CREATING NEW BUSINESS

THROUGH CIRCULAR DESIGN THINKING

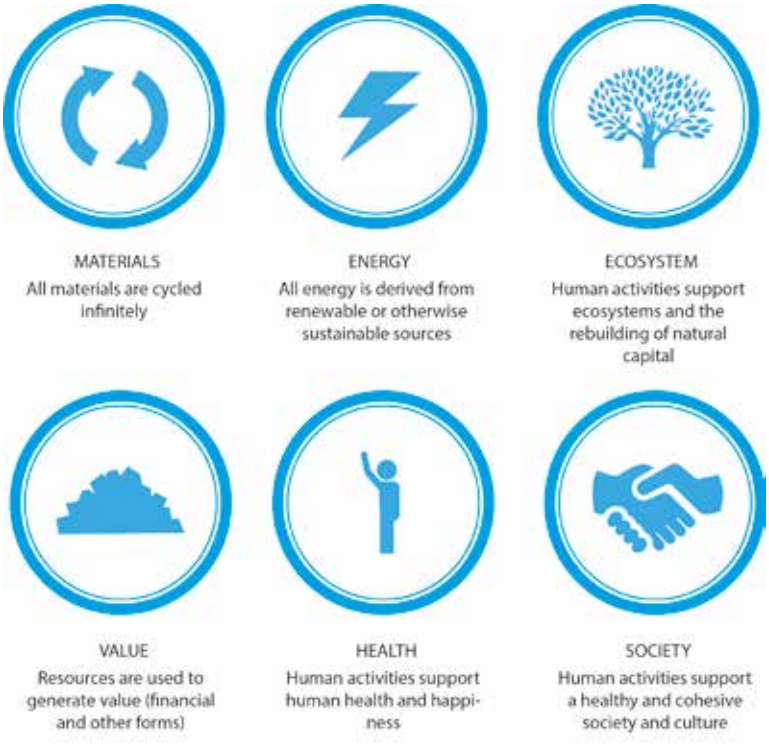
circle economy

INTRODUCTION

The concept of circular economy inherently calls for applying a new way of thinking about how we buy, use, and discard products. This implies opportunities for innovation focused around the design of the supply chain as well as products. A new approach to design thinking - circular design thinking - has appeared to guide this transition and circular innovation. This paper examines circular design methods currently being utilized by companies and practical ways you can begin applying it in your own.

This paper is based on the practical experience and knowledge collected over the past year and a half through Circle Economy's numerous member projects. Additionally, some information and quotes have been gathered during Project CIRCO, a joint initiative between Circle Economy, Reversed Concepts, ICE Amsterdam, Nuovalente coördinated by CLICKNL | DESIGN, and part of Nederland Circulair (circulairondernemen.nl).
CIRCO informs and inspires businesses, designers, and students to get started with circular economy through seminars, online case studies, and more.

Circular economy is all about closing resource loops, and mimicking natural ecosystems in the way we organize our society and businesses. In order to unleash the potential on an economic, social, and ecological level, these six principles should be taken into account [1]:



WHY APPLY CIRCULAR DESIGN THINKING?

It is helpful to understand the rationale for why manufacturers engage in circular design thinking before starting to apply it to your own company. Often by addressing customer needs or gaps in the supply, companies realize financial benefits and competitive advantage for going circular.

SUPPORT NEW SALES & GENERATE ADDITIONAL INCOME

Frequently gaps in a company's market are identified when applying circular design thinking. Addressing these markets through creation of new products and/or service concepts can generate new sales. By applying circular ideas such as selling or leasing products or components multiple times, new income can be generated.

Floow2, for example, has applied this thinking to create a B2B business that facillitates the sharing of equipment, services, and personnel, while office furniture provider Desko takes back, refurbishes and resells used furniture.

INCREASE COMPETITIVENESS

Resale or parts harvesting of used products can lead to reduction of product prices and stronger positioning in the market. The addition of services can also lead to market differentiation and increase ability to compete with lower priced competitors. At a recent CIRCO workshop, one participating healthcare company discovered if they reused equipment parts, it would enable them to lower the product's price and allow them to compete with lower priced competitors.

The supply chain view taken during circular design thinking many times identifies new opportunities for collaboration. This can

strengthen a company's competitive position by linking up formerly fragmented supply chains.

STRENGTHEN COMPANY IDENTITY

Companies that have created a mission driven perspective beyond profit, such as environmental or social, usually increase their brand image not only for customers but also as a place of employment. The results of circular design thinking can help reshape and strengthen the company mission. It can also make a company better primed for top performing teams. Entrepreneurial and innovation-oriented companies most often are very appealing to employers, which can be reflected in the quality of the workforce.

CREATE LONG-TERM LOYALTY

Service-based business models can increase customer loyalty and repeat customer rate due to more company-client interactions. Long term relationships are created through these interactions and reduce risk of customer loss. Stronger connections with customers also provide insight into the needs and wants of customer. This feedback can be then directed to innovation and sales.

PROTECT BRAND IMAGE

Many companies are aware of the large second-hand market for their products that is sold through channels such as Marktplaats.

