

In collaboration with
Bain & Company and
University of Cambridge



Circular Transformation of Industries: The Art of Scaling Circular Supply Chains

WHITE PAPER
NOVEMBER 2025



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Foreword



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In recent years, companies have begun to appreciate the value of circular approaches – not only for building resilience, but also for driving growth and profitability. Yet, scaling up from pilot projects has posed challenges – demand for circular goods is often unpredictable, regulation is sometimes unhelpful and logistics need to be invented anew. This paper offers a roadmap for scaling up circular supply chains in strategic, staggered steps.

The relevance of circular business models has never been greater. Once a sustainability theme, circularity is now a vital strategic issue for businesses in light of changing consumer expectations, resource scarcity and volatile input costs. In this new scenario, circularity can be a lever for long-term value creation and operational resilience. It holds the promise of generating new revenue pools, recurring income and a closer relationship with customers. At the same time, intensifying geopolitical dynamics around the sourcing and export control of rare earths and other critical minerals are reinforcing the strategic imperative of circular supply chains.

In short, the global conversation has shifted from **why** circularity matters to **how** it can be implemented at scale. Yet, circular strategies are complex – without clear prioritization of where to start and how to build, companies risk wasting their efforts.

This paper draws on the experience and insights of business pioneers in this field to explore how circular supply chains can be successfully scaled up. First, it introduces a framework to prioritize circular initiatives. Second, it outlines key design and operational characteristics that are relevant to successfully scale and manage circular supply chains. Finally, it discusses key enablers for scaling circular business models and supply chains.

This work is the result of a collaboration between the World Economic Forum, Bain & Company and the University of Cambridge. It has been enriched by insights from expert panels and a global survey of 491 executives in 10 manufacturing-centric industries. We thank the members of the Circular Transformation of Industries (CTI) community for their valuable inputs.

Executive summary

Circular supply chains are essential, but companies need clear priorities, smart design and strong partnerships to overcome scaling challenges.

Circularity is quickly moving from an ideal sustainability ambition to a business necessity. In a July 2025 survey of 491 executives across 10 manufacturing-centric industries, 95% said circularity will be important to their companies within three years, and 71% called it “very important”. This shift is happening because customers want it and it cuts costs in a climate where regulations are changing and supply chains need to be made stronger. While motivations vary by region, the trend is clear: circularity has become essential.

One major problem persists: too many companies still see circularity only as a sustainability issue or a way to reduce waste. In reality, it's about creating steady revenue streams, giving investors confidence in future profits and building closer customer relationships. This makes circularity fundamentally different from how most companies operate today. When leaders don't understand its power to drive growth and competitive advantage, adoption slows down.

Despite good intentions, only 20% of companies have actually built circular supply chains. Most hit the same roadblocks:

- **Operations:** low product returns, varying quality, reverse shipping complexities and demand fluctuation by season

- **Customers:** unclear demand for refurbished products, quality worries and established purchasing habits
- **Infrastructure and data:** limited collection systems, disconnected IT systems and poor tracking
- **Regulations:** inconsistent rules on moving waste, as well as warranty requirements and restrictive international frameworks
- **Organization:** skills shortages, resistance to change, fear of competing with own products and difficulty splitting costs and profits with partners

Because of this complexity, choosing the right priorities is critical to success. Without a clear focus on where and how to compete, companies spread themselves too thinly and fail to scale. Smart prioritization focuses on four areas (as outlined in Figure 1): products with high residual value and predictable return flows; customers most open to circular products; locations with good infrastructure and supportive regulations; and circular business models that balance what is possible, profitable and sustainable.

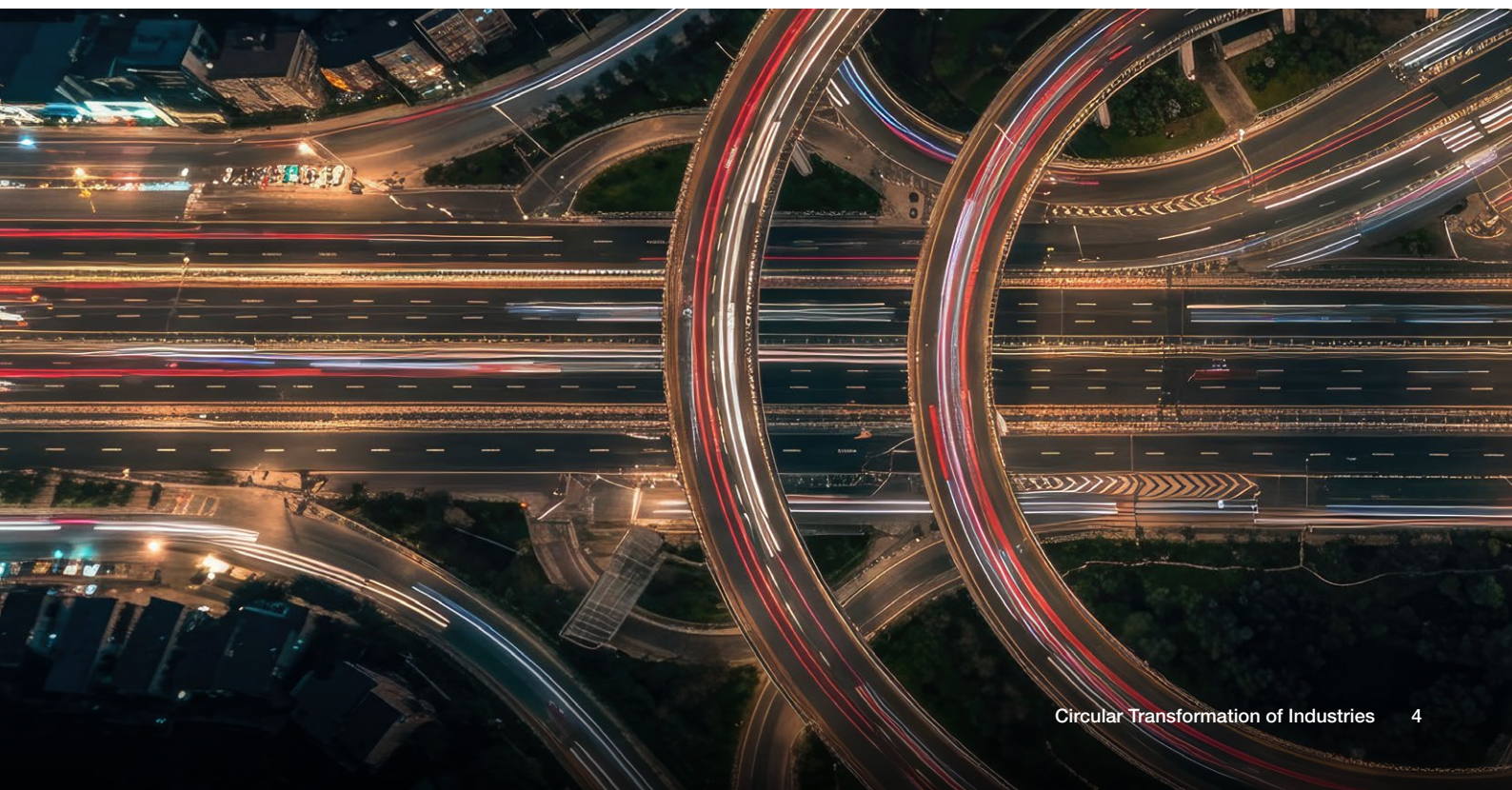
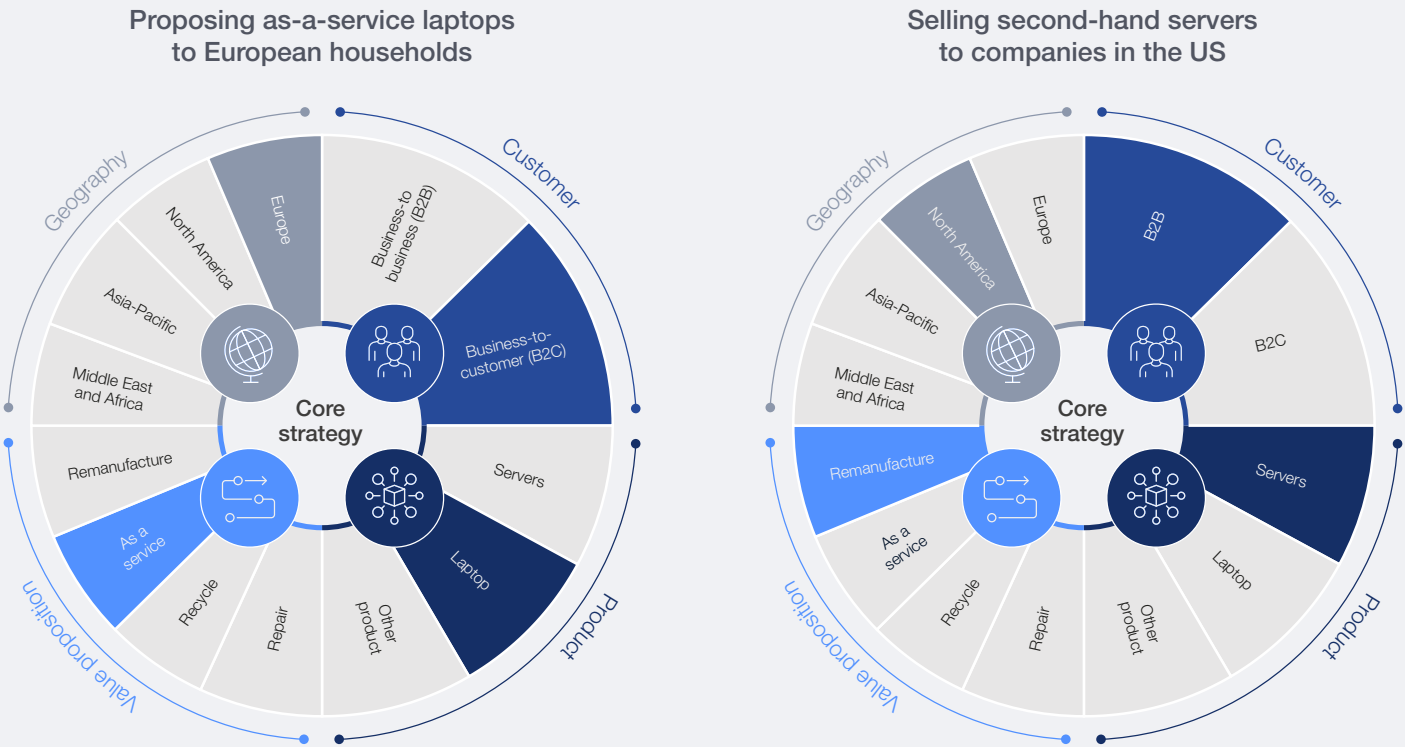


FIGURE 1 | Examples of two circular initiatives as combinations



Source: Circular Transformation of Industries (CTI) initiative and panel sessions.

