

1.1 CIRCULAR ECONOMY (CE) AND BUSINESS MODELS

What is a circular business model?



E-module 1: Circular Economy and Food Supply Chain
September 2021



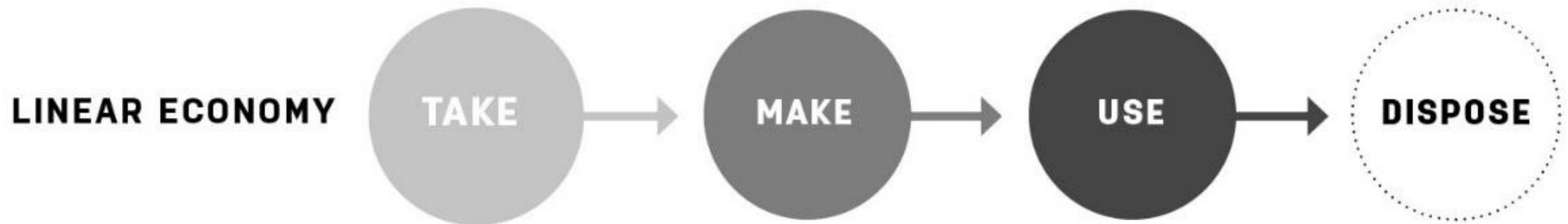
*“The goods of today
are the resources of tomorrow
at yesterday’s resource prices”*

(Walter Stahel)

Think to yourself, explain:

In a sentence, describe circular economy
(= *what it means, what is the purpose,
why is different*)?

What is the Circular Economy?



In our current economy, more and more raw materials are being extracted and more and more waste is being disposed of. **This current economy of "take-produce-use-dispose" is called a linear economy and is not a sustainable model.**

What is the Circular Economy?

- Designs conservation of value in the economy
- **Away from "taking, making, disposing of."**
- Is made possible by:
 - Design for regeneration
 - Substitution of materials
 - Products to services
 - Sharing or peer-to-peer economy
 - Repair and resupply industries



What is the Circular Economy?

It is based on three principles:

- **Preventing waste and pollution**
- **Keep products and materials in use**
- **Regenerate natural systems**



What is the Circular Economy?

Aims to radically limit the extraction of raw materials and the production of waste.

This is done by recovering and reusing as many products and materials as possible, in a systemic way, over and over again.

The Circular Economy is a "make/remake - use/reuse" economy.

CIRCULAR ECONOMY



The concept of a circular economy

In a circular economy, **economic activity builds and rebuilds the health of the whole system.** The concept recognizes the **importance of the economy functioning effectively at all levels** - for businesses large and small, for organizations and individuals, globally and locally.

The transition to a circular economy is not just about making adjustments aimed at reducing the negative impacts of the linear economy.

Rather, it is a **systemic change that builds long-term resilience, creates business and economic opportunities, and delivers environmental and societal benefits.**

Think to yourself, explain:

Can you provide one good example of circular economy business?

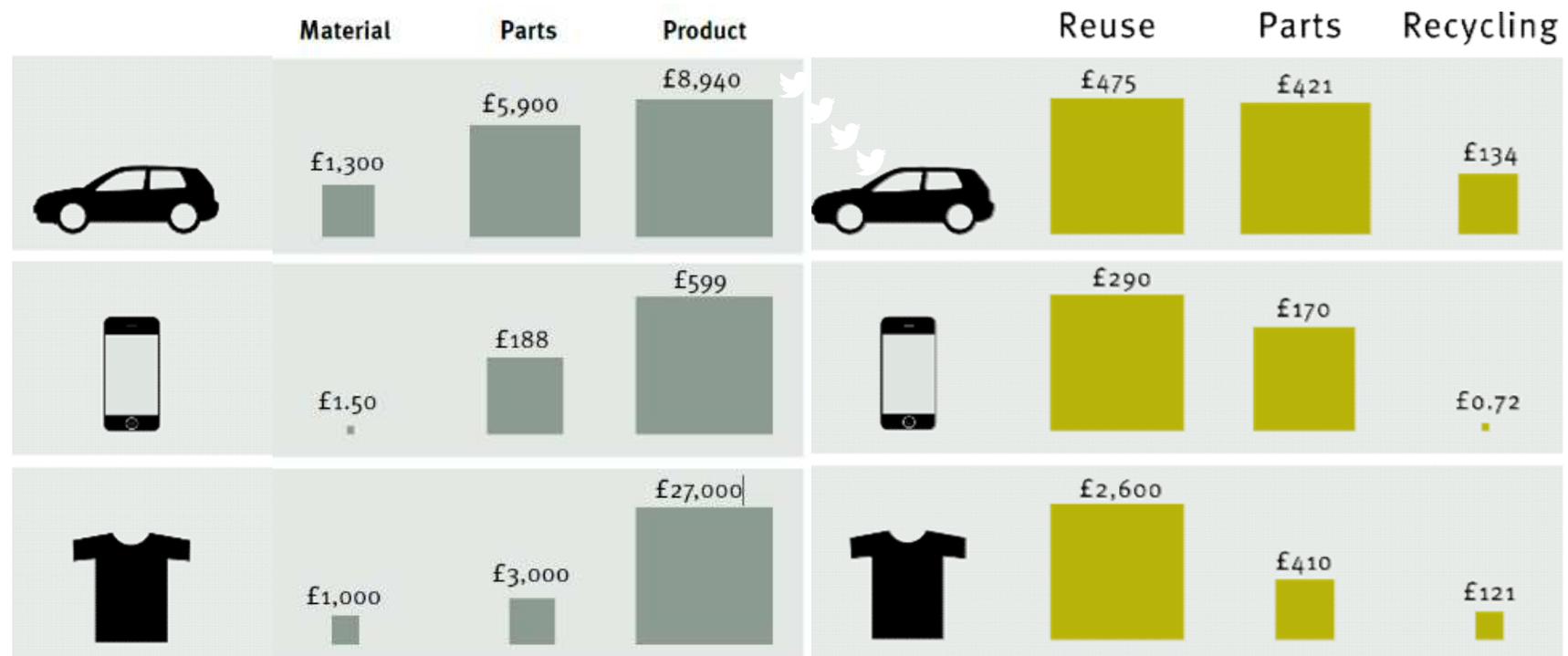
If not, look it up ...

Why bother with circular economy?

1. **Business risk**
2. **Value retention**
3. **Jobs and growth**
4. **Climate change**
5. **Competitive advantage**



Value creation and retention



Benefits of circular economy



Principles of the Circular Economy

Circular Economy takes inspiration from natural systems

Watch video: <https://www.youtube.com/watch?v=zCRKvDyyHmI>

Rethinking Progress The Circular Economy

- **In the world of living creatures, the waste of one species is the food of another, and energy is provided by the sun.** This is the inspiration for the Circular Economy.
- At Circular Economy recyclables and products are recirculated and produced and transported with renewable energy.

The four principles of the Circular Economy

- 1. Waste = Food**
- 2. Build resilience through diversity**
- 3. Use energy from renewable resources**
- 4. Think in systems**

Can you give a good example of one of the four principles, both in the natural world and in the man-made world?

Choose one of the four principles and give an example of a natural system and a man-made system.

The four principles of the Circular Economy

Example 1: **Waste = Food**

This principle considers the continuous cycle of materials and products. A material or product that is no longer used should not become "waste" but part of a new cycle of use.

Natural system, example: Birds eat berries. Bird droppings contain berry seeds. Bird droppings also serve as fertilizer for the seeds to grow into plants. Bird "waste" is "food" for berry plants.

Man-made system, example: I drink wine from a glass bottle. When the bottle is empty, I throw it in the bottle bank. The bottle is crushed, melted and formed into a new glass bottle. The "waste" of the glass bottle thus becomes the "food" for new glass bottles.

The four principles of the Circular Economy

Example 2: **Build Resilience Through Diversity**

Diverse systems, that is, systems with many different components, are more resilient. Resilient is defined as the ability to cope with change and evolve in the process. This is especially true when the components of a system respond differently to change and disruption. It is then unlikely that a particular disturbance will pose the same risk to all components at once.

Natural system, example: a jungle.

Man-made system, example: an organic farm with mixed crops (not one crop, but a variety of different foods).

The four principles of the Circular Economy

Example 3: **Energy from Renewable Resources**

The sun is one of the most important sources of renewable energy (wind power, tidal power, and plant growth are derived directly from sunlight), but it is not the only one. The other source is geothermal energy, generated deep within the earth.

Natural system, example: a green plant (sunlight converts CO₂ and water into sugar: photosynthesis).

