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Report on current and emerging Circular Business Models in EU Industries

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1. INTRODUCTION

This report presents the findings of a cross-sectoral desk research study on current and emerging Circular Business Models (CBMs) in the European manufacturing industry, with a specific focus on servitization, meant as the shift from product-based to service-based value creation (Baines et al., 2009; Tukker, 2015). The study investigates how companies across key manufacturing sectors are redesigning their business models to support more sustainable, circular approaches that reduce waste, extend product lifespans, and enhance resource efficiency (Reim et al., 2015; Lacy & Rutqvist, 2015). It focuses on industries such as automotive, packaging, and electronics—sectors selected for their relevance to circular economy strategies and their potential to offer transferable insights to other industries (Bocken et al., 2016; Geissdoerfer et al., 2017). Among these, the furniture sector is the primary target of this research, with the aim of informing its transition toward circularity through servitization (ACTAS Project, 2023).

The main objective is to identify and analyse CBMs across sectors, placing emphasis on how servitization practices - such as leasing, maintenance services, product-as-a-service, and reverse logistics - are being applied to support circular strategies (Tukker, 2015; Bocken et al., 2016). By examining successful examples and recurring patterns, the study aims to highlight both the opportunities and the challenges involved in adopting service-based circular models, particularly in the context of the furniture industry (Bressanelli et al., 2018).

The results of this research will feed into the development of the forthcoming FurnSERVICE Guide, offering strategic insights and inspiration for furniture companies aiming to strengthen or adopt circular practices through servitization.

A Desk Research Approach

The study methodology consists of a structured desk research, combining a review of existing literature with an analysis of practical business case studies (Denyer & Tranfield, 2009; Yin, 2018). The review of literature was used to identify key principles, typologies, and frameworks that define CBMs, with a particular focus on servitization as a strategic enabler. Sources included peer-reviewed articles, EU policy documents, and publications from institutional and research organisations focused on circular economy and sustainable manufacturing. This theoretical foundation informed the analysis of business cases and helped frame the key analytical dimensions (Rousseau, Manning, & Denyer, 2008).

Secondly, the research involved the collection and examination of business case studies that demonstrate how specific circular strategies—particularly those involving servitization—are being implemented in practice. These cases were selected to reflect a diversity of approaches across European countries and, as anticipated, across multiple manufacturing sectors: Automotive, Packaging, Textile & Fashion, and Appliances & Electronics (Eisenhardt, 1989; Yin, 2018).

To broaden the scope and stimulate cross-sectoral learning, the study also includes a selection of innovative cases from outside these core sectors, chosen by the authors for their originality and relevance to the circular transition (Miles, Huberman, & Saldaña,

2014). By integrating insights from both theory and practice, this desk research tries to offer a more comprehensive view of how servitization in CBMs in particular is evolving across European manufacturing, laying the groundwork for strategic development within the furniture industry.

2. SERVITIZATION FOR CIRCULARITY

What do we mean with Servitization?

Servitization is the strategic transformation where manufacturing firms evolve from solely selling products to delivering integrated product-service systems that focus on providing value through services related to product use and lifecycle management. This concept was first extensively discussed by Vandermerwe and Rada (1988), who described how companies create competitive advantage by offering services that complement their products. More recent research elaborates on servitization as a pathway for manufacturers to differentiate themselves in increasingly competitive markets by embedding services that increase customer value (Baines et al., 2009). The rationale behind servitization extends beyond economic benefits. With the growing emphasis on sustainability and resource constraints, servitization offers manufacturers an approach to rethink value creation, shifting from volume-driven sales to performance-based and usage-focused models. This shift aligns with the principles of a circular economy, as it encourages firms to prioritize product longevity, optimize resource utilization, and reduce environmental impact.

Servitization contribution to circularity in manufacturing businesses

Servitization is reshaping the traditional linear product lifecycle by fostering new extended relationships between manufacturers and users, which in turn facilitates circular practices. The embedded service components encourage manufacturers to invest in product durability and maintainability since revenues depend on product performance over time rather than single-point sales (Oliva & Kallenberg, 2003).

This ongoing responsibility enables manufacturers to implement closed-loop systems, such as product take-back schemes and remanufacturing operations, which are essential for circularity. Moreover, servitization enables better control and monitoring of products in use, allowing companies to optimize maintenance schedules and minimize resource waste. For example, through remote monitoring and predictive maintenance services, manufacturers can prevent premature product failures and enhance overall resource efficiency (Vezzoli et al., 2021).

Such integration of products and services also facilitates the shift from ownership to access, promoting sharing and leasing models that improve product utilization rates and reduce the need for new resource extraction. This aligns closely with the circular

economy's goal to maintain products and materials in use for as long as possible, reducing environmental impact while sustaining business profitability.

Product-as-a-Service (PaaS)

Among servitization strategies, Product-as-a-Service (PaaS) stands out as a model particularly well-established in the manufacturing sectors of traditional products, such as electrical appliances. In this approach, manufacturers retain ownership of their products while providing customers access through leasing, rental, or pay-per-use arrangements. This model incentivizes firms to design products that are durable, maintainable, and upgradable because the manufacturer remains responsible for the product throughout its lifecycle.

PaaS models are increasingly recognized in the literature on service system design and CBMs (Mont, 2002; Tukker, 2015). For instance, Tukker (2015) highlights how access-based consumption under PaaS can decouple business revenue from resource throughput, fostering circularity by extending product use cycles and enabling easier recovery of materials. Similarly, Bocken et al. (2016) position PaaS as a critical CBMs archetype that integrates economic and environmental benefits by aligning financial incentives with product stewardship.

Main Green Service Strategies

The transition toward "servitized" circular business models involves implementing several key green service strategies.

Repair and maintenance services are fundamental, as they extend product life and reduce the frequency of replacement. Research by Tukker (2015) emphasizes repair and maintenance as pivotal in minimizing resource consumption while maintaining customer satisfaction.

Refurbishment and remanufacturing take this a step further by restoring used products to a like-new state, enabling multiple life cycles and preserving embedded materials and energy. This approach is well documented in CBM literature, illustrating how companies can recapture value and reduce waste streams effectively (Lacy & Rutqvist, 2015).

Recycling and resource recovery services complete the circular loop by ensuring that materials are reclaimed and reintroduced into production cycles at the end of product life. Servitization supports these activities by maintaining ownership or control over products, enabling more effective collection and processing (Geissdoerfer et al., 2017).

Finally, sharing, leasing, and upgrade services are growing trends that maximize product utilization and adapt products over time to meet evolving customer needs without requiring full replacement. Such strategies not only contribute to sustainability but also offer firms ongoing revenue and customer engagement opportunities (Baines et al., 2009; Tukker, 2015).

3. SERVITISATION IN THE FURNITURE SECTOR

As the furniture industry seeks to reduce its environmental impact and align with circular economy principles, servitization is emerging as a central strategy. Servitization enables furniture firms to extend product life cycles, optimize resource use, and engage consumers in more sustainable consumption patterns. In the context of CBMs, servitization transforms the role of furniture companies from mere product manufacturers into providers of integrated solutions that include maintenance, customization, access, and reuse.

The image below (Fig. 1) captures the conceptual shift from a traditional linear model to a more circular and service-oriented value creation system. In the first steps with a grey circle, the traditional product-based model is represented, where goods move linearly from producer to consumer. Moreover, we observe in green a more complex set of activities ensuring a flow of materials and services characterized by loops and connections that support circularity.

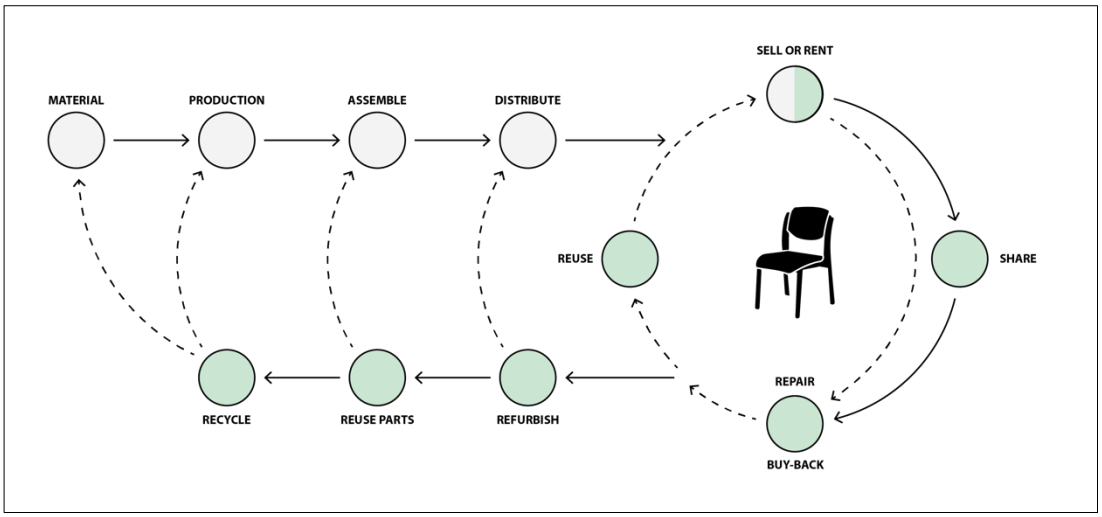

Figure 1. Circular Business Model in the Furniture Sector

In this landscape, several key servitization trends are reshaping the furniture sector:

• *Buy-Back Models* enable companies to recollect parts and materials at the end of product use, simplifying remanufacturing and recycling. These programs not only reduce waste but also create incentives for customers to return used furniture.

• *Free (Self-) Configuration Services* empower users to design or adapt products to their needs. This fosters emotional attachment and product longevity and facilitates disassembly and repair — core tenets of circular design – also restricting the purchase and return of items

• *Repairing Services* allow consumers to extend the life of their furniture through in-house or partnered repair schemes. These services are often bundled with warranties or service agreements, shifting the focus from replacement to maintenance.
• *Sharing Services* reflect a shift in consumption culture, allowing users to access furniture temporarily rather than owning it outright. This is particularly relevant in urban or transient settings, such as student housing or coworking spaces.
• *Event-Specific Renting Services* offer short-term access to furniture for events, exhibitions, or temporary installations. Such models decouple usage from ownership, reducing overproduction and underutilization.
• *Mediated Marketplaces (C2C)* enable customer-to-customer transactions for second-hand furniture. Companies may act as intermediaries, offering platforms that guarantee quality, logistics, or refurbishing services - thereby extending product life through multiple ownership cycles.
Together, these trends reflect a broader transformation in the furniture sector, one in which services play a vital role in enabling circular flows and minimizing waste. The following paragraphs presents specific business cases that illustrate how these servitization strategies are being implemented in practice, highlighting the diversity of approaches and the opportunities they present for sustainable value creation.

