



**Driving *automotive circularity*:**  
**The role of captives**  
**in leveraging innovative**  
**recycling platforms**

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# Executive summary

Due to fundamental structural changes, the automotive industry is at a pivotal moment, where traditional linear models of production and consumption with constantly eroding profit margins are increasingly seen as unsustainable. Such cradle-to-grave business models lack future competitiveness.

Circularity platforms leveraging the full power of circular economic principles, could be the answer: They reduce waste, minimize greenhouse gas emissions, and maximize resource efficiency along the entire value chain which, therefore, becomes fully circular.

Captives, the financial services providers of original equipment manufacturers (OEMs), have a unique position within the automotive industry to become frontrunners in building and owning such innovative platforms, establishing not only cradle-to-cradle business models, but also perpetual assets. A new form of value creation, delivery, and capture is born.

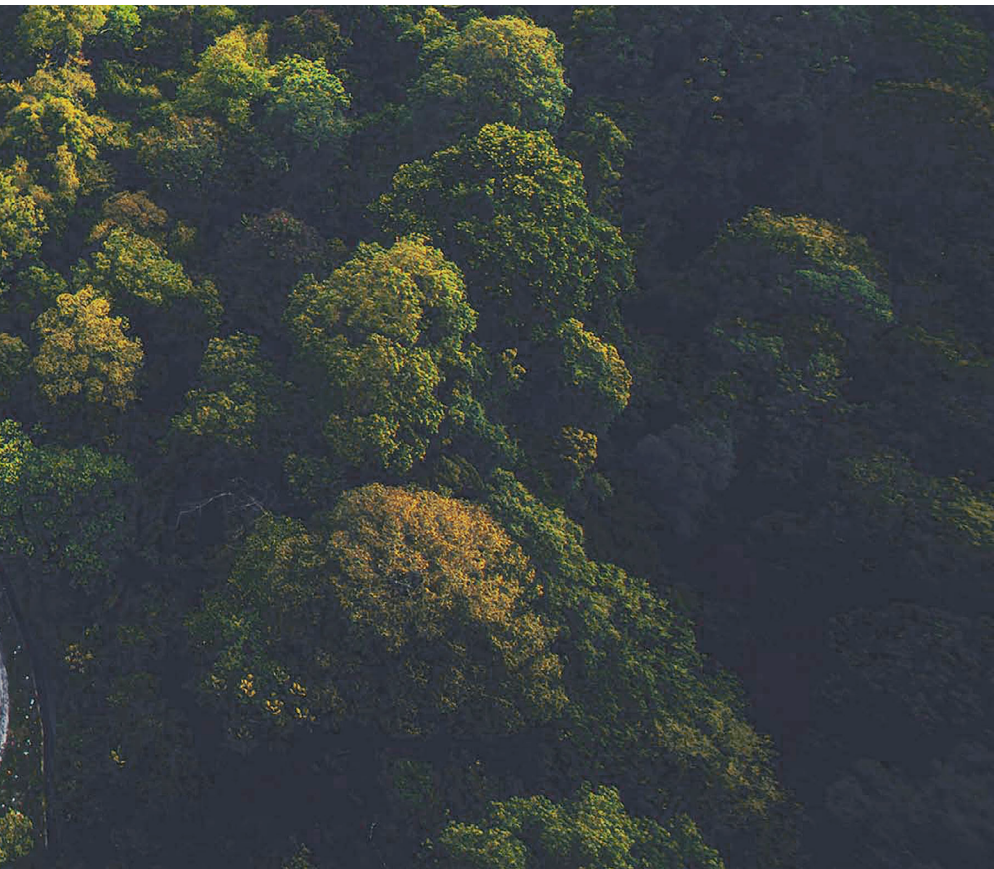
This point of view examines how innovative circularity platforms address current industry challenges. It highlights the crucial role of captives and their OEMs as key mobility providers in driving the next generation of sustainable growth and circular advantage within the automotive mobility sector.

01

An aerial photograph showing a winding asphalt road that curves through a dense, lush green forest. Several vehicles, including cars and a bus, are visible on the road. The forest is thick with trees, and the lighting suggests a bright, sunny day.

# Introduction to circularity in automotive mobility

## 1.1 The need to transition the entire automotive industry to achieve net-zero emissions



emissions from energy sources reached a new peak of 37.4 billion tonnes<sup>2</sup>. This cannot be offset by natural carbon sinks. The extraction of resources and the manufacture of new products are particularly harmful to the climate. They cause ~55% of all CO<sub>2</sub> emissions and ~90% of biodiversity loss and water stress.<sup>3</sup>

One of the main contributors to these developments is the automotive industry, which is responsible for approximately 10% of global carbon emissions in 2022<sup>4</sup>. Additionally, the industry consumes a large share of virgin raw materials, accounting for 50% of the overall usage of several critical raw materials in Europe<sup>5</sup>.

To prevent future ecological, social, and economic disasters of the world, the global automotive industry must be decarbonized and become climate neutral. To achieve this goal the linear system must be replaced by a circular economy. The aim is not only to eliminate major greenhouse gas drivers such as resource extraction, but also to preserve the value of products, materials, and resources for as long as possible while generating as little waste as possible. In essence, the circular economy “put[s] the ‘re’ back in resources” (William McDonough) creating a cradle-to-cradle economy.