Man-made system, example: a solar cell (sunlight is converted into electricity).

The four principles of the Circular Economy

Example 4: **Think in Systems**

Natural system, example: the food chain. If one species goes extinct, it can affect many other species because they are interdependent in complex ways.

Man-made system, example: unexpected effects. We have energy-saving light bulbs now. We feel good about them because they save electricity. But now we use these bulbs in places that were not lit before (e.g. gardens). As a result, we are not saving as much electricity as we expected.

Why we need a Circular Economy?

Linear Economy is not working very well

Linear economy doesn't work very well. There are three reasons for this:

- Resources like fossil fuels, food, and water are **getting harder to come by**.
- **Biodiversity is declining worldwide**. Yet nature's ecological services seem to be taken for granted.
- The **financial system has crashed almost the entire economy**.

FURTHER READING (OPTIONAL)

Webster, Ken. [The Circular Economy: A Wealth of Flows - 2nd edition](#). Ellen MacArthur Foundation Publishing, 2017.

The Butterfly Diagram

An Introduction to the Butterfly Diagram

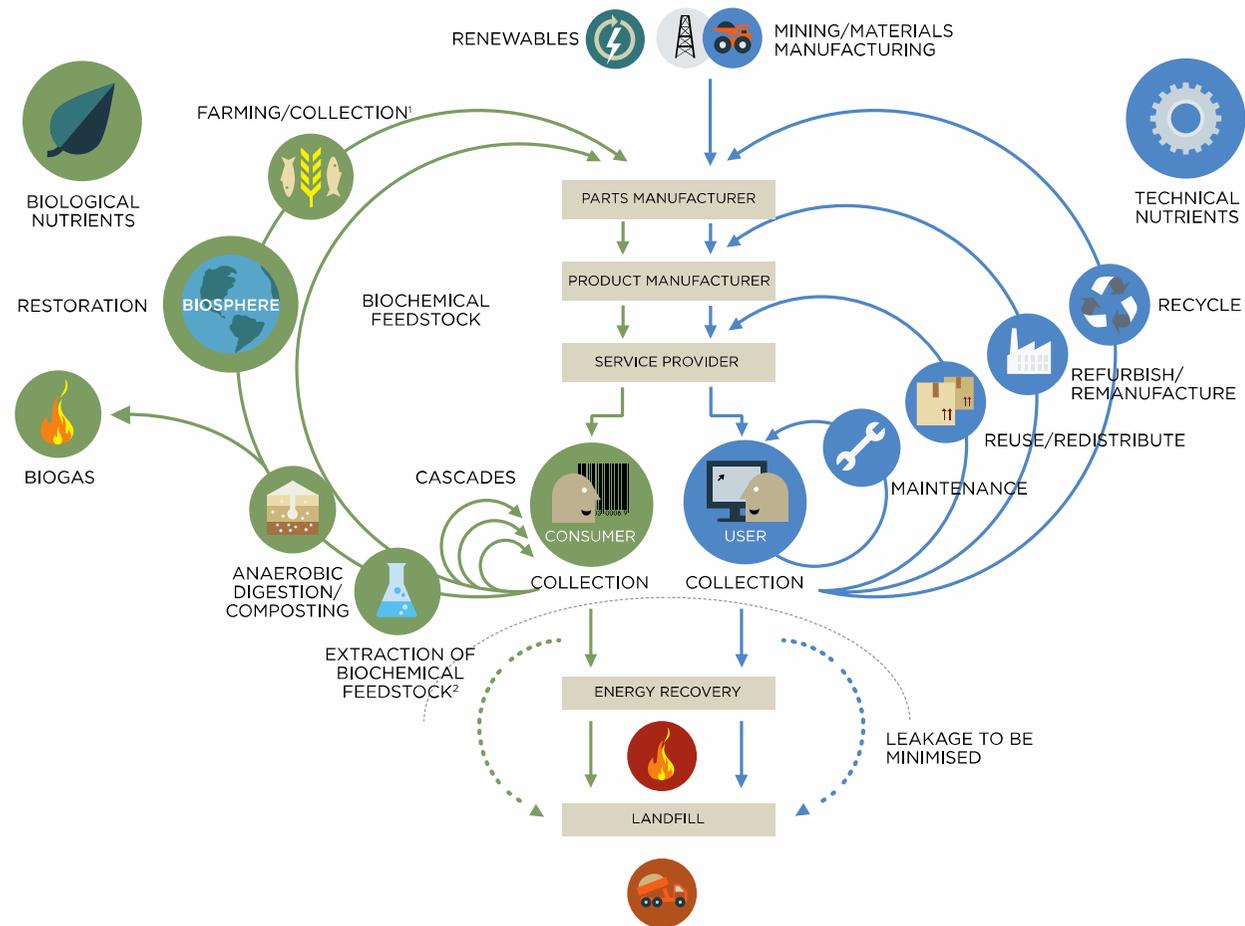
The circular economy system diagram, also known as '**Butterfly Diagram**', depicts **product and material flows in Circular Economy**.

The diagram starts from the current Linear Economy, represented as a central downward flow from material extraction and manufacture at the top to incineration and landfill at the bottom.

In Circular Economy resources are used but not consumed.

By applying appropriate strategies to products, components and materials during use and after the end of a life cycle, resources are kept in the system.

An Introduction to the Butterfly Diagram



Cycles in a Circular Economy

In a circular system, technical and biological *nutrients*, or materials, are retained in continuous loops. The circular flow of these nutrients is represented by the loops on either side: green for biological and blue for technical nutrients.

Biological materials can be safely returned to the biosphere and add value to the environment, once they have gone through one or more use cycles. These materials include food, natural fibres and bio-based materials, such as wood.

Technical materials cannot be returned to the biosphere. These materials should continuously cycle through the system so that their value can be (re)captured. These materials include plastics, metals and synthetic chemicals.

Explore the Butterfly Diagram in detail, since it is the backbone of this course.

Assignment: The Butterfly Diagram

ASSIGNMENT:

- Find two examples of businesses that are “going circular”.
- Give a one sentence description and indicate which part of the butterfly diagram they belong to.
- If possible, provide a link to a website or video.



The roots of circular economy

The roots of circular economy

- The concept of circularity has deep historical and philosophical origins.
- The idea of feedback, of cycles in real systems, is ancient and resonates in various philosophical schools. In the developed world, it experienced a revival after World War II , when the advent of computational studies of nonlinear systems clearly revealed the complex, interconnected, and therefore unpredictable nature of the world we live in - **it resembles a metabolism rather than a machine.**
- With current advances, digital technology has the power to support the transition to a circular economy by radically increasing virtualization, dematerialization, transparency, and feedback-driven intelligence.

The roots of circular economy

The circular economy concept has deep-rooted origins and cannot be traced back to one single date or author. Its practical applications to modern economic systems and industrial processes, however, have gained momentum since the late 1970s, led by a small number of academics, thought-leaders and businesses.

The following schools of thought can be seen as the basis for the concept of Circular Economy:

- **Cradle to Cradle,**
- **Performance economy**
- **Biomimicry**
- **Industrial Ecology,**
- **Natural capitalism,**
- **Blue Economy**
- **Regenerative design**

<https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought>

Cradle to Cradle

The German chemist and visionary Michael Braungart developed the Cradle to Cradle™ concept and certification process with American architect Bill McDonough. This design philosophy considers **all materials used in industrial and commercial processes as nutrients**, of which there are two main categories: technical and biological. The Cradle-to-Cradle framework focuses on design for effectiveness in terms of products with positive impacts and reducing the negative impacts of trade through efficiency.

- Cradle to Cradle instead of Cradle to Grave
- Consumers actually use very little; the rest is thrown away — but there is no "away"
- Waste is Food
- "Biomemetic" as Example of Ants

Cradle to Cradle

Cradle-to-cradle design sees the safe and productive processes of **nature's "biological metabolism"** as **a model for the development of an "engineered metabolism" of industrial materials**. Product components can be designed for continuous recovery and reuse as biological and technical nutrients within this metabolism.

- Eliminate the concept of waste. **"Waste equals food"**. Design products and materials with life cycles that are safe for human health and the environment and that can be used again and again through biological and engineering metabolisms. Create and participate in systems to collect and recover the value of these materials after their use.



<https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought>

<https://youtu.be/HM20zk8WvoM>

Cradle to Cradle

- Generate electricity with renewable energy. **"Take advantage of current solar capture"**. Maximize the use of renewable energy.
- Respect human & natural systems. **"Celebrate diversity"**. Manage water use to maximize quality, promote healthy ecosystems, and respect local impacts. Manage operations and stakeholder relationships with social responsibility.