Business Case 1: Circular Hub by Ikea – Sweden

IKEA, a Swedish multinational company known for its functional furniture design, affordable prices, and "do-it-yourself" model, has built a strong identity over the years based on accessibility, innovation, and sustainability.
In recent years, the company has made a significant shift toward a strategy and model based on the circular economy: it has launched a circular program that brings together various initiatives related to reuse, repair, and resale of products. At the heart of this approach are waste reduction, value recovery from used products, and the active involvement of customers in more circular practices, with the goal of reducing environmental impact and extending product life cycles.
One of the most tangible and visible elements of the program is the **Circular Hub**, a physical space found in many IKEA stores, where customers can purchase second-hand, returned, repaired, or refurbished furniture. Many of these items come from IKEA's take-back service, which allows customers to return used furniture after receiving an online valuation through a dedicated platform. Products are offered at reduced prices to promote conscious consumption and reuse. Customers also have the option to reserve items online and pick them up in-store within the following 48 hours.
The Circular Hub serves not only as an alternative retail point, but also as an experiential space where customers can learn more about circular economy practices and contribute personally.
Services available in the IKEA Circular Hub include:

- Second Life for Furniture: a service through which IKEA buys back used furniture from customers, valuing it online and collecting it in-store, before reselling it through the Circular Hub.
- Free access to spare parts: screws, hinges, legs, and other components can be requested free of charge to facilitate DIY repairs.
- Guides for creative reuse and do-it-yourself repair, available online to help customers extend the life of their IKEA items.
- Digital services that simplify used item evaluation, pickup scheduling, or the search for compatible parts.

Figure 2. The Circular Hub in an IKEA store in Italy

Through these initiatives, IKEA is shifting from a purely transactional business model to a hybrid one centered on servitization, offering not only products, but a range of services that support customers throughout the entire lifecycle of their furniture:

- Post-sale value creation: customers can return used furniture in exchange for compensation, fostering loyalty and repeat visits.
- Integration of physical and digital: online tools allow customers to estimate item value, book returns, and access repair or spare parts services.
- Reduction of ecological footprint: reuse and refurbishment limit the need for new resources and lower emissions from production and logistics.
- Customer education: through the Circular Hub and practical guides, IKEA promotes more sustainable consumption habits.

IKEA strengthens its relationship with customers, evolving from a product supplier to a long-term partner in managing the home, creating lasting value that is both economic and environmental.

(Source: https://www.ikea.com/)

Business Case 2: Gispen – Netherlands

Gispen is a Dutch company, founded in 1916, that designs and produces furniture for work, education, healthcare, and public spaces. Known internationally for its innovative, functional, and sustainable design, it combines quality products with circular economy services that support clients throughout the entire furniture lifecycle.

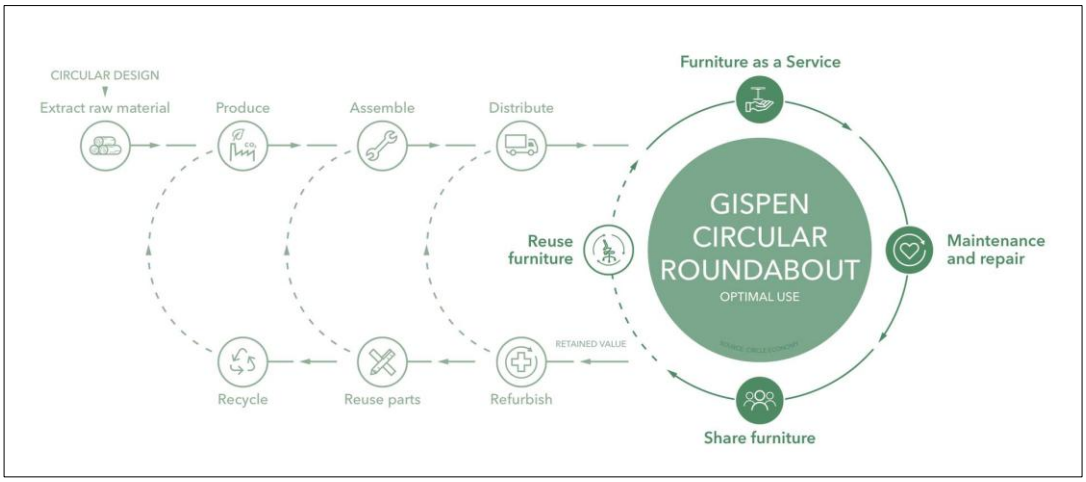

Figure 3. Gispen Circular Roundabout – a circular business model in the furniture sector.

Among the most representative solutions of Gispen's circular vision is the **Furniture as a Service (FaaS)** model, which allows users to access furniture through **operational leasing formulas**, avoiding direct purchase and promoting responsible resource use. This approach reduces the need for upfront investment, enhances flexibility, and ensures more sustainable resource usage.

With FaaS, clients can furnish their spaces by choosing from a wide range of ergonomic, modular, and easily upgradable furniture, without the burden of ownership or operational management. At the end of the contract, furniture is recovered, refurbished, and reintroduced into the market.

The service offers tailored space design, flexible leasing with upgrade options, and full lifecycle support, including maintenance and product monitoring, and certified recovery or recycling to minimize environmental impact.

This model is part of a broader ecosystem of services offered by Gispen, designed to support the client from the initial concept phase through to end-of-use reuse. The main services include:

- Circular Project Design: a consultancy and design service that applies circular design principles from the earliest stages of space planning, reducing waste and maximizing furniture lifespan.
- Inspiring Environments: creation of stimulating work or learning environments, tailored to functional, aesthetic, and sustainable needs.
- Project Management: complete project oversight, from activity coordination to logistics, delivery, and installation.
- Maintenance & Updates: ongoing support for furniture maintenance, replacement, or reconfiguration based on evolving space needs.

- Circular Take Back Service: retrieval of furniture at end-of-use, with assessment, recovery, and reintegration into the production cycle, avoiding premature disposal.
- Sustainable Advice: strategic consulting on the environmental sustainability of furniture and spaces, with measurement tools and reporting.

Through these services, Gispen has built a circular, service-based business model that shifts value from product sales to delivering integrated, evolving solutions tailored to clients over time. This strategy allows Gispen to:

- Foster customer loyalty through continuous support and updates;
- Promote the reduction of environmental impact by extending product life and closing material loops;
- Strengthen its identity as a strategic partner in the sustainable transformation of work environments;
- Enhance digital integration in management and traceability processes.

Gispen shows how servitization can create economic, environmental, and relational value. It supports the shift toward more sustainable business models.

(Source: https://www.gispen.com/en/)

Business Case 3: Suber - Italy

Suber is a project developed by Amorim Cork Italia, a leading producer of cork stoppers, that has transformed industrial expertise into a vision of sustainable and regenerative design. The brand was created to produce objects, furniture, and design surfaces from post-consumer cork, combining local craftsmanship, environmental responsibility, and material innovation.

At its core, there are values such as circular economy, territorial enhancement, and co-design between companies, communities, and NGOs.

In recent years, Suber has evolved from a product-based approach to a **servitization strategy**, building a system that integrates the **local collection of post-consumer cork** as a continuous, circular service, rooted in the network created through the Ethical Project.

This system does more than supply raw material: it actively involves the community, raises environmental awareness, and creates a link between businesses, citizens, and artisanal production. Cork is collected in partnership with restaurants, wineries, public venues, and individuals, and managed with non-profit organizations that enhance its social value.

The collected cork is transformed by Suber into CORE, a recyclable, low-impact composite material made from cork powder and natural resins. This closes the loop between use and reuse: venues participating in the collection, like wineries or bars, can host Suber furnishings made with the very material they helped regenerate, making the circular economy tangible and visible. Integrated services in the Suber model include:

- Custom design for private clients, architects, and businesses;
- Artistic and environmental installations in cultural and exhibition contexts;

- Education and outreach, such as workshops and learning activities promoting reuse and sustainable design;
- Research and development of new regenerated materials using both artisanal and technological approaches.

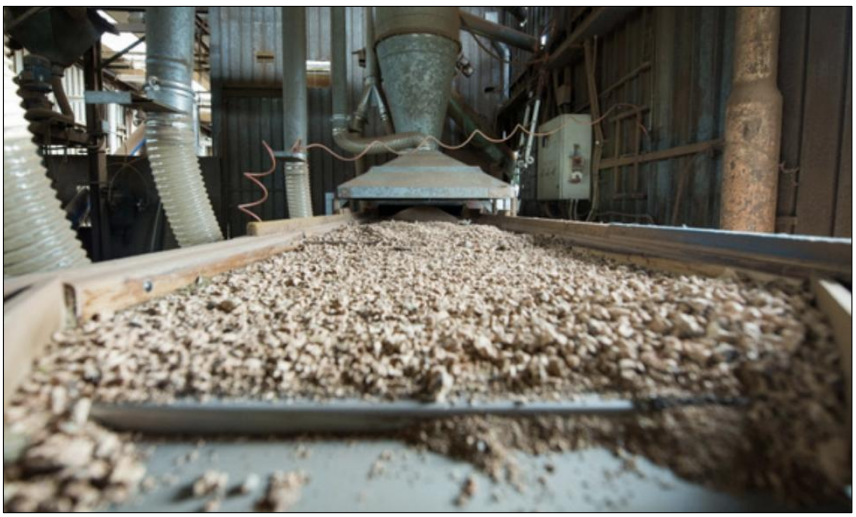

Figure 4. Manufacturing of post-consumer cork.

Through these services, Suber has evolved from a simple design brand into a circular platform that connects communities, businesses, and craftsmanship:

- Regenerative servitization: cork collection becomes a continuous territorial service with environmental and social value;
- Community collaboration: clients, restaurateurs, and citizens become active participants in the production process;
- Sustainable production: waste materials and local craftsmanship are enhanced through short supply chains and process innovation;
- Cultural and environmental impact: everyday spaces are transformed into hubs of awareness and reuse culture.

With this approach, Suber shows how a simple, often overlooked material can become the core of an innovative business model based on circular services and local relationships, generating aesthetic, environmental, social, and territorial value.

(Source: https://suberdesign.it/en/)

4. CIRCULAR BUSINESS MODELS ACROSS SECTORS

In the following section, as anticipated, the circular business models from the various manufacturing sectors, alongside representative case studies drawn from different European countries. These cases are meant to illustrate specific dynamics of servitization within the framework of the circular economy in their sector.