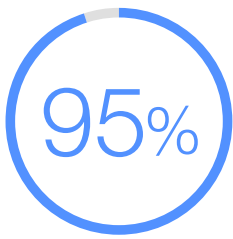
Once priorities are clear, supply chain design determines how they are executed. Companies must decide when to combine traditional and circular flows, when to keep them separate and how to build hybrid models – such as shared shipping with dedicated facilities for sorting, repair and remanufacturing. Network design – centralized hubs versus local operations – and ownership choices – in-house, outsourced or partnerships – determine how well the system can grow. Throughout, partnerships and clear reward systems are essential to secure materials, expertise and customer participation.¹

Scaling depends on four key enablers: supportive regulation, financing to cover start-up costs, digital tracking and AI to manage unpredictable flows, and cultural change that builds circularity into company governance, skills and rewards.

Just as digital supply chains defined success in the 2000s, circular supply chains will define it in the 2030s. The question isn't whether leaders will adapt but whether they'll scale fast enough to win.

Introduction: Setting the course

Circularity is a challenging yet rewarding undertaking. Organizations that embrace this shift can unlock innovative practices and meaningful rewards.



of 491 executives across 10 manufacturing industries said circularity will be important or very important to their organizations within three years.

Scaling circular models is like navigating a fleet through choppy seas: each value proposition sails at its own pace. Keeping the fleet on course requires coordination and the ability to adapt to changing conditions. Companies are no different. There is no “one-size-fits-all” approach to circularity. Instead, business leaders must chart their own course, drawing on their own experience and lessons from pioneers. For those who succeed, the rewards are substantial.

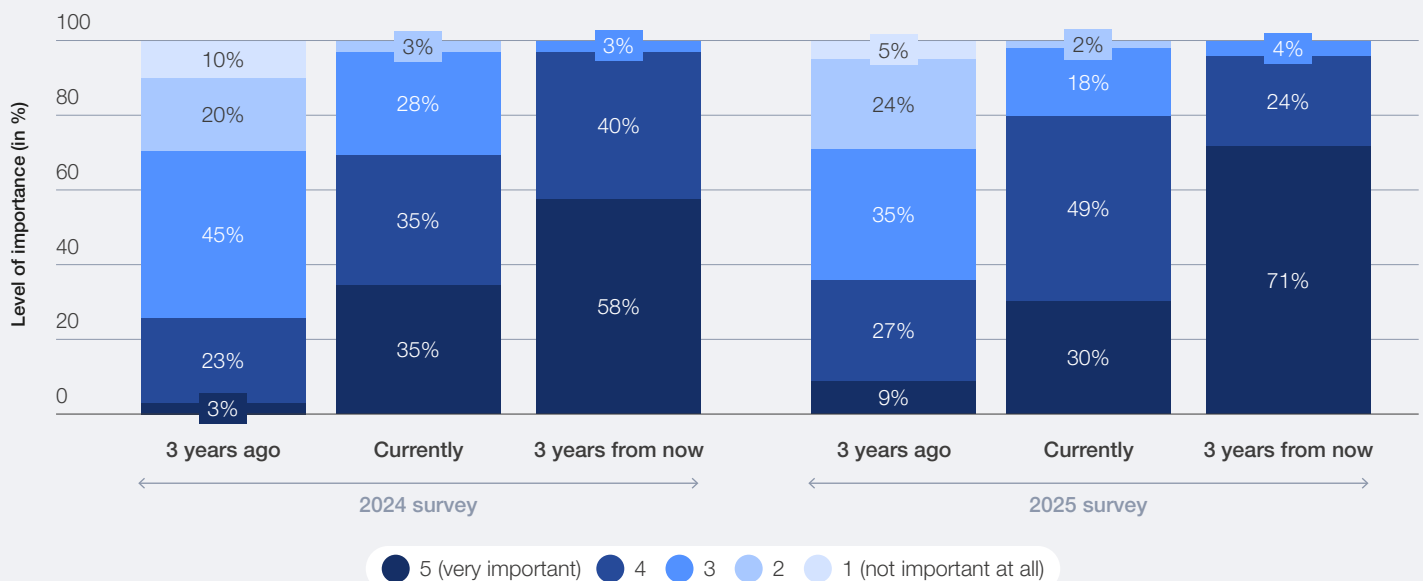
Circularity’s importance is growing rapidly. In a July 2025 survey of 491 executives across 10 manufacturing industries, 95% said circularity will be important or very important to their organizations within three years, with 71% rating it “very important”.

Growth expectations are equally strong. Respondents report that revenue from circular activities has kept pace with company averages so far, and 80% expect circular revenue growth

to exceed average growth within three years. Optimism is highest in the automotive sector, where 86% of respondents anticipate above-average revenue growth for their circular products. Profitability is expected to follow; 70% of executives anticipate higher margin growth from circular activities than from linear ones.

Yet the adoption of circular business models remains uneven, and maturity varies across industries. Realizing its potential requires profound organizational transformation. Bain & Company’s 2023 **Transformation and Change Survey** of 469 global executives found that 88% of major transformations fell short of their goals, with 13% achieving less than half of their intended impact.² Like any significant change, deploying circular value propositions brings complexities and hurdles that companies must navigate. This paper defines the key steps and success factors for implementing circular supply chains effectively.

FIGURE 2 How important is circularity for your organization for the given time frames?



Source: Global market survey by Bain & Company and the CTI initiative of 491 executives (July 2025).

1

Key challenges: unpredictability, volatility and linear thinking

While businesses now see clear economic potential in circularity, many struggle to set up and scale circular supply chains.

“ Building circular businesses requires a complete shift in thinking, and survey results show that supply chain issues consistently emerge as the most pressing barrier.

Key takeaways

- **Operational complexity is the biggest barrier:** Companies struggle most with getting products back from customers, dealing with unpredictable quality and quantities and managing reverse logistics.
- **Profitability remains elusive:** Many circular business models face structural cost challenges from reverse logistics, inspection and refurbishment that hurt margins.
- **Infrastructure and skills gaps limit scale:** Most companies lack the reverse logistics networks, repair facilities, digital tracking systems and specialized expertise needed for circular supply chains, while inconsistent

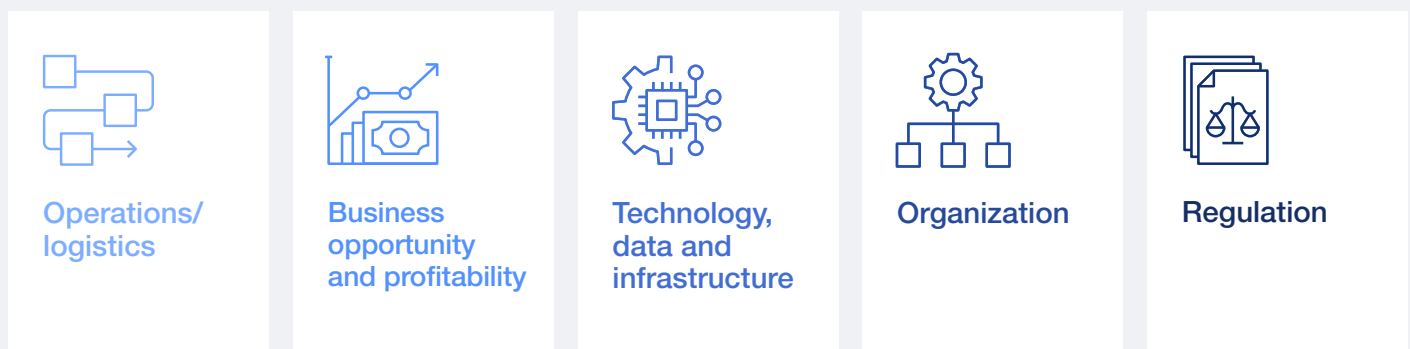
regulation creates additional barriers across different markets.

While businesses increasingly see the economic potential of circularity, scaling supply chains remains difficult. Building circular businesses requires a complete shift in thinking, and survey results show that supply chain issues consistently emerge as the most pressing barrier. These challenges are not the same everywhere but vary by industry and region. For instance, collection is the hardest step for recycling packaging, while remanufacturing is the most complex yet essential step in the automotive industry.

Overall, barriers can be grouped into five categories: operations and logistics, business opportunity and profitability, technology and infrastructure, organization, and regulation – the last being the only external factor.

FIGURE 3

Five barriers hindering the transition to circular supply chains

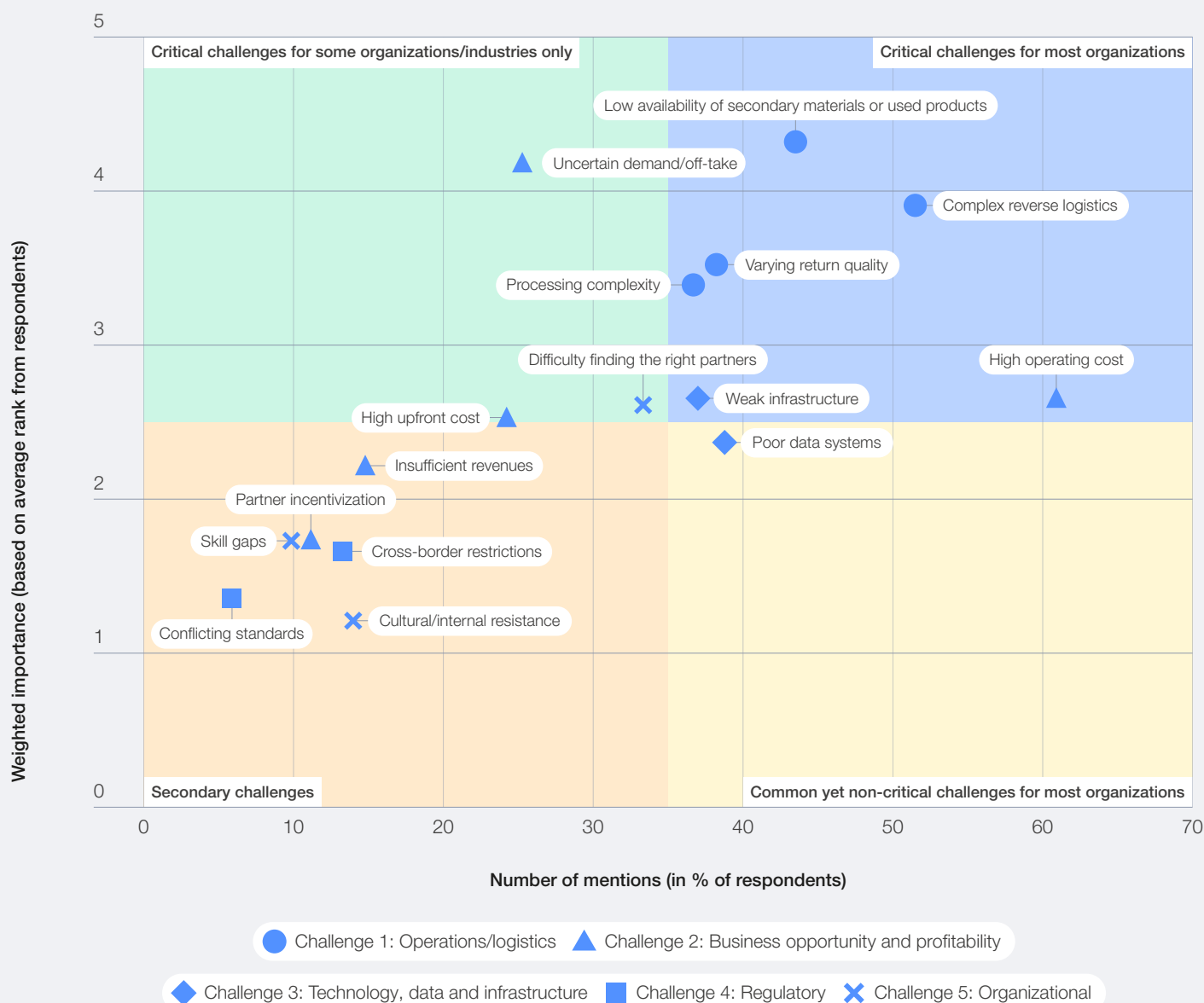


Source: CTI initiative and panel sessions.

