

# CHAIN REACTIONS

## INNOVATION BRIEF 2

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CIRCULAR ECONOMY

Version 1  
01 2020

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## ABOUT INNOVATION BRIEFS

CHAIN REACTIONS addresses the challenge for industrial regions to increase regional capacity to absorb new knowledge and turn it into competitiveness edge and business value. There is a strong need to help SMEs to overcome capacity shortages for innovation and integration into transnational value chains.

The project aims at empowering regional ecosystems with the knowledge and tools to help businesses overcome those barriers and generate sustained growth through value chain innovation.

CHAIN REACTIONS focuses thereby on modern approaches considering value chains and their complex developments rather than linear technology transfer approaches. The framework of value chain innovation builds on Porter's 5 forces framework (new entrants, substitutes, customers, suppliers and rivalry) and transversal innovation drivers: key enabling technologies, resource efficiency, digital transformation and service innovation.

During the project lifetime CHAIN REACTIONS will publish about every third month an INNOVATION BRIEF presenting the rationale behind specific innovation drivers and illustrate them with practical examples.

This second INNOVATION BRIEF is about CIRCULAR ECONOMY.

## CIRCULAR ECONOMY

### Definition

The concept of the circular economy has been studied for many years. However, it only became a mainstream concept in the European Union with the adoption of the EU Circular Economy Package in 2015. Before that time the notion of 'greening the economy', 'greening different economic sectors' was much more common. One of the proofs for that is that circular economy was missing in all documents associated with the Programming Period 2014-2020 of the European Structural and Cohesion Funds (ESIF).

The ambition of the Circular Economy Package was to "help European businesses and consumers to make the transition to a stronger and more circular economy where resources are used in a more sustainable way". The package includes new and revised legislation with focus on waste prevention and management, with clear timeframe for implementation and financing. The actions aim to contribute to "closing the loop" of product lifecycles through greater recycling and re-use. The Circular Economy Package refers to five priority areas to be addressed in a targeted way: plastics, food waste, critical raw materials, construction and demolition, as well as biomass and bio-based products.

Since the adoption of the Circular Economy Package circular economy has gained enormous traction in EU discourse but also in national, regional and urban policymaking. Circular economy strategies and action plans are mushrooming on all governance levels. Businesses are also exceedingly considering 'going circular'..



## Value optimization principle

According to this principle, companies have to keep all products, components and materials at their highest value and utility at all times, such as recirculation to be done with minimal energy consumption. Recirculation, in any form, is not the goal of circular economy. Recirculation is only a mean to create new value in the system from elements that are considered loss or waste. Value added is in cost-saving, in lower environmental impact, in higher business resilience, in new revenue streams and in better relationships with customers. Optimization is reached when the normalized impact (value weight) of each business activity in the value chain and each component from the product is of the same magnitude with their normalized costs. Thus, according to circular economy, the goal is not to optimize profit but rather the value.

Optimization of value is about finding an alternative (a solution) with the highest possible performance under given constraints (e.g. human, financial, natural, technological), by maximizing useful and desirable factors while minimizing harmful factors. Materials that are seen as waste in production or post- consumption can become valuable resource inputs in new products and applications. In this case, optimization is about minimizing the waste generation and maximizing the reuse of the resulted waste. Moreover, value can be increased by using products longer (prolonging their life-time) or recirculating them in multiple cycles (e.g. second hand refurbished industrial robots) with minimal modifications.

This approach requires cooperation across the value chain to enable changes in the design of products and the development of reverse logistics and reconditioning processes. New types of business models such as leasing or servitization can enable all stakeholders (producers, intermediaries, end-users) to capture a share of value.

In addition, a new value stream that can be optimized, specifically the spare capacity. There are spaces and equipments that are heavily underutilized by a single organization, indicating low returns on investment. By smart partnerships, such capital can be better exploited, sometimes with a neutral management of a third party. Sharing of facilities can be considered in all dimensions: business-to-business (B2B), business-to-customer (B2C), and customer-to-customer (C2C).

Value optimization principle is also about many interlinked outcomes. For example. the output of reducing CO2 emissions generates. as a first layer outcome. improvement of air quality. A better air quality leads to an improved natural environment and better health of population. This reduces costs with health systems and environmental interventions: thus. public money can be redirected to other areas. such as education and social security. In fact. reduction of CO2 emissions is an important aspect that encourages adoption of circular economy at large scale.