Often products purchased through secondhand platform are not as closely linked to the brand as ones sold directly through a brand-associated channel. The original producer not only misses the additional revenue, but this bypass can also potentially hurt brand image if the product is defective or flawed.

ADDRESS CUSTOMER DEMAND

As interest in the 'sharing economy' has shown, many customers are uninterested in responsibility and risk associated with ownership of certain products. Insurance and parking of cars, for example, are often viewed as a burden of ownership which is eliminated by the use are carsharing services such as Car2Go.

Companies that are 'in tune' with the needs of customers receive the business. Apple and Spotify didn't wait for customers to ask for the iPod or Spotify app – they realized the need and created a product that addressed the consumer demand. This 'thinking before they ask' way of working is also a driver for some frontrunner companies like Dutch street furniture companies Falco and Jan Kuipers. They are moving towards circularly designed products as they believe it will soon be part of clients' requirements.

CREATE LONG-TERM SUPPLIER RELATIONSHIPS

As industrial ecologists Frank Boons and Leo Baas found in an analysis of Dutch supermarket chains and milk delivery, creating and maintaining the loops of material in the circular economy require a specific mix of coordinative structures. A successful circular economy requires companies to look outside their own value chain and build collaborations across value chains; bringing together companies and sectors (and individuals) that are not used to working together.

ADDRESS SOURCING CONCERNS

Price volatility levels for materials in the first decade of the 21st century were higher than in any single decade in the 20th century [2]. A sharp price increase in commodities combined with future risk associated with price volatility and accessibility to materials has left many wondering the future impacts on business. Circular design of products can address these sourcing concerns by reducing reliance on virgin materials.

LEARN ABOUT CIRCULAR DESIGN

The drive behind circular design is to preserve and recapture value across the supply chain. This comes from the concept of circular economy which calls for a closed loop system instead of a system where value such as energy and materials escape.

WHAT IS VALUE?

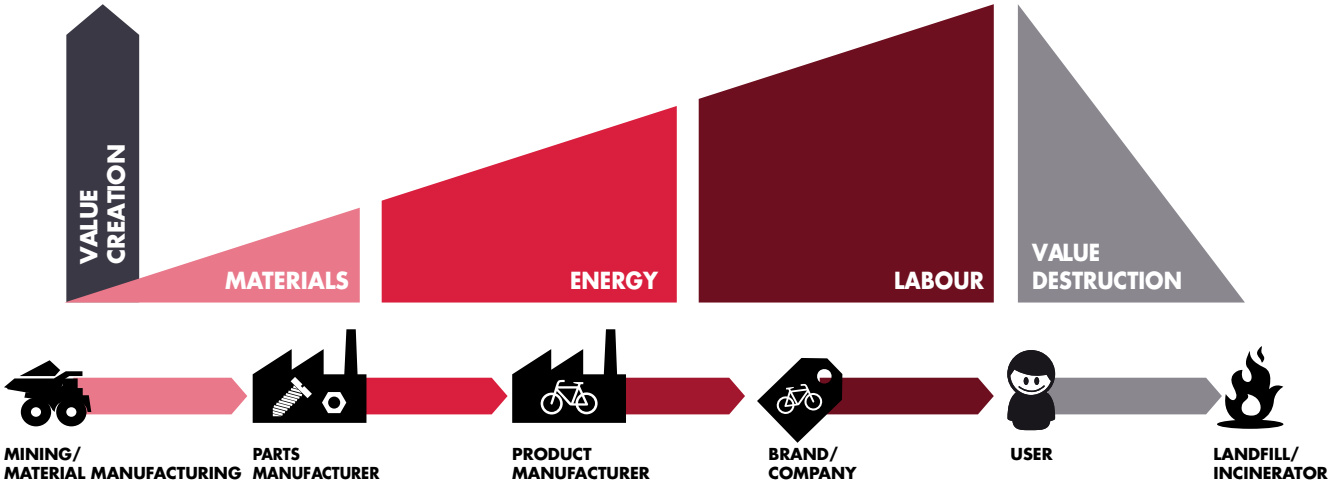
In the business ecosystem, various value is exchanged. There are many types of value [3] including:

- Information
- Labor
- Material
- Energy
- Economic
- Health/Social
- Ecological

Circular design is a carrier of various value, from material value, monetary value, social value, to all different value beyond economic.

