



IMMSA

Circular Business Models

Part 2:
Overview and examples



Colophon		
Author	Koen van Renswoude	koen.van.renswoude@imsa.nl
Co-author	Arthur ten Wolde	arthur.ten.wolde@imsa.nl
Co-author	Douwe Jan Joustra	douwe.jan.joustra@imsa.nl
Date	Title	
08-04-2015	Circular Business Models – Part 2: Overview and examples	
Citations	<p>For bibliographic purposes, this document should be cited under the Creative Commons License as follows: Koen van Renswoude, Arthur ten Wolde and Douwe Jan Joustra, Circular Business Models – Part 2: Overview and examples, IMSA Amsterdam, April 2015</p>	

This report is published under a Creative Commons License (CC BY- ND 4.0). This means that you are free to share (to copy, distribute and transmit) this work under the following conditions: You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work); and you may not alter, transform or build upon this work. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nd/4.0>

Content

1. INTRODUCTION	2
2. CIRCULAR BUSINESS MODELS.....	3
SUMMARY OVERVIEW OF CIRCULAR BUSINESS MODELS.....	3
EXTENSIVE OVERVIEW OF CIRCULAR BUSINESS MODELS	4
1. SHORT CYCLE.....	4
2. LONG CYCLE	6
3. CASCADES.....	9
4. PURE CIRCLES.....	10
5. DEMATERIALIZED SERVICES.....	11
6. PRODUCE ON DEMAND.....	12
2. CIRCULAR BUSINESS MODEL CHARACTERISTICS.....	13
2.1 HOW CIRCULAR ARE CIRCULAR BUSINESS MODELS	13
2.2 INTERCONNECTEDNESS OF CIRCULAR BUSINESS MODELS.....	15
APPENDIX 1. EXAMPLES CIRCULAR BUSINESS MODELS EXPLAINED.....	17
1.SHORT CYCLE.....	17
2. LONG CYCLE	20
3. CASCADES.....	23
4. PURE CYCLE.....	25
5. DEMATERIALIZED SERVICES.....	26
6. PRODUCE ON DEMAND.....	27

1. Introduction

This report provides an overview of circular business models, with examples of companies that are already putting the circular economy into practice. It further explains the models that were introduced in IMSA's report 'Circular business models - Part 1: an introduction to IMSA's circular business model scan'.

A business model can be generalized on four considerations:

1. What you do – product or service you deliver
2. How you do it – processes and supply chain
3. For who you do it - customers
4. Why you do it – financial incentives.

Breaking circular business models down in these four considerations creates valuable insights in why certain business models could work for your company and why not. In Part 1 of this report, we introduced 19 different business models that came out of the IMSA analysis. These are summarized in Table 1. For each of the nineteen business models the what, how, who and why question is answered as concisely as possible. Besides, best practice examples of all business models are provided and these can be found in Table 2. The examples from Table 2 are explained again in even greater detail in Appendix 1.

Two notions are applicable to the list of examples provided in this report. First, the real life examples associate companies with one particular business model. However, some company examples can be categorized under one or more business models as well. In reality we see that many business models are mutually beneficial and are to be used in combination for optimizing success. The interconnectedness of the business models will be discussed in chapter 3. Secondly, the examples provided are chosen because we believe they illustrate the particular business models rather well. However, besides the listed examples in this report, more examples of successful circular business practices exist. For example, the CE100, an initiative of the Ellen MacArthur Foundation lists 100 companies that have pledged to move towards a circular economy.

In our view, a circular business model ideally has the following characteristics:

- Ownership (and thus responsibility) of items remains with the producer;
- Functionality is intended;
- It is a holistic systems perspective;
- It holds social and organizational aspects;
- Resource inputs and waste creation is minimized.

Many of these characteristics are reflected in the examples provided in this report, which show a variety of creative solutions. We believe that this development has only just begun and that further business model innovations by companies will drive the transition to a circular economy.

2. Circular business models

Summary overview of circular business models

Table 1. Circular business models

1. Short cycle		
1	Pay per use	One time payment to use product or service
2	Repair	Product life extension by repair services
3	Waste reduction	Waste reduction in the production process
4	Sharing platforms	Products and services are shared among consumers
5	Progressive purchase	Pay periodically small amounts before purchase
2. Long cycle		
6	Performance based contracting	Long term contract and responsibility with producer
7	Take back management	Incentive to ensure product gets back to producer
8	Next life sales	Product gets a next life
9	Refurbish & resell	Product gets a next life after adjustments
3. Cascades		
10	Upcycle	Materials are re-used and its value is upgraded
11	Recycling (waste handling & repurpose)	Materials are cascaded and reused, recycled or disposed
12	Collaborative production	Cooperation in the production value chain leading to closing material loops
4. Pure circles		
13	Cradle to cradle	Product redesign to 100% closed material loops
14	Circular sourcing	Only sourcing circular products or materials
5. Dematerialized services		
15	Physical to virtual	Shifting physical activity to virtual
16	Subscription based rental	Against a low periodic fee consumers can use a product or service
6. Produce on demand		
17	Produce on order	Only producing when demand is present
18	3D printing	Using 3D printing to produce what is needed
19	Customer vote (design)	Making customers vote which product to make

Extensive overview of circular business models

Table 2. Circular business models explained

For more information on the examples see Appendix 1.