4.1 Automotive

As the automotive industry confronts mounting pressures especially to reduce emissions and address resource scarcity, servitization has emerged as a key enabler of CBMs. By moving away from ownership-based consumption, automakers and mobility providers are increasingly adopting service-oriented strategies that emphasize access and flexibility for circularity. In this context, servitization allows companies not only to optimize asset use and reduce environmental impacts, but also to engage customers through innovative value propositions cantered on convenience, sustainability, and digital service integration.
The image below (Fig. 5) showcase the transformation from the traditional path - where vehicles are produced, sold, and used in a one-way flow - to a restructured system in which materials, products, and services recirculate through multiple loops, enhancing value retention and reducing waste. These loops are fostered by service activity as sharing and leasing, which allow refurbishing and reusing, also supported by policy incentives.

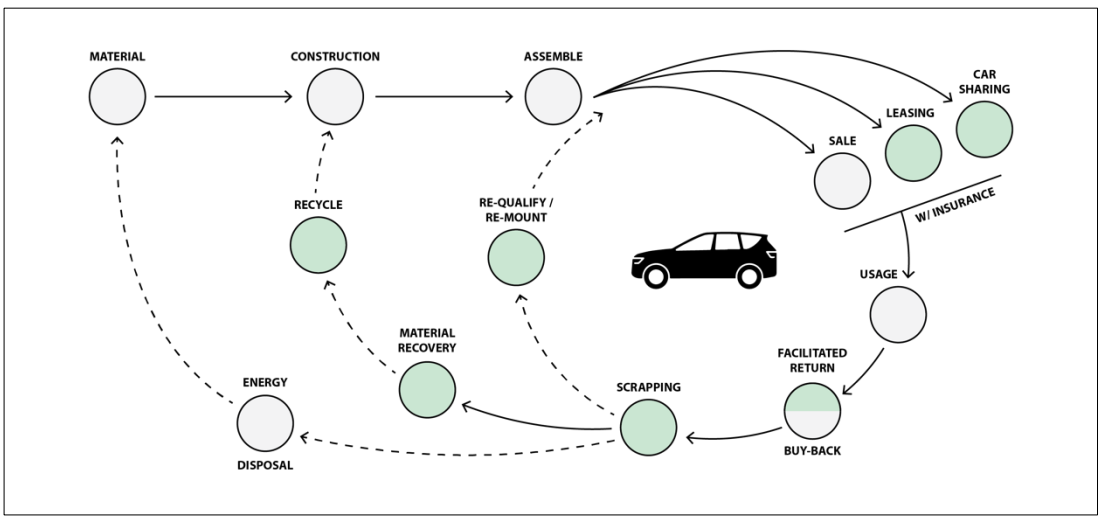

Figure 5. Circular Business Model in the Automotive Sector

In this evolving ecosystem, several servitization trends are reshaping the automotive sector.

• *Sharing Services* provide access to vehicles on demand, reducing the need for personal car ownership. Car-sharing platforms, subscription-based services, and peer-to-peer rentals offer flexible mobility while maximizing vehicle utilization rates.
• *Flexible Leasing models* give customers the ability to lease cars for variable durations with options for upgrades, returns, or contract modifications. This not only appeals to consumers seeking affordability and adaptability but also supports vehicle take-back and refurbishment strategies.
• *Incentives for Used Vehicle Re-Acquisition* for a long time has enabled manufacturers or dealers to recover used vehicles for inspection, remanufacturing, or resale. These programs help preserve the value of vehicles while extending their life cycles through controlled redistribution.
• *Incentives for Electric Vehicles with Free Power Supply Installation* are increasingly offered as part of bundled service packages. These initiatives not only support the transition to low-emission mobility but also create long-term customer relationships centered on energy services.
• *Insurance as a Service* decouples insurance from ownership and integrates it into mobility platforms. Usage-based, on-demand, or bundled insurance solutions align with flexible car access models and reduce entry barriers for users.
• *(Self-) Maintenance and Diagnostics Services* - often digitally integrated - provide predictive and preventive care for vehicles, reducing breakdowns and extending lifespan. These services are frequently embedded in subscriptions or leases, supporting the long-term usability of vehicles.
• *Mobility-as-a-Service (MaaS)* platforms combine various transport modes (including public, shared, and private options) into a unified service. This trend underscores the shift from vehicle ownership to mobility consumption, often facilitated by data-driven personalization.

Collectively, these trends illustrate how servitization has fundamentally transforming the automotive sector. By embedding services throughout the vehicle life cycle, from design and delivery to reuse and re-manufacture, automotive firms are creating new circular value propositions that can align business with environmental responsibility. The following section presents selected business cases that showcase how these servitization dynamics are being put into practice, illustrating the sector's ongoing transition.

Business Case 1: Michelin - France

Michelin, the historic French company and a leader in the tire industry, has created **Michelin Connected Fleet**, a platform dedicated to the management and optimization of commercial fleets that leverages a circular, digital, and data-driven approach. Through IoT technologies, advanced analytics, and integrated consulting, Connected Fleet supports businesses on their journey toward more sustainable, efficient, and safe mobility.

Among the most strategic solutions offered by Michelin Connected Fleet is the **EV Transition Management**: an advanced digital tool that analyzes fleet operational data and identifies which vehicles can be converted to electric. It estimates fuel savings, CO_2 emission reductions, charging impact, and operating costs. The service also includes a driver app and detailed reports on actual energy usage, making the transition to electric mobility tangible and measurable.

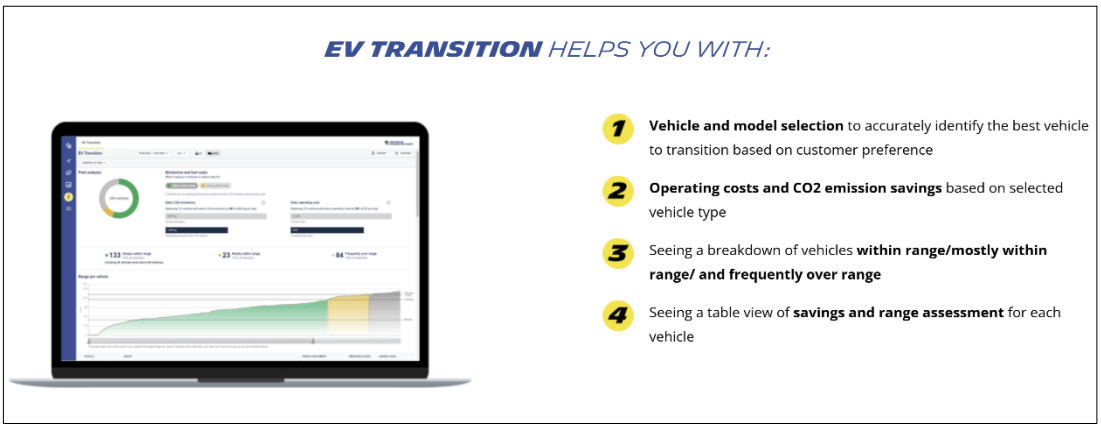

Figure 6. Data analysis for EV transition

The value of Michelin's offering lies in a servitized business model where technology and data are central, and vehicle ownership is replaced by a suite of continuous solutions:

- Comprehensive Fleet Management: GPS tracking, service scheduling, route monitoring, tire and cargo temperature control, aimed at optimizing safety, timing, and performance.
- Safety & Compliance: real-time feedback on driving behavior, incident analysis, driving hours management, and regulatory compliance.
- Predictive Maintenance: automated maintenance suggestions to prevent breakdowns and reduce downtime.
- EV Fleet Transition: data-driven analysis to support strategic decisions toward electrification, optimizing investment and emission reductions.
- MoveElectric Tool & EV Insights: tools to monitor charging, range, usage behavior, and energy costs.
- EV Charger Monitoring: real-time supervision of charging infrastructure, regardless of the provider.

This service package means Michelin is not just offering hardware and software, but truly end-to-end support for the energy transition. Mobility is no longer just about ownership, it becomes an intelligent, adaptive, and measurable service, with concrete impacts on costs, sustainability, and operational performance.

(Source: https://connectedfleet.michelin.com/)

Business Case 2: Arval – France

Arval, a company within the BNP Paribas Group, is one of the global leaders in full-service leasing and corporate mobility solutions. With operations in 29 countries and a managed fleet of nearly 1.8 million vehicles, Arval has solidified its role as a strategic partner in transforming the mobility paradigm, shifting progressively from simply providing vehicles to offering full support for sustainable and flexible mobility management.

In recent years, Arval has accelerated its transition toward sustainable and digital mobility, focusing on electrification, emission reduction, and smart services. Programs such as **Arval Energy** facilitate the adoption of electric vehicles and charging infrastructure, while platforms like Arval Connect and MyArval digitalize fleet management through monitoring tools and predictive analytics.

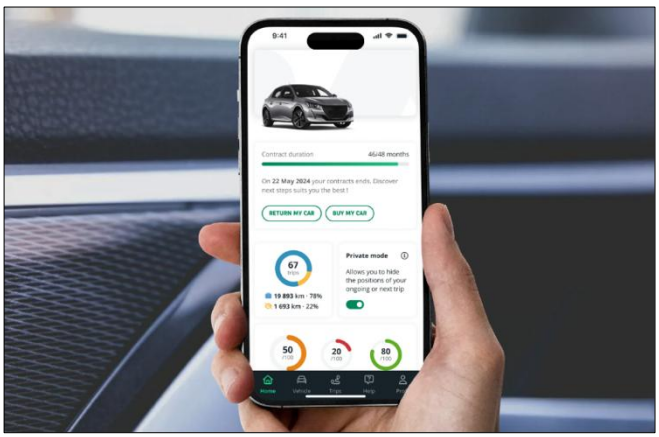

Figure 7. MyArval App for smartphone.

Arval's business model has thus evolved from a leasing provider to a **comprehensive mobility service platform**. The vehicle is no longer the core product, it becomes part of a larger ecosystem that includes services, data, and consulting. The value shifts from ownership to functionality: mobility as a service, tailored to each company's needs. Key services include:

- Full-service leasing, including maintenance, insurance, roadside assistance, and vehicle management;
- Arval Energy, for fleet electrification and optimized management of charging infrastructure;
- Arval Connect, for fleet monitoring and optimization through data analytics;
- Mobility as a Service: flexible and shared mobility solutions for employees, even without a company car;
- Centralized digital services via MyArval, for managing vehicles and requests through a single interface;
- Smart Repair and post-sales support, enhancing vehicle durability and reducing downtime;

- Arval Mobility Observatory, offering insights and consulting to guide companies in transitioning to more sustainable models.

Arval is no longer just a vehicle leasing company: it is building an integrated system that supports businesses throughout the entire mobility value chain. From energy transition to digitalization, from data management to daily user experience, every service is designed to deliver efficiency, sustainability, and control.