UNDERSTANDING PRODUCT INTEGRITY

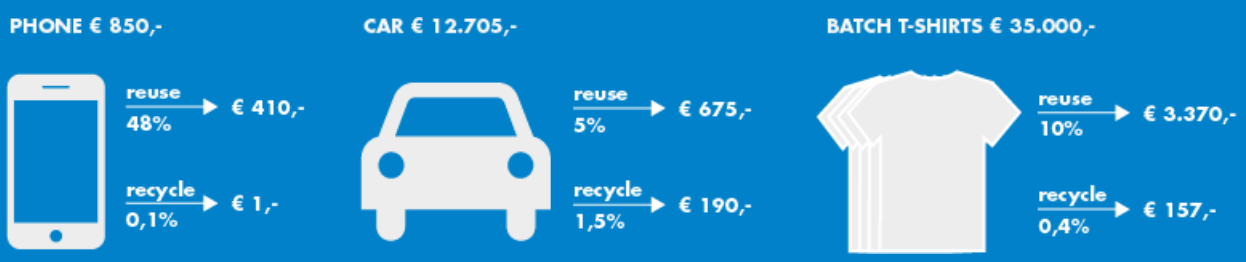
For most products, value is generated when parts and components are fabricated from materials, when products are manufactored from said parts and components, and when said products are marketed and sold to consumers. As illustrated in the figure below, each of these steps increase product



value through the additive expenditures of materials, energy, and labor utilized in the process. But most products are either sent to landfill or incinerated after use. This destroys the value that has been generated. A lot of value goes missing in our current system, and circular design thinking strives to find ways to preserve or recapture this value.

CASE STUDY PRODUCT INTEGRITY

In their Resource Resilient UK study [4], the Green Alliance estimated the economic values of materials, parts, and finished products for three different products. The value of finished products was found to be many times greater than the value of the products' raw materials or components. Reuse instead of recycling provided the highest value recovery to businesses and the greatest mitigation of risk. For example, reusing a smartphone provides a value of 290 British pounds (about half of the original product value), whereas recycling provides a value of only 72 pence.



Finished products are worth much more than the raw materials inside them. Value is lost by breaking products back down into components and materials.

Creation and preservation of value along the product chain (Benton & Hazell, 2013)

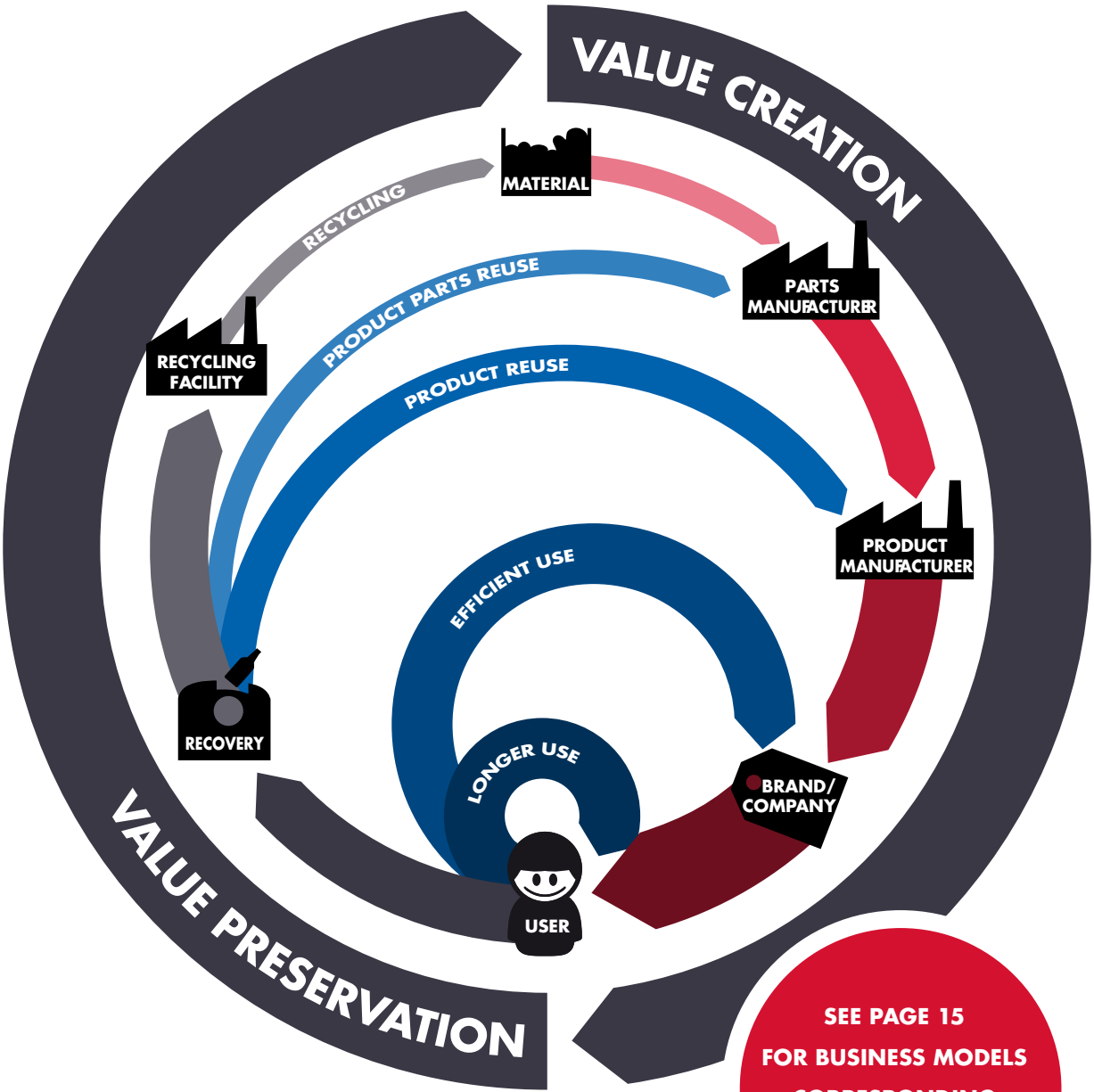
FRAMEWORKS FOR PRESERVING & RECAPTURING VALUE

Preserving and recapturing value should make sense to both the business and the customer. It can also help the economy become more resilient and competitive with creation of new employment opportunities - for every 10,000 tonnes of waste products and materials, it is estimated almost 300 jobs can be created if refurbished and re-used, whereas only one job can be created if incinerated [5].