In CHAIN REACTIONS we consider this broad approach of circular economy and its opportunities, building on the model developed by Peter Lacy and Jakob Rutqvist, and taking into account some of the most recent approaches to considering circular economy as an opportunity for creating economic and social value:

<b>Types of waste to be eliminated</b>	
	<ul style="list-style-type: none"> <li>Wasted resources are materials and energy that cannot be continually regenerated, but instead, are consumed and forever gone when used.</li> <li>Products with wasted lifecycles have artificially short working lives or are disposed of even if there is still demand for them from other users.</li> </ul>



	<ul style="list-style-type: none"> <li>• Products with wasted capability sit idle unnecessarily; for instance, cars typically sit unused for 90 per cent of their lives.</li> <li>• Wasted embedded values are components, materials, and energy that are not recovered from disposed of products and put back into use.</li> </ul>
<b>Business models</b>	
	<ul style="list-style-type: none"> <li>• Circular Supply-chain</li> <li>• Recovery and Recycling</li> <li>• Product Life-extension</li> <li>• Sharing Platform</li> <li>• Product as a Service</li> </ul>
<b>Technologies</b>	
	<ul style="list-style-type: none"> <li>• Engineering technologies: modular design, advanced recycling technology, life and material sciences technology...</li> <li>• Digital technologies: big data, machine to machine, mobile technologies...</li> <li>• Hybrid Technologies: Trace and return systems, 3D printing...</li> </ul>
<b>Circular capabilities:</b>	
	<p>Technologies alone will not give companies what they need to excel in their chosen circular business models. They must be paired with a range of new capabilities across the organizations that are vital to developing and institutionalizing new ways of working.</p> <ul style="list-style-type: none"> <li>• Circular networks/ecosystems</li> <li>• Designing for Many Lifecycles and Users</li> <li>• Circular Supplies</li> <li>• Continuous Customer Engagement</li> <li>• Opportunity-Driven Take-Back</li> </ul>

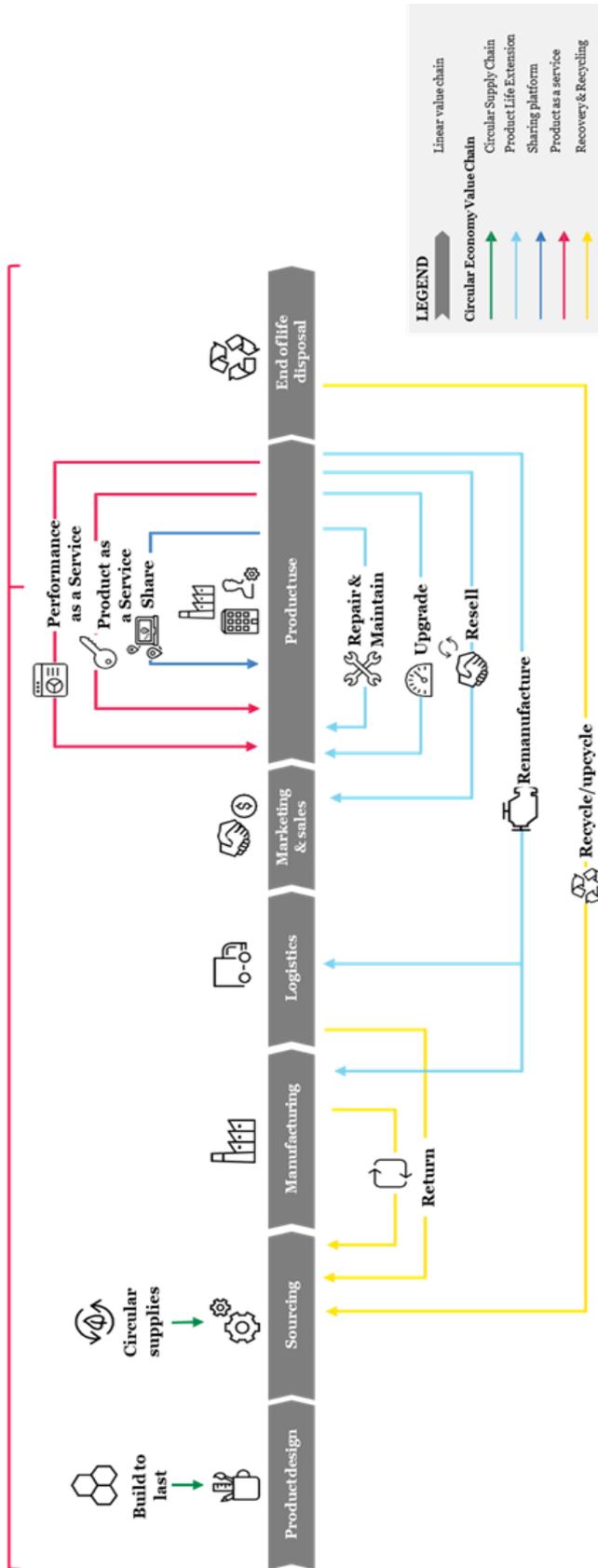
Circular economy framework for businesses

Source: Peter Lacy and Jakob Rutqvist

The following picture illustrates along traditional value chains where the five circular business models named in the table above offer opportunities for value chain innovation.