<https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought>

<https://youtu.be/HM20zk8WvoM>

Performance economy

- Walter Stahel , architect and industrial analyst, in his 1976 research report to European Commission "**The Potential for Substituting Manpower for Energy**," outlined the vision of a circular (or closed-loop) economy and its implications for job creation, economic competitiveness, resource conservation, and waste reduction.
- Stahel, who is credited with **coining the term "cradle to cradle"** in the late 1970s, worked to develop a "circular" approach to production processes and founded Product Life Institute in Geneva more than 25 years ago.

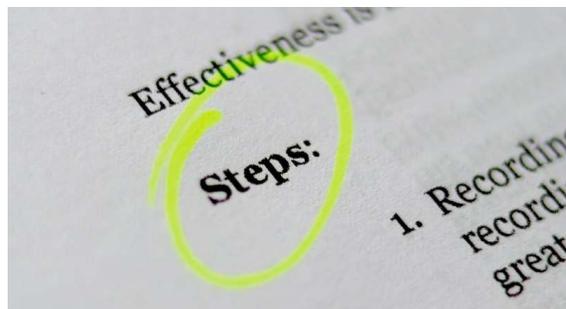


<https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought>

<https://youtu.be/PhJ-YZwDAVo>

Performance economy

- It has four main objectives: **Extending product life, durable goods, remanufacturing activities and waste prevention.**
- It also insists on the importance of selling services rather than products, an idea known as the "functional service economy", which is now more commonly subsumed under the term "performance economy". Stahel argues that the **circular economy should be viewed as a framework**: As a general concept, the circular economy draws on several more specific approaches, grouped around a set of basic principles.



Biomimicry

Janine Benyus , author of *Biomimicry: Innovation Inspired by Nature*, defines their approach as "a new discipline that **studies nature's best ideas and then mimics those designs and processes to solve human problems.**" Studying a leaf to invent a better solar cell is one example. She sees it as "nature-inspired innovation."

Biomimicry is based on three basic principles:

- **Nature as a model:** study nature's models and mimic these forms, processes, systems and strategies to solve human problems.
- **Nature as benchmark:** use an ecological standard to judge the sustainability of our innovations.
- **Nature as mentor:** View and value nature not on the basis of what we can get out of the natural world, but what we can learn from it.

<https://youtu.be/AE-2rDZwMXA>

<https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought>

Industrial Ecology

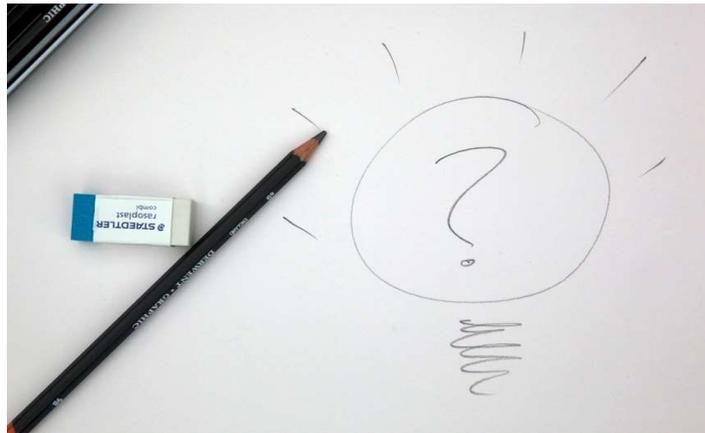
- Industrial ecology has arisen over the past few decades as the study of these coupled environmental and industrial systems offering us a systems-based approach to modelling, designing and managing industrial systems **in relation to the natural environment**.
- **Industrial ecology is the study of material and energy flows through industrial systems.** Or on its most practical level it may be understood as simply a set of tools for achieving energy efficiency and high environmental standards through lifecycle, assessment and material flow accounting among other tools that are commonly used in the field.
- Industrial Ecology is concerned with the study of material and energy flows through industrial systems.
- Industrial Ecology and the Circular Economy share similar goals and principles.
- **Real-life systems are not static:** we must continuously strive to improve them.

Natural Capitalism

- **“Natural capital” refers to the world’s stocks of natural assets including soil, air, water and all living things.** In their book “Natural Capitalism: Creating the Next Industrial Revolution”, Paul Hawken, Amory Lovins and L. Hunter Lovins describe a global economy in which business and environmental interests overlap, recognizing the interdependencies that exist between the production and use of human-made capital and flows of natural capital. The following four principles underpin natural capitalism:
- **Radically increase the productivity of natural resources** - through radical changes to design, production and technology, natural resources can be made to last much longer than they currently do. The resulting savings in cost, capital investment and time will help to implement the other principles.
- **Shift to biologically inspired production models and materials** - natural capitalism seeks to eliminate the concept of waste by modelling closed-loop production systems on nature’s designs where every output is either returned harmlessly to the ecosystem as a nutrient or becomes an input for another manufacturing process.

Natural Capitalism

- Move to a “**service-and-flow**” **business model** - providing value as a continuous flow of services rather than the traditional sale-of-goods model aligns the interests of providers and customers in a way that rewards resource productivity.
- **Reinvest in natural capital** - As human needs expand and pressures on natural capital mount, the need to restore and regenerate natural resources increases.



<https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought>

<https://youtu.be/7aZSxp7S4Dc>

Evolution of parallel phases of circularity

Timeline	CIRCULARITY	CIRCULAR SOCIETY	INDIVIDUAL CIRCULAR SOCIETY	CIRCULAR INDUSTRIAL ECONOMY (CIE)
Started by	Forever	Mankind	Industrial man	Industrial firms
Drivers	Nature	Beliefs, culture, tradition (Amish)	Necessity, good husbandry	Maintaining values, efficiency in use
Actors		Groups	Individuals	Fleet managers
Examples	Water cycle, carbon cycle	Shared use, commons, traditional dress, public libraries,	Sense of caring, reuse of garments, collectors' items, maintenance	Service-life extension, remanufacturing of goods & components, recovering molecules
Values	Immaterial	Non-monetary	Personal	Monetary
In control	Nature	Owner-users	Owner-users	Owner-managers
Circular activities	Forestry, agriculture	Sharing schemes	Do-it-yourself, repair craftsmen	Rental schemes, leasing, eu rail pool
Range	Global	Local	Local	Objects regional, molecules global

Stahel, W. R., *The circular economy : a user's guide*. p 1 online resource (119 pages).

Build up in stages of a circular economy

THE SANDWICH

SYSTEMS THINKING

- SCIENTIFIC WORLDVIEW
- COMPLEX ADAPTIVE SYSTEMS
- HOW WE TEACH AND LEARN

PRODUCTION & CONSUMPTION

- CRADLE TO CRADLE
- PRODUCT SERVICE SYSTEMS Etc
- SLOW RESOURCE FLOWS AND 'CLOSE LOOPS'

ENABLING CONDITIONS

- GOVERNMENT 'RULES OF THE GAME'
 - ICT INFRASTRUCTURE
 - ADJUSTED TAX AND SPENDING
-



Sustainable
business
development

Principles for a Sustainable Business

- Companies can move toward a sustainable business model by **not allowing resources from the biosphere to enter the economic cycle faster than they are replenished.**
- Ideally, waste should be eliminated, or at least not produced faster than the biosphere can absorb it.
- Finally, the energy that powers the economic system should be renewable, ultimately relying on the sun, the only energy that is truly renewable.

Principles for a Sustainable Business

- The exact impact of sustainability will vary for specific companies and industries; but **three general principles** will guide the path to sustainability.
 1. Businesses and industries must become **more efficient in their use of natural resources**;
 2. They should **align their entire production process with biological processes**;
 3. They should **focus on producing services** rather than products.

Principle 1: Eco-Efficiency

- **Eco-efficiency** has long been a part of the environmental movement. "Doing more with less" has been an environmental policy guideline for decades.
- Companies can improve **energy and material efficiency** in areas such as lighting, building design, product design, and distribution channels.
- Some estimates suggest that companies could achieve a **4-fold** and even a **10-fold increase** in efficiency with today's technologies alone.
- Consider that a 4-fold increase, referred to in the sustainability literature as "**Factor-Four**", would allow twice the productivity to be achieved with half the resource consumption.

Principle 2: Biological Process Models

- Imagine that the waste that leaves the economic cycle is returned to the cycle as a productive resource.
- **"Closed-loop" production** aims to put what is currently waste back into production.
- Ideally, one company's waste becomes another's resource, and such **synergies can create eco-industrial parks**.
- Just as biological processes such as photosynthesis transform the "waste" of one activity into the resource of another, this principle is often referred to as biomimicry.