Human-made climate change is the single greatest challenge of our times. If society is not able to restrict global warming to below 2 degrees Celsius until 2100 compared to pre-industrial levels, an ever-increasing number of natural catastrophes of unprecedented magnitude will be the logical consequence. As of today, six of nine planetary boundaries are

already crossed signaling a point of no return.<sup>1</sup>

The main driver for this development is simple: greenhouse gases – emitted by our prevailing cradle-to-grave economic system, which has been practiced for 250 years and follows the principle of “take-make-waste”. In 2023, global CO<sub>2</sub>

## William McDonough

(Chief Executive, McDonough Innovation and Co-Author of Cradle to Cradle)

“The automotive industry heavily contributes to CO<sub>2</sub> emissions but has immense potential for sustainable innovation. For Ford, we initiated the concept for the circular ‘Model U’—a car that is re-creational and regenerative, combining fun with environmental benefits. This vision puts the ‘re’ back in resources, leading the auto industry toward a circular economy.”

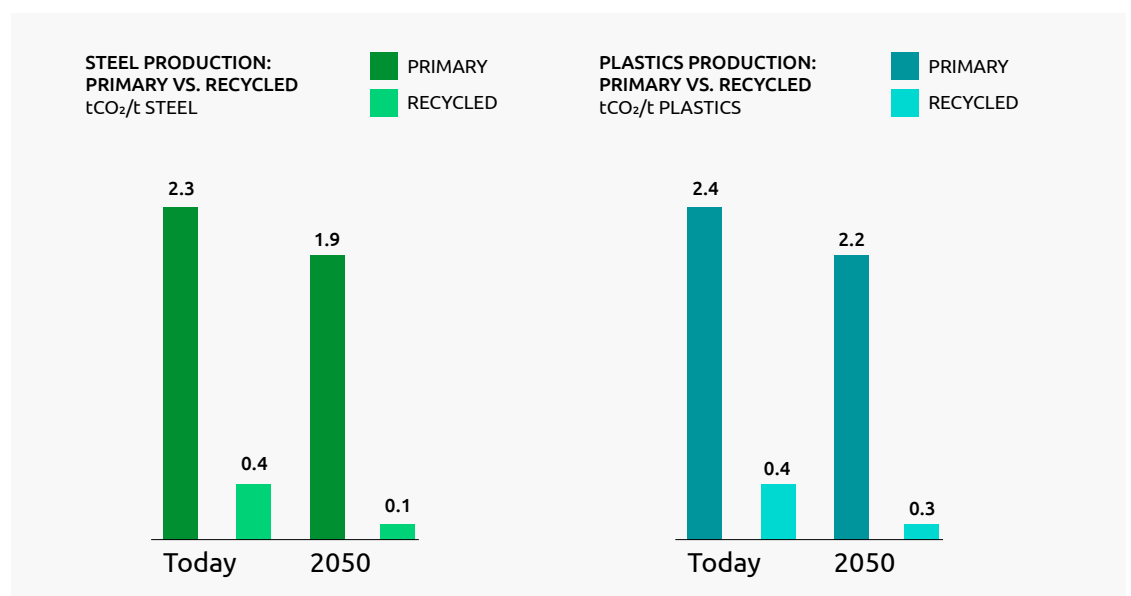


## 1.2 Circular Economy as a potential catalyst for the automotive industry

To address climate emergency as well as growing pressure from policy makers and consumers, OEMs need to rethink current design and manufacturing processes, vehicle lifecycle management and partnerships by adopting a higher degree of circularity. Several leading OEMs are already tapping the potential of circularity and reaping associated financial benefits on their way to achieve climate neutrality.

- Renault started to incorporate recycled materials, such as copper, steel, textiles, and plastics, into over one-third of its new vehicles. The company claims reaching ~95% recyclability rate of its truck vehicles and 19 000 t of CO<sub>2</sub> emission savings through using remanufactured parts in production.<sup>6</sup> Additionally, each remanufactured part costs ~50% less than a new part. The French manufacturer targets to achieve US\$2.5 billion profit by 2030 with its “The Future Is NEUTRAL” enterprise.<sup>7</sup>