Figure 4 maps the July 2025 survey results. It positions the challenges to circular business models in terms of their frequency and difficulty, identifying which hurdles are most widespread across industries and which pose the greatest threat to scaling. Operational bottlenecks, such

as the low availability of secondary materials or used products, varying return quality and complex reverse logistics, are the most common problems. This confirms that day-to-day operational issues are the main obstacle to circular supply chains.

FIGURE 4 | Challenges to scaling circular supply chains



Source: Global market survey by Bain & Company and the CTI initiative of 491 top executives (July 2025).

1.1 Challenge 1: Getting products back

Four of the five most-cited barriers are operational: low availability of secondary materials or used products, varying return quality, complex reverse logistics and processing complexity. The greatest hurdle is motivating customers to return products. Incentives such as payments, vouchers or loyalty points are being tested, but adoption depends on convenience – if processes are cumbersome, returns collapse. Quality is also unpredictable: items may be obsolete or damaged, requiring

costly assessments, repairs and refurbishments. Even when returns are usable, flows are volatile, creating inventory peaks and cash-flow strain. Some firms partner to manage this complexity. For example, Renault and Suez developed the **Future Is Neutral** initiative to recover end-of-life vehicles and recycle materials. Renault brings its automotive expertise as well as factories for remanufacturing, while Suez provides its network and know-how for collection and dismantling.

1.2 Challenge 2: Spotting highest value

Consumer behaviour still favours new products. While 67% of people in one global survey cite environmental motives for adopting circular behaviours, far fewer act, with only 29% buying second-hand furniture and 35% buying secondhand clothing.³ Trust gaps around quality and the appeal of new products persist. Companies are trying to bridge these gaps through discounts, warranties and certifications. At the same time,

some circular models remain expensive: reverse logistics, inspection and cleaning erode margins, and rental models often struggle with low uptake. For example, Patagonia's Worn Wear programme faced initial profitability struggles due to logistics set-up and significant collection, cleaning and repair costs. Over time, the resale programme gained popularity, and operational efficiency improved, shifting economics towards profitability and enhanced customer loyalty.⁴

1.3 Challenge 3: Getting information right

Circular flows need reverse logistics networks, repair facilities and digital systems that many companies simply don't have. Legacy IT built for linear models may not be able to track products across their life cycle. This undermines the ability to forecast supply and demand, trace circular goods and balance inventory. Automation and AI-enabled

sorting are still limited, slowing efficiency. Survey results show logistics and remanufacturing are the steps most hindered by infrastructure gaps. To reassure customers, some platforms collect data. For example, Material Mapper in Norway tracks the origin and estimated emissions savings of building materials, demonstrating the value of transparency.

1.4 Challenge 4: Navigating complex rules

Rules designed for traditional systems often hinder circular models. Refurbished goods may have to meet new product standards, creating extra compliance costs, while waste shipment laws complicate cross-border flows. Incentives are uneven; France's Repair Bonus and "Loi Anti-gaspillage pour une économie circulaire" (AGEC Law)

encourage reuse, but most countries provide little support. Inconsistencies force companies into costly workarounds. For example, HP (see full case study in the appendix) must apply the same documentation to refurbished devices as to new ones and, in India, returned products must be refurbished inside country borders, limiting international scale or outsourcing.

1.5 Challenge 5: Putting it all together

Scaling circularity exposes skills gaps in collection, testing and remanufacturing. Linear value chains were built for predictable one-way flows, while circularity requires complete reinvention and new expertise. It requires reorganization and a different way of thinking about operations and value creation. Companies also face trade-offs – centralizing or

decentralizing, insourcing or outsourcing – that complicate execution. Some pioneers respond with dedicated teams. For example, Hitachi built a specialized unit to remanufacture screw processors, ensuring quality and cost control. Partnerships are essential, yet standards remain scarce, leaving firms struggling with partner evaluation and profit-sharing.

2

Setting clear priorities: products, customers and markets

Knowing where to begin is the foundation of successful circular supply chains.

Key takeaways

- **Choose pilot markets strategically:** Launch in regions with supportive regulations, existing infrastructure and strong customer demand before scaling to more challenging markets.
- **Target receptive customers first:** Identify segments most likely to buy circular products and return used items, whether they're motivated by price, sustainability or convenience.
- **Start with the right products:** Focus on items with high return rates, strong resale value and technical feasibility for repair or remanufacturing – not all products are equally suited to circular models.

Varying customer acceptance, product economics and regulatory environments demand careful

choices about where to begin circularity. This chapter sets out which product characteristics, customer segments and markets are most suited to circular business models.

Smart prioritization sets a clear direction and establishes where to focus resources. Pilots help companies translate strategy into action. Early wins serve as proof points – testing different markets, products, customer segments and business models – before expanding to broader activities.

Prioritization isn't sequential. Companies must consider four dimensions together – geography, customer, product and value – as they tend to interact. This is because the appeal of a circular offering for a specific product depends on the customer segment, its value proposition and the market in which it is sold.

FIGURE 5

The World Economic Forum and Bain & Company framework for developing and scaling circular initiatives



Source: CTI initiative and panel sessions.

2.1 Geography: consider differing policies, demand and infrastructure

“ Financial incentives such as subsidies, tax credits or repair programmes may improve the business case for circularity.

Starting in a specific region helps focus efforts, test operational models and generate insights for broader scaling. Consider prioritizing regions that are vulnerable to market volatility or supply chain disruption. This is where circularity can add value by enhancing supply security, thereby boosting resilience.

Start with one geographic region to prove demand and pilot operations. Pilot markets are typically chosen for their strong customer presence, product base, growth potential or operational feasibility. If circular behaviours like recycling, returns and refurbished product use are already established, these will support faster adoption. Familiarity with product-as-a-service programmes and strong local demand can also help drive pilot success, as uncertain demand remains a key challenge.

Countries with extended producer responsibility (EPR) policies or landfill taxes often provide stronger foundations for early circular efforts. Financial incentives such as subsidies, tax credits or repair programmes may improve the business case for circularity. Stable governance or alignment with regional strategies like the EU Green Deal, China's 14th Five Year Plan on Circular Economy or the ASEAN Circular Economy Framework support

smoother expansion, especially in markets with long-term environmental goals.

Geographies with existing infrastructure, such as reverse logistics networks, certified recyclers or sorting centres, facilitate fast implementation, while manageable labour and logistics costs limit financial risk. Digital maturity, including traceability systems and product registries, supports efficient circular processes.

Scaling across multiple geographies: tackling regulations and operations. Cross-border circular flows face regulatory hurdles. Frameworks such as the Basel Convention or EU Waste Shipment Regulation may classify used goods as waste, requiring permits or restricting movement of items like used electronics, machinery or automotive parts shipments for remanufacturing. Restrictions complicate centralized reprocessing and add compliance risk. Scaling is easier in country clusters with harmonized standards, reducing friction and improving predictability.

Efficient circular models depend on reverse logistics, making transport networks and geographic proximity critical. Well-connected regions help manage cost, carbon impact and lead times. Compatibility across data systems also supports end-to-end visibility across partners and borders.

CASE STUDY 1

Colt – test first, then scale

Colt Technology Services, a global digital infrastructure company, launched its Synchronous Digital Hierarchy (SDH) End-of-Life project in 2023 as part of a network modernization programme that replaced legacy energy-intensive telecom equipment. Colt chose Sweden for a pilot because it was a relatively small market, yet

with existing equipment. This enabled Colt to test new circular approaches before scaling across Europe. Local collaboration with Swedish recycler Urban Miners achieved significant revenue from material recovery in 2023-2024, and the initiative is now being rolled out across Europe.

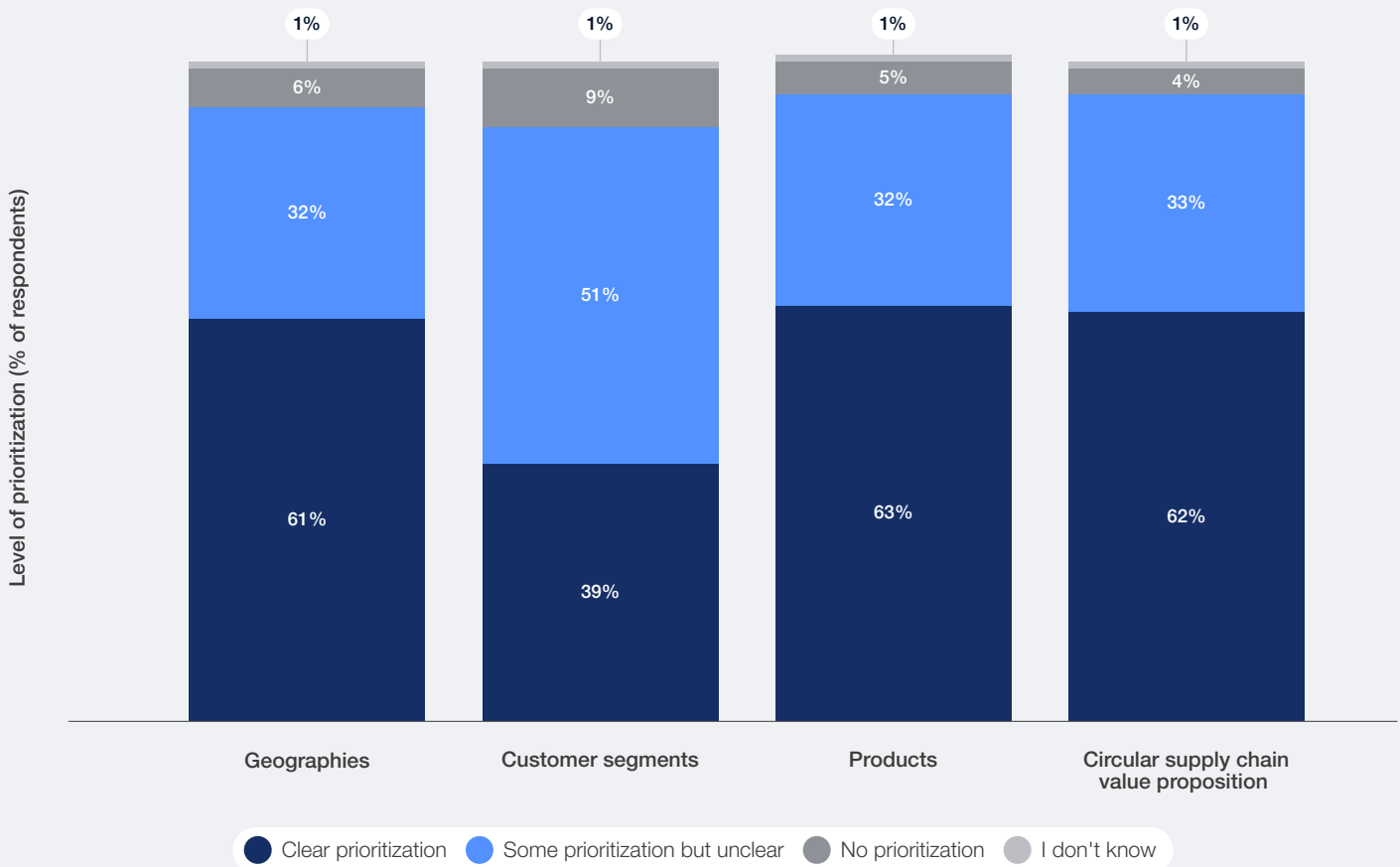
2.2 Customer: target the right segments with the right approach

Not all customer segments are equally receptive, accessible or profitable. Identifying which ones to target first remains challenging. In the 2025 survey, more than 60% of organizations

lack clear client prioritization, especially in machinery (74%) and medtech (67%). This section presents steps to help companies target the right customers.