Principle 3: Shift from Products to Services

- Traditional economic and business models interpret consumer demand as the demand for products, e.g., washing machines, carpets, light fixtures, consumer electronics, air conditioners, cars, computers, etc.
- **A service-based economy interprets consumer demand as demand for services**, e.g., clothes cleaning, floor coverings, lighting, entertainment, cool air, transportation, word processing, and so on.



Key definitions

MAINTAIN/PROLONG (& SHARE)

This innermost loop of the technical cycle shows the strategy of keeping products and materials in use by prolonging their lifespan for as long as possible through designing for durability as well as maintenance and repair. These longer-lasting products can then be shared amongst users who are able to enjoy access to the service they provide, removing the need to create new products.

REFURBISH/REMANUFACTURE

Remanufacturing and refurbishment are two similar, yet slightly different, processes of restoring value to a product. When a product is remanufactured it is disassembled to the component level and rebuilt (replacing components where necessary) to as-new condition with the same warranty as a new product. Refurbishment is largely a cosmetic process whereby a product is repaired as much as possible, usually without disassembly and the replacement of components.

<https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

RECYCLE

Recycling is the process of reducing a product all the way back to its basic material level, thereby allowing those materials (or a portion of them at least) to be remade into new products. While this is undoubtedly an important process in a circular economy, the loss of embedded labour and energy, the necessary costs to remake products entirely, and the inevitable material losses mean that it is a lower value process than those closer to the centre of the system diagram, such as reuse and remanufacturing.

CASCADES

This loop, within the biological cycle, refers to the process of putting used materials and components into different uses and extracting, over time, stored energy and material order. Along the cascade, this material order declines until the material ultimately needs to be returned to the natural environment as nutrients. A cascade, for example, might be a pair of cotton jeans being turned into furniture stuffing and then into insulation material before being anaerobically digested so that it may be returned to the soil as nutrients.

REUSE/REDISTRIBUTE

Technical products and materials can also be reused multiple times and redistributed to new users in their original form or with little enhancement or change. Marketplaces such as eBay are proof of this already well-established approach.

BUSINESS MODELS

What are the macroeconomic impacts of shifting to a new economic model?

The circular economy has gained attraction with both businesses and government officials.

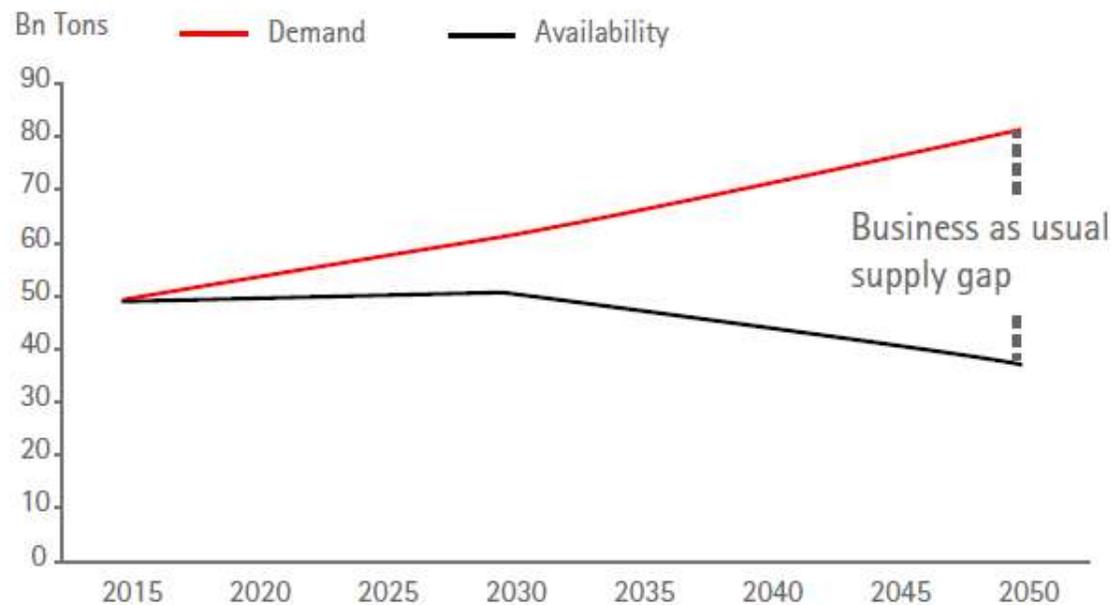
Their imaginations are fired by the **possibility of gradually decoupling economic growth from the use of new resources, encouraging innovation, boosting growth and creating more robust jobs.**

As we move to a circular economy, the effects will be felt throughout society.

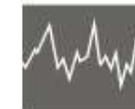
The slider below illustrates some of the potential macroeconomic benefits of moving to a circular economy.

The widening gap between sustainable resource availability and demand

Resource supply / demand imbalance 2015-2050



Rising costs for material, energy, land, water



Extreme volatility in commodity markets



Economic and social risk of supply disruptions

Economic benefits in detail

ECONOMIC GROWTH

Economic growth, as defined by GDP, would be achieved mainly through a combination of increased revenues from emerging circular activities, and lower cost of production through the more productive utilisation of inputs. These changes in input and output of economic production activities affect economy-wide supply, demand, and prices. Its effects ripple through all sectors of the economy adding to overall economic growth.

MATERIAL COST SAVINGS

Based on detailed product-level modelling, it is estimated that, in the sectors of complex medium-lived products (such as mobile phones and washing machines) in the EU, the annual net-material cost savings opportunity amounts to up to USD 630 billion. For fast moving consumer goods (such as household cleaning products), there is a material cost-saving potential of up to USD 700 billion globally.

Economic benefits in detail

JOB CREATION POTENTIAL

The largest comparative study to date of the employment impacts of a circular economy transition points to “positive employment effects occurring in the case that the circular economy is implemented”. This impact on employment is largely due to increased spending fuelled by lower prices; high-quality, labour-intensive recycling activities; and higher skilled jobs in remanufacturing. New jobs will be created across industrial sectors, within small and medium enterprises, through increased innovation and entrepreneurship, and a new service-based economy.

INNOVATION

The aspiration to replace linear products and systems with circular ones is an enormous creative opportunity. The benefits of a more innovative economy include higher rates of technological development, improved materials, labour, energy efficiency, and more profit opportunities for companies.

What is business model?

- A business model is a **company's core strategy for operating profitably**.
- Models generally include information such as products or services the company plans to sell, target markets, and any expected expenses.
- The two levers of a business model are pricing and costs.



What is your definition of business model?
You can look up Wikipedia or search other sources!

<https://www.investopedia.com/terms/b/businessmodel.asp>

Circular economy is all about value chains & ecosystems

No single enterprise is the entire economy.
To have the greatest impact, businesses must work together.



Source: www.boardofinnovation.com

2 very different angles to innovate ecosystems:

Follow 1 value chain of a product:

Limit the impact of 1 product line. Redesign how value can be created for all stakeholders involved (factory, distribution, retail)

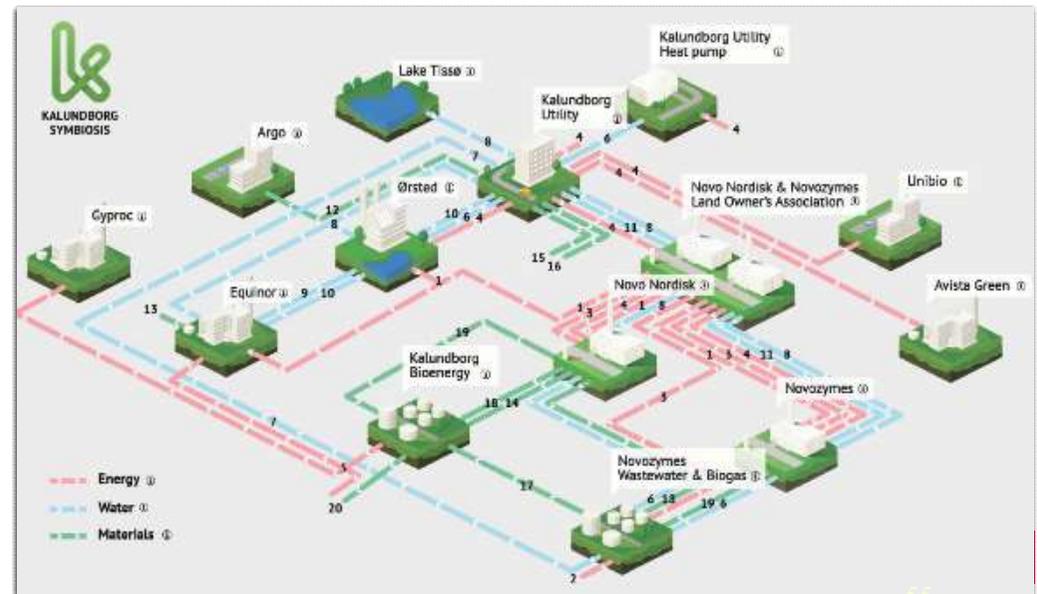
e.g. Mudjeans value chain



Source: www.boardofinnovation.com

Mix value chains of different products

Companies, often close-by, can work together to exchange resources to limit their impact while each producing very different products. e.g.: Kalundborg industrial region Denmark