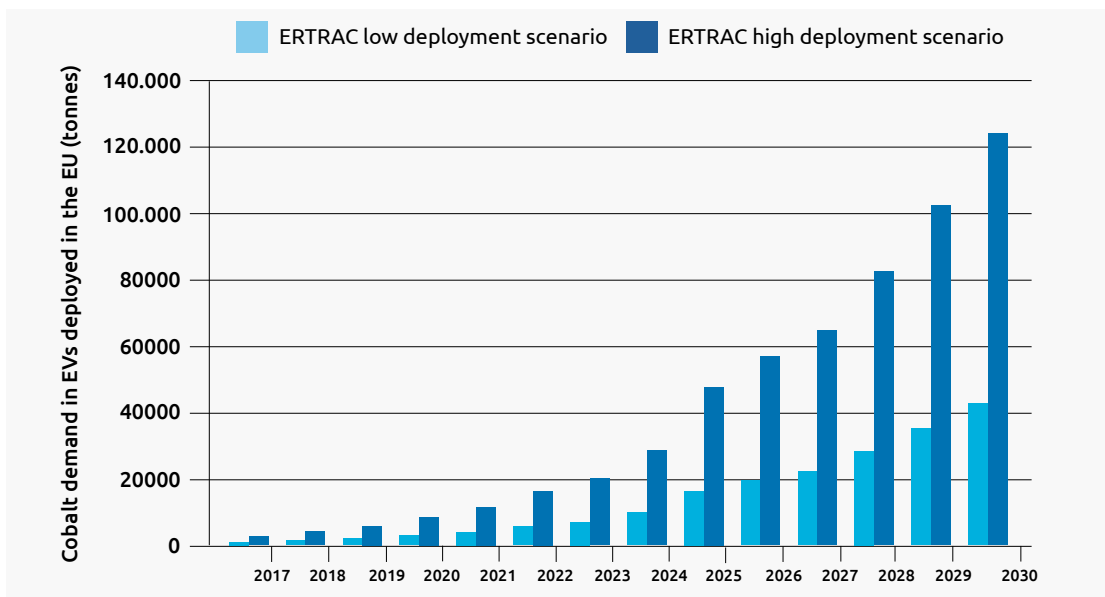
**Figure 1:** Recycled material significantly reduces carbon emissions in the production compared to using primary materials due to lower energy consumption and the avoidance of extraction, processing, and transport of virgin materials.



**Source:** Figures and facts retrieved from Material Economics (2018). The circular economy. A powerful force for climate mitigation.<sup>8</sup>

- Adopting circularity can increase resilience and reduce dependency on supply disruption for parts and raw materials. By reusing end-of-life batteries, BMW is seeking to strengthen its supply chain resilience, reduce dependency on primary raw materials and achieve a significant increase in reintroduced core raw materials in its own supply chain.<sup>9</sup> By 2030, the EU's need for cobalt for EV batteries and energy storage is expected to increase by 5 times and in 2050 by 15 times.<sup>10</sup>

**Figure 2:** Estimation of the annual cobalt demand in the European EV sector (2017-2030) based on ERTRAC (European Road Transport Research Advisory Council) deployment scenarios.

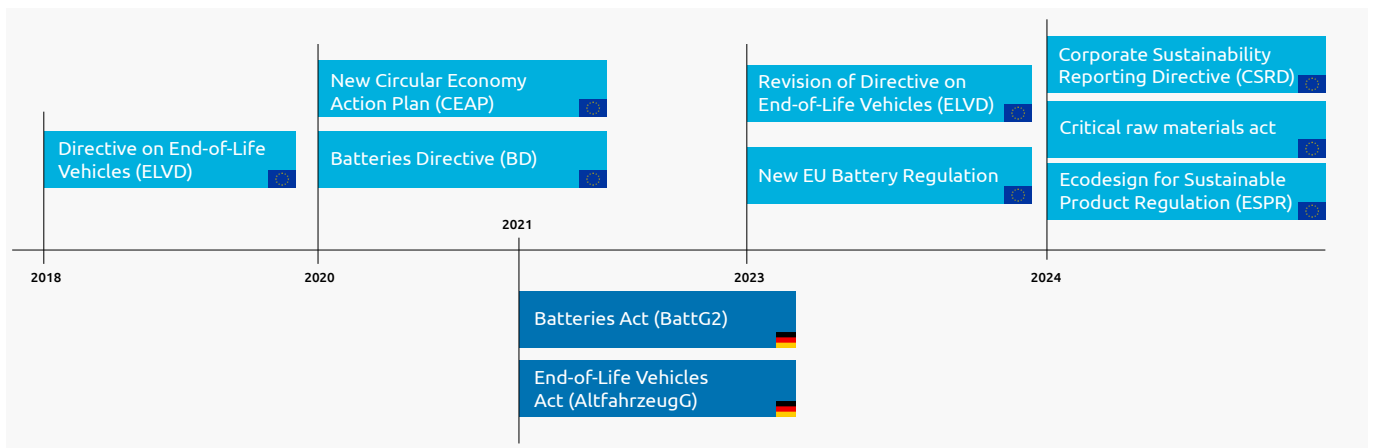


**Source:** Figures and facts are retrieved from Alves Dias, P., Blagoeva, D., Pavel C. & Arvanitidis, N. (2018). Cobalt: demand-supply balances in the transition to electric mobility.<sup>11</sup>



- Moreover, adoption of circular economy is estimated to result in significant cost savings and generation of new revenue streams. By applying circular economy principles such as recycling, remanufacturing, and application of used parts Volvo forecasts ~ US\$100 million of saving per year<sup>12</sup> while Stellantis is aiming to achieve more than US\$2 billion in revenues driven by its circular economy business unit by 2030<sup>13</sup>. Research shows that by 2030, the circular economy might generate between US\$1.5 trillion<sup>14</sup> and US\$4.5 trillion in value<sup>15</sup>.\*
- On the regulatory level, the European Commission is increasingly focusing on the instrument of a mandatory recycled content and reuse of spare parts as a prerequisite for placing products on the European market to accelerate the integration of circular and low-carbon materials. Corresponding requirements such as provision of mandatory minimum levels of recycled content have been integrated into the new Batteries Directive<sup>16</sup>, and a revised End-of-Life Vehicles Directive<sup>17</sup>.