(Source: https://www.arval.com/)

Business Case 3: Lynk & Co – China/Sweden

Lynk & Co, an automotive brand born from the joint venture between Geely and Volvo Cars, has revolutionized the concept of car ownership by transforming it into a fluid, connected, and shared mobility experience. Founded in 2016 and headquartered in Gothenburg, the company positions itself as an alternative to traditional automakers, offering a model that integrates technology, community, and sustainability.

The most innovative element of the Lynk & Co model is its **built-in peer-to-peer car sharing**, seamlessly integrated into the vehicles and managed via app. Users who own or drive a Lynk & Co vehicle can share it with other community members by setting availability, pricing, and terms. This system maximizes vehicle utilization, reduces the number of cars on the road, and delivers more efficient, sustainable, and accessible mobility. It is all powered by connected in-car technologies and digital tools for remote control, safety, and usage tracking.

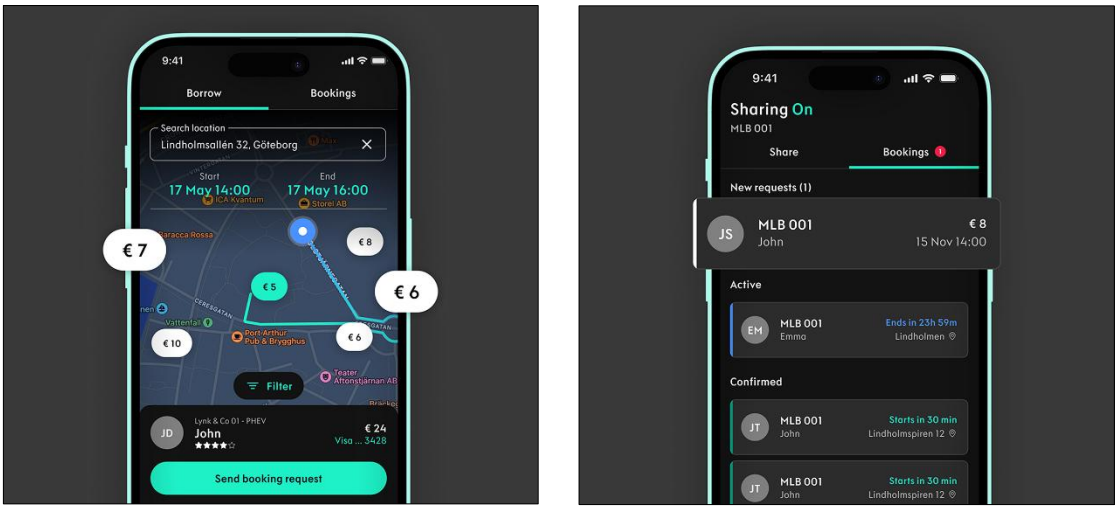

Figure 8. Lynk & Co App for renters and car owners.

Lynk & Co's business model is built on an integrated service platform:

- Flexible all-inclusive monthly subscription, with no long-term commitments, one flat rate that includes access to the car, insurance, maintenance, roadside assistance, and updates.
- 100% digital management, from vehicle configuration to delivery.
- Over-the-air updates, keeping the vehicle always up to date.

- Physical urban clubs, experiential spaces where users can test the car, attend events, and engage with the brand.

Lynk & Co goes beyond the concept of ownership, turning the car into a shared, smart resource designed to meet the needs of new urban generations. Servitization isn't just part of the model, it's the core logic, enabling mobility to be offered as a function, not as a possession.

(Source: https://www.lynkco.com/)

4.2 Packaging

The packaging industry is undergoing a fundamental transformation as it faces growing regulatory pressure, consumer expectations, and environmental concerns. Servitization has emerged as a critical enabler of CBMs in this sector, allowing firms to reduce material waste, extend packaging life cycles, and add value beyond the physical container. In this context, packaging companies are evolving from producers of disposable goods to providers of service-based systems focused on reuse, efficiency, and transparency.

The image below (Fig. 9) illustrates how circularity in the packaging sector is shifting from linear use-and-dispose models to systems focused on reuse and material recovery. While traditional packaging ends after single use, emerging circular business models rely on mechanical and chemical reuse - such as cleaning and refilling containers or breaking down materials for remanufacturing. Companies are increasingly offering refill and reuse services, including in-store refilling and take-back schemes, alongside more established recycling services. These strategies help retain material value, reduce waste, and embed packaging in circular loops rather than linear flows.

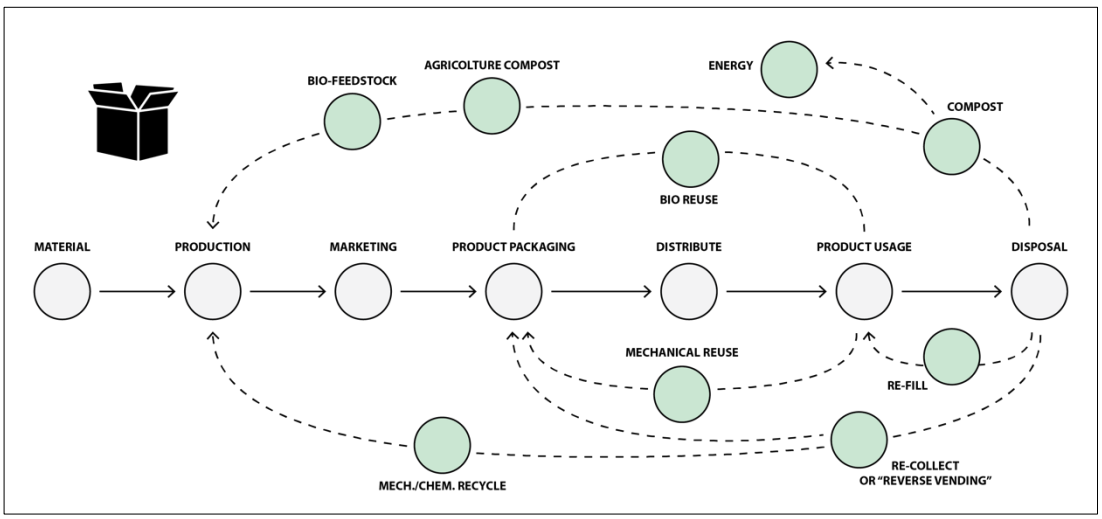

Figure 9. Circular Business Model in the Packaging Sector

In this landscape, emerging servitization trends are reshaping the packaging sector.

• *Reverse Vending for Simplified Reuse of Packaging* allows consumers to return used packaging (e.g. bottles, containers) at automated stations. These systems support closed-loop collection while providing incentives such as refunds, discounts or loyalty points - enhancing material recovery and user participation.

• *Replenishment/Refill Services* enable consumers to refill packaging either in-store or through delivery-based subscriptions. These services strengthen brand loyalty and reduce single-use waste, often supported by smart packaging or digital tracking tools.

• *Materials Consulting Services* offer clients expert guidance on sustainable material choices, recyclability, and packaging optimization. This shifts value creation from production volume to advisory and compliance-oriented services, especially for business-to-business (B2B) relationships.

• *Green Labelling Services* help brands communicate sustainability credentials to end-users. This includes third-party certification, carbon footprint labelling, and digital traceability tools, adding informational value and improving transparency across the supply chain.

• *Packaging-as-a-Service Models* (emerging) involve leasing or subscription-based access to reusable containers, often bundled with logistics and cleaning services. These models reduce the environmental impact of packaging while fostering circular logistics partnerships.

Taken together, these trends signal a shift toward a service-based ecosystem in which packaging is not just a disposable product but a vehicle for long-term value, loyalty, and sustainability. Servitization supports multiple loops of reuse and knowledge exchange - from returnable systems to consultancy and digital labelling - enabling a circular model that balances packaging efficiency with environmental responsibility. The following section explores concrete business cases that exemplify how these dynamics are being implemented across packaging contexts.

Business Case 1: Circulation - Germany

Circolution, a German startup, is revolutionizing food packaging with a circular model centered on reusable containers and automated return processes. The goal is to eliminate single-use packaging by offering technological and logistical solutions that make reuse simple, efficient, and scalable.

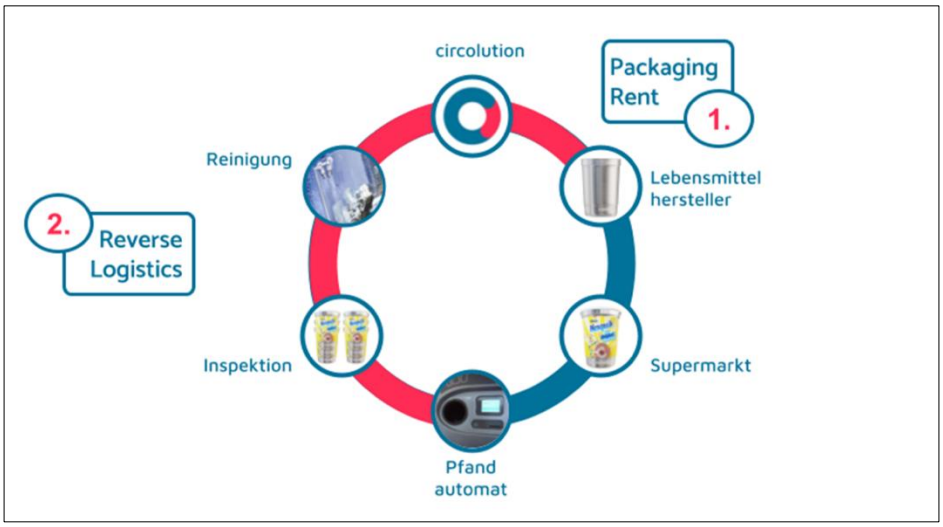

Figure 10. Circolution's circular business model.

Circolution is built on a **Packaging-as-a-Service model**, using durable stainless-steel containers and reverse vending machines placed in supermarkets. The mechanism is simple and intuitive: consumers purchase the product by paying a deposit, consume it, return the container to the automated machine, and reclaim their deposit at the checkout. Circolution handles the collection, inspection, cleaning, and redistribution of the containers, which are digitally tracked throughout the entire cycle. The system enables complete circularity across production, consumption, cleaning, and reuse.

Circolution's business model is built around an integrated system combining technology, logistics, and consulting:

- Returnable Packaging: rental of containers to food producers, including reverse logistics and deposit handling.
- Reverse Logistics: collection, quality control, and centralized cleaning of used containers to ensure safety and reusability.
- Digital Tracking & Traceability: each container is equipped with digital identification to measure actual reuse and optimize flows.
- Return Infrastructure: utilization of existing reverse vending machines, with no additional in-store setup costs.
- Modular Packaging: standardized containers in various shapes and materials, adaptable to different product categories.
- Partnerships & Expansion: collaborations with major retailers, food brands, and logistics players to scale and diversify the offering.