1. Short cycle

1. Pay per use	
What	One time payment to use product or service – short term use
How	Provide accessibility to customers while remain owner
Who	Customers that are in need of your service or product performance
Why	Revenue is generated because people use your service or product. Since you provide a low threshold to use your product, it is easily accessible and attractive for customers. Costumers have no responsibility with the product or service after use.
Examples	Car2go - https://www.car2go.com/en/amsterdam/what-is-car2go/ Hertz – car rental www.hertz.com NS – train ticket www.ns.nl OV fiets – http://www.ov-fiets.nl/ovfiets/wat-is-ov-fiets/submenu/ov-fiets.html

2. Repair	
What	Product life extension by repair services
How	Providing service on location or via logistics to do it at the service company
Who	People that benefit / profit from extending product life
Why	People pay you for your service. It provides a secondary revenue stream if you also delivered the product initially. This can become a third – fourth, etc... This can help you to build longer-term customer relations. Your costs are fairly low since you don't have to provide high investment costs for new resources, since products already exist.
Examples	Ricoh service - https://www.ricoh.com/environment/management/concept.html

3. Waste reduction	
What	Waste reduction in the production process
How	Better, smarter design Use your created waste, again as a resource (closed loop)
Who	Your company, companies that manufacture
Why	Reducing waste leads to less demand for purchasing materials, which results in cost reductions that boost profitability. Cost not only go down from purchasing less, waste handling will be less, reducing costs as well. Reselling leftover materials as secondary resources can bring considerable additional revenues that further reduce production costs. Furthermore, you become less depend on your supply chain for resources, and more resilient against resource (world market) price dependency. This can boost your competitive position in your sector.
Examples	AkzoNobel - http://www.theguardian.com/sustainable-business/recycling-reuse-fresh-approach-paint-waste Unilever – Radio interview Paul Polman - http://www.bbc.co.uk/programmes/p02gyp65

4. Sharing platforms	
What	Products and services are shared among consumers
How	Making sharing accessible, for example via platforms Design, manufacture, create financial & social incentive to enhance sharing
Who	Companies that currently sell to single clients only Consumers that seek for lower product prices and who do not want to possess everything individual, but want easy access to products and services.
Why	You can increase your target market by reaching more potential customers, even though they share, you can gain market share, increase brand loyalty, and receive more feedback to improve your product. Customer demand for sharing is increasing; facilitating these consumers will provide you with a competitive advantage. On the contrary, not setting up sharing possibilities your self will most likely mean that consumers will share via other platforms.
Examples	Peerby - www.peerby.nl AirB&B - www.airbnb.nl ThredUP - http://www.thredup.com/mythredup FLOOW2 - http://www.floow2.com/sharing-marketplace.html Parkflyrent - http://parkflyrent.nl
5. Progressive purchase - Pay periodically small amounts before purchase	
What	Pay periodically small amounts before purchase
How	Provide a (expensive) product against a low price for a long period of time. Be able to finance investments up front
Who	Customers with low spending power, which would benefit from your product substantially
Why	Lease period is guaranteed revenue, with revenue streams of selling eventually. Better accessible for consumer with low spending power, potentially tapping into a huge target market of consumers. Opportunities of scale, brand loyalty and innovation.
Examples	Simpan networks - http://simpanetworks.com

2. Long cycle

6. Performance based contracting	
What	Providing long term access to a product or service, where ownership and responsibility remains with producer
How	Logistics need to be in place to deliver, maintenance and take back products Long term contracts are most likely to be established
Who	Customers that want convenience, a performance
Why	You offer the customer convenience of accessibility to a product or service. This makes the threshold lower for consumers to use it, while long-term contracts are most likely to be established, enhancing your customer relation. Constant contact with your customers creates the possibility of product feedback, enabling improvement of your deliverables. Since you remain owner, products get back to you at the end of contract, providing you resources for new cycles. Benefits are resource security, becoming more resilient against market volatility. Supply chain cooperation is likely to occur to arrange logistics, strengthening the value chain's competitive position.
Example	Michelin – pay per km - http://www.ellenmacarthurfoundation.org/business/articles/snapshot-michelin.pdf Rolls Royce. – pay by the hour (airplane engines) - http://www.rolls-royce.com/news/press_releases/2012/121030_the_Hour.jsp Philips – pay per lux - http://www.lighting.philips.com/pwc_li/main/shared/assets/downloads/casestudy-rau-int.pdf Interface - http://www.interfaceglobal.com/Sustainability/Products/Manufacturing.aspx
7.1 Take back management: Closed loop	
What	Ensure product gets back to producer
How	Logistics to organize this action
Who	Customers are serviced (not having to deal with waste), you gain resources
Why	Returning products make you more resource resilient, allows risk reduction of resource scarcity, and risk reduction on price volatility. Costs reductions can occur for procurement. Chain agreements for costs burden of collection will strengthen partnerships and value chain cooperation. Positive brand image.
Examples	Desso – http://www.desso.nl/c2c-corporate-responsibility/cradle-to-cradle-mijlpalen/ Dell – http://www.dell.com/learn/us/en/uscorp1/corp-comm/closed-loop-recycled-content Interface – http://www.interfaceglobal.com/Sustainability/Products/Manufacturing.aspx Cisco – http://www.cisco.com/web/about/ac227/ac228/ac231/about_cisco_takeback_recycling.html