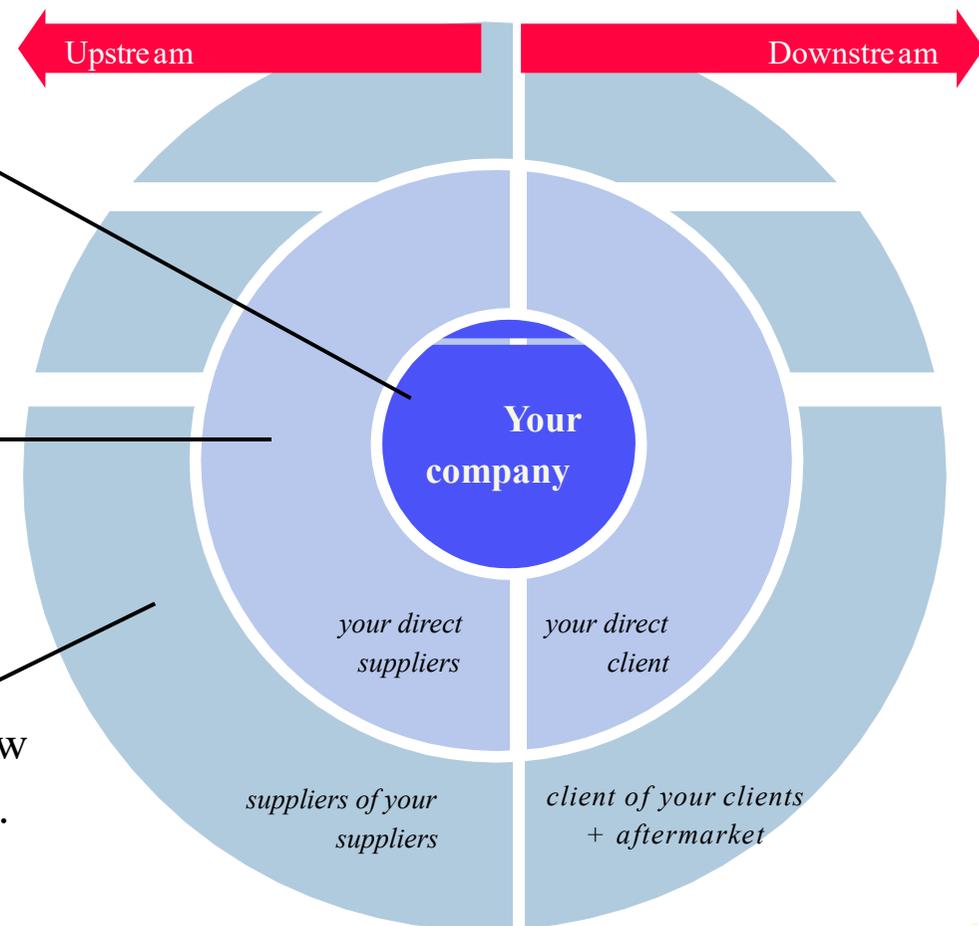


Innovate alone or together with other partners?

1. Easiest, but impact is limited Focus on your own product & business model.
(e.g. sourcing of alternative raw materials)

2. Co-create with direct stakeholders
Use your existing relations to develop circular businesses to create value for all.

3. Challenging, but biggest impact
Go beyond your direct contacts to develop new circular business models within your ecosystem.



How to make links between organisations.

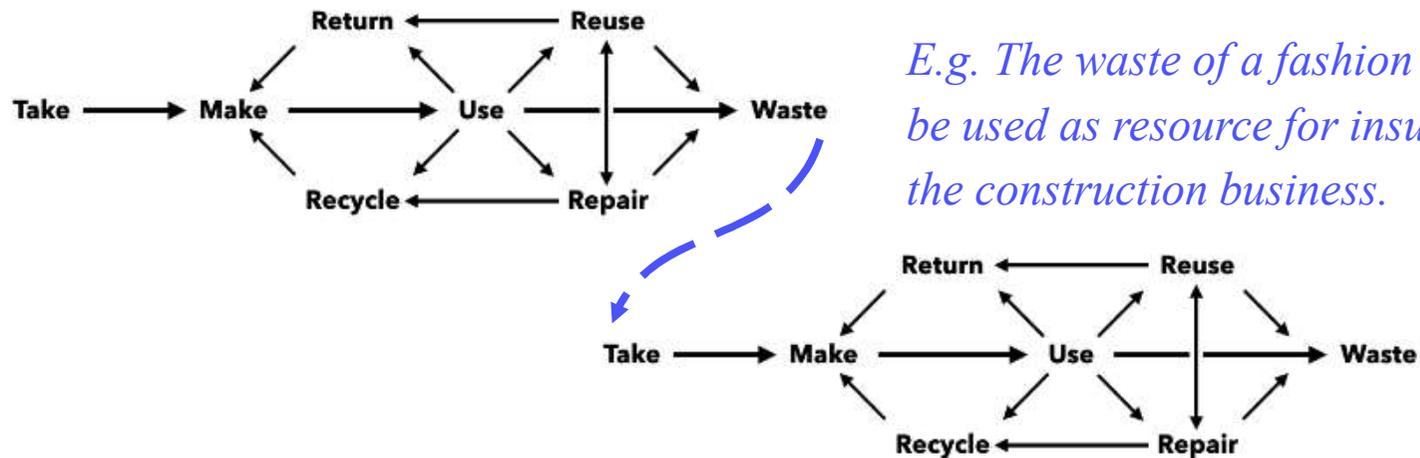
SOMETIMES YOU NEED TO SWITCH BETWEEN VALUE CHAINS

STAY WITHIN THE SAME VALUE CHAIN

e.g. Aluminum drinking cans can be collected to be recycled to new drinking cans.

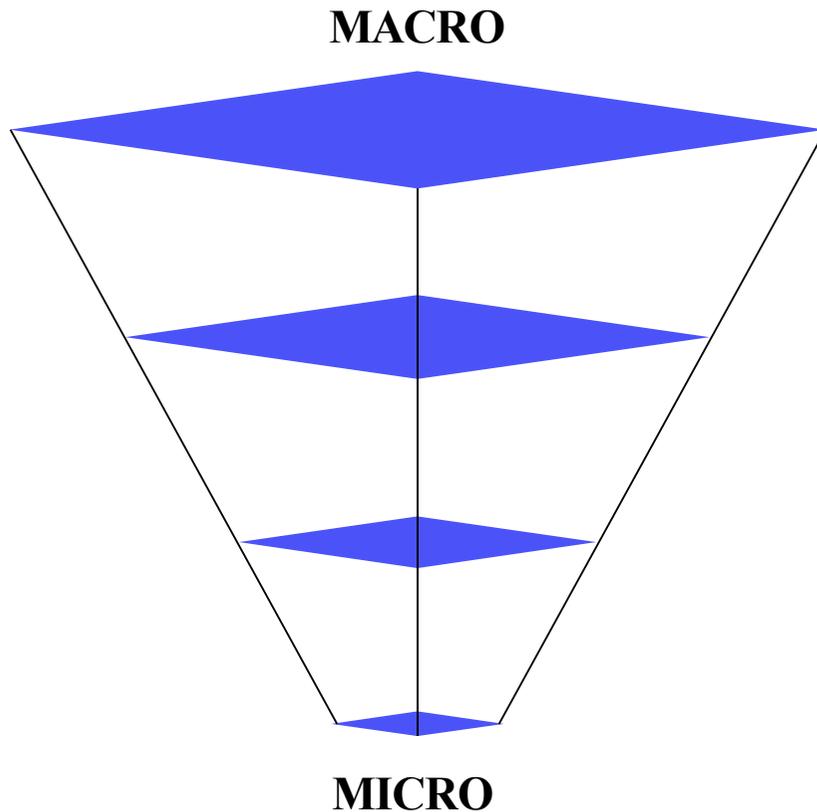
LINKING DIFFERENT VALUE CHAINS

e.g. The waste of one industry can be used as a resource for another.