Thanks to this approach, Circolution offers not just a product, but a comprehensive end-to-end service for reusable food packaging. Consumers gain access to a sustainable and transparent system, brands can align with sustainability goals without infrastructure investment, and the entire cycle becomes regenerative and traceable.

(Source: https://circolution.com/en/homepage/)

Business Case 2: The Source by Mugler - France

Mugler, the iconic French brand in high-end perfumery, began transforming its business model as early as 1992 by introducing "born refillable" bottles and a refill system that today stands at the core of its offering. Through an international network of boutiques, dedicated technologies, and after-sales services, the company has evolved perfume from a simple product into a circular and long-lasting experience.

At the heart of Mugler's strategy is the **Refill service**, which is structured around two main modes: in-store refilling via the Fountains, and at-home refilling using refill bottles. The Fountains, inspired by the perfumed fountains of the past, allow customers to refill iconic fragrance bottles directly in-store, with the assistance of trained staff. The at-home version offers a convenient and intuitive alternative for refilling bottles without waste.

Through this system, Mugler enables customers to reduce their use of glass, plastic, metal, and secondary packaging. Each refill thus becomes a sustainable and conscious gesture, strengthening the bond between brand and consumer while lowering the environmental impact of luxury perfumery.

Figure 11. Refill of a Mugler product.

Mugler's business model is built around a set of integrated services that enhance prolonged product use, consumption rituals, and waste reduction:

- Bottle as a Platform: Mugler containers are sturdy, refillable, and designed to last, transforming packaging into a durable component of the experience.
- Customer Support: options for personalizing bottles through engravings, receiving repair assistance, and accessing exclusive in-store services.
- Traceability and Loyalty: each refill can be linked to a customer profile, supporting loyalty programs and transparently communicating the environmental savings achieved.

Mugler evolves from a fragrance manufacturer to a provider of a continuous, accessible, and renewable olfactory experience. The model, based on product servitization, not only extends the life cycle of fragrances but also builds a deeper and more lasting relationship with the customer.

(Source: https://www.mugler.com/fragrance.html)

Business Case 3: Stora Enso – Sweden

Stora Enso, a multinational company operating in the packaging, biomaterials, and wood construction sectors, has transformed its business model to lead the transition toward a bio-circular economy. With a long-standing tradition in wood and pulp processing, the company now positions itself as a provider of regenerative solutions based on renewable fibers, designed to replace fossil-based and single-use materials across various industries. A distinctive element of Stora Enso's strategy is the integration of advanced services related to sustainable materials and recycling. Through dedicated initiatives such as the **Beyond Board services**, the company supports customers in adopting circular packaging solutions, offering tools for environmental analysis, eco-friendly design, and regulatory training. These services aim to reduce environmental impact, facilitate the replacement of plastics with renewable fibers, and improve the recyclability of packaging.

Figure 12. Stora Enso – the Beyond Board services

Stora Enso's business model is based on a servitized offering that includes:

- Packaging Design & Development: tailored packaging solutions optimized for functionality, recyclability, and sustainability.
- Material Fit & PackTester: compatibility testing of materials with production lines and evaluation of mechanical, preservation, and recycling performance.

- Sustainable Packaging Solutions: development of innovative materials such as mono-material paper, liquid cartons, and cellulose-based foams.
- Material Recovery & Recycling Infrastructure: systems for the collection, sorting, and reintegration of recycled fibers into industrial processes.
- Digital Tracking & LCA Reporting: material traceability, environmental declarations, and digital tools for impact measurement.

Through these services, Stora Enso evolves from a mere material supplier to a strategic partner in the design and management of sustainable solutions. The service-centric approach enables clients to extend material life cycles, reduce waste, and enhance the environmental performance of their operations.

The company does not simply offer renewable products, it builds a complete ecosystem where the design, use, and recovery of materials are integrated into a circular, measurable, and replicable logic.

(Source: https://www.storaenso.com/en/)

4.3 Textile & Fashion

The textile and clothing sector is under increasing scrutiny due to its high environmental footprint, fast fashion consumption cycles, and mounting waste streams. In response, servitization is playing a growing role in the development of CBMs, shifting the focus from rapid product turnover to long-term value creation through services. In this transformation, fashion companies are evolving from being purely product-focused to becoming providers of re-styling, repair, reuse, and personalization services that foster circularity through consumer engagement.

The image below (Fig. 13) illustrates the shift shift from a linear model – which has characterized all level of the fashion industry - to a more service-oriented and textile recovery-based value creation system. In the first steps with a grey circle, we observe the traditional linear path, where clothing move linearly from producer to consumer to traditional disposal. Nowadays, we observe in green a more complex set of activities ensuring a flow of materials and services which creates loops especially regarding textile regeneration and second-hand value creation to support circularity. Companies are increasingly offering resell, repair and restyle services related to second hand clothes, alongside more traditional activities of recycling and regeneration of textile materials.

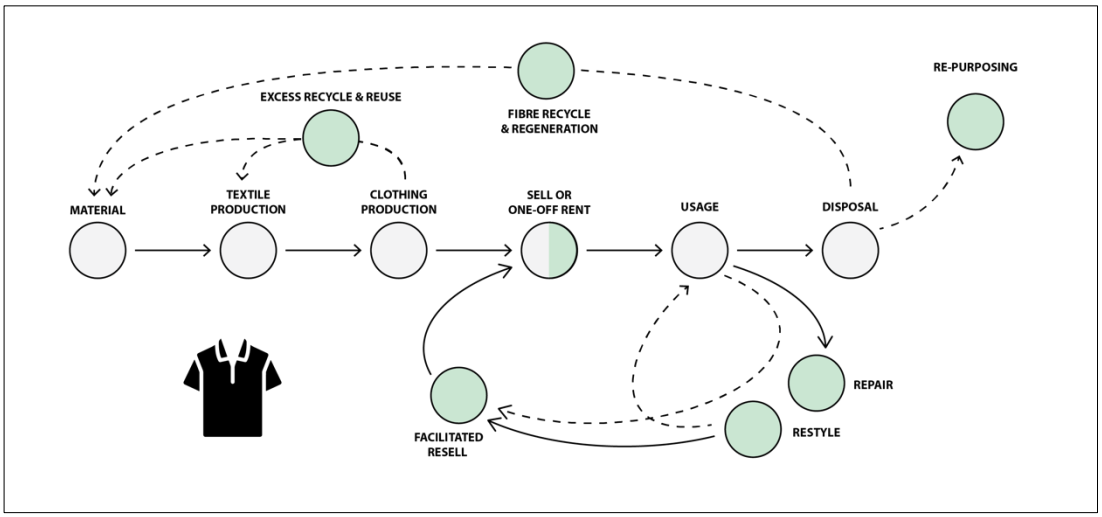

Figure 13. Circular Business Model in the Textile & Fashion Sector

In this evolving landscape, several key servitization trends are transforming the textile and clothing industry.

• *Repurposing of Textile* involves services to creatively transform old garments or leftover fabrics into new pieces. Fashion brands and platforms now offer in-house or partnered services that support textile upcycling, extending material life and reducing waste.
• *One-Off Rental services* allow customers to access clothing items temporarily for events, occasions, or experimentation. These services decouple usage from ownership and support circularity by increasing the use frequency of each garment.
• *Free Consulting on Old Fashion Piece Restyling* offers customers personalized advice on how to update or refresh outdated garments. These services foster emotional attachment, reduce disposal rates, and encourage continued use of existing clothing.
• *Suggestions for Repurposing and DIY Repairing* are increasingly provided via brand platforms, social media, or in-store engagement. By empowering users with creative and practical knowledge, these services promote self-sufficiency and material care, prolonging garment life cycles.
• *Clothing-as-a-Service Models* (emerging) combine wardrobe subscriptions, styling guidance, and wear-and-return systems. These models support dynamic, low-waste consumption while reducing overproduction and underutilization.
Together, these servitization dynamics represent a meaningful departure from the fast-fashion paradigm. Instead of emphasizing volume and turnover, companies are embracing strategies that keep garments in use longer, reduce demand for virgin materials, and engage consumers in circular practices. The following section presents a series of business cases that demonstrate how these trends are being implemented across the textile and clothing sector, offering diverse examples of sustainable value creation through services.

Business Case 1: Spinnova - Finland

Spinnova is a Finnish company that is revolutionizing the textile industry through a circular business model based on renewable resources, chemical-free production, and industrial collaborations. Its proprietary technology converts FSC-certified wood pulp, agricultural and textile waste into SPINNOVA®, a biodegradable, recyclable, and high-performance textile fiber that offers a sustainable alternative to cotton and synthetic fibers.

Production relies on a closed-loop mechanical process that uses no harmful solvents, requires very little water and energy, and enables the recovery of heat and liquids, minimizing waste. This allows Spinnova to offer an innovative material with a low environmental impact, already produced on an industrial scale thanks to Woodspin, a joint venture created in partnership with Suzano, one of the world's leading producers of wood pulp.

Spinnova's business model is built on a **Regenerative Material Platform**, combining a bio-based fiber with a network of industrial, technological, and training services to support the entire textile value chain. The core value lies not only in the fiber itself but in its ability to be integrated into existing supply chains through scalable, circular, and reuse-oriented solutions.

Figure 14. Spinnova's material processing.

The main components of the model include:

- Technology licensing and industrial partnerships: Spinnova does not produce finished garments but collaborates with international brands such as Adidas, Marimekko, and The North Face, offering usage licenses and support for integrating the material into their production processes.
- Circular sourcing: utilization of regenerative and secondary inputs, certified wood, agricultural, and textile waste, to reduce dependence on virgin resources.
- Material Recovery & Re-spinning: SPINNOVA® is designed to be reused and regenerated without any loss in quality, enabling a truly closed-loop system from raw material to use and back again.

Through these elements, Spinnova offers a tangible alternative to the linear models of the textile industry, demonstrating that it is possible to scale sustainable innovation without

compromising on performance or profitability. The material, together with its service network, enables the design of resilient, adaptable, and fully circular supply chains.
With this approach, Spinnova evolves from a fiber supplier to a strategic partner in the regeneration of the fashion industry, offering an integrated platform where value is built on durability, traceability, and reuse. It's a solution that combines sustainable design, a scalable model, and measurable impact, positioning itself as a benchmark for a truly regenerative textile industry.

(Source: https://spinnova.com/)

Business Case 2: ClooV – Italy

ClooV is an Italian startup that supports fashion brands in transitioning from traditional sales to a circular economy model. Through a customizable digital platform, ClooV enables brands to integrate circular services, directly into their e-commerce websites, transforming the product into a continuous and flexible experience.