7.2 Take back management: Variable resell price	
What	Incentive to ensure product gets back to producer
How	Provide financial incentive to customer to return a product Logistics to organize this action
Who	Customers that want to monetize used products
Why	You create an incentive for customers to (re)buy products again with your company, for example by providing them with a credit only to be used at your company. Returning products make you more resource resilient, allows risk reduction of resource scarcity, and risk reduction on price volatility. Costs reductions can occur for procurement. Chain agreements for costs burden of collection will strengthen partnerships and value chain cooperation. Positive brand image
Examples	Ikea Barendrecht – Return product, get credit. – http://www.ikea.com/ms/nl_NL/img/local_store_info/barendrecht/beeldmateriaal_overig/Meubel%20inruilservice.pdf
7.3 Take back management: Guaranteed resell price	
What	Incentive to ensure product gets back to producer
How	Provide a guaranteed resell price for a purchased product upon returning after use Logistics to organize this action
Who	Conscious consumers
Why	You create an incentive for customers to (re)buy products again with your company, for example by providing them with a credit only to be used at your company. Returning products make you more resource resilient, allows risk reduction of resource scarcity, and risk reduction on price volatility. Costs reductions can occur for procurement. Chain agreements for costs burden of collection will strengthen partnerships and value chain cooperation. Positive brand image
Examples	Mud Jeans – http://www.mudjeans.eu/lease-philosophy/
7.4 Take back management: Disposal service	
What	Incentive to ensure product gets back to producer
How	Build in logistics to pick up used products Have disposal services in store
Who	Conscious consumers
Why	Having delivery and return logistics in place creates the image of a responsible company, adding to a positive brand image. In addition, it provides consumers with an easy way to dispose the products, which makes this service more acceptable. Returning products make you more resource resilient, allows risk reduction of resource scarcity, and risk reduction on price volatility. Costs reductions can occur for procurement. Chain agreements for costs burden of collection will strengthen partnerships and value chain cooperation.
Examples	Auping – http://www.auping.nl/web/over-auping/duurzaam-en-veilig/auping-take-back-system Nespresso – Cups take back - http://www.nespresso.com/ecolaboration/fr/en/article/9/2906/recycling-from-home.html H&M - http://www.hm.com/nl/longliefashion

8. Next life sales	
What	Product gets a next life
How	Create a resell / reuse moment Logistics Via your company or by individuals
Who	Consumers that do not mind used products, often paying a lower price
Why	Currently we see next life sales being organized by individuals or platforms that collectively organize transactions. As a business you want to be in charge of this second, third, fourth, etc. moment of sales. Multiple moments of revenue generation become available against low production costs, creating profitable margins. It provides opportunities to expand your target market and thus getting more customers loyal to your brand. Emerging markets show interest in next life products, conscious consumers do as well as customers with less spending power. As a sales platform operator you can generate revenue from advertising space since you reach a very large group of people.
Examples	Tata Motors Assured – http://www.tatamotorsassured.com Marktplaats & Ebay – Connecting individuals and businesses on second hand products. Ikea – http://www.the9billion.com/2013/11/06/ikea-creates-online-flea-market-to-resell-reuse-2nd-hand-furniture/ ThredUp – http://www.thredup.com/mythredup

9. Refurbish & resell	
What	Product gets a next life after adjustments
How	Assuring quality standards Resell logistics
Who	Consumers that do not mind used products, often paying a lower price
Why	You can create a second, third, etc. revenue stream against low production costs. Multiple moments of revenue generation become available against low production costs, creating profitable margins. It provides opportunities to expand your target market and thus getting more customers loyal to your brand. Emerging markets show interest in next life products, so do conscious consumers, as well as customers with less spending power.
Examples	HP - http://www.hp.com/sbso/buspurchase_refurbished.html Dell - http://www.dell.com/learn/us/en/uscorp1/corp-comm/closed-loop-recycled-content Caterpillar - http://www.caterpillar.com/nl/company/sustainability/remanufacturing.html Techreturns - http://www.techreturns.com BMW - http://www.fastcoexist.com/1681904/5-business-models-that-are-driving-the-circular-economy

3. Cascades

10. Upcycle	
What	Materials are re-used and their value is upgraded
How	By using materials that otherwise would go to waste
Who	Conscious consumers Seems to be a small / niche market currently
Why	This business model generates value because resources are obtained against low costs. Low purchasing costs allows generating margin, especially since products are often sold at a premium. Positive corporate image, attracting those conscious consumers.
Examples	Worn Again - http://wornagain.info Freitag.ch - http://www.freitag.ch/about/production Upcycled.nl - http://www.upcycled.nl/index.html
11. Recycling (including waste handling & repurpose)	
What	Materials are cascaded and reused, recycled or disposed
How	Waste collection – sorting – recycling – cascading – energy extraction
Who	Waste companies Citizens
Why	Waste becomes a resource, since it holds potential value. By recycling materials the need for new inputs in the system will decrease making the recycled content, especially with increasing virgin resource prices more and more valuable.
Examples	MBA Polymers - http://www.mbapolymers.com/home/images/PDF/mba_polymers-corporate_social_responsibility_report_2014-2015.pdf Suez & SITA. - http://www.suez-environnement.fr/wp-content/uploads/2014/09/CP-Matinée-Plastique-23_-09_-2014_VA1.pdf Van Gansewinkel - http://www.vangansewinkel.nl/over-van-gansewinkel/afval-bestaat-niet.aspx Rubies in the Rubble - http://www.rubiesintherubble.com/our-mission/
12. Collaborative production	
What	Cooperation in the production value chain leading to closing material loops
How	Seeking partnerships, synergy & cooperation
Who	Value chain partners
Why	Value chain resilience will occur because of long-term cooperation between chain partners. This creates for the entire chain, including your company, a stronger competitive position. Resource use is likely to be reduced since synergy will take place leading to more efficient processes. This will reduce costs and boosts profitability. Cooperation could also lead to better resource resilience when resources cycle between value chain partners.
Examples	Carlsberg – http://www.carlsberggroup.com/investor/news/Pages/Carlsbergmakes_furtherprogressonsustainability,environmentalefficiency.aspx#.VS0me8ZnW2V Steinbeis – www.steinbeis.de Dutch aWEARness - http://dutchawareness.com/circulareconomy/circular-economy/