E.g. The waste of a fashion brand can be used as resource for insulation in the construction business.

The best level to contribute to the circular economy?



Level: Society or nation

Taxes/subsidies, regulation + fines, policies, credible communication

Level: Large organisations & multinationals

Valuable & convenient products, ecosystem partnerships, inspirational branding, policies/guidelines

Level: Teams or groups

Enforce culture & value, spot bottlenecks & issues

Level: Individual

Role model, peer pressure, purchasing decisions

Reasons to join a circular economy:

IT WILL HELP A BUSINESS TO

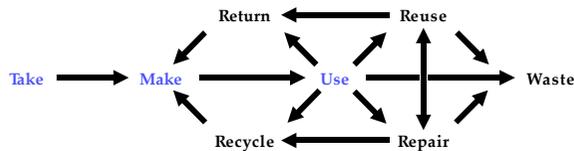
- **Save costs**
E.g. Recover resources
- **Access new markets**
E.g. Client expect companies to lead
- **Resilience to shocks**
E.g. Don't depend on limited resources



- **Compliance**
E.g. Regulation quickly evolves
- **Access to talent**
E.g. Meaningful work

Source: www.boardofinnovation.com

3 main types of players in the circular economy:



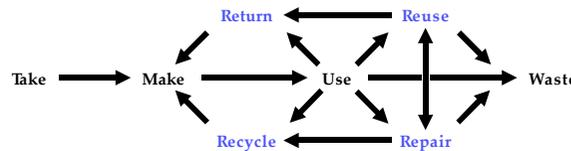
A. PRODUCT BUSINESSES

Companies with hardware/physical products that aim to **evolve from a traditional linear model to circular business models.**

Designer of the product already decides of 80% of the circular impact.

e.g. Adidas, Philips, Volvo

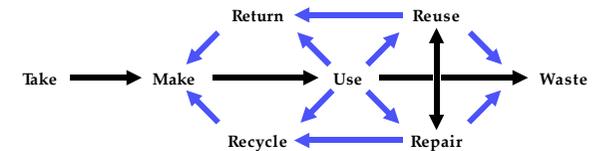
Source: www.boardofinnovation.com



B. SOLUTION PROVIDERS

Solutions providers with a **specific focus** on a single stage to help TYPE A companies transition to the Circular economy.

e.g. Reseller of refurbished products, Recycler



C. FACILITATORS

Organization that provide services for support the whole ecosystem or a significant part of a value chain.

e.g. Data brokers, Government platforms

D. OTHER (LESS RELEVANT)

Regular service business (e.g. HR services, hotels, sports business)

3 main types of players in the circular economy:

All create circular impact



= an alternative business model to subscribe on a bike-service

= This company tries to minimize the impact of its own products, controls lifecycle

- Broken bikes are repaired instantly, or replaced
- The company has strong incentives to create durable bikes that are easy to repair

TYPE A



= traditional business model with circular procurement

sells protein & ingredients in bulk to be used in food production and B2C

Takes food waste + breed black fly larvae:

- Provides 'circular' raw materials for downstream companies
- Helps companies to get rid of food waste
- Protix creates a circular link between 2 different value chains

TYPE B



= a data platform business model

- Offers a data-passport for materials in the building industry
- Aim is to support transition of the building industry from linear to circular by letting users identify value potential throughout the building cycle

TYPE C



Packbags: durable bags



Leatherman: durable tools

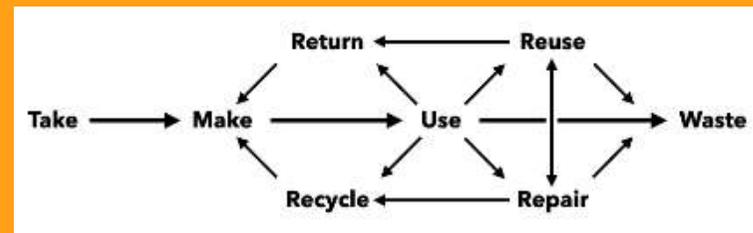
Source: www.boardofinnovation.com

Phase: Use

Are you making products that can last a lifetime?

Ideally, the Use-phase, should be as long as possible, but very few businesses are doing this.

Conflict with revenue & profit target.





Re-pello model 16: repairable bike



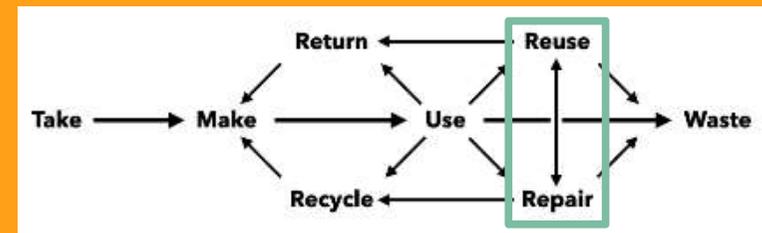
Skanska Norway: reusable concrete decks

Source: www.boardofinnovation.com

Phase: Reuse & Repair

Next best thing to extend life cycle: Offer options to reuse product (e.g., via after market, find new users) or make sure to offer repair options.

Again, very few businesses are taking this phase seriously.





Vanderlande: baggage-handling as a service

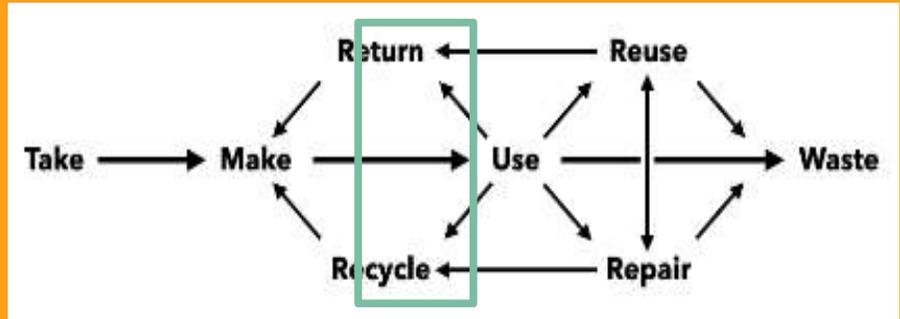


DOW: PU mattress recycling

Source: www.boardofinnovation.com

Phase: Return or Recycle

Gradually, some companies switch to a service model where they remain the owner of products and remain responsible for the return & recycling.





SAPPI: Paper-based alternative to plastic

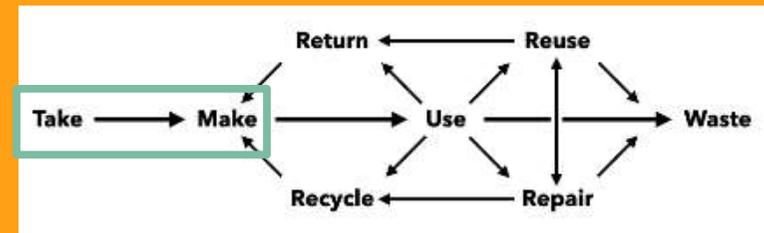


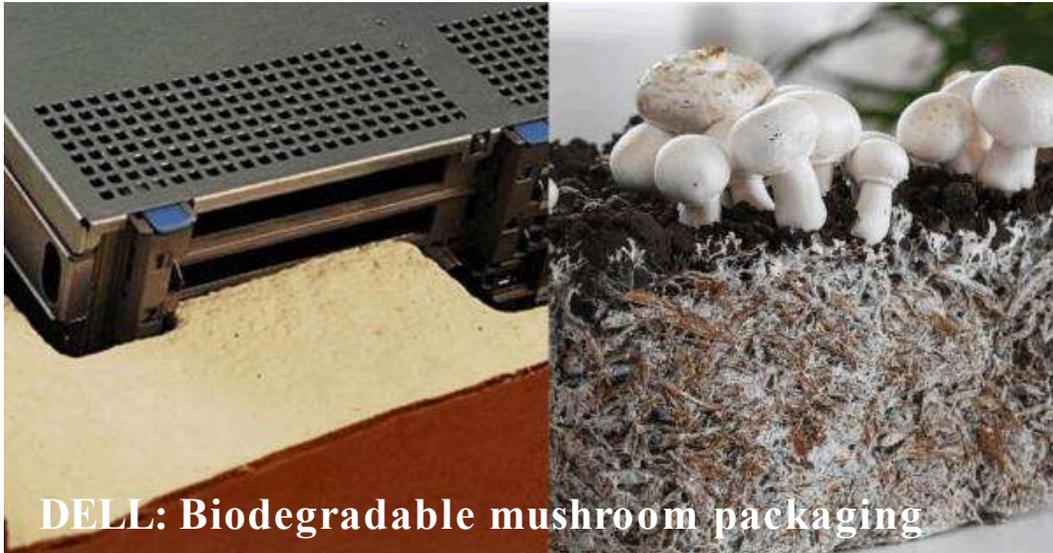
Kenoteq: Brics from construction waste

Source: www.boardofinnovation.com

Phase: Take & Make

- When companies invest in the circular economy, they often start here: Sourcing recycled materials and reducing resource consumption in the production process.
- That's a good start, but creating a product with 80 % recycled materials that still ends up on a landfill is not good enough.