FIGURE 6 Prioritization is less clear for customer segments

How would you describe your organization's prioritization of circular initiatives for each of the following categories, in terms of clear prioritization?



Source: Global market survey by Bain & Company and the CTI initiative of 491 top executives (July 2025).

Companies must assess whether demand for circular products aligns with return flows. When these differ, each requires separate engagement strategies. Return patterns may vary by geography, sales channel or demographics, even with similar product use.

Organizations can focus on existing customers or engage new ones, such as those who are environmentally motivated or price-sensitive. Price-sensitive clients may favour more affordable second-life products, while sustainability-minded customers value impact, such as lower-carbon offerings. Customers who already trust circular quality or are open to learning about circular options can serve as proof of concept and influence adjacent segments.

For premium-priced products, demand may come from customers prioritizing repairability and longevity. Finally, some customer groups may be most relevant because they are priorities for growth or retention.

Several strategies encourage the return of used goods, depending on whether customers are motivated by sustainability concerns, financial rewards or convenience. Online platforms and local collection points are helpful in this regard. Retailers The North Face and H&M offer collection bins in stores for customers to return used items and receive vouchers. These accept returns from multiple brands.



2.3 Product: choose items built for circularity

“ Where strategic materials are scarce, recycling can strengthen supply chains and business resilience.

Not all products work equally well in circular models. Products with strong return flows and high leftover value that can be easily reworked are natural starting points. Scaling up requires balancing technical potential, market demand, regulations and economics.

Market demand: Products with large existing customer bases and higher resale value often generate more consistent returns. Steady flows make scalable collection and reworking operations possible. Circular appeal is stronger for items with proven demand in refurbished, reused or as-a-service formats.

Products covered by EPR laws motivate companies to develop circular offerings early. It is important to keep abreast of fast-evolving regulations in categories such as batteries, packaging, textiles, electronics, vehicles and consumer goods.

Value retention: Circular efforts often start with products that retain value despite use, making cost-effective repair, refurbishment or remanufacturing before resale viable. Items with high-value or recoverable materials – such as electronics with rare earths or critical raw materials – support profitable refurbishment and recycling, either as a whole or just with certain components.

Technical feasibility: Technical factors influence which products work best in circular systems. Items that disassemble and process easily are typically more viable. Design elements such as modular architecture significantly improve reuse potential, even when circularity wasn't originally intended.

Environmental and strategic benefits: Products with high emissions, resource consumption or waste output are good candidates for recycling and refurbishment because of their high environmental impact. Second-hand and recycled products often deliver lower carbon footprints. According to the 2025 survey, emissions reduction is a leading motivation for pursuing circularity.

Products using scarce or strategic materials, such as rare earths or critical materials, provide additional value by reducing consumption of virgin materials. Where strategic materials are scarce, recycling can strengthen supply chains and business resilience. For example, Wilo's recovery of used pumps enhanced its material supply, demonstrating economic viability within a year. This can enable economic profitability from the start of the initiative.

2.4 Circular value propositions: prioritize what matters most

Choosing circular value propositions requires balancing ambition with feasibility. The matrix below provides a decision-making tool based on industry experience, with targeted questions to assess feasibility and impact for each company and product.

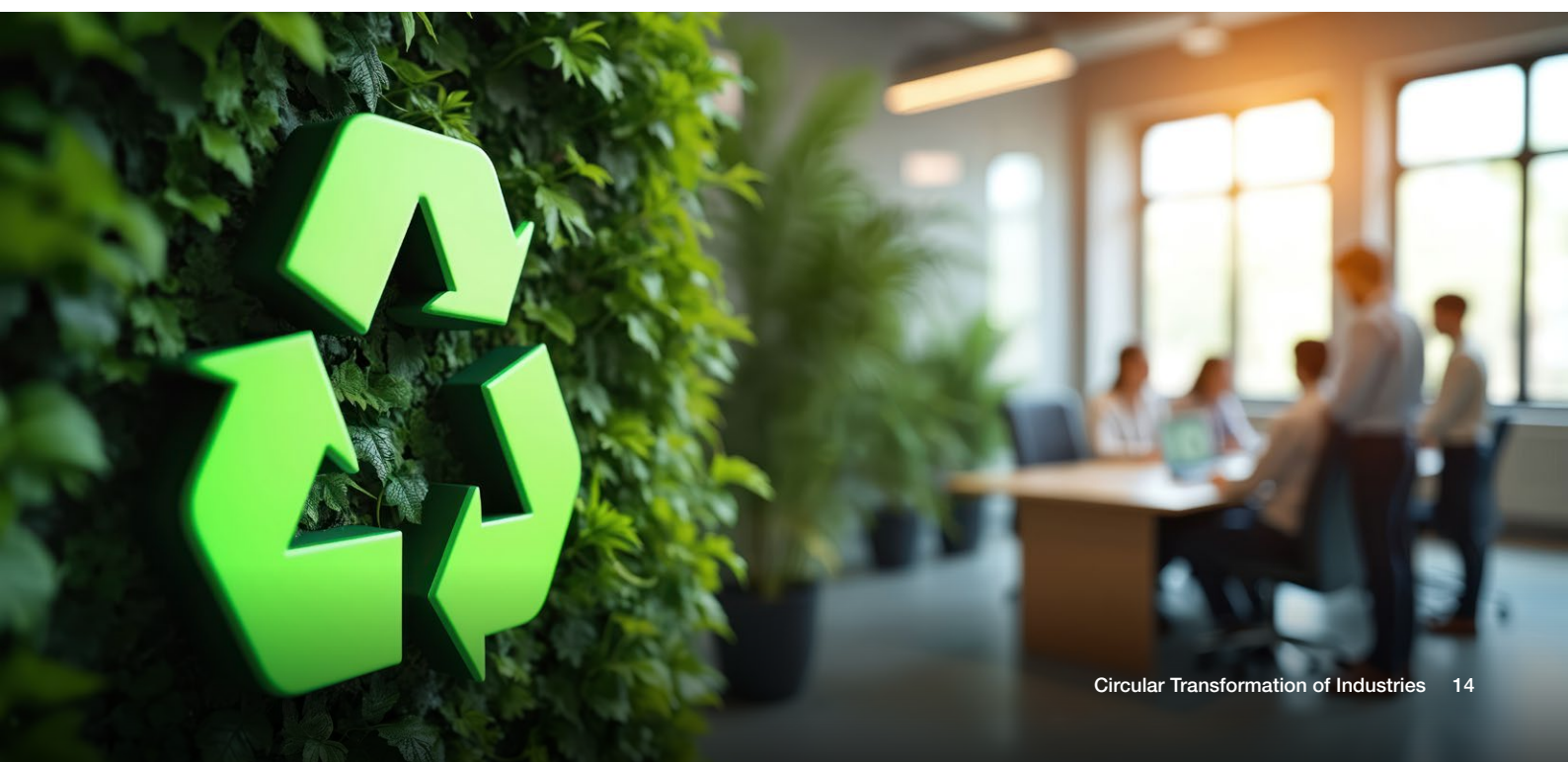
TABLE 1 Illustrative matrix to prioritize circularity value proposition for a given product category

Assessment based on feasibility and impact, to adapt for each company and product category – example for heavy equipment and machinery.

● Favourable ● Neutral ● Unfavourable		Repair services	Retrofit services	Product-as-a-service/leasing	Refurbished product sale	Remanufactured product sale	Recycled material sale
Company/ product category drivers	Product fit: Is the value proposition compatible with the design and life cycle of the target product category?						
	Value creation: Does the financial value generated align with objectives for the product category? (e.g. recurring revenue, cost reduction)						
	Sustainability strategy: Does the value proposition contribute to key sustainability goals? (e.g. reduction in waste, emissions or resource use)						
Market drivers	Customer demand: Are customers aware of and willing to adopt this proposition?						
	Regulations: Do policies in place favor this value proposition?						
	Competitors: Are competitors offering such a value proposition?						

Example for a product category having high residual value and a possibility of second life

Source: World Economic Forum and Bain & Company analysis based on panel sessions and interviews with market participants.



“ Supportive measures like EPR schemes, repair bonuses and recycled content mandates create market pull, while fragmented standards or waste shipment restrictions raise costs.

Product fit: Certain products align naturally with specific circular approaches – e.g. copiers or cars with refurbishment, and packaging with recycling. Matching product characteristics (like durability or modularity) with process requirements improves operational success. For example, automotive equipment, particularly equipment with durable cores (e.g. gears, alternators), is well-suited for remanufacturing. Standardized designs, high material value and predictable wear make disassembly and remanufacturing feasible and economically viable.

Value creation: Circular models generate value through cost savings, recurring revenues and reduced exposure to volatile raw materials. They open new markets with price-sensitive or sustainability-oriented segments, strengthen customer relationships and enhance brand equity. Capturing residual value from components also improves supply security and resilience. For example, remanufacturing enables a leading equipment manufacturer to capture residual value from returned parts, reduces raw material costs and buffers against supply volatility.

Sustainability strategy: Certain circular processes are essential for achieving long-term goals such as carbon reduction or resource efficiency. For example, many car manufacturers demand low-carbon equipment from suppliers, with a key approach being high-recycled-content materials. Emissions, waste and resource impact across the full product life cycle are deciding factors. For example, by reusing parts and minimizing virgin material input, remanufacturing sharply reduces a leading equipment manufacturer's carbon dioxide (CO₂)

emissions and resource extraction. This directly supports the original equipment manufacturer's (OEM) decarbonization targets and their clients' constraints on life cycle impact reduction.

Customer demand: Customer openness to refurbished goods, leasing or take-back programmes, as well as familiarity with circular models, supports uptake and retention. Recurring service models also enhance customer relationships and lifetime value. In particular, customers accept remanufactured automotive parts when backed by warranty and OEM standards.

Regulations: Policies can accelerate or constrain circularity. Supportive measures like EPR schemes, repair bonuses and recycled content mandates create market pull, while fragmented standards or waste shipment restrictions raise costs. Staying ahead of evolving rules on repairability, recyclability and product passports enables compliance and first-mover advantage. For example, EU policies promoting waste prevention, repairability and circularity (e.g. the End-of-Life Vehicle Directive) support remanufacturing. Compliance readiness offers early-mover advantages in navigating emerging product passport and recycled content requirements.