4. Pure circles

13. Cradle to cradle	
What	Product redesign to 100% closed material loops
How	Design and manufacture process in such a way products can be easily and fully disassembled, not containing any toxic materials.
Who	Circular purchasers Conscious consumers
Why	By using cradle to cradle you can become a preferred supplier or manufacturer. It will deliver you a positive corporate image. When companies only want to purchase circular products or services they will often search for cradle to cradle. Besides you might benefit from legal issues in the future when for example law restricts the use toxic materials in production.
Examples	Desso – http://www.desso.nl/c2c-corporate-responsibility/cradle-to-cradle/ Herman Miller – http://www.hermanmiller.com/about-us/who-is-herman-miller/our-story.html Van Houtum - http://www.vanhoutum.nl/mvo/293/cradle-to-cradle.html Ahrend – http://www.ahrend.com/en/Royal-Ahrend/CSR/Cradle-to-Cradle-Company/
14. Circular sourcing	
What	Only sourcing circular products or services
How	Circular suppliers Sourcing / purchasing strategy
Who	For your company
Why	You set your company up for future resource security since circular products and services will remain available. This could lead to cost reductions in procurement, and creating resilience against price volatility on the market. Besides you might benefit from legal issues in the future when for example law restricts the use virgin materials in production. N.B. A shared definition of what exactly qualifies as circular products and services is currently lacking. Each company should therefore develop their own criteria while seeking connection with other stakeholders about what circular products are. For more information see the program created by Dutch government and businesses ‘Green Deal, Circular Purchasing in the Netherlands’. http://www.mvonderland.nl/publicatie/green-deal-circulair-inkopen (links to a Dutch webpage)
Examples	Interface – fishnets – http://www.sustainability.com/library/model-behavior#.VNIdU8Yre2U p. 30

5. Dematerialized services

15. Physical to virtual	
What	Shifting physical activity to virtual
How	IT services, internet, software and logistics
Who	Customers with access to virtual world
Why	Shifting could substantially lower overhead costs. For example the costs of a shop or office space. Having less fixed assets makes your company more flexible in the market and better able to respond to changing customer demand, creating competitive advantage. Furthermore you can reach and thus serve a larger market, theoretically everyone connected to the internet. It also allows for better customizing demand, focusing on the needs of customers. Reducing transaction costs can boost profitability.
Examples	Sungevity - http://www.sustainability.com/library/model-behavior#.VNIdU8Yre2U HelloFresh - www.hellofresh.nl Capgemini - http://www.capgemini.com/resources/saas-myths-and-realities Blendle - www.blendle.com
16. Subscription based rental	
What	Against a low periodic fee consumers can use a product or service
How	IT services, internet and software
Who	Customers with access to virtual world
Why	With low periodic fees there is easy access for consumers. The large base of users provides commercial value by means of advertisement for example. Upgradability provides revenue potential, also adding to personalization of demand.
Examples	Netflix - http://www.sustainability.com/library/model-behavior#.VNIdU8Yre2U p. 30 Spotify - www.spotify.nl

6. Produce on demand

17. Produce on order	
What	Only producing when demand is present
How	Ensure you create demand
Who	Customers in need of capital intensive products or products with an unpredictable market demand
Why	You prevent unnecessary production, preventing waste, boosting profitability. You can customize your supply, with the same effect. You do not have upfront investments, or no stock keeping, before sales.
Examples	Zelf je boek uitgeven (print your own book) - http://www.zelfjeboekuitgeven.nl/pod/ Airbus and Boeing – www.airbus.com & www.boeing.com
18. 3D-printing	
What	Using 3D printing to produce what is needed
How	Deliver access to those in need of particular objects
Who	People in remote locations People in need of only one spare part for an expensive machine to keep functioning
Why	You prevent unnecessary production, preventing waste, boosting profitability. A 3D-printer can operate independent of geographic location. 3D-printing holds scaling potential. You attract customers since you offer a more economic alternative for consumers than existing supply.
Examples	Print 3D Matter - http://www.print3dmatter.com 3D systems - http://www.3dsystems.com/nl/node/3427
19. Customer vote (design)	
What	Making customers vote which product to make
How	Reach potential customers and let them (design) vote what to produce Sales / marketing to reach customers
Who	Customers that value personality & identity
Why	You can create customer loyalty when you allow them to be part of your production process, enhancing the social value of co-creation and customer engagement. Besides this can save you on designing costs, boosting profitability. You receive instant feedback on demand from consumers that can be used to improve your products and services. You prevent unnecessary production and waste, boosting profitability.
Examples	Threadless T-shirts – http://www.sustainability.com/library/model-behavior#.VNIdU8Yre2U p. 25 LEGO Cusoo – http://www.sustainability.com/library/model-behavior#.VNIdU8Yre2U

2. Circular business model characteristics

2.1 How circular are circular business models

Based on the list of circular business models, and the theory on circular economy, we generated the following list of five questions to categorize circular business models.

1. Is the producer responsible (PR) for the product after exchange?
2. Does the business model require product- or production redesign (RD)?
3. Does the business model require value chain cooperation (VCC)?
4. Do you become more resource resilient (RR)?
5. Do you create additional revenue opportunities (ARO)?

The answers in the table are indicated with a Y (yes) or an N (no), or with an O (open) in case both answers are possible. For instance, when redesign is not strictly necessary but highly beneficial. An overview of this analysis is shown in Table 3.

Observations from Table 3

- Performance based contracting is the only business model that answers each question with yes.
- When you use multiple business models together, the combined level of circular character will often increase.
- All business models in the long cycle offer opportunities for additional revenue generation.