The circular design thinking process looks for potential business opportunities to preserve product integrity and finds ways to recapture value by taking into account user needs. The graphic to the right can also be a helpful reminder about product integrity and a product's value. The tighter the loop, the greater the embodied value preserved.

Five types of frameworks provide guidance for prioritizing product integrity and finding opportunities to preserve and recapture value in a system.

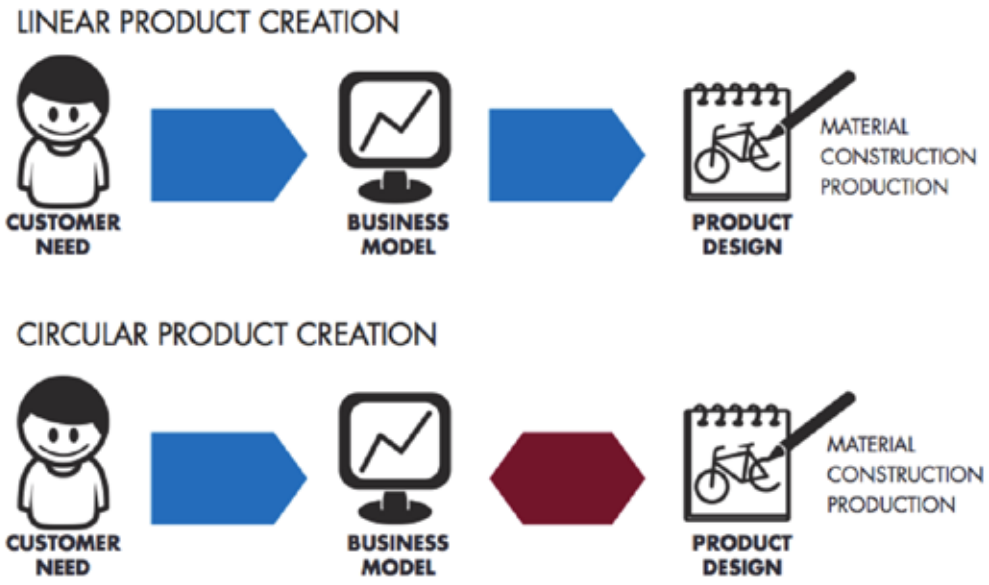
- Preserving value or complexity of a product starts with **longer use**. This can be by designing the product to be more durable or through maintenance and repair.
- Using a product smarter or sharing the asset, such as car sharing, allows for **efficient use** and requires only one product to be created rather than multiple products.
- **Product reuse** by a new customer extends the life of the product and gives the product a second life.
- Many times components can be reused. By **reusing product parts**, this can reduce reliance on raw materials and reduce costs.
- **Material recovery** preserves the least product integrity and value. However, for a product to be truly circular, its materials should be able to be recovered at end of life. Recovered materials can be used as non-virgin material inputs for other products.



SEE PAGE 15
FOR BUSINESS MODELS
CORRESPONDING
TO THIS FRAMEWORK

UNDERSTAND THE ELEMENTS OF CIRCULAR DESIGN

Imagine you have a car. All moving parts must be in sync in order for the car to work and move forward. The same ideal holds true for products and services in a circular system. Your design must take into account various elements of the system and each must be aligned with one another in order to keep value from escaping. We have identified five main elements which should be considered to keep the system circular.



Circular product creation differs from normal product creation in that is calls for co-development of products and their business models.

SUPPLY CHAIN

The circular economy requires shifts and transformation in supply chains. Currently most companies function in one aspect of the supply chain, such as retailer or manufacturer, rather than across the entire value chain. Going circular requires expanding or collaborating across the entire supply chain to keep materials in a loop.

USER NEEDS

While every part of the chain must be considered, new innovations often start with thinking about the people you want to create value with and for. This starting point, which is also similar for many design thinking business methods, can be a way to pinpoint opportunities for circular redesign.

BUSINESS MODEL

Most products have a linear business model. By applying circular design thinking there is a shift towards new business models as they better enable closing loops. New services are also becoming relevant as they can generate additional revenue and lead to easier collection of products at their end of life.

PRODUCT CONSTRUC-TION

When moving towards more circular ways of doing things, product design must be considered. TU Delft researcher Fabian Watelet discovered it took 45 minutes to access the valuable parts of a coffee machine [6]. Clearly construction is important - it if you can't access valuable (or broken) parts of a product in a timely matter, what's the point of having them returned to you?