*As a Service models are mostly concerned with the operation phase, but span across the value chain*



Circular value chains

Source: Accenture



In the following, we provide some further insight into the five circular business models.

### **Circular Supply-chain**

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When a company needs resources that are scarce or environmentally destructive, it can either pay more or find alternative resources. The Circular Supply-Chain introduces fully renewable, recyclable, or biodegradable materials that can be used in consecutive lifecycles to reduce costs and increase predictability and control.

#### **Industrial example**

Such thinking is the core of CRAiLAR Technologies' business. The company produces renewable and environmentally friendly biomass resources using flax, hemp and other bast fibres that let apparel companies produce a garment that is as soft and durable as cotton, without the environmental risks associated with cotton's cultivation. Similarly, AkzoNobel, a leading global paints and coatings company and a major producer of speciality chemicals, has teamed up with cleantech company Photanol to develop a process for harnessing the power of the sun to make chemicals. The technology mimics the way plants use photosynthesis to produce "green" chemical building blocks that will eventually replace fossil-based linear raw materials.

### **Recovery and Recycling**

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The Recovery & Recycling model creates production and consumption systems in which everything that used to be considered waste is revived for other uses. Companies either recover end-of-life products to recapture and reuse valuable material, energy and components or they reclaim waste and by-products from a production process.

#### **Industrial example**

Two leaders in the use of this model are Procter & Gamble and General Motors. P&G has 45 facilities now operating on a zero-waste basis – meaning all of the manufacturing waste at those sites is recycled, repurposed or converted into energy – while General Motors currently recycles 90 per cent of its worldwide manufacturing waste and has landfill-free facilities (and generates \$1 billion in revenue annually from by-product recycling and reuse).

### **Product Life-extension**

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Consumers discard products they no longer value – because the products are broken, out of fashion or no longer needed. But many of these products still hold considerable value, and the Product Life-Extension model seeks to recapture it. By maintaining and improving products through repairs, upgrades, remanufacturing or remarketing, companies can keep them economically useful for as long as possible. This means shifting from merely selling things to actively keeping them alive and relevant. It also means moving customers from transactions to relationships, tailoring upgrades and alterations to specific needs.

#### **Industrial example**

Dell – a global leader in computer technology – is using this business model to serve a wider set of customer segments, increase revenues and keep technology out of the landfill. Through its Dell Outlet and Dell Refurbished businesses, the company takes back and resells unused products (for example, returns), certified refurbished products



(for example, ones coming back from leasing) and “scratch and dent” goods with cosmetic blemishes. Construction equipment manufacturer Caterpillar saves itself and its customers considerable money and up to 90 per cent energy use by remanufacturing millions of components each year in a profitable operation employing more than 4,000 people and growing.

### **Sharing Platform**

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In developed economies, up to 80 per cent of the things stored in a typical home are used only once a month. The Sharing Platform model – increasingly enabled by new forms of digital technology – forges new relationships and business opportunities for consumers, companies and micro-entrepreneurs, who rent, share, swap or lend their idle goods. Fewer resources go into making products that are infrequently used, and consumers have a new way to both make and save money.

#### **Industrial example**

A number of companies built on this business model have gained millions of members, considerable media attention and in some cases \$40 billion-plus valuation. These include Airbnb (home sharing), Uber and Lyft (ridesharing), Deliv (shipping services sharing) and Peerby (consumer goods sharing). By making it easy for people and companies to use idle products, these businesses are squeezing much more value from the re-sources used to make them.

### **Product as a Service**

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What if manufacturers and retailers bore the “total cost of ownership”? Many would immediately adjust their focus to longevity, reliability and reusability. When consumers lease or pay for products by use through the Product as a Service model, the business model fundamentally shifts – in a good way. Performance trumps volume, durability tops disposability, and companies have an opportunity to build new relationships with consumers.

#### **Industrial example**

Michelin solutions ([www.michelin-solutions.com](http://www.michelin-solutions.com)), a new business launched by Michelin, the tire manufacturer, has embraced this model by enabling fleet customers to lease instead of purchase tires outright – effectively selling “tires as a service,” with customers paying per km driven. Similarly, consumer electronics giant Philips is selling “lighting as a service,” charging customers not for the LED diodes themselves but for their usage, in a push to improve the customer value proposition.