Note

It should be stated that the answers are generalized based on processes currently prevalent in business and information available. It can vary per specific company how these questions are answered per business model.

Table 3. Characteristics of circular business models

Business model	PR	RD	VCC	RR	ARO
<i>Short cycle</i>					
1 Pay per use	Y	Y	N	Y	Y
2 Repair	O	O	Y	N	Y
3 Waste reduction	N	Y	N	Y	N
4 Sharing platforms	N	Y	Y	O	Y
5 Progressive purchase	N	N	Y	N	Y
<i>Long cycle</i>					
6 Performance based contracting	Y	Y	Y	Y	Y
7 Take back management	O	N	Y	Y	Y
8 Next life sales	N	N	O	Y	Y
9 Refurbish & resell	O	N	Y	Y	Y
<i>Cascades</i>					
10 Upcycle	N	Y	O	O	N
11 Recycling (waste handling & repurpose)	N	O	Y	O	N
12 Collaborative production	O	O	Y	Y	N
<i>Pure circles</i>					
13 Cradle to cradle	O	Y	Y	Y	Y
14 Circular sourcing	Y	Y	Y	Y	N
<i>Dematerialized services</i>					
15 Physical to virtual	O	Y	Y	Y	Y
16 Subscription based rental	O	Y	Y	N	Y
<i>Produce on demand</i>					
17 Produce on order	N	N	O	O	N
18 3D printing	N	Y	Y	Y	Y
19 Customer vote	N	Y	Y	N	N

PR = Producer responsibility

RD = Redesign

VCC = Value chain cooperation

RR = Resource resilience

ARO = Additional revenue opportunity

2.2 Interconnectedness of circular business models

The business models identified are by no means independent but highly interconnected. In Table 4, the interconnectedness of circular business models is visualized. The table provides an overview of the business models that are mutually beneficial, in other words which business models can well be used together. Often, in order to reach optimal circular activity in your company a combination of business models will need to be considered. If you are deciding to use a certain business model, this table directs you to take a few more into consideration as well.

Table 4. Interconnectedness of circular business models

1. Pay per use	Refurbish & resell
Performance based contracting	Subscription based rental
Take back management	Recycling
Recycling - waste	Collaborative production
Collaborative production	Cradle to cradle
Subscription based rental	Produce on order
3D printing	3D print
	Costumer vote / design
2. Repair	
Performance based contracting	7. Take back management
Take back management	Pay per use
Next life sales	Repair
Upcycle	Performance based contracting
3D printing	Next life sales
	Refurbish & resell
3. Waste reduction	Recycling - waste
Recycling - waste	Cradle to cradle
Collaborative production	
Produce on order	8. Next life sales
Costumer vote / design	Repair
	Sharing platforms
4. Sharing platforms	Performance based contracting
Next life sales	Take back management
Physical to virtual	Refurbish & resell
Subscription based rental	Upcycle
Costumer vote / design	Cradle to cradle
	Circular sourcing
5. Progressive purchase	3D printing
Performance based contracting	
	9. Refurbish & resell
6. Performance based contracting	Performance based contracting
Pay per use	Take back management
Repair	Next life sales
Progressive purchase	Upcycle
Take back management	Cradle to cradle
Next life sales	3D printing

10. Upcycle

Repair
Next life sales
Refurbish & resell

11. Recycling - waste

Pay per use
Waste reduction
Performance based contracting
Take back management
Cradle to cradle

12. Collaborative production

Pay per use
Waste reduction
Performance based contracting
Produce on order
3D printing
Customer vote / design

13. Cradle to cradle

Performance based contracting
Take back management
Next life sales
Refurbish & resell
Recycling - waste
Circular sourcing

14. Circular sourcing

Next life sales
Cradle to cradle

15. Physical to virtual

Sharing platforms

Subscription based rental
3D printing

16. Subscription based rental

Pay per use
Sharing platforms
Performance based contracting
Physical to virtual
Customer vote / design

17. Produce on order

Waste reduction
Performance based contracting
Collaborative production
3D printing

18. 3D printing

Pay per use
Repair
Performance based contracting
Next life sales
Refurbish & resell
Collaborative production
Physical virtual
Produce on order
Consumer vote

19. Customer vote / design

Waste reduction
Sharing platforms
Performance based contracting
Collaborative production
Subscription based rental
3D printing

Observations from Table 4

- Every circular business model can be combined with at least one other business model.
- Performance based contracting is the business model that can be used in combination with the highest number of other circular business models. This confirms that this business model lies at the core of circular economy.
- Progressive purchase can be used in combination with only one other business models.

Appendix 1. Examples circular business models explained

Category 1. Short cycle

1. Pay per use

Car2go

A car rental service available in various large cities around the world, operated by Mercedes-Benz. Cars aren't picked-up or dropped-off at fixed locations but can be left anywhere in town. You gain access to a vehicle by using your smartphone. You pay time you use the vehicle.

<https://www.car2go.com>

Hertz

You rent a car, don't buy one. It is a one time transaction to transport yourself from one point to another (example can be given for any car rental company)

www.hertz.com

NS

You buy a train ride. Not a train. It is a one time transaction to transport yourself from one point to another. (example can be given for any commercial train provider. It must be said that the NS is using 'green' energy on their grid making them a preferred example)

www.ns.nl

OV-Fiets

The OV-fiets is a public transportation bike that can be used against a low fee. At most Dutch train stations there is the availability to use a bike.

<http://www.ov-fiets.nl/ovfiets/wat-is-ov-fiets/submenu/ov-fiets.html>

2. Repair

Ricoh

Ricoh has, since 1994, it's Comet Circle concept in place.