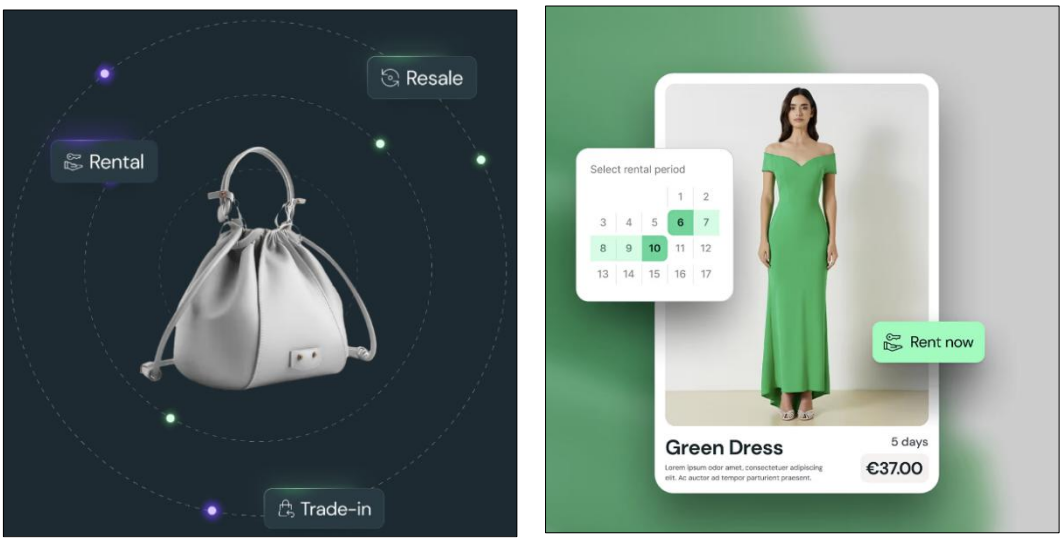

Figure 15. Cloov services overview and a platform rental example.

At the core of the model is **Re-commerce as a Service**: a white-label solution that allows fashion brands to quickly launch new sustainable service channels without the need for infrastructure investment. Products can be rented, resold, or repaired within the brand's own ecosystem, with all operations fully managed by ClooV. The platform includes software, logistics, intelligent pricing, customizable user interfaces, and data analytics, providing a seamless experience for both the brand and the end customer.

ClooV offers a full suite of services that enable a business model based on servitization:

- Resale: second-hand garments can be resold directly from the brand's website. ClooV handles the entire process, automated evaluation, authentication, pickup and refurbishment, giving previously used products a new life.

- Rental: full management of short- or long-term rentals, including logistics, cleaning, and refurbishment, enabling flexible temporary use of fashion items.
- Repair: activation of post-sale maintenance and repair services through a network of certified service centers.
- Technology & Analytics: advanced dashboards allow brands to monitor environmental impact, customer lifetime value, and the performance of activated services.

Through this platform, ClooV enables brands to move from a linear model, based on one-time sales, to a circular system where each product can generate value multiple times. Customers no longer just buy a garment, they access an extended experience: they can rent it, resell it, buy it second-hand, or have it repaired, helping reduce waste and extend the product's lifecycle.

(Source: https://www.cloov.tech/)

Business Case 3: Recover - Spain

Recover™ is a Spanish company with extensive experience in textile regeneration and an industrial vision rooted in circularity. Using proprietary technology that transforms post-industrial and post-consumer textile waste into new recycled cotton fiber, Recover™ has built a **Regenerative Textile Platform,** a scalable system that combines product innovation, a sustainable supply chain, and digital services for the entire fashion industry. At the heart of the innovation is a low-impact mechanical process that produces high-quality fibers (RCotton) and pre-dyed blends (RColorBlend) without the use of harmful chemicals, while significantly reducing water and energy consumption. The resulting materials are traceable, certified, and ready to be integrated into existing supply chains, providing a viable alternative to virgin cotton and synthetic fibers.

The value offered by Recover™ goes beyond the sale of raw material: it is based on a regenerative material platform, where the fiber is supported by a network of services, technologies, and collaborations throughout the value chain.

Figure 16. Recover™ Design Process for Cyclability

Key services that enhance and complete the model include:

- Design for Cyclability: supporting companies in designing circular products that are easy to recycle, reuse, or regenerate.
- Digital Traceability: through partnerships with solutions like TextileGenesis, every fiber is accompanied by a transparent tracking system aligned with emerging regulations (e.g., Digital Product Passport).
- Customization and Pre-dyeing Services: thanks to the RColorBlend system, Recover™ offers pre-colored fibers made from textile waste, eliminating the need for additional dyeing processes.
- Decentralized Production: facilities located in strategic regions to reduce emissions from logistics and efficiently serve a global customer base.
- Industrial Partnerships: collaborations with global brands to integrate fibers into commercial collections and promote circularity across the fashion sector.

In this way, Recover™ enables brands and manufacturers to transition from a linear model to a regenerative one, where waste becomes a resource and materials are designed to last, be reused, and reintroduced into the production cycle.

(Source: https://recoverfiber.com/)

4.4 Appliances & Electronics

The appliances and electronics sector has also increasingly turned to servitization as a pathway to circularity in response to challenges such as resource scarcity, electronic waste, and pressure for energy efficiency. CBMs in this domain rely heavily on services that extend components and hardware lifetimes, enhance functionality over time, and reduce energy consumption impacts. This marks a shift from one-off transactions to ongoing customer relationships centred on maintenance, upgradeability, and responsible end-of-life management.

The image below (Fig. 17) represents the biggest transformation from the traditional appliances lifecycle - where they are produced, sold, used and disposed linearly - to a restructured system in which materials, products, and services recirculate through one mayor loop, enhancing value retention and reducing waste. These loops (in green) are fostered by service activities as sharing, relocation, maintenance, and parts substitution, which allow overall refurbishing and reusing.

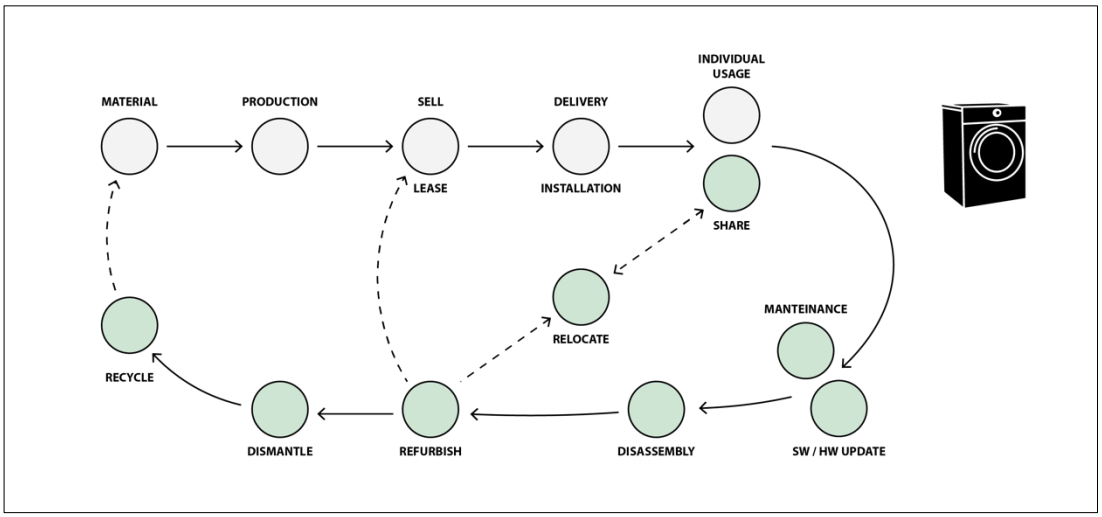

Figure 17. Circular Business Model in the Appliances & Electronics Sector

In this context, several servitization trends are gaining momentum.

• *Services of Recommendation Systems and Eco-Feedback tools* provide users with real-time insights on energy and resource use. These services promote more sustainable consumption habits and are increasingly integrated into smart appliances and digital platforms.

• *Product Updates (software or modular hardware) services* allow devices to remain functional and relevant over longer periods. These services delay obsolescence and encourage upgradability over replacement.

• *Free Same-Day Repair services* offered by premium brands or subscription programs ensure minimal downtime and promote product longevity. Quick, localized repair infrastructure can reduce the tendency toward early replacement.

• *Free Installation and Removal services* make it easier for customers to adopt more energy-efficient appliances or lease alternatives. These services also facilitate proper recycling or refurbishment of removed units, supporting circular logistics.

• *Flexible Leasing models* allow consumers or businesses to access appliances or electronics on a subscription basis. This ensures high utilization, encourages manufacturer accountability for maintenance, and enables easy upgrades.

• *Battery Disassembly and Recovery programs* aim to safely retrieve and reuse valuable components such as lithium, cobalt, or rare earth metals. This is especially relevant for electronics and appliances with embedded energy storage systems.

• *Device-as-a-Service Models (emerging)* combine hardware, maintenance, updates, and take-back services in one integrated offer. These models are becoming more common in both business and consumer markets, reducing e-waste and improving affordability.

Together, these dynamics illustrate how servitization is redefining the electronics and appliances sector. Services now play a pivotal role in enabling circular flows of materials and knowledge - from predictive maintenance to responsible disassembly - creating new forms of value for both users and producers. The following section introduces specific

business cases that illustrate how these servitization strategies are being applied in practice across diverse market segments.

Business Case 1: Fixables by Philips - Netherlands

Philips, a longstanding company in the personal care and small appliance sectors, is renewing its industrial and commercial model with Fixables, an initiative that transforms the concept of after-sales service into a collaborative digital repair ecosystem. The project aims to extend product lifecycles, reduce electronic waste, and actively involve users in the care and maintenance of their devices.

At the core of Fixables is an open-source digital library that provides official 3D files for the self-printing of replacement components, such as heads, levers, caps, or brackets. These files, verified by Philips, can be downloaded for free and printed at home or through certified partners, including local maker communities or 3D printing hubs.

Fixables breaks away from the "use and replace" mindset and introduces a regenerative model based on the immediate availability of digital spare parts that can be printed anywhere. This helps avoid logistics costs, long waiting times, and the waste associated with replacing entire devices. The process is also environmentally sustainable, reducing the need for physical production and transportation of millions of spare parts.

With Fixables, Philips promotes a new relationship between company and customer, based on empowerment, transparency, and co-creation. Consumers become active participants in maintenance, and the community can contribute ideas and improvements.

Figure 18. Examples of 3D-Printed Component to Repair a Philips Razor

Fixables represents a substantial shift in Philips' business model, evolving from a simple manufacturer and seller of devices to a provider of digital services for regeneration and repair. The new **Repair-as-a-Service** system includes:

- An open-source library of official 3D files, continuously updated.