Competitors: Monitoring competitors helps identify market trends and gaps. Successful repair, leasing or remanufacturing models signal both feasibility and shifting customer expectations. Companies can then imitate or differentiate to sharpen positioning and accelerate capability building. In automotive, for example, remanufacturing is already practiced by key OEMs and tier 1 suppliers, validating market viability.

3

Design options: building circular operations that work

Integrated or separate? In-house or externalized? With partners or alone? Circular supply chains come in many forms.

Key takeaways

- **Design a supply chain structure:** Decide whether to integrate circular flows with existing linear operations, separate them completely or use a hybrid approach – most successful companies combine elements of both.
- **Choose to do either in-house or through partnership:** Focus internal capabilities on high-value, knowledge-intensive activities such as sorting and remanufacturing. Partner for scale-intensive tasks like collection and basic logistics.
- **Build the right operational skillsets:** Develop skills in demand forecasting, reverse logistics, customer engagement, product triage and reconditioning. These are fundamentally different from traditional supply chain skill sets.

3.1 A design framework for circularity

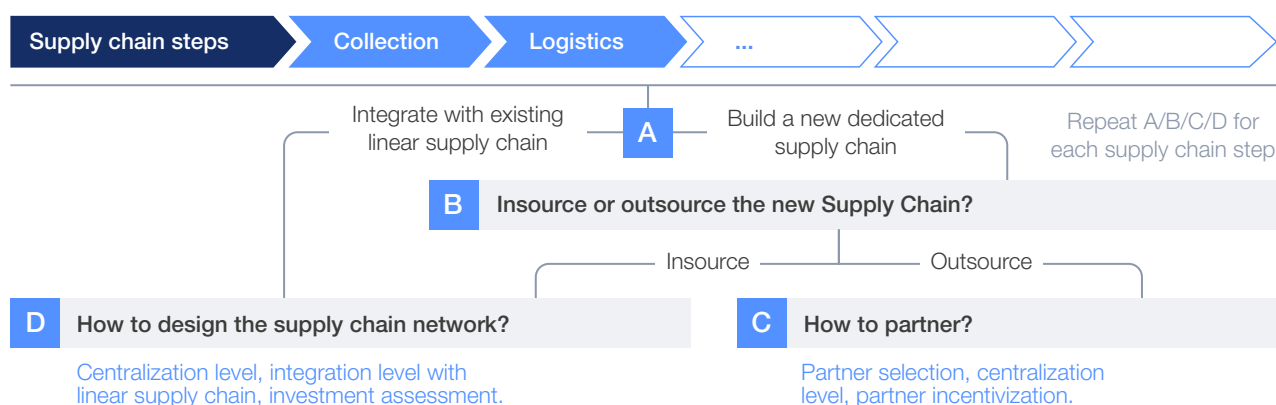
Once circular priorities are set, companies face choices when it comes to designing and operating robust circular supply chains. Should circular flows be integrated into existing operations or be separate from the main business? Should circular activities be developed in-house or outsourced? Should companies pursue circularity in partnership with other companies?

In the 2025 survey, only 20% of businesses said they had an execution plan for their circular supply chain, while 70% said they were working on one.

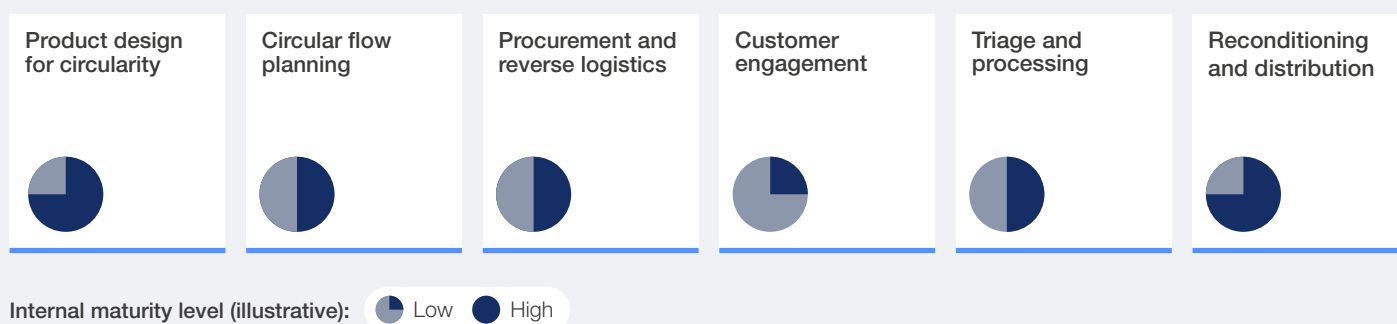
The framework below can help companies make the right choices to turn circular ambitions into operational reality.



2.1 Circular supply chain configuration



2.2 Assessment of operational capabilities



Source: CTI initiative and panel sessions.

3.2 Key design decisions

Supply chain structure: integration, separation or hybrid?

While circular and linear supply chains share functions such as logistics and warehousing, critical differences emerge at scale. Circular operations like return forecasting and product condition assessment require distinct capabilities. Many companies find that traditional models cannot simply stretch to accommodate reverse flows.

Integrating circular and linear operations such as shared logistics, warehousing and IT systems improves visibility and streamlines management, improving coordination and reducing duplication. In the 2025 survey, 56% of companies reported mostly or fully integrated circular and linear supply

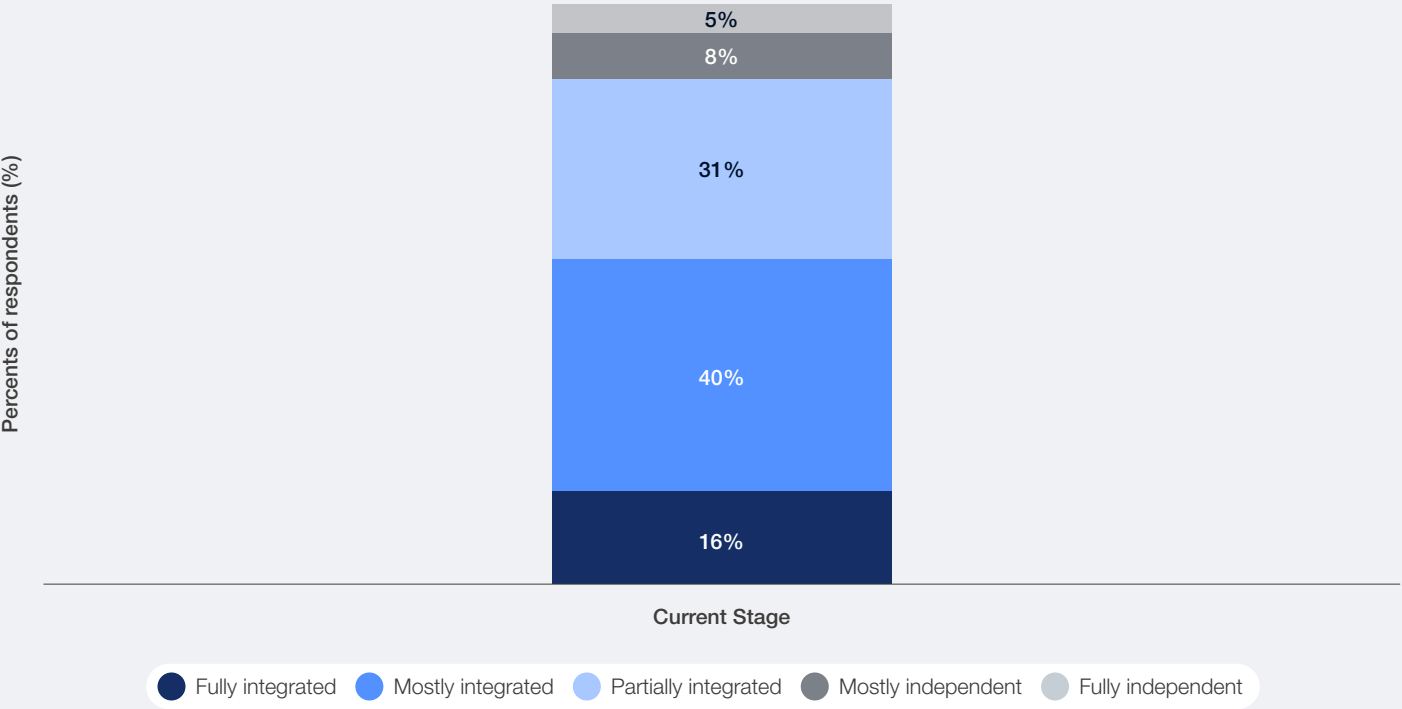
chains. Integration was particularly prevalent in consumer tech and machinery – over 70% – where operational compatibility is higher.

Separation, meanwhile, allows organizations to meet circularity demands without disrupting traditional operations. Dedicated infrastructure and workflows enhance focus and reduce friction, providing flexibility to test and scale circular models.

Hybrid models can offer the best of both worlds: Most circular leaders use hybrid models, selectively integrating or separating supply chain elements. For example, logistics and collection may be shared, while sorting and remanufacturing use dedicated set-ups. Hybrid configurations offer flexibility and efficiency where needed.

FIGURE 8 | **Most companies run circular supply chains in hybrid or integrated configurations, with only 5% operating fully independent networks**

How is your circular supply chain currently organized in relation to your linear supply chain?



Source: Global market survey by Bain & Company and the CTI initiative of 491 executives (July 2025).

CASE STUDY 2

Schneider Electric – using existing structures

Schneider Electric converted two French production sites into refurbishment hubs and integrated a circular distribution centre into a standard distribution centre. The company adapted tools for order tracking, condition monitoring and demand planning. By 2024, this model

operated across 13 sites, recovering 160 tons of equipment. Circular product coverage increased from 6% in 2022 to 38% of Schneider Electric ranges two years later. It kept sorting, testing and refurbishment in-house for expertise, while outsourcing reverse logistics.

Partnership strategy: building internal capabilities or working with others

Map current capabilities and gaps: Companies must assess operational capabilities across each circular supply chain step, identifying assets, systems and teams that can be repurposed, as well as gaps that need filling. While traditional infrastructure offers a base, circular models often require new workflows, roles and metrics.