DELL: Biodegradable mushroom packaging



UPS: Offset carbon footprint

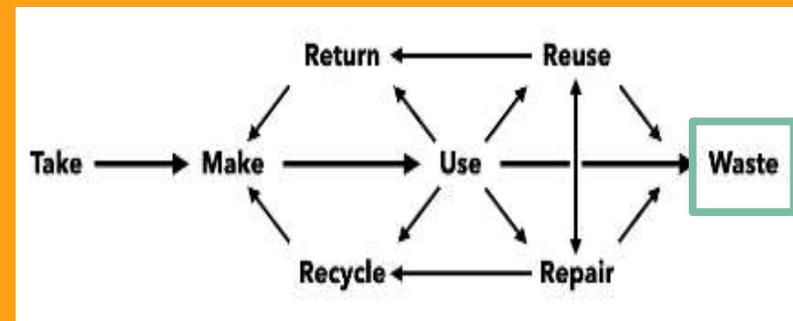
Source: www.boardofinnovation.com

Phase: Waste & Disposal

When there are no more options, the products are disposed of. Not many companies actively address this last stage.

Waste from one industry can often be used in another as raw material.

(* waste from side-streams are not limited to the final stage of the product itself)

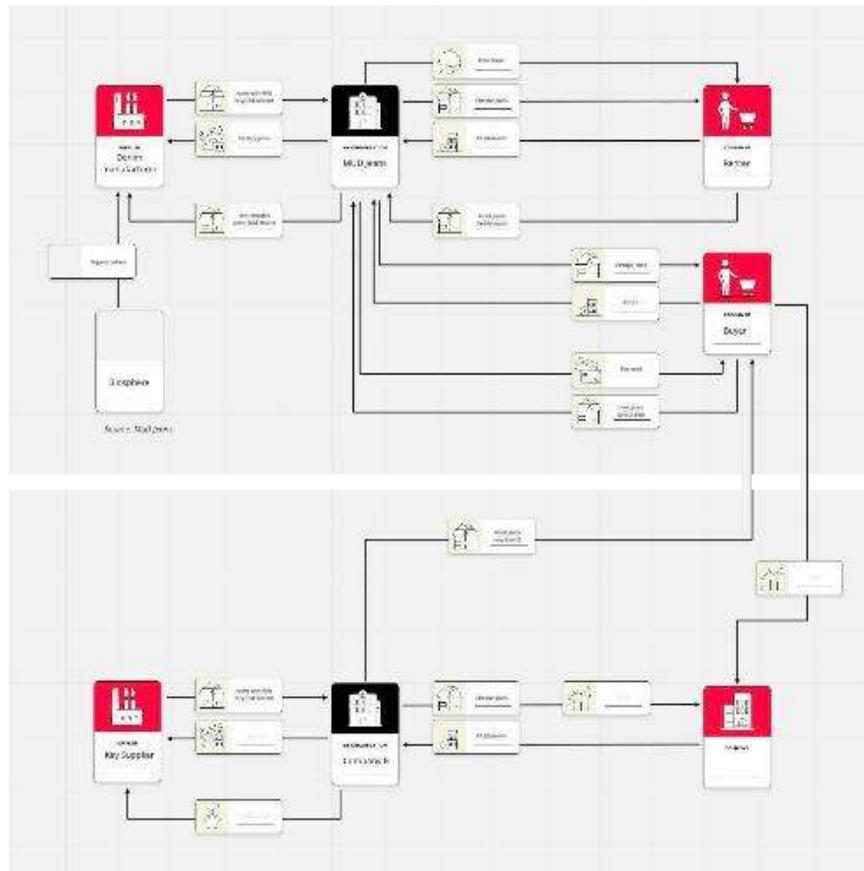


If possible, try to co-create business models with partners to close all circular flows.

**Business Model
Company A**

+

**Business Model
Company B**



Business models based on circular economy

- Accenture presented 5 central business models of the circular economy:
 - **Product Life Extension** - the lifecycle of a product can be extended by repairing, upgrading & reselling
 - **Resource Recovery** - modularity and material maximize economic value of product return flows
 - **Circular Supplies** - supply fully renewable, biodegradable or recyclable resource inputs
 - **Product as a Service** - products are used by customer by means of lease or pay-for-use
 - **Sharing Platforms** - customer collaboration among product use

Business models based on circular economy

Typical value chain



CIRCULAR INPUTS

Use of renewable energy, bio-based or potentially completely recyclable materials



SHARING PLATFORMS

Increased usage rates through collaborative models for usage, access, or ownership



PRODUCT AS A SERVICE

Offer of product use with retention of the product at the producer to increase resource productivity



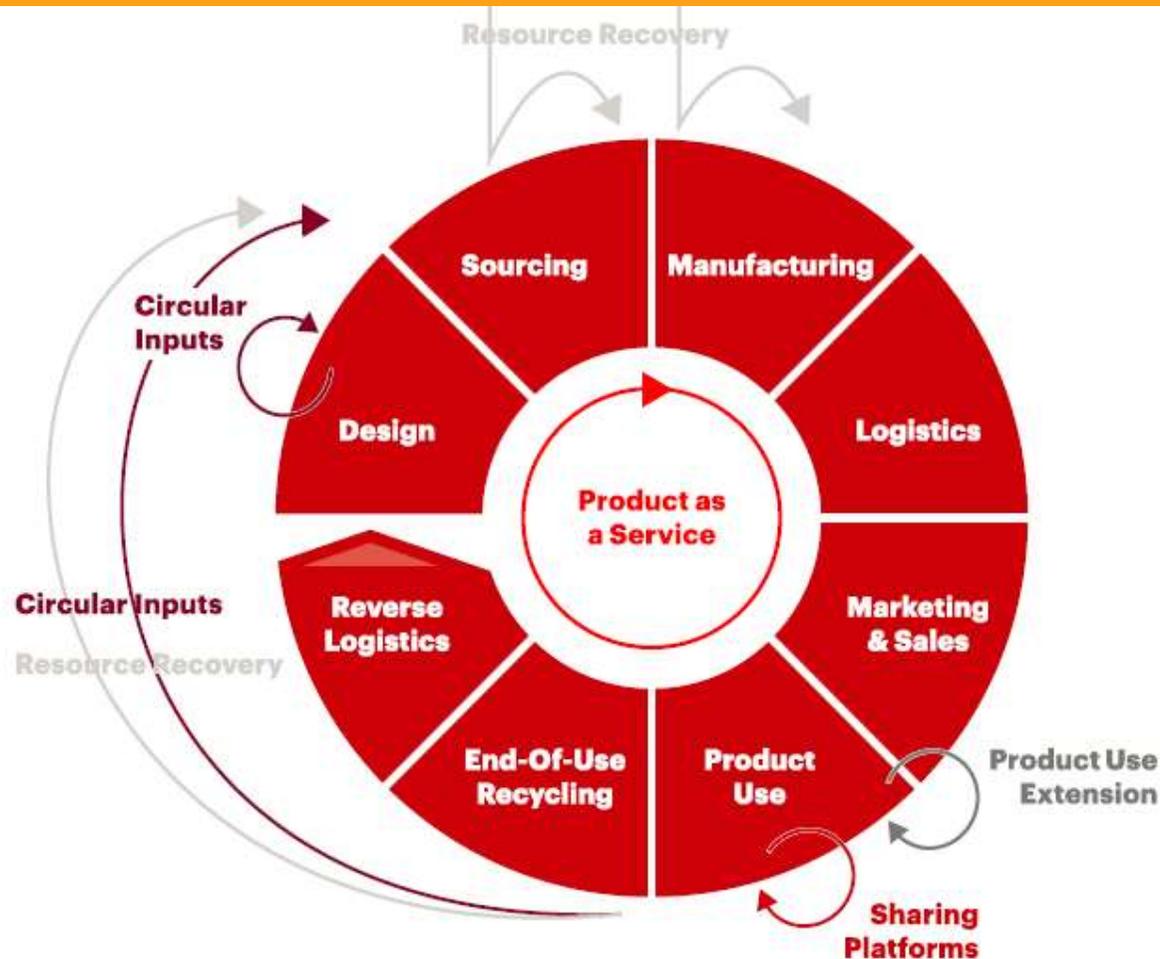
PRODUCT USE EXTENSION

Prolongation of product use through repair, reprocessing, upgrading and resale



RESOURCE RECOVERY

Recovery of usable resources or energy from waste or by-products



Source: Peter Lacy, Jessica Long, Wesley Spindler, 2020. The Circular Economy Handbook, Realizing the Circular Advantage.