**Figure 3:** The regulatory landscape gains in complexity and forces OEMs to minimize their environmental impact. Overview with publication dates of new regulations.



**Source:** Council of the European Union. (2023, July). Council adopts new regulation on batteries and waste batteries; European Commission. (n.d.). End-of-Life Vehicles.

As the demand for circular inputs grows, OEMs must reassess their approach to securing competitively priced supplies of essential quality and quantity over the long term.



\*(Authors' note: Depending on the source, estimates vary from US\$1.5 to US\$4.5 trillion).



# 02



## Challenges in securing secondary resources for advancing circular economy in the automotive industry

For OEMs and their suppliers, access to the corresponding quantities of secondary materials is therefore becoming a strategic challenge. Despite improvements in recycling rates, they remain significantly below the desirable levels for economic efficiency. According to the Circularity Gap Report, the global economy's consumption of secondary materials has seen a decline from 9.1% in 2018 to 7.2% in 2023, marking a 21% decrease over a period of five years.<sup>18</sup>

**Several factors have thus impeded the widespread adoption of a circular economy, leading to a preference for virgin materials and obstructing the development of circular economy solutions:**



**Market fragmentation**

The market for secondary materials is highly fragmented, with numerous small players and limited coordination. This results in a lack of economies of scale and reduces the overall effectiveness of resource recovery efforts.



**Insufficient information flow**

The inadequate information flow regarding the availability, quality, pricing, and location of secondary materials leads to inefficiencies and missed opportunities for resource utilization and recycling.



**Lack of standardization**

A significant lack of standardized processes and definitions across the circular economy hinders the efficient exchange and reuse of resources. This creates challenges in quality assurance and complicates transactions between different stakeholders.



**Economic viability**

The economic viability of recycling and reuse is often uncertain due to high initial investment needs, fluctuating market prices for secondary materials and the current absence of synergy effects.



**Customer misconceptions**

Reservations of the customer against quality and unawareness of suitability of secondary materials as well as a risk aversion limit the demand and lead to a preference for virgin materials.



**Regulatory deficits**

Many of the current regulations do not incentivize circular economy practices, additionally there are significant legal and administrative hurdles. These barriers discourage investment in circular economy initiatives and limit market growth.



**Technological gaps**

There is a lack of advanced technologies for sorting, processing, and recycling materials efficiently. These limitations hinder the scalability and efficiency of circular economy processes.

Authors' own elaboration based on Berg & Wilts (2019).<sup>19</sup>

# 03



## The Circularity Platform

How can the automotive industry overcome these challenges to set a new standard for end-of-vehicle-life recycling and eventually achieve a closed-loop system?

The solution lies in creating a digital platform that tackles the barriers of a circular economy while addressing the sustainability and economic challenges faced by OEMs and their captives – the **Circularity Platform**.

# 3.1 What is the Circularity Platform?

The Circularity Platform is a digital marketplace designed to align supply and demand for secondary materials and the corresponding old vehicle parts required. It connects stakeholders across the circularity ecosystem to optimize the recovery of valuable materials such as steel, aluminum, plastics, and more. By establishing an efficient marketplace for automotive end-of-life materials, the platform aims to streamline material flows, minimize waste, and reduce the need for primary extraction processes. This digital marketplace facilitates unprecedented collaboration among

various stakeholders, including carmakers, suppliers, recyclers, dismantlers, and scrap collectors, creating a transparent and trusted network for implementing value-generating recycling processes.

The Circularity Platform has the potential to dissolve intransparency, enhance cooperation in fragmented markets, and overcome the lack of standardization, while offering significant economic potential for OEMs, their captives, and all platform participants.

# 3.2 How does the Circularity Platform work?

Platforms create value by facilitating interactions among stakeholder groups, such as buyers and sellers. While the concept is not new, modern business platforms leverage technology to drive these interactions more effectively. Today's platforms act as technology infrastructures that empower individuals and organizations. They address key challenges like

inefficiency in transactions, lack of trust, market fragmentation, and limited access to goods, services, and information. By enabling seamless matchmaking and resource exchange, platforms enhance market reach and efficiency. Thus, they are the ideal vehicle to address the challenges of the circular economy within the automotive value chain.