MATERIALS

As the circular economy aspires for all materials to be cycled, products should be suited for recycling and recovery of materials. Recycling materials reduces impact from virgin production. Materials can be prioritized in design for recovery based on criteria such as sourcing concerns. Material purity should also be considered.

TRY TO APPLY CIRCULAR DESIGN THINKING TO YOUR COMPANY

A solution-oriented, creative process that helps you design meaningful circular solutions for your organization. Early introduction of circular design thinking increases the circularity of the outcome.

DESIGN A CIRCULAR BUSINESS MODEL

1. **Understand your user.** Get inside your customers' heads. What are their needs, wants, desires, habits, motivations? Is a physical/new product needed to fulfil those needs?

2. **Reflect on your own brand.** What are your brand values? What is your value proposition? Can you combine the two to offer customers something that others can't?

3. **Reflect on your products.** Identify if any components or resources should be prioritized for recovery due to current or future economic, social, ecological, or political concerns.

4. **Brainstorm new business models** and how you fulfill your customers' needs while still matching your brand. Do you even need a product? Think about your business' role in the circular economy (see next page). Get input from a wide range of stakeholders: sales, procurement, engineers, managers, and customers. Bring a designer on board who understands how to translate values and insights from these different stakeholders into one value proposition.

5. **Plot your new model through your customer's perspective.** Imagine you are the customer. What comes before, during and after receiving your goods and services? Think about if new products and/or services must be in place in order to provide this experience.

6. **Redesign your products and services.** to fit the new business model. (Recall the five elements for circular design on page 11.)

7. **Evaluate.** your new ideas for their circularity using Circle Economy's six principles listed on page 1.

FIND YOUR BUSINESS' ROLE IN THE CIRCULAR ECONOMY

"It's not just about products, but also circular services." - CIRCO Workshop participant

Finding ways to systematically preserve and recapture value means cycling products and their components. Many circular economy advocates emphasize service-based business models as the leading way to offer circular options. Some companies such as Philips have done this. Instead of selling a product to the customer (such as a lightbulb), the company installs the lighting fixtures, manages the bills, and only charges the customer for the light, while remaining owner of the lighting fixtures.

Service-based business models usually require expanding the company's current position and role in the supply chain. This can be a barrier to adoption for many companies as they are unable expand their company's role in the supply chain. Luckily, there are other options so any company can move towards a circular business.

Companies often choose to collaborate closely between different parts of the supply chain rather than expanding their role. In the Netherlands, Auping, a manufacturer of bed frames and mattresses is partnering with Van Gansewinkel, a waste management company, to collect and prepare used mattresses for material recovery. Linking up two formerly separate parts of the supply chain allows value to be recaptured.

BUSINESS MODELS FOR THE CIRCULAR ECONOMY

Building off of research by TU Delft in the project 'Products that Last' [7] and Circle Economy's work with members, we have identified ten business archetypes for circular-focused companies to create a closed loop across the supply chain. In creating new business models, there is no 'one size fits all' - most best practice cases draw on a combination on the below:

CASCADE MATERIAL SUPPLIER

Sells recaptured materials and components to substitute the use of virgin or recycled material.

LONG LIFE PRODUCTS TRADER

Sells high-grade products with a long useful life.

HYBRID PRODUCTS TRADER

Sells consumables, spare parts and add-ons to support the lifecycle of long lasting products.

2ND HAND TRADER

Refurbishes and maintains used products if necessary and re-sell them.

REPAIR SERVICE

Extends the working lifecycle of products and components by repairing or upgrading.

ACCESS PROVIDER

Enables an increased utilization rate of products by enabling or offering shared use/access/ownership.

THINK ABOUT RETURN LOGISTICS

For the circular economy to be created, products should be properly collected and returned after use for further use, component harvesting, or material recovery. Closing the loop after the consumer can be done in one of two ways:

Incentivised collection of sold products

Selling products and setting up an incentivised scheme for collection after use can lead to the return of products. It is difficult for a company to ensure 100% collection of products. However, it is usually easier for a company to implement than staying product owner as it does not require much of a shift in the current business model. It is also sometimes more convenient for the customer as the cash flow is not continuous (see buy-back example).