- Partnerships with local manufacturers and platforms like Printables to ensure quality and broad accessibility.
- Community engagement, through bottom-up contributions and C2C support.
- Reduction of costs and emissions related to parts production and shipping.
- Compliance with EU regulations on the right to repair and extended producer responsibility.

In this way, Philips shifts its focus from product sales to prolonged usage value, enabling a system where each product can remain efficient over time with minimal environmental impact.

(Source: https://www.philips.it/, https://www.le.pub/?campagna=fixables)

Business Case 2: WeWash by Bosch - Sweden

Bosch, one of Germany's leading industrial groups in the home appliance sector, is renowned for its technical innovation and the reliability of its products. In recent years, the company has undertaken a strategic transformation that goes beyond manufacturing, shifting toward digital and service-based business models.

One of the most significant innovations in this direction is WeWash, a service developed by BSH (a Bosch Group company) that digitalizes and simplifies the use of shared laundry facilities in residences, student housing, hotels, and campsites. The project is centered on sustainability, user convenience, and resource optimization. WeWash aims to extend the lifecycle of existing machines by digitalizing them and transforming them into an easily accessible service.

The key technology is the WeWash Box, a mobile network-connected device that can be installed on any washing machine or dryer, regardless of brand, model, or age. Thanks to this module and its dedicated app, users can book, pay for, and receive live updates on machine availability, eliminating physical queues and simplifying the management of shared laundries. Installation requires no Wi-Fi or structural modifications, making the system applicable in minimally equipped settings.

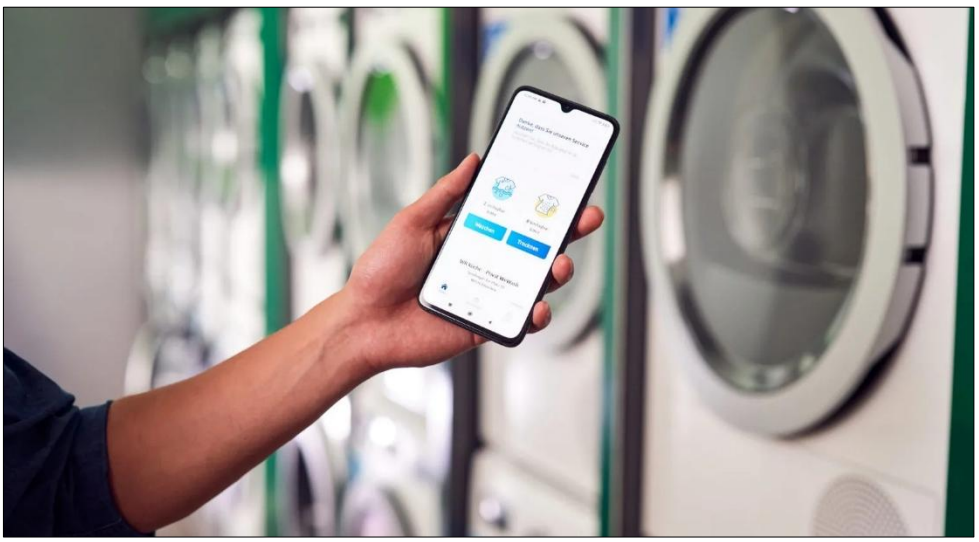

Figure 19. WeWash App.

WeWash services include:

- Digital booking and real-time notifications: Users reserve their wash or dry cycles via the app, avoiding queues and overlaps.
- Integrated cashless payment: Each cycle is paid for online, removing the need for coins or tokens.
- Maintenance and support included: Bosch handles installation, remote monitoring, and technical issue management.
- Retrofit of existing machines: The WeWash Box upgrades existing appliances, extending their lifespan without replacement.
- Turnkey solution for new facilities: With the WeWash Care package, a full set of Bosch commercial laundry machines is supplied, installed, and managed with no upfront costs.
- Automated reporting and accounting: Operators receive monthly payments and have access to real-time usage data.

Through these initiatives, Bosch is shifting from a product-centric model to a hybrid model based on servitization, where value is no longer tied to ownership, but to intelligent and sustainable usage.

Key benefits include:

- Post-sale value: Existing machines are enhanced, regenerated, and remotely managed, creating new revenue streams while reducing waste.
- Physical-digital integration: The app provides intuitive and instant access to services, improving the user experience.
- Environmental impact reduction: Reusing appliances and optimizing energy consumption helps lower the environmental footprint of shared laundries.
- Active customer engagement: End users, property managers, and operators become active participants in the system, gaining greater control and flexibility.

Bosch is reinforcing its role not only as a technology manufacturer, but as a long-term partner for efficiency, sustainability, and smart management of shared spaces, offering a service that extends product lifespan and enhances everyday life quality.

(Source: https://www.bosch.com/stories/wewash/)

Business Case 3: Fairphone – Netherlands

Fairphone, a Dutch company founded with the goal of making electronics more ethical and sustainable, has made its mark in the smartphone industry with a radically different model, one based on transparency, repairability, and social and environmental responsibility throughout the supply chain.

In recent years, the company has strengthened its strategy through a circular approach aimed at extending the lifespan of devices and reducing electronic waste. At the heart of this business model is modular design: every Fairphone is built so that users can easily replace components such as the battery, screen, camera, and connectors. This design promotes **self-maintenance and regeneration**, making the product durable, upgradeable, and easily recyclable.

Figure 20. Replaceable parts in Fairphone.

Fairphone complements this technical approach with a service platform that supports the servitization of the product:

- Direct sale of spare parts, available online, allowing users to carry out repairs themselves or with support from certified centers.
- Extended warranty up to 5 years and long-term software updates, ensuring digital longevity.
- B2B offering: a subscription-based service for businesses that includes modular devices, maintenance, refurbishment, and device replacement at the end of the contract.

- Take-back and refurbishment programs: used devices are collected, reconditioned, and reintroduced to the market as "New Life Edition" phones.
- Repair support with official tutorials, online communities, and direct assistance.

Through these initiatives, Fairphone operates a **regenerative and circular business model**, where the smartphone is viewed as an evolving platform, designed to last, be repaired, and regenerated. The customer is no longer just a consumer, but an active partner in the conscious management of the product.

(Source: https://www.fairphone.com/nl)

4.5 Promising cases in other sectors

Lighting Business Case: Green Switch by Signify – Netherlands

Signify, a global leader in the lighting sector, has undergone a profound transformation of its business model, shifting from product sales to a service-centered offering. Through its **Green Switch program**, the company is responding to the growing demand for sustainable and digital solutions by providing public institutions, businesses, and communities with a comprehensive system to accelerate the energy transition, aligned with the goals of the European Green Deal.

At the core of Green Switch's innovation is the integration of LED technology, IoT connectivity, and customized services. It's not just about replacing old lights with energy-efficient lamps, but about transforming the entire lighting management system into a circular and intelligent ecosystem, capable of generating environmental, economic, and operational value.

Figure 21. Services Offered by the Green Switch Program.

Among the services offered:

- Custom design and consulting, to define tailored solutions based on the client's energy and sustainability needs.
- Turnkey installation and management of connected LED systems, with ongoing operational support.
- Light-as-a-Service: clients do not purchase the lighting fixtures but pay for the use of light, with monitoring, maintenance, and technology upgrades included.

Digital platforms such as Interact, enabling remote control of lighting systems, consumption data analysis, and predictive resource management.

End-of-life recycling and material recovery, with circular solutions that prevent waste and extend product lifespans.

Signify is shifting its focus from product to performance, adopting a hybrid model where hardware, software, and services are deeply integrated. Light is no longer a product to buy and replace, it becomes a flexible and upgradable service over time.

(Source: https://www.signify.com/it-it/sustainability/green-switch-program)

Tech Business Case: ByteNite – United States

ByteNite is a tech startup based in San Francisco that is revolutionizing the world of high-performance computing through a serverless distributed computing platform. Founded with the goal of simplifying access to computing power, ByteNite eliminates the complexity of server management, offering developers and technical teams a ready-to-use, flexible, and highly efficient infrastructure.

ByteNite's innovation is built around a compute engine that automatically distributes workloads across a multi-cloud server network, optimizing resources and execution time. Thanks to a system that intelligently handles process partitioning, real-time monitoring, and dynamic container allocation, every job starts instantly and is completed as quickly as possible, without complex configurations required from the user. All of this comes with a significantly lower environmental impact and cost compared to traditional solutions.

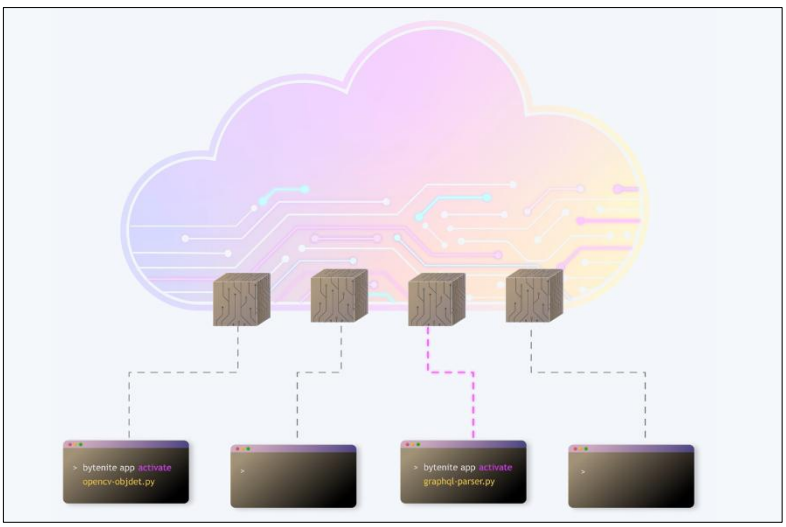

Figure 22. ByteNite Workflow: From Code to Cloud.

ByteNite's business model is strongly oriented toward servitization. It doesn't sell computing power as infrastructure to manage; instead, it offers a **platform-as-a-service**, where customers pay only for the time and resources actually used, without having to worry about provisioning, scaling, or maintenance.
The main services offered include:

- Containerized serverless computing, accessible via web or command line.
- Automatic job splitting and orchestration, enabling efficient management even for complex workloads.
- Usage-based billing, with transparent metrics for CPU and GPU consumption.
- Compatibility with major storage services and pipelines, for easy integration into existing workflows.
- Real-time monitoring and centralized log management, providing full control over process execution.
- Direct technical support and personalized onboarding.