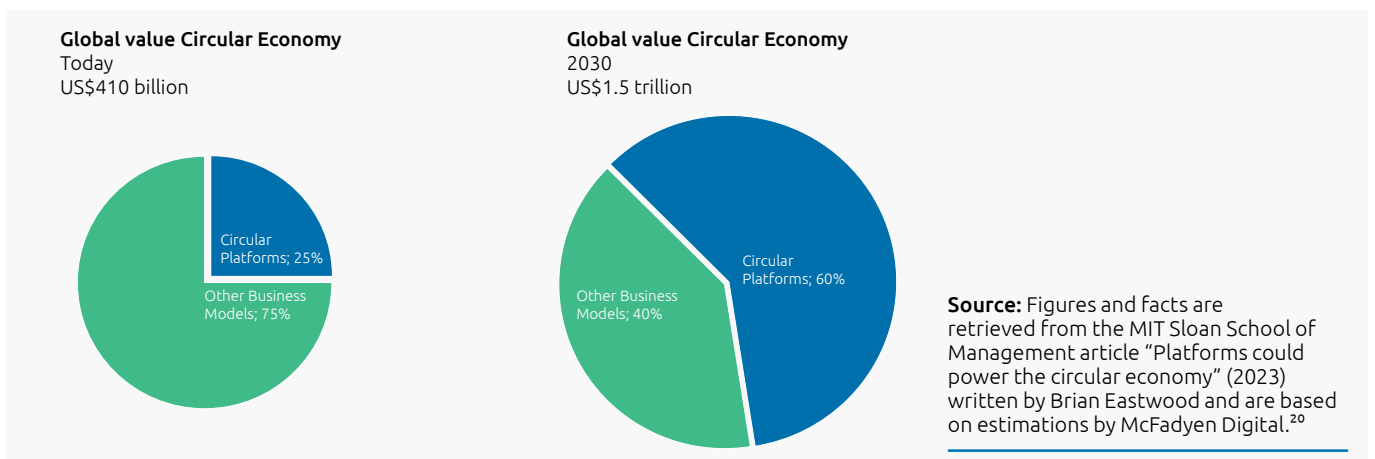


## Geoffrey Parker

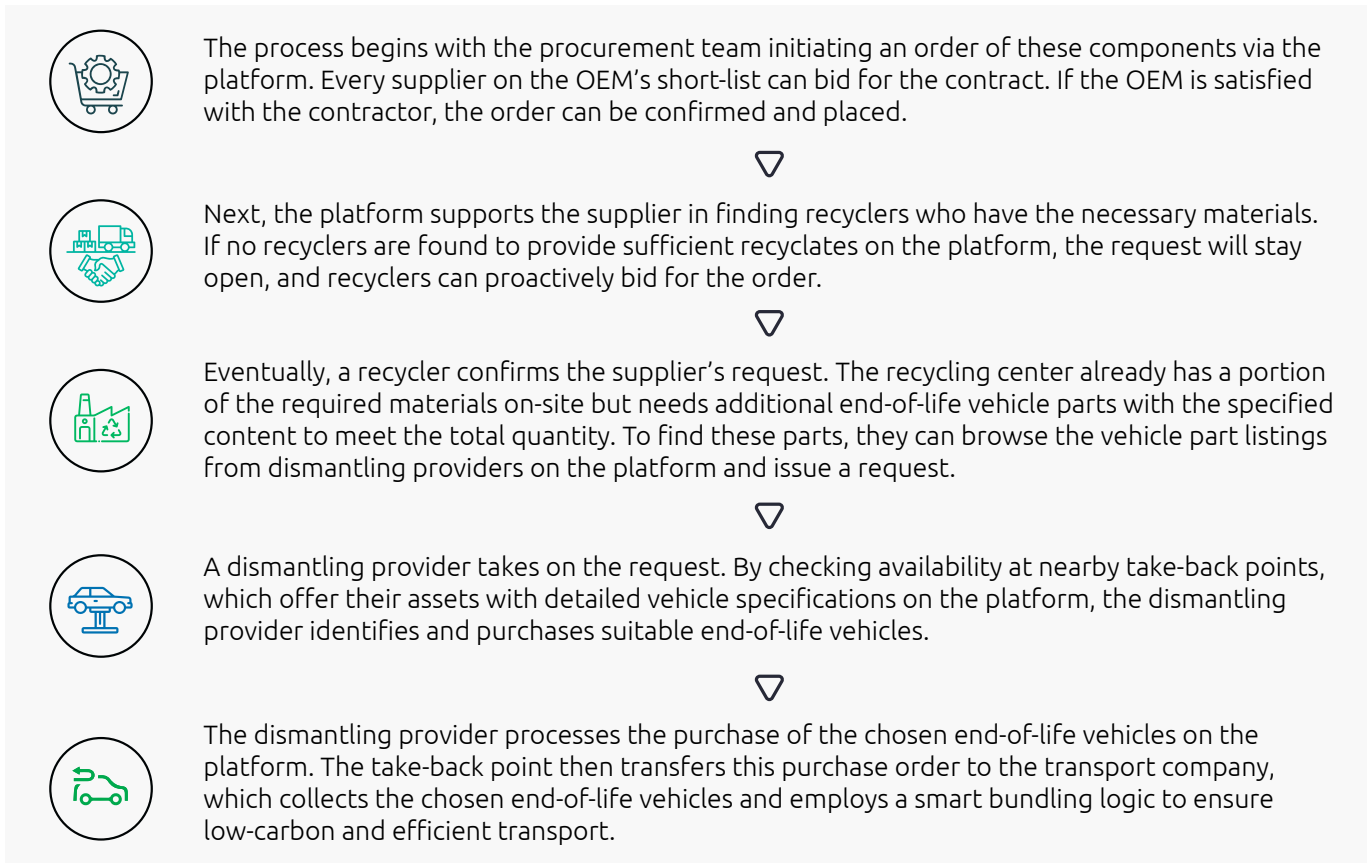
(Charles E. Hutchinson Professor of Engineering Innovation, Dartmouth College; Fellow, MIT Sloan School Initiative on the Digital Economy)

“Driving collaboration and resource optimization, digital platforms serve as catalysts for the shift to a circular, low-carbon economy, fueling tomorrow’s sustainable supply chains.”