Stay owner

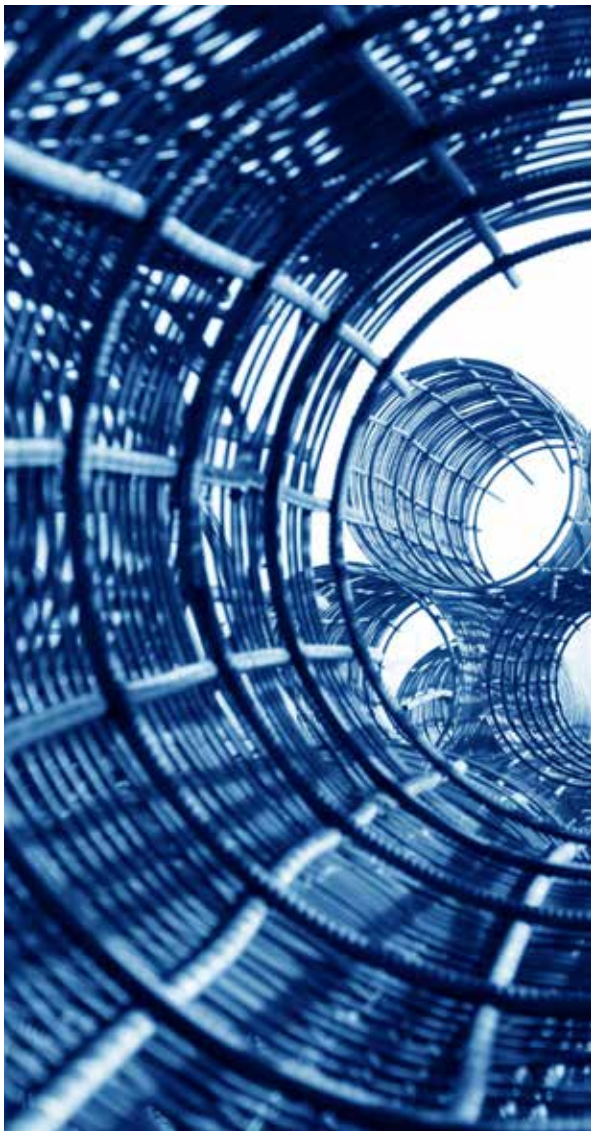
Remaining owner of products and providing customers access to the product or benefit of the product - such as by leasing - ensures product returns. This can also strengthen the company brand as the focus is less on the product and more on the company's offering. This option is not as convienent for products that lose value, and financial constructions of payment can also be potential barriers of adoption for the customer.

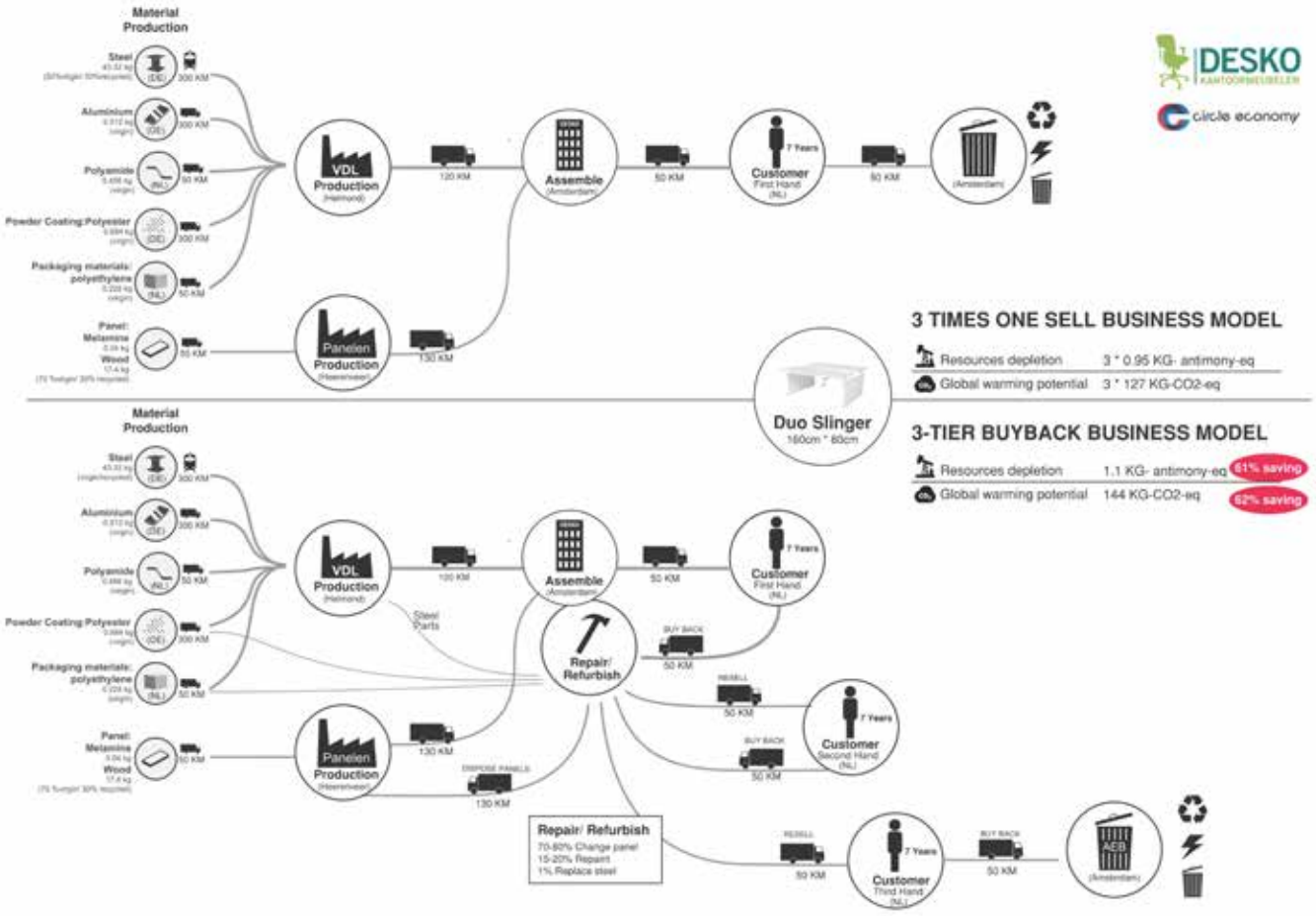
PERFORMANCE PROVIDER

Delivers product performance rather than the product itself. Primary revenue stream results from payments for performance delivered.