This philosophy aims at achieving 3 goals.

1. identifying and reducing environmental impact at all stages of lifecycle
2. putting priority on inner-loop recycling
3. establishing a partnership at every stage

Ricoh has implemented their 'Comet-Circle' concept that aims at reusing materials brought into the product cycle as optimal as possible by what they call 'inner loop recycling'. This includes having scheduled repair and maintenance work done on all their machines.

<https://www.ricoh.com/environment/management/concept.html>

3. Waste reduction

AkzoNobel

AkzoNobel is actively pursuing optimization of paint use and paint cans.

<http://www.theguardian.com/sustainable-business/recycling-reuse-fresh-approach-paint-waste>

Unilever

All 250 factories are operating on zero waste right now. Economic value is created by more productivity, less hazard, less costs. According Paul Polman in a BBC radio interview. Furthermore, water reduction initiatives are implemented in their product line. For example, introducing washing liquids that save water use. Reduction of packaging materials is a \$3trillion business for Unilever.

<http://www.bbc.co.uk/programmes/p02gyp65>

“Eliminating waste has avoided more than €200 million of cost and created hundreds of jobs. In Egypt, for example, the local team has launched a programme which gives disabled employees the opportunity to earn extra income by recycling waste material from production lines.”

<http://www.unilever.com/sustainable-living-2014/news-and-resources/sustainable-living-news/zero-waste.aspx>

4. Sharing platforms

Peerby

Sharing any kind of products and services with others. A platform that connects individuals.

www.peerby.nl

AirB&B

Renting your apartment, house or room to others.

www.airbnb.nl

ThredUp

Browse thousands of like-new clothing items, which we've hand-selected and certified for quality. You'll find all your favorite brands discounted up to 90% off, year-round.

And, when you're done with clothing, simply fill up a thredUP bag and put it on your doorstep.

thredUP covers the shipping, and pays you for every item we can sell to other families.

Our goal is to make your life just a little bit easier.

- We eliminate the stress of deal hunting by offering consistent discounts every day.
- We take the hassle out of bringing your kids into a store by allowing you to thredUP online.
- We relieve that recycling guilt by helping you lighten your family's carbon-footprint with every order.

Ready to give thredUP a try? We think you'll love what you find.

<http://www.thredup.com/mythredup>

FLOOW2

FLOOW2, World's Reset Button, is the business-to-business Sharing Marketplace where companies and institutions can share equipment and the skills & knowledge of personnel.

FLOOW2 unites supply and demand and creates transparency concerning who has what, and where and when it will be available.

www.floow2.com

Park fly Rent

When you park your car at Schiphol, Amsterdam International Airport the company provides you with parking and cleaning, but will also rent out your car to others. You receive a share of the rental fee while not having to pay any parking fees.

www.ParkFlyRent.nl

5. Progressive purchase

Simpa Networks

Sells distributed energy solutions on a “progressive purchase” basis to underserved consumers in emerging markets.

Currently operational in India, Simpa's goal is to transform the market for solar energy systems.

Customers make a small initial down payment for a high-quality solar photovoltaic (PV) system and then pre-pay for the energy service, activating their systems in small user-defined increments using a mobile phone. Each payment for energy also contributes towards the final purchase price. Once fully paid, the system unlocks permanently and produces energy, free and clear.

<http://simpanetworks.com>

<http://www.sustainability.com/library/model-behavior#.VNIIdU8Yre2U>

Category 2. Long cycle

6. Performance based contracting

Michelin

As of 2011, Michelin Fleet Solutions had 290,000 vehicles under contract in 23 countries, offering tire management (upgrades, maintenance, replacement) to optimize the performance of large truck fleets—in Europe, 50% of large truck fleets externalize their tire management. By maintaining control over the tires throughout their usage period, Michelin is able to easily collect them at end of the leases and extend their technical life as well as to ensure proper reintegration into the material cascade at end of life.

<http://www.ellenmacarthurfoundation.org/business/articles/snapshot-michelin.pdf>

Rolls Royce

'Power-by-the-Hour', a Rolls-Royce trademark, was invented in 1962 to support the Viper engine on the de Havilland/Hawker Siddeley 125 business jet. A complete engine and accessory replacement service was offered on a fixed-cost-per-flying-hour basis. This aligned the interests of the manufacturer and operator, who only paid for engines that performed well.

Rolls-Royce CorporateCare®, launched in 2002, added a range of additional features. These include Engine Health Monitoring, which tracks on-wing performance using onboard sensors; lease engine access to replace an operator's engine during off-wing maintenance, thereby minimizing downtime; and a global network of authorized maintenance centres to ensure that world-class support is readily available to customers whenever required.

http://www.rolls-royce.com/news/press_releases/2012/121030_the_Hour.jsp

Philips

Pay per lux – Philips provides light and the customer pays per lux.

http://www.lighting.philips.com/pwc_li/main/shared/assets/downloads/casestudy-rau-int.pdf

Interface

“In 2013, we made great strides in our mission of becoming a sustainable enterprise – which we refer to as Mission Zero®. We launched the Net Effect™ Collection of carpet tile products (one of which is featured on the cover of this report) with yarn that is partly made from recycled fishing nets collected by communities in the Philippines through our Net-Works™ project. This program is a big step in redesigning our supply chain from a linear take-make-waste process toward a closed loop system, and it advances our ultimate goal of becoming a restorative enterprise. Our plant in Europe reached a significant milestone, as it now uses 100% renewable energy from a combination of bio-gas and green electricity, with almost no water used or waste sent to a landfill. In addition, we created new programs to strengthen employee connections to our sustainability goals, holding our first ever Mission Zero week celebrations at several locations worldwide, with activities that included legacy projects, biomimicry training workshops, enhanced communications and employee recognition programs.”