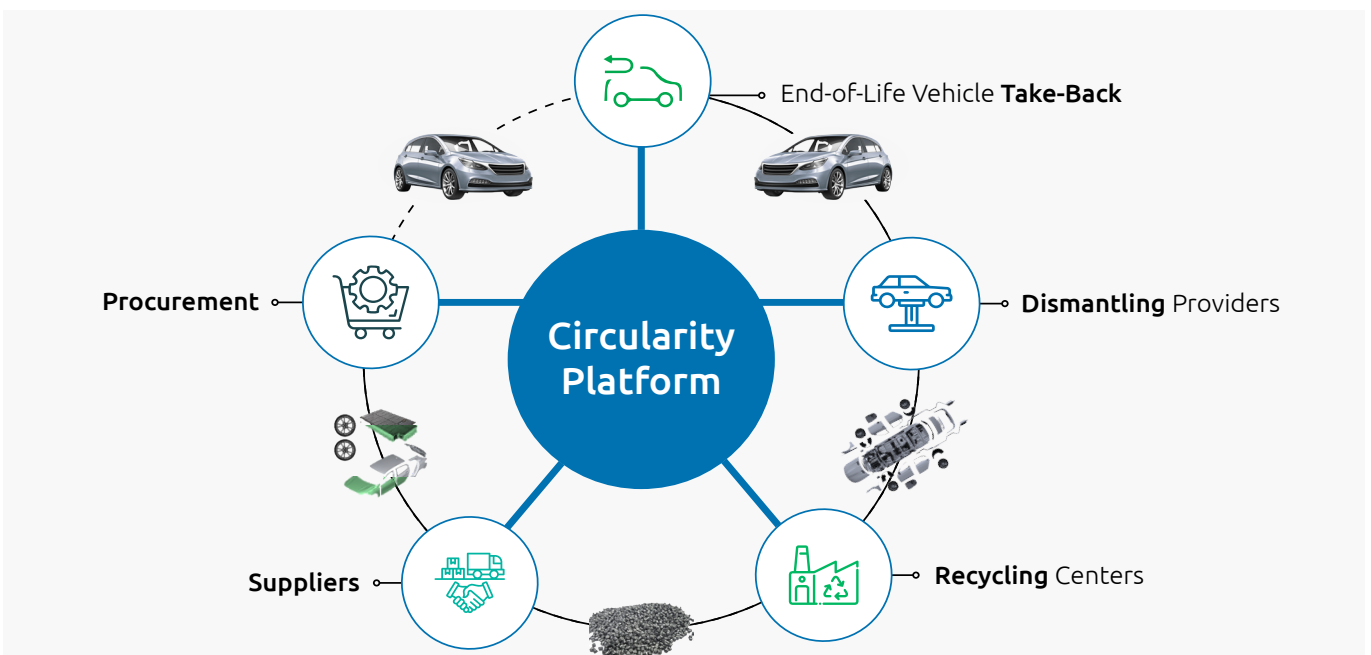
Figure 4: Platforms as enablers for Circular Economy.



**To understand the processes facilitated by the platform, it is useful to take the perspective of an OEM's procurement team that requires vehicle components to meet specific secondary material quotas:**



**Figure 5:** Platforms as enablers for Circular Economy.



Source: Capgemini Invent (2024).

## 3.3 What are the Circularity Platform's benefits?

All stakeholders on the Circularity Platform can capitalize on a range of benefits to achieve sustainability goals while boosting operational efficiency and market competitiveness.



## For OEMs, the key advantages include:

- 1 Supply chain control and lock-in effects:** By establishing a closed-loop supply chain via the platform, the OEM gains unique insights and control over secondary materials, while creating strong lock-in effects among suppliers and partners, potentially dominating the circular materials market.
- 2 Compliance with secondary material quotas:** The platform facilitates adherence to regulatory recycling quotas by improving access to secondary materials.
- 3 Ownership of material banks and cost reduction of green components:** OEMs can monetize old vehicle parts, ensuring a consistent supply of high-quality recyclates and facilitating their integration into larger production volumes. This streamlined access and optimized end-of-life processes lead to significant cost reductions for components made from secondary materials.
- 4 Improved ESG KPIs and ratings:** Establishing a circular supply chain showcases a strong commitment to Environmental, Social, and Governance (ESG) standards, improving corporate sustainability ratings and boosting investor confidence.
- 5 Data sovereignty and transparency:** Enhanced visibility and transparency across the supply chain lead to better forecasting accuracy and operational efficiency, ensuring a stable supply of parts made from secondary materials.

## The Circularity Platform participants stand to gain significant benefits, as outlined below:

- 1 Take-Back Points:** The platform introduces a new revenue-generating business model for vehicle dismantlers, dealerships, and scrapyards by facilitating the collection and return of end-of-life vehicles.
- 2 Dismantling Providers:** With just-in-time dismantling based on recycler demand, the platform reduces storage time, improves material flow, and cuts inventory costs.
- 3 Recycling Centers:** The platform ensures a reliable supply of parts with composition data, optimizing recycling processes and enables the production of higher-quality secondary materials at reduced costs.
- 4 Suppliers:** The part suppliers benefit from trusted relationships with recyclers via the platform, receiving verified, high-quality secondary materials delivered on time and in the desired quantities.
- 5 Procurement:** The platform lowers costs for parts containing recyclates by maximizing upstream process efficiency and reducing quality risks through the use of in-house recyclates.