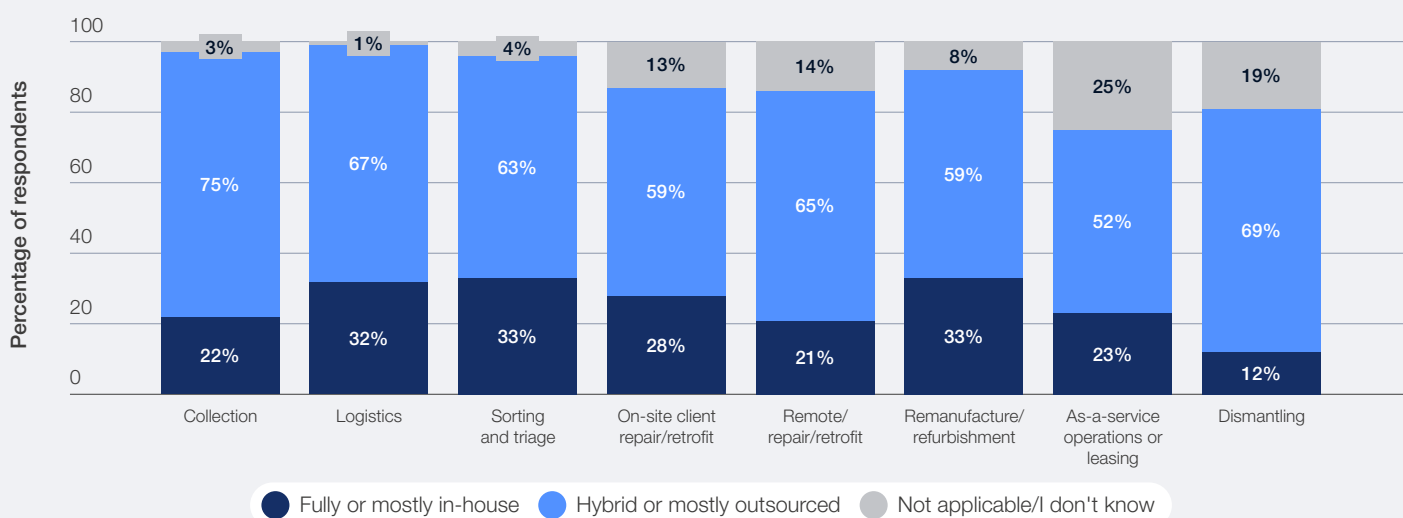
Strategic priorities guide ownership decisions: After identifying gaps, companies

should evaluate whether to address these internally through investment and hiring, or through partnerships. Strategic priorities and cost-benefit analyses should guide choices. It's crucial to consider where control or product knowledge must remain internal and where speed or scale are critical.

Each model offers different benefits. In-house control works for high-value or sensitive processes like diagnostics or remanufacturing, providing more control over quality and customer experience. Outsourcing offers speed, scale and cost-efficiency for labour-intensive or distributed tasks such as collection and basic repairs.

FIGURE 9 | Most circular supply chain steps use external partners

Which supply chain steps would typically be managed internally for most of your portfolio?



Source: Global market survey by Bain & Company and the CTI initiative of 491 executives (July 2025).

Survey results show that most supply chain steps in circular models use outsourcing or hybrid set-ups. The highest internal control is in sorting/triage and remanufacturing, where quality control and technical expertise are critical. Yet, there is variation across sectors; over 40% of machinery, heavy industry and medical technology companies manage remanufacturing internally, compared to 18% in apparel.

Collection and dismantling are outsourced by 80% of organizations, reflecting their scale intensity and cost sensitivity.

Access to materials: partnerships and incentives

Choose the right partnership type: Partnership strategies accelerate circular initiatives across three approaches: securing material access, gaining data and predictive capabilities, and accessing circular customers through marketplaces and technology providers. Local partnerships can be useful when

there are infrastructure or emissions constraints. For more about the role of partnerships, please refer to [Circular Transformation of Industries: The Role of Partnerships](#),⁵ an earlier publication by the World Economic Forum, Bain & Company and the University of Cambridge.

Set partner selection criteria: Effective partnerships require more than technical fit. They depend on data transparency, traceability, alignment with circular key performance indicators (KPIs), partners' ability to scale, their capacity to operate at the right level of centralization (central hubs versus local networks), and system compatibility. Survey respondents indicate that technical expertise and cost are their top selection criteria for partners, while circular-specific factors such as KPI alignment and data sharing are secondary.

Incentive models: Specific incentive models that ensure every player captures benefits are essential for scaling circularity. The most common mechanisms are joint innovation (79% of respondents), long-term contracts to secure feedstock (52%) and service fees (45%).

CASE STUDY 3

Vestas and Renewable Parts – a win-win partnership

Wind turbine manufacturer Vestas partnered with Renewable Parts for wind turbine services. Renewable Parts specializes in refurbishing used turbines, enabling

Vestas to reduce new turbine production, cutting cost per turbine by 30-60% and limiting waste.

🗣️ **Urban areas may benefit from designated collection points, while rural areas require home collection. Consumer preferences should shape the network.**

Network design: choosing central hubs or local operations

Network design determines how and where reverse flows are managed – from collection to reconditioning – and how they connect back. The key question is whether to centralize or localize these activities. This question is valid both for insourced and outsourced capabilities.

Start with customer geography and behaviour:

Network design begins with understanding where returns originate and how customers engage. Urban areas may benefit from designated collection points, while rural areas require home collection. Consumer preferences should shape the network.

Assess needs for each supply chain step:

Circular supply chain steps have distinct needs. Local collection and sorting benefit from proximity to return sources, while remanufacturing often requires centralized hubs with skilled labour and diagnostics.

Weigh central versus local trade-offs:

Centralized networks such as regional hubs offer consistency and scale efficiency, useful for complex tasks. Localized models bring speed and customer convenience, especially for collection or basic repair. Most organizations benefit from hybrid set-ups.

Plan for growth: Early-stage circular initiatives often begin in key locations. As programmes scale, networks must adapt. Designing with modularity and flexibility in mind will enable growth.

3.3 Operational capabilities: building blocks for circular scale

After making design choices, companies need to assess and strengthen underlying operational capabilities.

Circular flow planning: Companies need to analyse return dynamics, including product life cycles, failure patterns, seasonality and customer behaviour to manage unpredictable returns. According to the 2025 survey, forecasting and planning rank as the most critical capabilities, surpassing logistics. Internet of things (IoT) sensors and real-time monitoring of status and location, augmented with AI, improve maintenance predictions and return timing. Some companies hold inventory buffers while others, such as Logitech, adopt build-to-order approaches to minimize excess inventory.

Procurement and reverse logistics: Early visibility into product condition is critical. Quick checks by stores or logistics partners, customer self-declarations, IoT diagnostics and product passports

reduce unnecessary transport and flag unsuitable returns (see GreenPlat traceability study in Chapter 4 of this paper). Customer education improves return quality. Apple, for example, provides in-device battery health prompts to guide users for service timing. Procurement must move towards sourcing used products and recycled materials.

Customer engagement: Understanding customer behaviour is central to circular participation. Loyalty and buyback programmes, used by over 40% of surveyed companies, encourage returns. Refurbished product sales at lower prices reflect rising demand for sustainable, affordable options. In 2023, 71% of UK, US, France and Germany consumers reported buying or selling used goods.⁶ Because consumer behaviour varies between regions, companies must tailor their strategies to local markets. For companies looking to go further, new models like product-as-a-service or leasing can extend customer retention and life cycle control.

CASE STUDY 4

Volvo Group – incentivizing customers

Volvo Group's remanufacturing programme maximizes value by extending product life. The company recovers used parts through a global network, restores them in one of eight remanufacturing sites or through one of approximately 100 partners and reintegrates them into vehicles.

Key enablers for customer demand include: competitive value-based pricing, efficient core returns with fast deposit handling, as-good-as-new quality and worldwide availability. The profitable programme employs over 800 people in Volvo Group plus additional people at the external partners.⁷

Triage and reprocessing: Effective triage aligns returned products with the right repair, reuse, refurbishment or recycling path. AI, visual screening and robotics enhance speed and accuracy. Tracking product, part and material flows enables continuous improvement. Circular processes must be modular and flexible to handle varying returned products. They may also require new skills in terms of design, service and cost-control.

Reconditioning and distribution: Cleaning, repacking and reconditioning mark the final steps of bringing goods back to market. Logistics must optimize dual flows that integrate forward and reverse movements. Digital platforms enhance coordination, while partnerships with logistics providers extend reach without owning all infrastructure. Unlike linear chains, circular models face fluctuating volumes and product conditions, necessitating flexible infrastructure and processes. Networks must also support diverse return channels.

CASE STUDY 5

Beko – nationwide network of recycling centres

Beko runs a nationwide appliance take-back programme in Turkey, where customers return old appliances for discounts on new products. The company uses its dealer

networks for home collection and centralized recycling facilities. Since 2014, Beko has collected and recycled 1.86 million units.



Enablers: catalysts for circular supply chains

Technology, regulation, finance and cultural change are also crucial to scale circular supply chains.

Key takeaways

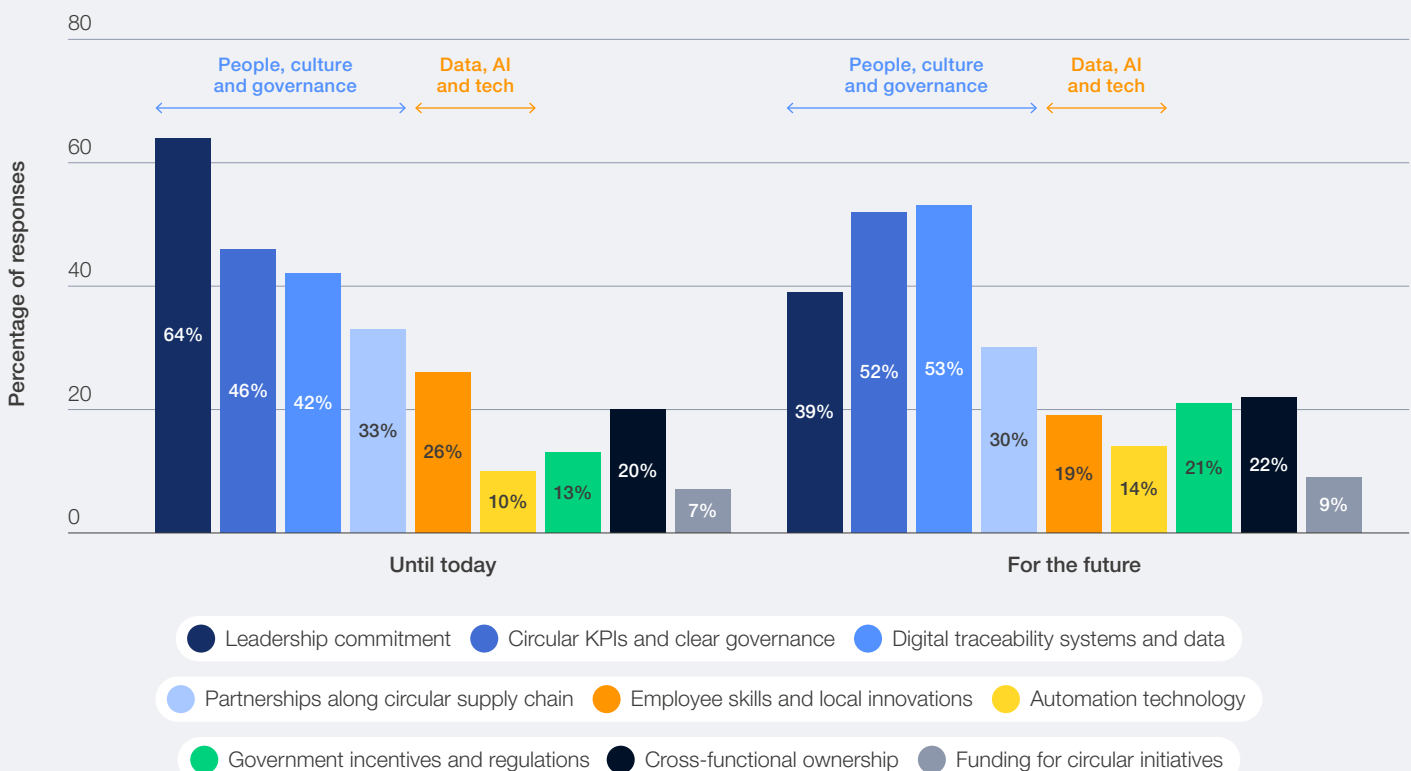
- **Technology and data are mission-critical:** Digital tools such as IoT sensors, blockchain traceability and AI-powered analytics transform circular operations from reactive to predictive, though adoption remains uneven.
- **Cultural transformation drives success:** Scaling circularity requires fundamental mindset shifts from “disposal” to “repair and reuse”, supported by leadership commitment, new KPIs and skills training for new activities.