1. Product Life Extension

- The product life extension business model aims to extend the life cycle of a product so that it remains economically useful. **Remanufacturing, repairing, upgrading, or remarketing** preserves or even improves material that would otherwise be discarded from the life cycle.
- By extending the life of the product as long as it makes sense (not as long as possible!), companies can keep material out of landfills and create new revenue streams.
- *What does your product/service look like? What is its projected lifespan? Is it modular in design?*
- *Do you offer a service manual for your product? Is your product designed to be disassembled? Can parts of your product be reused?*

2. Resource Recovery

Once a product has reached the end of its use, the task of Resource Recovery is to **return the embedded materials or energy to the production cycle**, thus closing the "loop" of the product from procurement to use and back to procurement.

Resource recovery creates products of value that use waste as an input material. The main feature of resource recovery is to reduce the amount of waste generated and to get the maximum added value from discarded products.

Resource recovery **minimizes the need for new raw materials** in the manufacturing process.

3. Circular Supplies

- Model based on providing fully renewable, recyclable or biodegradable resource inputs that underpin circular production and consumption systems.
- Companies replace linear resource approaches and end the use of scarce resources while **reducing waste and eliminating inefficiencies**.
- This model is particularly powerful for companies dealing with scarce resources or those with a large environmental footprint.
- The circular economy focuses on the "ingredients" that go into products during the design, procurement, and production phases. These inputs, such as renewable resources, aim to eliminate resource waste (including toxic and disposable materials) and are a stepping stone for all other models.
- In some of the more advanced examples, Circular Inputs can go beyond zero-waste and be resource-additive (e.g., when waste streams are processed into material streams).

4. Product as a service

- Model provides an alternative to the traditional buy and own model. **Products are used by one or more customers through a lease or pay-for-use arrangement.** This business model turns the incentives for product longevity and upgradability on their head and shifts them from volume to performance.
- In a product-as-a-service business model, product longevity, reusability, and sharing are no longer seen as cannibalization risks, but as **drivers of revenue and reduced costs.**
- This model would be attractive to companies whose products have a high proportion of operating costs and who have a skills advantage over their customers in managing product maintenance (giving them an advantage in selling services and recovering residual value at end of life).

5. Sharing Platforms

- The sharing platform business model promotes a **platform for collaboration between product users, either individuals or organizations**. These facilitate the sharing of excess capacity or underutilization, thereby increasing productivity and value creation for users.
- This model, which helps maximize utilization, could benefit companies whose products and assets have low utilization or ownership rates.
- The classic example is cars. They remain **unused 90% of the time**. This significant resource can be leveraged by car sharing platforms, an opportunity for new economic solutions.
- Today, however, it is found mainly in companies that specialize in increasing the utilization rate of products without producing them themselves, which places a **significant burden on traditional manufacturers**.

Five Capabilities of Successful Circular Leaders

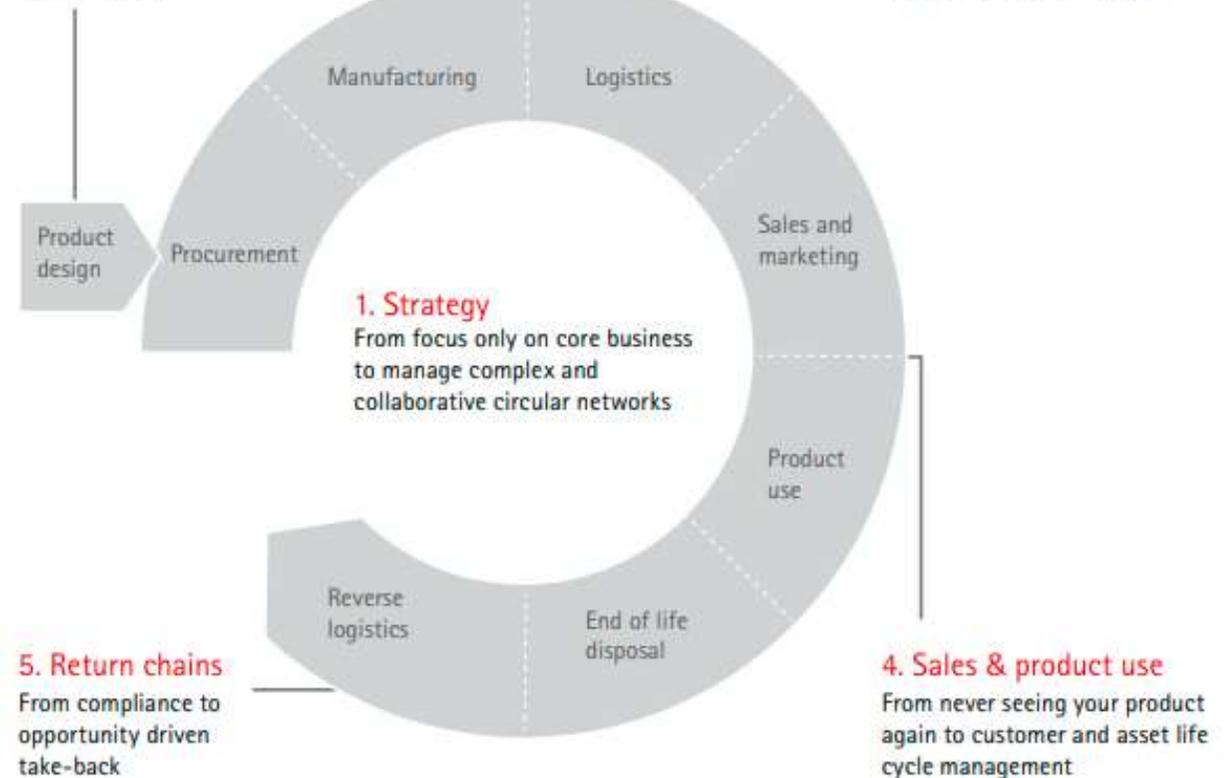
Core capability shifts supporting circular business model adoption:

2. Innovation & product development

From designing for single use to designing for many life cycles and users

3. Sourcing and manufacturing

From homogenous supply chain to heterogeneous resource flow innovation and cascading



Bottlenecks of the circular
economy?

Common pitfalls of circular economy innovation

- **Vanity metrics**

E.g., switch to 5% recycled materials while producing 10% more product overall. Your net impact will still be very negative.

E.g., you make your products easier to recycle or repair without making sure they are recycled or repaired. To achieve this, you need to integrate further into the value chain.

- **“Less harmful” mindset** (not good enough!) Be honest about the negative impact you still have on virgin resources, landfills and natural ecosystems.

- **"Single-player" innovation.**

Most circular innovation is based on partnerships and collaborations within an ecosystem. You won't get far on your own. Look for upstream and downstream partners in your value chain.

- **Ignorance is bliss**

Many companies have serious gaps in tracking their full impact on the circular economy. This hinders evidence-based decision making and enables inertia.

Bottlenecks of the circular economy

Convenience

Single-use items, ignoring waste, etc. are often too convenient for consumers and companies to go for alternatives.



Trust issues

Collaborating in the value chain means sharing data & product info. Many companies are reluctant to do so.



Value perception

Most clients & consumers are not willing to pay extra for products, just because they are circular.



Bottlenecks of the circular economy

Friction for change

Switching to a new business model, negotiation new contracts etc. takes time and energy.



Profitability/ Viability

In many industries the tech or processes are not ready to create enough profit or cost-saving to justify investments.



Knowledge

While there are successful first movers, many businesses lack the blueprints to follow in their path.



*“Buy less
Choose well
Make it last”*

(Vivienne Westwood)



TRAIN-CE-FOOD project

<https://trancefood.si/en/home-english>



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