information, peace and security, and increasing social inclusion <i>relatively more than</i> their peer organizations (Bacq and Janssen, 2011; Choi and Majumdar, 2014; Hutchins and Sutherland, 2008; Kroeger and Weber, 2015; Whiteman et al., 2013; Zahra et al., 2009)	Toms and Humble Brush's toothbrushes 'buy one - give one' initiative, Tony's Chocolonely slave free and fair chocolate

Sustainability of BM Actors:

- Environmental sustainability:
 - The value proposition is coded *environmental* if the value proposition provides a superior solution from an *environmentally* sustainable perspective compared to peer organizations in the local or national context (e.g., less pollution, highly efficient material use, nontoxic materials, etc.)
 - The customer segment is coded *environmental* if it is relatively more *environmentally* sustainable than peer customer groups in the local or national context
 - The key activities are coded *environmental* if the *environmental* sustainability performance is better than peer organizations in the local or national context (e.g., less pollution, recycling, nontoxic materials, etc.)
 - Activities can only be considered for coding if they are key to the business model
 - Activities are only coded *environmentally* sustainable if it is a substantial share that is sustainable (e.g., amount of sustainable transport out of total transport)
 - If applicable we mapped the provider of transport services (i.e., the carrier) as a separate actor to code the sustainability on this activity at the right actor (e.g., short distance, electric/bicycle, clustered transport, etc.)
- Social sustainability:
 - The value proposition is coded *social* if the value proposition provides a superior solution from a *socially* sustainable perspective compared to peer organizations in the local or national context
 - The customer segment is coded *social* if it is relatively more socially sustainable than peer customer groups in the local or national context
 - Serving an underprivileged user/customer group(s) is coded *socially* sustainable. It is coded on the core organization if these customers constitute a substantial share out of all customers. (social user group)

- The key activities are coded *social* if the *social* sustainability performance is better than peer organizations in the local or national context (e.g., short distance, electric/bicycle, clustered transport, etc.)
- Activities can only be considered for coding if they are key to the business model
- Activities are only coded *environmentally* or *socially* sustainable if it is a substantial share that is sustainable (amount

of donations out of total profit, supermarket vs. eco supermarket)

- If an actor has significantly better working conditions throughout its supply chain than peer organizations (e.g., for social workforce, no slavery, no child labor, etc.)
- Deploying a social workforce is coded *social* (i.e., people that experience difficulty with getting employed because of their age, handicap, ethnicity, background, etc.)
 - Coded on focal organization key activities if applicable
 - Coded on other BM actors throughout supply chain if applicable
- Fair working conditions is coded *social* (i.e., fair wages, less pollution, no slavery, no child labor, etc.)
 - Coded on focal organization key activities if applicable
 - Coded on other BM actors throughout supply chain if applicable (e.g., slave free, child labor free product from B.O.P. and Brick countries)
 - Can be anywhere else in the world as long as it is more socially sustainable in comparison

Sustainability of value transfers:

- Environmental sustainability:
 - Coded *environmentally* sustainable if the value transfer content is *environmentally* sustainable
 - *Environmentally* sustainable value transfer content does not make the originator or receiving party automatically *environmental/social*.
 - If originator has no sustainable value proposition and no sustainable key activities he remains non-sustainable
 - If the overall share of sustainable items of the entire product/service portfolio is very limited it is not coded as sustainable
 - Goods, waste, etc. are coded *environmental* if they are:
 - Products/services that are *environmentally* sustainable

- On their way to recycling
- After recycling (e.g., recycled material)
- On their way to reuse
- During reuse
- shared use
- Access instead of ownership, if usage of resource is shared by different parties/increase in product usage efficiency
- Adhere to eco-design principles
- Donations:
 - are coded *environmental* on value transfer if they are given for serving an environmental goal
- Artisan products are only coded *environmentally* sustainable if applicable, they are not always more sustainable than alternative solutions
- Social sustainability:
 - Coded *socially* sustainable if the value transfer content is *socially* sustainable
 - *Socially* sustainable value transfer content does not make the originator or receiving party automatically *socially sustainable*.
 - If originator has no sustainable value proposition and no sustainable key activities he remains non-sustainable
 - If the overall share of sustainable items of the entire product/service portfolio is very limited it is not coded as sustainable
 - Product/service, etc. that are socially sustainable are coded *social*
 - Social interaction is always coded *socially* sustainable (should only be mapped if it is meaningful interaction, and thus increase social inclusion)
 - Donations:
 - Are coded *social* on value transfer content if they are given for serving a social goal
 - Coded *social* on key activities of the originator (the one that gives donations) on if it is donating relatively more than its peer organizations
- Subsidies:
 - Are not coded *social* because governmental/municipal responsibility to support society/environment
- Alternative currencies are coded *social* if they enable underprivileged user groups to gain access
- Value capture is coded *social*:
 - If there is a 'top-up' paid (extra currency) as part of the price that goes to underprivileged user group. It has to be passed on to the underprivileged user group (consumer or workforce somewhere in the supply chain). The 'top-up' can only remain with the focal organization if that is where the underprivileged group is located in BM architecture. Otherwise this should be coded as 'social' on all value transfers leading to where the underprivileged user group is served, so not only from customer to focal organization but also beyond. (e.g., buy one - give one principle, paying a little bit more than market average prices to support local farmers).
 - If it is an honest price for the product in comparison to peer organizations
- Fair wages paid throughout the supply chain
- Fair price for what is produced (no dumping prices)
 - Coded *social* if the payment compensates value that cannot be captured somewhere else in the BM because other users can otherwise not gain access or afford product/service
- Artisan products are only coded *socially* sustainable if applicable