ByteNite goes beyond the traditional cloud computing infrastructure model by offering a platform that puts the power of distributed computing at the service of productivity. Users don't manage machines, they access scalable, reliable, on-demand computing capacity, as if it were a digital utility.(Source: https://www.bytenite.com/)

Toys Business Case: Whirli – United Kingdom

Whirli is a UK-based company offering an innovative toy subscription service designed for families with children up to around 8 years old. With a catalog of over 1,000 toys, Whirli has completely reimagined toy consumption by focusing on savings, circularity, and flexibility.
The service is based on a monthly subscription that provides virtual credits (Whirli Tokens) equal in value to retail prices. Families can use these tokens to select toys to receive at home. Children can keep the toys as long as they love them; once interest fades, the toys are returned and new tokens are issued to choose other toys. Returned toys are professionally cleaned and made ready for reuse, while any toy kept for more than 12 months automatically becomes the family's property at a reduced price.
Whirli introduces a circular consumption model applied to toys: no more single-use purchases that end up in landfills. The constant rotation of toys transforms the child's play experience, encouraging variety and cognitive development, while reducing household clutter and environmental waste. The system promotes reuse and slows down the production cycle of new plastic products.

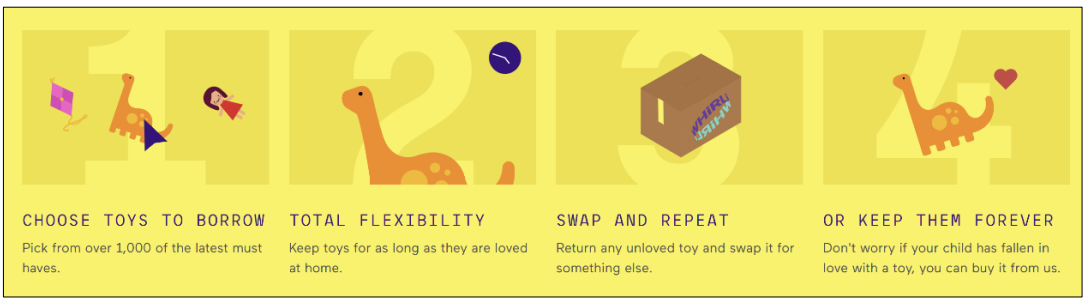

Figure 23. Whirli: how does it work?.

Whirli's **Toy-as-a-Service** model includes several integrated features:

- Flexible monthly subscription plans: Parents choose a plan) based on the desired Token value, with no long-term commitment.
- Accessible digital library: Over 1,000 curated toys available, organized by age, theme, or brand.
- Unlimited, penalty-free swaps: Children can return toys at any time and receive equivalent Tokens for new ones.
- Discounted ownership option: If a toy becomes a favorite, it becomes the customer's property after 12 months at a lower cost than retail.
- Professional cleaning and sanitization: Every toy is hygienically treated to ensure high safety standards.
- Logistics and support included: Whirli handles shipping, returns, and maintenance, freeing families from operational burdens.

Whirli is redefining the relationship between childhood consumption and sustainability. Families no longer buy individual toys, they access an evolved service that turns play into a dynamic, circular, and low-impact experience.
Moreover, Whirli promotes a new toy culture: less unnecessary plastic, more shared and continuous play.

(Source: https://whirli.com/how-it-works)

Food Waste Business Case: Krill Design - Italy

Krill Design is an Italian startup that has built its identity around the fusion of sustainability, innovation, and design. The company develops and produces home and decor solutions using food waste transformed into a new biopolymeric material, completely natural and compostable: Rekrill®. With a radically circular approach, Krill reimagines the entire product supply chain, turning organic waste into resources, and returning beautiful, functional, and low-impact objects.
At the heart of Krill's innovation is a process that recovers and valorizes agro-food waste—such as orange peels, coffee grounds, or nut shells, transforming it into a versatile material compatible with 3D printing technologies. This enables on-demand production

with no stock or waste, designed to be local, customizable, and closed-loop. The result is sustainable design, both in form and substance, blending aesthetics with regeneration.

Figure 24. Krill Design: circular transformation process and the 3D filament.

Krill Design has built a regenerative platform business model, based on the use and distribution of **Rekrill® as a service**. It doesn't just produce objects, it offers a complete system in which the material, know-how, and technology become tools available to brands, designers, and companies. Key services include:

- Supply of Rekrill® in pellet form, for use in existing production processes.
- Production and sale of 3D-printed design objects, with customizable aesthetics and no inventory.
- Collaborations with companies to transform specific waste streams into custom products or packaging.
- Design and consulting services to help integrate circular solutions into third-party production models.
- Development of a local network of micro-production hubs, enabling more sustainable distribution.

Krill Design is evolving from a simple manufacturer into a provider of sustainable solutions, building its value proposition around an innovative material and a distributed, flexible, zero-waste production logic. The customer doesn't just buy an object, they access an ecosystem where matter is regenerated, production is responsible, and environmental impact is minimized.

(Source: https://en.krilldesign.net/)

Plastic Waste Business Case: Precious Plastic – Netherlands

Precious Plastic is a project dedicated to the democratization of plastic recycling: a global open-source platform that makes it possible for anyone to transform plastic waste into

new, useful products. Launched in 2013 in the Netherlands, the project has created a network of thousands of autonomous labs, driven by the sharing of knowledge, technology, and practical tools.

At the heart of the innovation is a set of open-source DIY machines, designed to shred, melt, and mold recycled plastic. Every prototype, from shredder to injection press, is freely available online, complete with step-by-step assembly instructions. Alongside this, Precious Plastic provides a Marketplace for buying and selling machines, molds, and recycled products, and a Community Platform that offers guides, maps, tutorials, and tools for setting up local recycling spaces.

Figure 25. Overview of Precious Plastic Solutions.

Precious Plastic positions itself as a true **Regenerative Waste Platform**, where value is built through shared services and replicable tools:

- Starter Kits and Business Tools: Complete packages to launch local recycling spaces, including machine blueprints, business models, financial planning tools, and setup support.
- Open-source machines: Freely accessible designs to build small-scale recycling tools (shredders, extruders, presses, printers) with low-cost, widely available materials.
- Community Platform: A digital hub to share guides, techniques, results, and projects, facilitating global collaboration across the network.
- Training, workshops, and consulting: Hands-on training for building and managing a recycling lab, along with technical and environmental support.
- Verified Workspaces certification: A recognition system for local workshops operating under the network's standards, ensuring quality and safety impact.

Thanks to this approach, Precious Plastic goes beyond recycling: it removes technological barriers, distributes production capabilities locally, and enables the creation of micro-

enterprises that transform waste into value, whether educational, artistic, or commercial. Each workshop is autonomous but connected to a global community that shares progress and continuously improves.
A concrete example of how servitization and open design can give life to an inclusive, geographically distributed, and self-sustaining circular economy.

(Source: https://www.preciousplastic.com/)

5. CONCLUSIONS

Servitization is redefining the business model of European manufacturing industries through a strategic transformation that shifts the emphasis from simply selling products to providing integrated product-service systems. This change aims to create value through services related to product use and lifecycle management. Originally conceived as a means of gaining competitive advantage, servitization is now a crucial way for European manufacturers to differentiate themselves (Baines & Lightfoot, 2013; Baines et al., 2009), and, increasingly, to align with the principles of the circular economy, promoting sustainability and resource efficiency (Tukker, 2015; Reim et al., 2015).
With the furniture sector also moving towards circularity through servitization, there are differences in trends compared to other sectors. For example, in the automotive sector, servitization often focuses on flexible access and use models (e.g., car sharing, leasing), aimed at maximizing vehicle utilization and facilitating recovery for reconditioning (Bocken et al., 2016). In packaging, the emphasis is on waste reduction and container reuse through return and refill systems, often with strong technological support (Lacy & Rutqvist, 2015). The textile sector promotes reuse, rental, and repair of garments (Pal & Gander, 2018), while electronics focuses on modularity, software updates, and repair services, which significantly extend the life of products (Baines et al., 2017; Stahel, 2010). These differences highlight how servitization adapts to the specific characteristics of each sector to promote sustainability and resource efficiency.

Take-Aways for the Furniture Sector

Inspired by successful business models from other sectors, the furniture industry can further explore new strategies to strengthen its transition towards circularity through servitization, moving beyond traditional sales and end-of-life product management. Some promising directions could include:
• **Self-Producible Parts for Repair**: Following the model of Philips Fixables in the home appliance sector, furniture companies could offer a digital open-source library of 3D files for printing common replacement components (e.g., specific hinges, knobs, small structural joints). This would enable consumers to perform minor repairs independently

or through certified centers, reducing logistics costs, waiting times, and waste associated with replacing entire products, thereby extending furniture's useful life.

• **Locations for Self-Refurbishment:** Drawing inspiration from IKEA's Circular Hub and the "community platform" concept of Precious Plastic, furniture companies could create or support physical spaces (e.g., circular hubs, workshops, "makerspaces") where customers can bring their furniture for minor repairs, customizations, or refurbishments. These spaces could provide access to tools, guides, spare parts, or materials supplied by the company. They could also serve as collection points for take-back programs or facilitate the buying and selling of second-hand furniture, promoting customer engagement in circular practices.

• **Extended Furniture-as-a-Service (FaaS) Models:** While Gispen already offers FaaS, the sector could explore flexible subscription or leasing models (similar to those of Arval and Lynk & Co in automotive, or Whirli for toys) not only for B2B but also for B2C. This would include furniture for temporary rentals, students, or a "home wardrobe" model where furniture can be swapped, updated, or returned, with maintenance and cleaning services included, maximizing utilization and reducing the need for new production.

• **Material and Circular Design Consulting:** Similar to how Stora Enso offers sustainable material consulting for packaging, furniture companies could offer consulting services to clients (both B2B and B2C) on how to choose furniture designed for circularity, facilitating repair, modularity, and disassembly at end-of-life. This would push the industry towards a more systemic approach focused on waste prevention.

• **Managed Platforms for Resale, Rental, and Restyling/Repurposing:** Taking inspiration from ClooV in the fashion sector, furniture companies could leverage or create white-label digital platforms to manage the entire post-sale lifecycle of their products. This would include facilitating the resale of used furniture, managing rental schemes, and critically, offering services or resources for restyling and repurposing existing pieces. This could involve partnerships with designers for bespoke transformations, offering workshops, or even providing digital tools for customers to visualize potential updates, thereby giving furniture new lives and preventing disposal.

• **Modular Product Design for Direct Spare Part Supply:** Drawing on the example of Fairphone in electronics, furniture manufacturers could adopt a deeply modular design approach, making components easily replaceable by end-users or local repair services. Complementing this, companies could establish a robust system for the direct sale of individual spare parts online or through certified partners. This not only empowers consumers to perform self-repairs but also ensures product longevity and reduces reliance on full product replacements, thereby minimizing waste.

The integration of these approaches, supported by a service infrastructure and a mindset oriented towards collaboration and customer empowerment, can transform the furniture sector into a circular ecosystem that generates economic, environmental, and relational value.

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