- **Finance and supportive regulation provide essential fuel:** Circular supply chains need upfront investment with mid-term returns. Progressive regulations like the EU’s frameworks create market demand and competitive advantages for early movers.

According to the 2025 survey, internal engagement remains the strongest enabler of circularity. Leadership commitment and governance are highly valued in this regard, while partnerships and technology are seen as increasingly important.

FIGURE 10 Internal engagement is the most instrumental driver

Which attributes have been or will be the most instrumental in enabling your organization to scale circular initiative(s)? Please select up to three



Source: Global market survey by Bain & Company and the CTI initiative of 491 top executives (July 2025).

4.1 Technology and data

Circular operations run blind without robust data systems. Digital tools shift operations from reactive to predictive. IoT sensors optimize maintenance and recovery, blockchain supports traceability, and analytics balance variable flows. Automation – robotic sorting, 3D scanning – improves speed and quality.

But adoption remains uneven. Survey results show that 70-80% of companies plan to use AI for circularity in the future, compared to approximately 30% today. Strong cybersecurity is essential to safeguard data and trust.

CASE STUDY 6

GreenPlat – traceability systems to secure recycling

GreenPlat, in partnership with Arcos Dorados (McDonald's largest Latin American franchisee), has built a circular value chain for used cooking oil (UCO) in Brazil that collects and converts UCO into biodiesel. A blockchain-based traceability platform that monitors all collection points

has been essential to managing this fragmented, multi-participant value chain. Since its 2021 launch, GreenPlat's supplier base has grown by 30% and greater scale has increased UCO sales revenue by 16%. The company recycled more than 2.57 million litres of UCO in 2024.

4.2 People and culture

“ Making circularity part of company strategy requires strong leadership, proper management systems, rewards that encourage the right behaviour and ways to measure success.

Changing mindsets is as important as upgrading skills. Circular initiatives work when company leaders embrace the shift from disposal to repair and reuse. Manufacturing companies need a complete cultural change in which extending product life and giving products a second chance becomes an attractive business opportunity, not something they fear will hurt new product sales. Making circularity part of company strategy requires strong leadership, proper management systems, rewards that encourage the right behaviour and ways to measure success. These include repeat customer revenue, connected products, resource savings, reuse rates and circular income.

Changing how people think is essential. Employees often resist change or don't understand circularity, which creates major obstacles. Training helps build skills for remanufacturing, refurbishment and sorting – activities that traditional supply chains don't normally do. Companies can either teach existing employees these new skills or hire people who already have circular experience. Without building these capabilities, organizations become too dependent on outside partners and fail to make circularity central to their business.



4.3 Finance and investments

Circular supply chains require upfront investments but cannot deliver immediate returns. Those gains, in the form of savings, resilience and new revenues, materialize in the medium term and, as a result, circular investments should be classified as strategic, with multi-year planning.

Securing capital is difficult, given that circular projects compete with linear ones for scarce resources, but financing is expanding. Impact investors, green bonds and public grants are increasingly available. In 2024, global circular funding reached \$400 billion, up \$170 billion since 2021.⁸

4.4 Policy and regulation

“Circularity-centred public procurement rules can also create a market for recycled goods, thereby reducing supplier risk.

Policy is a critical driver, and local business context matters. Regulations define what is deemed a product and what is waste. They can set reuse and recycling standards, assign producer responsibilities and shape markets with incentives or penalties. Governments can encourage adoption through subsidies – for example, VAT exemptions on refurbished goods. The EU Taxonomy further supports financing by requiring disclosure of circular revenues, capital expenditure (CapEx) and operating expenditure (OpEx).

In Europe and Asia, regulation often precedes voluntary action. The EU leads with frameworks such as the Waste from Electrical and Electronic Equipment (WEEE) rules and Packaging and Packaging Waste Regulation (PPWR). Anticipating circularity initiatives could give first

movers a competitive advantage. Groupe SEB is already doing so with its right-to-repair rules for home appliances.

Circularity-centred public procurement rules can also create a market for recycled goods, thereby reducing supplier risk. France's AGECLaw, mandating 20% reused or recycled content for all public procurement, is a case in point.

Corporate engagement with evolving regulation is essential. Without it, new rules may be misaligned and costly. Active participation helps shape workable standards. Aligning with ISO 59000 or the EU's Corporate Sustainability Reporting Directive (CSRD) enhances predictability, while consistent metrics and benchmarks ensure comparability and allow companies to set and track progress.

Conclusion

Circular supply chains are moving beyond experimentation to become strategic and operational. That is because the business case for circularity is growing stronger. Circularity supports resilience, cost efficiencies, revenue growth and customer satisfaction, in addition to its sustainability benefits. Just as digital transformations reshaped business models in the past two decades, circular transformations will determine competitiveness in the decades ahead.

Yet progress is uneven. Only 20% of companies today have fully functional circular supply chains. Those that have succeeded have done so by having clear priorities, strong partnerships and targeted investments.

Scaling circular supply chains calls for a new level of ambition. Supply chains will have to be reconfigured. Customers and partners need to be engaged in new ways. New sources of capital must be found.

This cannot be a solitary endeavour. A circular ecosystem will be required to secure materials, know-how, technology, and markets. In it, every participant must be able to capture part of the value add of circularity.

To build circular supply chains, chief executive officers need to keep three principles in mind:

- 1 **Prioritize with discipline:** Focus initial efforts on the most promising products, customer segments, geographies and circular value propositions.
- 2 **Design for scale:** Assess and strengthen operational capabilities, determine what to insource versus outsource, and configure supply chains that harness existing assets while adding new ones where needed.
- 3 **Enable and influence:** Harness enablers across regulators, financiers, technology and culture, and engage stakeholders early to shape markets instead of reacting to them.

Circular supply chains will redefine value creation for the next decade and beyond. Organizations that act decisively today, with clear choices, bold pilots and scalable infrastructure, will lead the next industrial transformation.

In a world of tightening resources, rising capital costs and mounting climate pressure, corporate excellence will be defined by the companies that succeed in extending product life, recovering embedded value and delivering financial performance within the limits of planetary boundaries.

Appendix: Case studies

Industry proof point 1: Hitachi Channel Solutions – reuse of ATM parts

 Industry	Manufacturing
 Employees	2,000
 Case maturity	Ongoing scaling

Hitachi is advancing circular manufacturing, sustainability and the efficient use of resources in Japan by installing ATMs with reused components. New ATMs are being equipped with used parts that have been collected, remanufactured and tested to new part standards and then reassembled. Unneeded materials are recycled.

Launched in January 2024, the initiative is being adopted by regional banks, Japan Post Bank and convenience stores. Hitachi has also contributed to the efforts of the Japan Electronics and Information Technology Industries Association (JEITA) to define green transformation (GX) product standards.

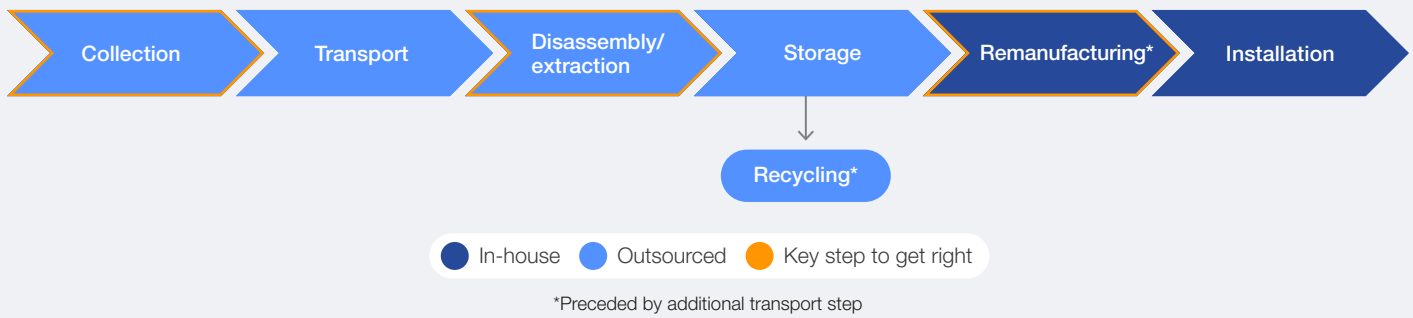
FIGURE 11 Hitachi prioritization



 Geography – Start in Japan: dense ATM network, favorable regulation, nearby collection and disassembly facilities – Domestic focus enhancing quality control and coordination with banking partners	 Customers – Regional banks and institutions like Japan Post Bank, with pressure to meet sustainability targets – Facing challenges in disposing of used heavy ATMs	 Product – ATMs: devices with durable, high-value components and modular design – Long innovation cycles enabling reuse of certain parts across generations	 Circular value proposition – Remanufacturing prioritized for value retention, compatibility with ATMs, and sustainability – Leveraging Hitachi's precision manufacturing and quality assurance; non-reusable parts sent to recycling partners
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Supply chain design choices

FIGURE 12 Hitachi supply chain configuration



Hitachi has designed a hybrid supply chain model that combines external partnerships with in-house expertise. Logistics partners handle collection, the extraction of useful components, transport and storage, while Hitachi oversees remanufacturing and harnesses its precision manufacturing and testing capabilities.

The design of Hitachi's circular supply chain integrates elements that deliver the biggest contribution to value recovery, quality assurance and customer acceptance. These include:

- **Integrated collection and delivery:** Used ATMs are collected directly from customer sites during the delivery of new machines. This minimizes customer disruption while ensuring reliable return rates. The reverse logistics flow builds on years of recycling experience and has been adapted to support the shift towards remanufacturing.
- **Targeted extraction capability:** Extraction requires skilled handling to maximize component recovery while minimizing damage. Given the additional transport and labour cost involved, Hitachi relies on specialized partners to manage this step and protect remanufacturing potential.
- **Insourced reprocessing:** Hitachi handles diagnosis, cleaning, remanufacturing and testing within the same facilities and processes used for new ATMs. This ensures remanufactured units meet new-product standards and builds customer confidence through consistent quality control across linear and circular supply chains.

Operational capabilities and incentivization

To support customer adoption of remanufactured ATMs, Hitachi focused on three areas:

- Clear certification and traceability of reused components
- Identical testing protocols and environments for new ATMs
- Retaining the same price, despite added remanufacturing costs, ensuring no perceived trade-off in quality or value

Key enablers

Japan's certification system for industrial waste, which grants Hitachi the legal right to collect and process used ATMs throughout the country, is a critical enabler. This regulatory approval removes a major reverse logistics barrier and underpins the feasibility of a nationwide circular supply chain.

Impact

Hitachi is working to increase the collection rate of its domestically manufactured ATMs to 90%. Several banks highlight refurbished ATMs as their own contributions to the circular economy.

Industry proof point 2:

Siemens – building a circular future on the strength of services in India

 Industry	Technology
 Employees	312,000
 Case maturity	Ongoing scaling

Siemens' circularity approach centres on doing more with less, such as by creating circular products, embracing circular business models and empowering customer circularity. This enables customers to become more competitive, resilient and sustainable.