<http://www.interfaceglobal.com/Sustainability/Products/Manufacturing.aspx>

7.1 Take back management - Closed loop

Desso

Desso has their Take Back™ program in place to obtain used floor tiles and their Refinity® program to disassemble the tiles.

<http://www.desso.nl/c2c-corporate-responsibility/cradle-to-cradle-mijlpalen/>

Dell

Dell has a closed loop recycle program in place.

<http://www.dell.com/learn/us/en/uscorp1/corp-comm/closed-loop-recycled-content>

Interface

Interface has a take back system in place.

<http://www.interfaceglobal.com/Sustainability/Products/Manufacturing.aspx>

Cisco

<http://www.cisco.com/web/about/ac227/ac228/ac231/WEEE/netherlands.html>

7.2 Incentivized return – Variable resell price

Ikea Barendrecht

Return your product, and get credit for this particular Ikea store.

http://www.ikea.com/ms/nl_NL/img/local_store_info/barendrecht/beeldmateriaal_overig/Meubel%20inruilservice.pdf

7.3 Incentivized return – Guaranteed resell price

Mud Jeans

Upon returning your old pair, you receive a EUR30 voucher for a new pair. This can be termed a take back initiative.

<http://www.mudjeans.eu/lease-philosophy/>

7.4 Incentivized return – Disposal service

Auping

Auping has a program in place, the Auping Take Back System (ATBS), to take used mattresses upon delivering the customers new one. In cooperation with the Van Gansewinkel Groep these mattresses are taken apart and serve as resource for other products.

<http://www.auping.nl/web/over-auping/duurzaam-en-veilig/auping-take-back-system>

Nespresso

Cups taking back program and recycling.

<http://www.nespresso.com/ecolaboration/fr/en/article/9/2906/recycling-from-home.html>

H&M

H&M collects garments in their shops to be reused - reprocessed after collection.

<http://www.hm.com/nl/longlivefashion>

8. Next life sales

Tata Motors Assured

Tata resells their second hand cars including guarantee.

<http://www.tatamotorsassured.com>

Marktplaats & Ebay

Connecting individuals and businesses to trade second hand products.

Ikea

Creating a platform for second hand Ikea furniture.

<http://www.the9billion.com/2013/11/06/ikea-creates-online-flea-market-to-resell-reuse-2nd-hand-furniture/>

9. Refurbish & resell

HP

HP refurbishment department.

http://www.hp.com/sbso/buspurchase_refurbished.html

Dell

<http://www.dell.com/learn/us/en/uscorp1/corp-comm/closed-loop-recycled-content>

Caterpillar

Providing heavy machinery for mainly constructing companies, Caterpillar has a pay per unit system in place and intensive maintenance programs. Besides, used machinery is remanufactured and provided with a discount afterwards.

<http://www.caterpillar.com/nl/company/sustainability/remanufacturing.html>

Techreturns

Reusing electronic devices as well as recycling parts of electronic devices. Techreturns buys used electronic devices, refurbish them and resells, mostly in Africa again.

<http://www.techreturns.com>

BMW

With the right design and remanufacturing capabilities, they can be put together to form new products. This is product transformation. For BMW, it can mean a 50% cost saving for customers buying remanufactured parts as compared to new ones. You get exactly the same quality specifications as a new BMW part subject to the same 24-month warranty.

<http://www.fastcoexist.com/1681904/5-business-models-that-are-driving-the-circular-economy>

Category 3. Cascades

10. Upcycle

Worn Again

Website: 'Business as usual is not an option. Radical and transformative business models and attitudes are required to turn the problem of textile waste into an opportunity and solution.' It became clear there was a better way to design out textile waste and design in 'closed loop' solutions. The team is currently engaged in full time development of a closed loop recycling technology and resource model for the textile and clothing industry, working closely with its' development partners.

<http://wornagain.info>

Freitag.ch

'Giving used materials a new life is called "recontextualizing" at FREITAG. Whereas similar reincarnations do not reveal exactly how the transformation process happened and thus leave consumers in the dark, we want to lay our cards on the table.'

<http://www.freitag.ch/about/production>

Betterfuturefactory

Betterfuturefactory upcycles plastics by making plastic waste ready to be used for 3D printing with their perpetual plastic project.

<http://www.betterfuturefactory.com>

Upcycled.nl

A small business making bags by upcycling waste materials.

<http://www.upcycled.nl/index.html>

11. Recycling (waste handling & repurpose)

MBA Polymers

Company specified in recycling plastics. Recycling plastics is what they do and thus their business model. They state in their 2014-15 sustainability report that only 5% of materials processed by them is sent to landfill. (p. 17)

http://www.mbapolymers.com/home/images/PDF/mba_polymers-corporate_social_responsibility_report_2014-2015.pdf

Suez & SITA

'... SUEZ ENVIRONNEMENT is making the circular economy the key point of its strategy, and is offering innovative solutions for recovering plastic via its SITA subsidiary, thanks to its nine specialized plants in Europe, which treat over 400,000 tonnes of plastic waste and recover 135,000 tonnes of new plastic resources every year.'

http://www.suez-environnement.fr/wp-content/uploads/2014/09/CP-Matinée-Plastique-23_-09_-2014_VA1.pdf

Rubies in the Rubble

Making jellies, compotes out of discarded fruits.