RECOVERY PROVIDER

Provides take back systems and collection service to recover useful resources out of disposed products or by-products.





BUSINESS MODEL CASE STUDY: THREE-TIER BUY-BACK SCHEME

Since the 1950s, Desko uses a 'three tier buy-back scheme' to get assets back. In short, furniture gets sold and bought back three times, so furnitures lifetime expand. Not only does it provide more income for the same amount of desks produced, it helps Desko reach new market segments and benefits customers who are interested in affordable second- or third hand furniture.

Here's how the business model for Desko's Duo Slinger desk works:

Desko sells a newly manufactured desk to a customer. After the user is finished using the desk, Desko purchases it back from the customer at roughly 10% of the product's initial price.

After in-house refurbishment at Desko's headquarters, the desk is sold to a new customer at roughly 50% of the initial product price. Again, the customer is able to sell Desko back the desk when she is done using it, and this time Desko buys it back at roughly 5% of the product's initial price.

Desko refurbishes the desk once more and resells the product for the last time at 25% of the original price. While Desko doesn't buy back the desks again, they do offer a disposal service to these customers and scrap the desk for parts once it has returned to Desko headquarters.

For more information read Circle Economy's blog series about Desko

TALK ABOUT DESIGN STRATEGIES

In 'Understand the Elements of Circular Design', we discussed how it's crucial to must match your business model and product's design/construction (and visa versa). As the coffee machine illustrated, even if products are returned, value is unable to be recaptured in most cases unless they have been designed in a way that allows recapturing resource efficiency.

Accompanying the previously identified business models, there are some principles that are applicable to products in a circular economy. Additionally, some design strategies and techniques can be applied as needed to help products be more circular.

CIRCULAR DESIGN PRINCIPLES

DESIGN FOR HEALTH AND SAFETY OF NATURE AND HUMANS

Health and safety of both nature and humans should be considered throughout a product's lifecycle. Not only what is embodied in products (such as non-toxic materials) should be taken into account, but also the health and safety of the ecosystem around the product (such as the working conditions of the producers) should be considered.

DESIGN FOR STANDARDIZATION

Standardizing products and components increases ability for replacement or reuse of components. It can also enable collaborative recovery of products and components.

DESIGN FOR ENERGY EFFICIENCY

Products should be designed to be energy efficient in production, use, logistics, and recovery. Weight and volume should especially be considered as their reduction generally reduces material usage and increases transportation efficiency.

DESIGN FOR USE

Circular products consider how the customer will be using the product and design accordingly.

For example, adaptations in the product's design might be needed when changing from an ownership use model to an access model.

DESIGN FOR REVERSE LOGISTICS

Reverse logistics after a product's use needs to be considered during its design. Material choice and construction should be suited for intended collection mechanisms.

DESIGN FOR DISASSEMBLY

To enable reuse of products or product parts in a cost and time-effective manner, a product's ability to be disassembled needs to be considered during design. This ensures material/component quality is maintained and the product or product parts can be reassembled or reused.

DESIGN FOR RECYCLING

As the circular economy aspires for all materials to be cycled, products should be suited for recycling and recovery of materials. Recycling materials reduces impact from virgin production.

CIRCULAR DESIGN STRATEGIES

DESIGN FOR ATTACHMENT AND TRUST

Product's design encourages the user to become attached to a product which extends product life.

DESIGN FOR ADAPTABILITY AND UPGRADABLITY

Product construction incorporates possibilites to change the product during time of use and keep it up to date in terms of technology and/or fashion.

DESIGN FOR EASE OF MAINTENANCE AND REPAIR

Construction enables easy repair by the customer, manufacturer, or repairer. This means less durable components (those most likely to fail) must be designed to be accessible for repair and exhange.

DESIGN FOR EASY USE

The product is only being used and not owned by by the user. Therefore the design should be as self-explanatory as possible.

DESIGN FOR DURABILITY

The product design ensures optimum product reliability. Ideally the durability should match its intended lifespan.

CASE STUDY

DESSO ECOBASE®

Carpet manufacturer Desso is one of the frontrunners in creating business through circular design. In this case study, the business models and design strategies they apply are highlighted to illustrate how they can work in practice.

DESSO EcoBase® is a polyolefin based carpet backing. Unlike many other carpet backings, EcoBase® is non-toxic, C2C Gold certified, and 100% recyclable in Desso's own production process [DESIGN FOR HEALTH AND SAFETY OF NATURE AND HUMANS; DESIGN FOR RECYCLING].