## 3.4 What are the requirements for OEMs regarding the platform?

To successfully build and sustain a Circularity Platform, many aspects must be considered, ranging from technical and data infrastructure to the organizational structure for operations. The following three dimensions are particularly important:

### Partnership & Platform Collaboration

Comprehensive partner assessments and selection based on well-defined criteria across the entire value chain are crucial for rapidly scaling transactions and ensuring long-term platform viability. The Circular Platform can only succeed if a critical mass of relevant stakeholders is involved. Addressing the so-called “chicken-and-egg problem”, the Capgemini and MIT study on B2B platforms found that 31% of evaluated platform initiatives start by building the supplier side first, 58% develop both

sides in parallel, and only 11% begin with customers before adding suppliers to the platform.<sup>21</sup> All participants within a platform must be carefully coordinated to mitigate the risk of adverse network effects. In the B2B market, substantial market and process knowledge are required to select and onboard participants, along with integrating systems. Other key partners for platform setup include providers of technological infrastructure and essential value-added services, such as payment processing.

### Platform Competence

22% of all platforms, Capgemini and the MIT examined, are not monetized at all. Establishing and operating B2B platform-driven ecosystems is highly complex and requires deep expertise in understanding their operational dynamics. Critical

success factors such as monetization strategies, platform governance, the level of openness, and the organizational structure of a platform venture must be thoroughly understood and strategically managed.

### Circular Design

To facilitate closed material loops within the Circularity Platform, it is crucial to adapt circular design practices. In a client project Capgemini aimed to identify and prioritize vehicle components for future design changes to simplify dismantling processes and enhance the profitability of circular business models. The study revealed that approximately 30% of

the observed vehicle components are complex to dismantle, resulting in costs that render disassembly economically inefficient for the recycling business model too. This demonstrates a high potential that design optimizations can leverage economic viability of material recycling.



04



# Captives as predestined owners of the Circularity Platform

# 4.1 The changing role of captives in the automotive industry

Traditionally the role of captives has been focused on offering financial services to consumers and dealers, with a primary emphasis on selling new vehicles and supporting the first usage cycle. Currently, they are evolving to become comprehensive mobility providers, leveraging multiple societal paradigm shifts and market trends.

This shift includes exploiting profit pools throughout the entire vehicle usage phase across several usage cycles, rather than just focusing on the initial sale. Accordingly, captives are expanding their portfolios to offer a rising number of vehicle-on-demand products as well as innovative in-life-services. The next strategic step for captives is to tap into post-usage profit pools, and an excellent way to achieve this is through the Circularity Platform.

## The emerging business models for captives

### Vehicle-on-demand

Captives are offering subscription-based products and services, car sharing, and rental options, allowing customers to access various vehicles on-demand, reducing the need for ownership, and promoting resource efficiency. Flexible terms and all-inclusive packages cater to evolving consumer preferences for convenience and flexibility.

### Mobility-related solutions

Captives are offering customized downstream services to consumers during vehicle usage, such as connected services, personal usage analytics, tolling, parking, and charging services. These services drive resource efficiency and add significant value to the consumer experience by enhancing convenience and providing personalized insights.

### Expansion into sustainable mobility

As part of their evolution, captives are increasingly focusing on sustainable mobility solutions, integrating EVs and hybrid options into their portfolios. They are also investing in charging infrastructure and promoting the use of renewable energy sources.

### Advanced fleet management solutions

Captives are developing advanced fleet management solutions for corporate clients, including real-time tracking, predictive maintenance, and telematics services. These solutions help businesses optimize their fleet operations, reduce costs, and improve vehicle utilization.

# 4.2 Captives' unique position and benefits

Captives are uniquely positioned to drive circularity and become the owners of the Circularity Platform for various reasons:



## Captives' unique position and benefits

### Deep integration with OEMs:

Captives are closely tied to OEMs, facilitating seamless integration and collaboration opportunities. This deep integration allows captives to align their circularity initiatives closely with the OEMs' production and design processes, ensuring that sustainability is embedded from the outset. The close relationship also enables better coordination and communication, making it easier to implement circular economy principles across the entire product lifecycle.

### Access to customer and vehicle lifecycle data:

Due to their innovative on-demand products, captives retain ownership of both the vehicles and their data. This unique position provides access to extensive data on vehicle usage, maintenance, and end-of-life. With detailed insights into how vehicles are used and maintained, captives can identify opportunities for improving product longevity, optimizing maintenance schedules, and designing for easier disassembly and recycling.

### Strengthened brand loyalty and customer relationships:

A Circularity Platform can significantly enhance customer relationships by demonstrating a commitment to sustainability and environmental responsibility. Customers are increasingly valuing sustainability, and by owning the platform, captives can ensure that their OEMs meet these expectations. Additionally, captives can offer customers incentives for participating in recycling programs or using refurbished products, thereby creating a more engaged and loyal customer base.