<http://www.rubiesintherubble.com/our-mission/>

12. Collaborative production

Carlsberg

Carlsberg has set up the Carlsberg Circular Community, together with selected suppliers. In cooperation with EPEA and MBDC they have create a Cradle2Cradle roadmap to optimize their packaging portfolio. This can be read in their sustainability report 2013.

<http://www.carlsberggroup.com/investor/news/Pages/Carlsbergmakesfurtherprogressonsustainability.environmentalefficiency.aspx#.VS0me8ZnW2V>

Steinbeis

Steinbeis is partnering with Oce, DestraData and Van Gansewinkel to create a closed loop system on white paper recycling.

www.stp.de/en/returnity-cycle/cradle-to-cradler/

Dutch aWEARness

'The projects that we initiate are based on the principles of the circular economy. Our products are part of an endless cycle and our fabrics/materials can be re-used over and over. When the products are returned after use, their elements can be retrieved. The raw material that derives can be used to create new products, which brings the circle back to where it began.'

<http://dutchawearness.com/circulareconomy/circular-economy/>

Category 4. Pure cycle

13. Cradle to cradle

Desso

Desso is silver certified by Cradle to Cradle® for their floor carpet tiles.
<http://www.desso.nl/c2c-corporate-responsibility/cradle-to-cradle/>

Herman Miller

Making furniture pieces that are easy to dismantle, cradle to cradle certified.
<http://www.hermanmiller.com/about-us/who-is-herman-miller/our-story.html>

Van Houtum

Manufacturer of hygienic paper. Following a presentation of MVO Nederland from Michel Schuurman they cooperate with a local beer brewery from which they receive the used labels. They use this paper supply for manufacturing toilet paper. The larger 'paper grain' that isn't fine enough for toilet paper is passed on to the manufacturer of carton boxes in which the toilet paper eventually gets packaged. Van Houtum has a product line that is cradle to cradle certified.
<http://www.vanhoutum.nl/mvo/293/cradle-to-cradle.html>

Ahrend

Ahrend manufactures office furniture according to cradle to cradle standards.
<http://www.ahrend.com/en/Royal-Ahrend/CSR/Cradle-to-Cradle-Company/>

14. Circular sourcing

Interface

Interface is its own supplier to the extent that they have a program in place that collects discarded and abandoned fishnets, all around the world. In this way they contribute to cleaner oceans as well as secure themselves with resources. <http://www.sustainability.com/library/model-behavior#.VNIdU8Yre2U> p. 30

Category 5. Dematerialized services

15. Physical to virtual

Sungevity

This residential solar installation and financing company has streamlined the way solar panels are sold to individual consumers. Rather than relying on local retail outlets or representatives, Sungevity has developed a scalable online sales model where customers can get a price quote within 24 hours. A team of remote engineers designs the solar systems based on satellite imagery. Sungevity subcontracts the installation work to smaller, local operators. This capital-light model has enabled the company to streamline its processes and has resulted in quick expansion to new markets across the US and to countries around the world.

www.sungevity.com

<http://www.sustainability.com/library/model-behavior#.VNIdU8Yre2U> p. 24

HelloFresh

Delivering groceries, fruits and vegetables, weekly to people's home that are subscribed.

www.hellofresh.nl

Capgemini

CapGemini amongst other ICT service providers: provision of software or infrastructure as a service (SaaS or IaaS), rather than the hardware or software on a disk focusing on the activity of the software such as payroll or logistics.

<http://www.capgemini.com/resources/saas-myths-and-realities>

Blendle

Blendle is a web application from which you can buy any news article currently published in Dutch media. Thus, you only pay for the articles you read, not for an entire newspaper.

www.blendle.com

16. Subscription based rental

Netflix

The physical-to-virtual model eliminates brick and mortar infrastructure to dramatically reduce the resources needed to supply a product to a consumer. It changes where and how a transaction happens.

www.netflix.com

Spotify

Replacing all physical music collections to an online music platform.

www.spotify.nl

Category 6. Produce on demand

17. Produce on order

Airbus and Boeing

Airplanes are only produced once ordered.

www.airbus.com or www.boeing.com

Zelf je boek uitgeven (publish your book yourself)

Via this webshop you can print on demand. For example a book you would like to publish. In this way you only have to produce when there is an order for your product.

<http://www.zelfjeboekuitgeven.nl/pod/>

18. 3D printing

Print 3D matter

Amsterdam based company that provides 3D printing solutions.

<http://www.print3dmatter.com>

3D systems

US company specialized in 3D printing.

<http://www.3dsystems.com/nl/node/3427>

General information on 3D printing & circular economy

<http://fr.slideshare.net/wiithaa/how-can-3d-printing-make-the-economy-more-circular>

<http://www.greatrecovery.org.uk/3d-printing-a-new-mindset-for-the-circular-economy/>

19. Customer vote / design

Threadless T-shirts

Threadless is a t-shirt company that invites artists to create designs, which users vote on; the most popular ones go into production, and designers receive monetary compensation by the company.

<http://www.sustainability.com/library/model-behavior#.VNIdU8Yre2U> p. 25

LEGO Cusoo

LEGO Cusoo: This LEGO offshoot is an online platform, created through a partnership between the Japanese company Cusoo and The LEGO Group in 2008, which allows users to submit ideas for LEGO products to be turned into potential sets available commercially, with the original designer receiving 1% of the royalties. LEGO Cusoo engages consumers in a new way by including them in the design process and sharing revenue. The revenue sharing agreement incentivizes existing and new consumers to interact with the brand. While there is no sustainability intent behind this example, if scaled, it could streamline production and consumption.

<https://ideas.lego.com>

<http://www.sustainability.com/library/model-behavior#.VNIdU8Yre2U> p. 25