One main material input in EcoBase® is calcium carbonate (chalk). Recently DESSO announced they have partnered with Reststoffenunie, an association of Dutch drinking water companies, and expect to use up to 20,000 tonnes of chalk from local drinking water companies as a source for the calcium carbonate in their EcoBaseTM product [CASCADE MATERIAL SUPPLIER]. The chalk is a byproduct of water softening, a process which prepares the water for drinking.

SOURCES

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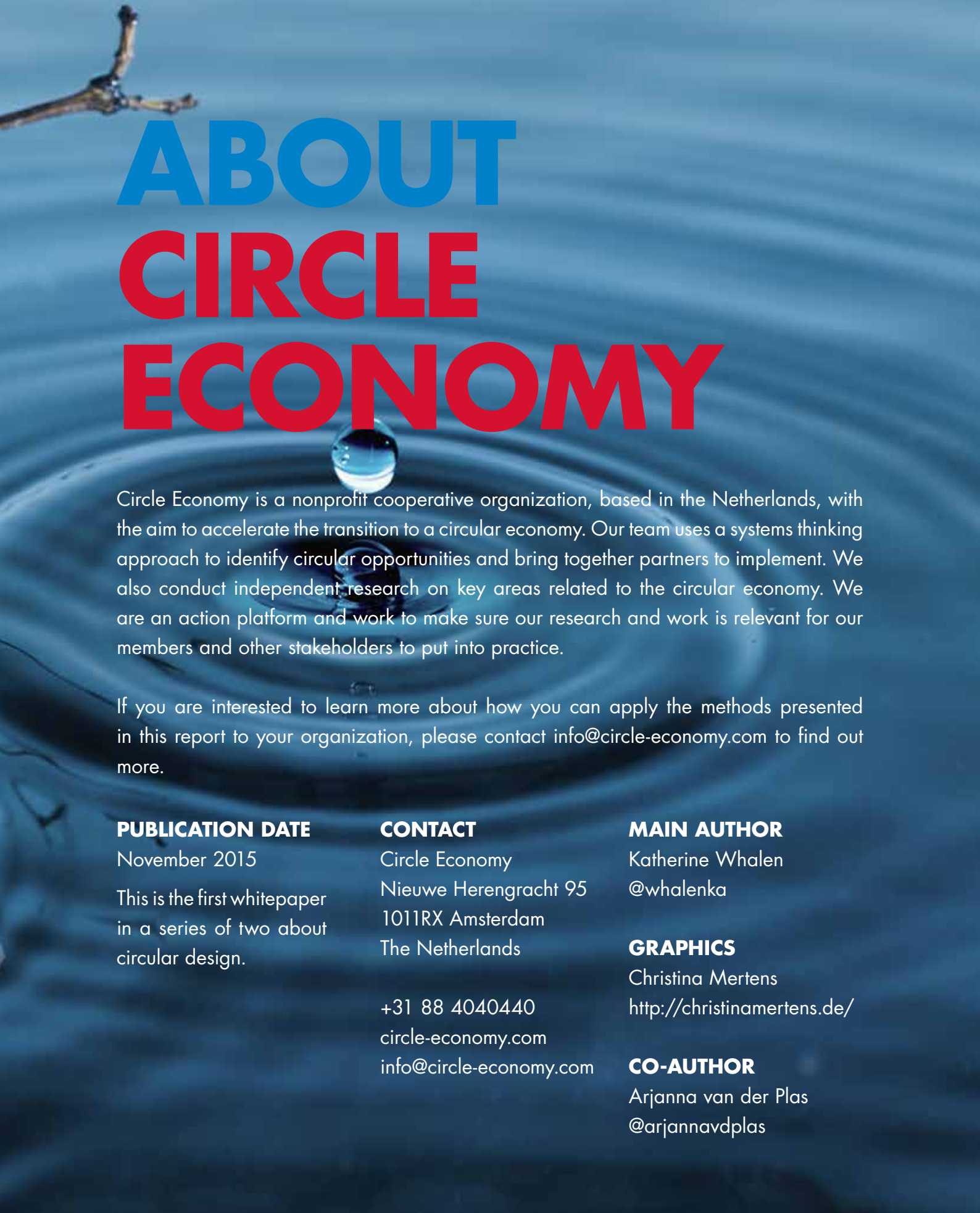
A special thanks to our CIRCO colleagues and participants! (http://www.clicknl.nl/circo)



ABOUT CIRCLE ECONOMY

Circle Economy is a nonprofit cooperative organization, based in the Netherlands, with the aim to accelerate the transition to a circular economy. Our team uses a systems thinking approach to identify circular opportunities and bring together partners to implement. We also conduct independent research on key areas related to the circular economy. We are an action platform and work to make sure our research and work is relevant for our members and other stakeholders to put into practice.

If you are interested to learn more about how you can apply the methods presented in this report to your organization, please contact info@circle-economy.com to find out more.

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This is the first whitepaper in a series of two about circular design.

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