Appendix D. Overview of cases

Several cases belonged to more than one industry. For clarity purposes, we chose to code each case under one industry.

Table D.1
Cases per industry, including general coding, BM structure type, and value content.

Companies	B2B/B2C/P2P	FP/NP	Business model structure type	Content of value creation	Content of value capture	Value proposition
Agriculture						
1 Dacom	B2B	FP	Make-sell	Product; Service	One-time payment; Repeated payment	Environmental
2 De Hagert	B2B	FP	Make-sell; Asymmetric multi-sided	Service	Repeated payment	Social
3 Orgaworld	B2C	FP	Make-sell	Product	One-time payment; Repeated payment	Environmental
4 Rooffood,	B2B	FP	Make-sell	Product; Service	One-time payment; Repeated payment	Environmental
5 Rotterzwam	B2C	FP	Make-sell	Product	One-time payment	Environmental
6 Stichting Merkartikel Bio+	B2B	NP	Resell	Product; Service	Repeated payment	Environmental, social
7 Tony's Chocolonely	B2C	FP	Make-sell	Product	One-time payment	Environmental, Social
8 Zeewaar	B2B	FP	Make-sell	Product	One-time payment	Environmental, social
	B2C					
Building						
9 Co-Green	B2B	FP	Make-sell	Product; Service	One-time payment	Environmental
10 GreenFox	B2B	FP	Make-sell	Product; Service	One-time payment; Repeated payment	Environmental, social
11 IBuildGreen	B2B	FP	Symmetric multi-sided	Product; Service	One-time payment; Repeated payment	Environmental
12 Qwiksense	B2B	FP	Make-sell; Resell	Product; Service	One-time payment; Repeated payment	Environmental
13 Sustay	B2B	FP	Make-sell	Product; Service	One-time payment	Environmental, social
14 ThermIQ BV	B2B	FP	Make-sell	Product	One-time payment	Environmental
15	B2B	FP		Product, service		Environmental

(continued on next page)

Table D.1 (continued)