### Financial strength:

Captives possess the financial resources and flexibility to invest in new business models and technologies. This financial strength allows them to fund the development and implementation of a Circularity Platform. With the ability to allocate significant resources toward research and development, captives can explore cutting-edge technologies and practices that enhance circularity.

### Regulatory compliance:

By owning the platform, the captive can proactively address regulatory compliance, particularly with the European Commission's End-of-Life Vehicle Directive and recycle quotas. This ensures the platform meets or exceeds regulatory standards.

### Innovation and competitive advantage:

By integrating a Circularity Platform, captives can foster innovation in product design and development as well as experiment with innovative approaches to sustainability. The emphasis on reuse and recycling can lead to the creation of new, innovative products that are designed with their entire lifecycle in mind. Furthermore, it can open new market opportunities and revenue streams through the sale of refurbished products or materials. Additionally, captive ownership positions the OEM as a sustainability leader, showcasing circularity as a core business strategy and enhancing the brand's appeal to environmentally conscious consumers.

## There are multiple benefits for captives to become the Circularity Platform orchestrators:



### Vertical integration options

Due to the vast amount of vehicle and customer data, captives gain the opportunity to progressively integrate into various stages of the circular supply chain, capturing additional value and reducing dependency on external suppliers. The integration enhances control over the quality and availability of recycled materials, ensuring that the OEM's sustainability standards are consistently met while also driving down costs.



### New revenue streams

As orchestrator of the Circularity Platform, captives can expand their business model with additional revenue streams: Firstly, they can not only charge a fee from players on the platform for listing, but they can also establish a transaction fee. Secondly, they can expand their service portfolio and offer marketplace participants additional digital services thanks to the wealth of car and customer data they uniquely possess.



### Residual value steering

Through the usage of new business models enabled by the Circularity Platform (e.g., extended vehicle lifecycle management) and products, such as lifelong leasing in combination with upcycling engagements across usage cycles, captives can actively enhance and steer the value retention of vehicles and thereby steer residual value risks.



### Strengthening OEM-captive synergy

Owning the platform strengthens the synergy between the OEM and its captive by fostering closer collaboration on circularity initiatives. With the captive in control, there is a unified strategic direction across the entire lifecycle of the vehicle. This alignment ensures that the OEM's sustainability goals are fully integrated into every aspect of the vehicle's journey, from production to end-of-life.

Captives play a pivotal role in driving sustainability for OEMs by orchestrating the Circularity Platform. Their deep integration with OEMs ensures seamless alignment of circularity initiatives with production processes, fostering innovation. With access to extensive lifecycle data, captives can make informed decisions to enhance sustainability efforts. Their financial strength enables

significant investment in new business models, positioning them as leaders in the circular economy. In an increasingly competitive and regulated market, such ownership provides the captive and its parent OEM with a distinct advantage, positioning them as leaders in the transition to a circular economy.

## Julia Müller

(Head of Sustainable Futures, Capgemini Invent)

“Captives, aligned with OEMs and equipped with lifecycle data, drive innovation, make bold sustainability decisions, and invest in transformative models—securing leadership in the circular economy.”



# 05



## Strategic recommendations for a successful transition

As already indicated at the beginning of this study, captives and OEMs face several challenges in adopting circular practices. These include regulatory and compliance hurdles, the need for significant capital expenses paired with uncertain capital returns, and a need for a drastic shift in consumer behavior.



The following are our strategic recommendations for transforming these challenges into economic opportunities:

- 1 Circularity platform strategy and MVP launch:** Focus on deploying a digital marketplace that connects all stakeholders to close the material loop. Start with a joint captive-OEM task force to define your strategy and create initial MVPs that can quickly validate the business model.
- 2 Build circular capabilities:** Develop expertise across the value loop to maximize benefits. Key areas include circular car design for effective end-of-life treatment, ensuring material waste is transformed into production wealth.
- 3 Strengthen stakeholder collaboration:** Form strategic partnerships at various levels along the circularity platform value chain. These partnerships will help build the platform's technological infrastructure, streamline operations, and provide value-added services efficiently. Innovative models can also spread investment costs across multiple parties.
- 4 Communicate platform benefits and create incentives:** Highlight the benefits for all potential circularity platform participants through targeted marketing. To reach critical mass, offer financial and non-financial incentives, such as fee waivers, transaction discounts, or complimentary digital services that enhance business performance.

# Summary and outlook

Circularity in automotive mobility is essential for environmental sustainability, economic efficiency, and regulatory compliance. Captives, with their unique position and strengths, can lead this transformation for their OEMs by adopting circular business models, leveraging technology, and fostering ecosystem collaboration via a Circularity Platform. It is critical to build circular business models that embody a modern form of value creation. The premise becomes value over volume.

The future of the automotive industry lies in embracing circularity. Captives, OEMs, regulators, and consumers

must work together to create a sustainable and circular automotive ecosystem. The shift towards circularity will not only benefit the environment but also create new economic opportunities and ensure long-term industry viability.

Captives are encouraged to take proactive steps in driving circularity, while OEMs and other stakeholders should support these efforts through collaboration, innovation, and investment in sustainable technologies and practices. Reach out to us, we are more than happy to partner with you. Together, we can pave the way for a sustainable future in automotive mobility!



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