Companies	B2B/B2C/P2P	FP/NP	Business model structure type	Content of value creation	Content of value capture	Value proposition
16 <i>Unika Ecopower B.V.</i> (Energy service company) <i>WoonConnect</i>	B2B B2C	FP	Make-sell; Resell Make-sell; Resell	Product; Service	One-time payment; Repeated payment One-time payment; Repeated payment	Environmental
Business services						
17 <i>Broodfonds</i>	B2B	NP	Symmetric multi-sided	Service	Repeated payment	Social
18 <i>Epea</i>	B2B	FP	Make-sell	Service	One-time payment	Environmental
19 <i>FLOOW2</i>	B2B	FP	Symmetric multi-sided	Product; Service	One-time payment; Repeated payment	Environmental
20 <i>Geencrowd Energy B.V.</i> , <i>Geencrowd foundation</i>	B2B B2C	FP, NP	Make-sell; Symmetric multi-sided	Product; Service	One-time payment; Repeated payment	Environmental, social
21 <i>Recover E</i>	B2B B2C	FP	Make-sell; Resell	Product; Service	One-time payment; Repeated payment	Environmental, social
22 <i>TradeQoin</i>	B2B	FP	Make-sell	Product; Service	One-time payment; Repeated payment	Social
23 <i>True price</i>	B2B	NP	Make-sell	Service	One-time payment; Repeated payment	Environmental, social
24 <i>Women on Wings</i>	B2B B2C	NP	Symmetric multi-sided	Service	One-time payment; Repeated payment	Social
Consumer products/services						
25 <i>Bundles</i>	B2C	FP	Make-sell	Product; Service	Repeated payment	Environmental
26 <i>Buurtleren</i>	P2P	NP	Symmetric multi-sided	Service	Repeated payment	Social
27 <i>Dopper</i>	B2B B2C	FP	Make-sell	Product	One-time payment	Environmental, social
28 <i>Lease a Jeans</i>	B2C	FP	Make-sell	Product; Service	One-time payment; Repeated payment	Environmental, social
29 <i>Noppes</i>	P2P	NP	Symmetric multi-sided	Product; Service	One-time payment; Repeated payment	Environmental, social
30 <i>Peerby, Peerby Go</i>	P2P	FP	Symmetric multi-sided	Product; Service	Free, One-time payment	Environmental, social
31 <i>Repair Café</i>	B2C P2P	NP	Make-sell; License	Product; Service	Free, One-time payment; Repeated payment	Environmental, social
32 <i>WatMooi</i>	B2C	FP	Resell	Product; Service	One-time payment	Environmental, social
Energy						
33 <i>FRES (Rural Energy Services)</i>	B2B B2C	FP, NP	Make-sell; Resell	Product; Service	One-time payment; Repeated payment	Environmental, social
34 <i>Greenchoice</i>	B2B B2C	FP	Resell; Symmetric multi-sided	Product; Service	Repeated payment	Environmental, social
35 <i>Rooftop Energy</i>	B2B	FP	Make-sell	Product; Service	One-time payment; Repeated payment	Environmental
36 <i>SwitchMyLight</i>	B2B B2C	FP	Make-sell; Resell	Product; Service	One-time payment	Environmental
37 <i>Wind delen/de Windcentrale</i>	B2C	FP	Resell; symmetric multi-sided	Product; Service	One-time payment; Repeated payment	Environmental
38 <i>Aerspire</i>	B2B B2C	FP	Make-sell	Product	One-time payment	Environmental
39 <i>Tvilight BV</i>	B2B	FP	Make-sell; resell	Product; Service	One-time payment; Repeated payment	Environmental
40 <i>WakaWaka (Off-grid Solutions BV, shine bright)</i>	B2B B2C	FP/NP	Make-sell; Resell; Asymmetric multi-sided	Product	One-time payment	Environmental, social
Food						
41 <i>Beebox (The)</i>	B2C	FP	Make-sell; License	Product; Service	Repeated payment	Environmental, social
42 <i>BoxBites</i>	B2B B2C	FP	Resell	Product; Service	Repeated payment	Environmental
43 <i>Rechtstreex</i>	B2B B2C	FP	Resell; License	Product; Service	One-time payment	Environmental, social
44 <i>Thuisafgehaald</i>	B2B P2P	NP	Symmetric multi-sided	Product; Service	Free, One-time payment; Repeated payment	Environmental, social
45 <i>Vegetarische slager (de)</i>	B2C	FP	Make-sell	Product	One-time payment	Environmental, social
46 <i>GEEF-cafe</i>	B2C	NP	Make-sell	Service	One-time payment; Repeated payment	Social
47 <i>Kromkommer</i>	B2B B2C	FP	Make-sell	Product	One-time payment	Environmental, social
48 <i>Swop</i>	B2C	NP	Make-sell; Resell	Product; Service	Free, One-time payment; Repeated payment	Social

Table D.1 (continued)

Companies	B2B/B2C/P2P	FP/NP	Business model structure type	Content of value creation	Content of value capture	Value proposition
Mobility						
49 Car2go	B2B B2C	FP	Make-sell; Resell	Product; Service	Free, One-time payment; Repeated payment	Environmental, social
50 Fastned	B2B B2C	FP	Make-sell; Resell	Product; Service	One-time payment; Repeated payment	Environmental
51 Greenes	B2C	FP	Make-sell	Product; Service	One-time payment; Repeated payment	Environmental
52 Greenjoy	B2C	FP	Resell	Product; Service	One-time payment; Repeated payment	Environmental
53 Greenwheels	B2B B2C	FP	Make-sell	Product; Service	One-time payment; Repeated payment	Environmental, social
54 MyWheels	P2P	NP	Symmetric multi-sided	Product; Service	One-time payment	Environmental, social
55 Snappcar	P2P	FP	Symmetric multi-sided	Product; Service	One-time payment	Environmental, social
56 Taxi Electric	B2B B2C	FP	Make-sell	Service	One-time payment; Repeated payment	Environmental, social
Recycling/waste						
57 Afvalloont/Ryck	B2B	FP	Resell	Product	One-time payment; Repeated payment	Environmental, social
58 De Klik, Biomass do-it-yourself	B2B B2C	FP	Symmetric multi-sided	Product; Service	Free, One-time payment; Repeated payment	Environmental
59 Healthy seas	B2B	FP, NP	Make-sell	Product; Service	One-time payment; Repeated payment	Environmental
60 Plastic Whale	B2B B2C	NP	Make-sell, Resell Asymmetric multi-sided	Product; Service	Free, One-time payment	Environmental, social
61 Refil	B2B B2C	FP	Make-sell	Product	One-time payment	Environmental, social
62 Roetz-bikes	B2B B2C	FP	Make-sell	Product; Service	One-time payment	Environmental, social
63 Shop & Drop	B2C	FP	Symmetric multi-sided; (future: also asymmetric multi-sided)	Product; Service	Free; (future: payment)	Environmental
64 Weelec	B2B	FP	Make-sell	Service	One-time payment	Environmental

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