The company has embarked on a journey to advance circularity by offering a comprehensive portfolio of services aligned with optimal R-strategies such as refurbishment, retrofitting and repair for buildings and energy infrastructure. These efforts aim to scale circular supply chains and life cycle management services.

Customer cost savings vary depending on the type of circularity-related service and product. For building and

electrical products, repair, refurbishment and component retrofits typically result in cost reductions of 10-30%. Repairing building technology, such as fire safety technology, building automation or other field devices can reduce CO₂ emissions by up to 90% compared to producing new units. Extending product lifespans and reducing material use also significantly cuts waste.

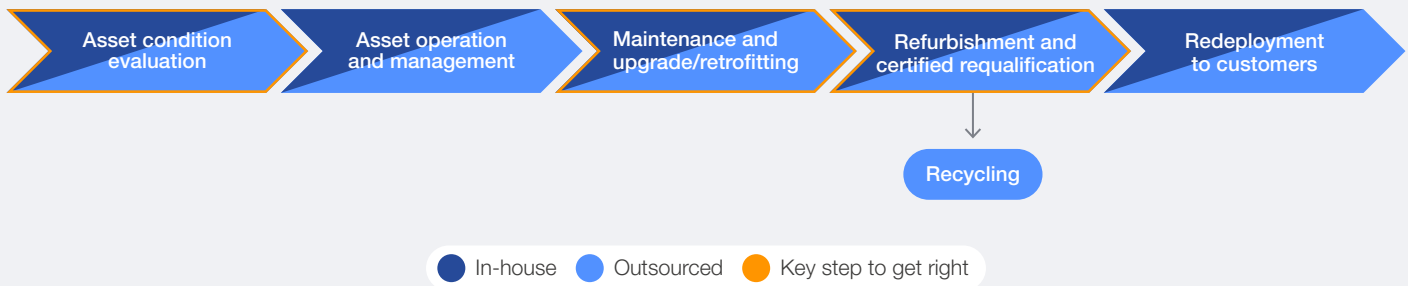
Beyond buildings, electrical infrastructure can also be repurposed to meet modern standards while minimizing environmental impact. This case study will look at how India now serves as Siemens' global competence centre for low-voltage (LV) and medium-voltage (MV) switchgear retrofitting, exporting standardized kits and engineering expertise worldwide.

FIGURE 13 Siemens prioritization



 Geography	 Customers	 Product	 Circular value proposition
- Comprehensive retrofit portfolio in India, a rapidly growing circular market with high customer demand and strong regulations (e.g. waste responsibility) - India also serving as a regional competence centre for regions such as the Asia-Pacific, Middle East and selected European and Latin American markets	Range of industries, including state and private utilities, as well as heavy industries such as steel, cement, oil and gas. While sustainability is increasingly on the radar, key decision drivers include reducing downtime, managing obsolescence, optimizing total cost of ownership and ensuring asset availability	Outdated MV air-insulated switchgear (AIS) units from the 1980s, each unit typically having 2-20 panels, each panel weighing 500-2,000 kg and 2.5 m tall. Old AIS units often containing sulfur hexafluoride gas or mineral oil, both hazardous substances. Another programme focuses on old LV switchgears, where end-of-life becomes a safety concern	Retrofit of existing units with modern vacuum and air circuit breakers, retaining up to 70% of the original cubicle mass instead of replacing entire systems. Asset life extension reducing material waste and embodied carbon, eliminating restricted gases and oils, and ensuring future-readiness and safety

FIGURE 14 Siemens supply chain configuration



Siemens has reconfigured its supply chain to support circularity, combining insourced capabilities with a network of partners to transform the traditional “take-make-waste” model into a closed-loop system. For MV switchgears, Siemens’ Service Corner in India has standardized 80% of designs; with a modularization concept, retrofits are available for over 200 designs, delivered as kits worldwide.

Insourced capabilities: Dedicated customer service teams, along with engineering, vacuum and air circuit breaker manufacturing, and digital diagnostics teams, provide essential retrofit services.

Partnerships: Reverse logistics retrieves legacy panels and hazardous materials, which are harvested, tested and reintegrated into operations. For LV switchgears, Siemens has a network of authorized service centres that are essential players in circularity. Outsourcing these processes enables Siemens to harness partners’ specialized skills and tools. For sulphur hexafluoride (SF₆) handling of MV switchgears, Siemens works with qualified partners who enforce rigorous safety protocols, ensure personnel are trained and manage safe transport.

Siemens ensures active development of partner ecosystems to facilitate continuous improvement and customer-centric delivery in line with its commitment to sustainability and service quality.

Operational capabilities and incentivization

To support customers at every step, Siemens conducts site reliability assessments to identify panels that have reached the end of life – even when customers do not maintain a database.

Quality assurance checks are carried out to ensure that switchgears are fit for use. Each panel is tested according to IEC certification standards, and warranties are issued where appropriate to provide transparency on the condition assessment.

Key enablers

Siemens actively collaborates with customers to demonstrate how retrofits can enable system upgrades with the latest technologies. For example, during retrofitting, IoT sensors are integrated to provide real-time visibility and safety alarms and support modern predictive maintenance practices. Advanced technologies such as 3D scanning and QR-coded digital twins have also enhanced retrofit delivery by enabling precision fit-ups.

Internally, Siemens established a defined governance framework and cross-functional collaboration model to manage the life cycle of retrofitted assets. A cultural shift – from a replacement mindset to a retrofit-first philosophy – has been pivotal in driving adoption.

To further support customers, Siemens offers tools such as an impact calculator, abatement certificates and financing options.

Impact

Customers can achieve total cost savings of 40-50%, including increased uptime and energy efficiency compared to old switchgear.

Sustainability gains are significant: Lifespan extension and material savings reduce material use by up to 70% and emissions by up to 75% compared to new panel installation. Customers also avoid reliance on restricted chemicals and mineral oil supplies.

Retrofit services enhance operational resilience: Greater service agility means the lead time from delivery to on-site installation is 1-3 days (compared to 1-4 weeks for new switchgear), resulting in less downtime and more production time. Customers also benefit from up to 70% reduced dependency and volatility on global parts. Furthermore, retrofitting creates a future-proof asset, extending equipment lifetime by 10-15 years.

Industry proof point 3:

HP – extending product life and getting past transport and certification challenges

 Industry	Information technology
 Employees	58,000
 Case maturity	Ongoing scaling

HP's Renew service offers high-quality, affordable refurbished hardware and circular services for business-to-business (B2B) customers. It maximizes technology return on investment (ROI) through flexible cost and fleet management, improving IT

and employee experiences without sacrificing quality or performance. Each HP-certified refurbished product undergoes rigorous refurbishment with HP-approved parts and meets the company's quality standards, backed by lifetime extension support.

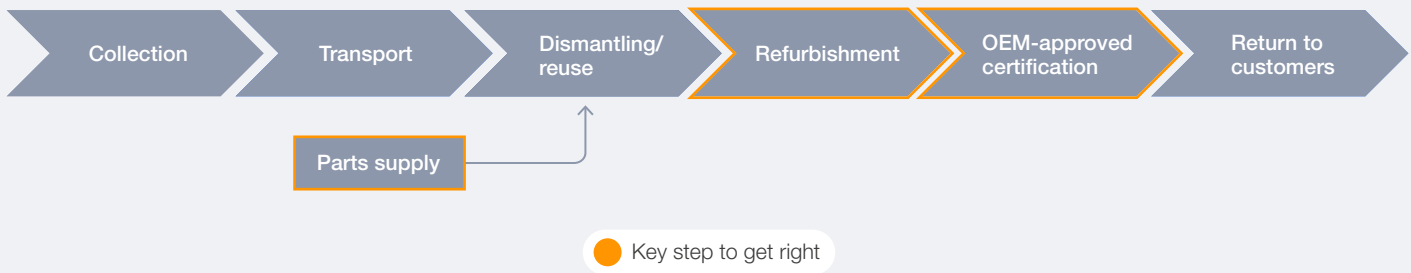
FIGURE 15 HP prioritization



 Geography	 Customers	 Product	 Circular value proposition
– Start in France and India: most demanding regulations pushing circularity, and public procurement contracts asking for equipment with reused or recycled content – Ongoing scaling in HP key markets: US, UK, India and European nations such as France, Spain	– B2B focus: conscious of the value of service models – Prioritization based on region x product: converting the same customers as for linear businesses	– Laptops: HP's largest segment representing almost 50% of revenue, and printers	– Service model with refurbishment every 3-4 years to extend lifespan to 7 years and data analysis to support more effective use

Supply chain design choices

FIGURE 16 HP supply chain configuration



HP Certified Refurbished devices undergo a strict OEM certification process to ensure partners meet HP's standards. Cross-border movement is complex, as refurbished products must often meet the same regulatory and documentation requirements as new ones due to unclear legal definitions.

- HP's refurbished product flows adapt to regional regulations. In India, refurbished products must be sourced, processed and sold domestically due to trade restrictions. In the EU, volumes are consolidated in hubs in France, Hungary and Germany, where certified partners manage sourcing, grading and refurbishment to meet HP's quality and environmental standards.

Operational capabilities and incentives

- The top refurbishment challenges are local shortages of specific units and devices, which HP is addressing through targeted efforts – for example, facilitating customer transitions to new devices.
- Forecasting and planning teams have also developed additional capabilities for sales and inventory estimates of refurbished devices.

To support customer adoption of refurbished laptops, HP focuses on two levers:

- **Quality guarantee:** HP enforces strict quality standards for its refurbishment partners. Requirements include the use

of OEM-approved parts, comprehensive functional testing and repairs, data wiping compliant with NIST guidelines, and firmware updated to the most current version.

- **Sustainability targets:** HP helps customers extend IT asset lifespans, supporting their customers' circularity goals.

Key enablers

Cybersecurity and data cleanup protocols guarantee safety and good-as-new devices. Traceability of certifications with partners is also key.

Regulation and public procurement are major circularity drivers. HP launched the programme in France and India, where policies support sustainability. In France, 20% of public procurement must be for equipment with reused or recycled content.

Impact

Total lifetime value has grown as product extension offerings, repair, refurbishment and warranties generate service revenues, while residual value is recovered through the reuse of parts and recycling materials at the end of life of a product.

Cost-based pricing enables HP customers to reduce upfront costs and optimize the total cost of ownership (TCO) over a longer life cycle.

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Acknowledgements

The World Economic Forum and Bain & Company would like to thank the following organizations for their valuable contributions. While individuals from the organizations acknowledged on the following pages provided significant input to the development of this report, their participation does not necessarily imply their own or their organization's endorsement of the report's contents or recommendations.

African Circular Economy Network

Alshaya Group

Beko Corporate

Circulor

Closed Loop Partners

Cognizant

Colt Technology Services

DePoly

DHL

Dockflow

Elkj p Nordic

Enpal

Free Pack Net

Gemini Corporation

GeSi

Google

Green Mining

GreenPlat

Hitachi

IBM

International Organization for Standardization

Jabil

Karo Sambhav

Korea Zinc

KTH Royal Institute of Technology

Lenovo

Logitech

Manchester Fashion Institute, Manchester Metropolitan University

Novo Nordisk

Re (Return, Refill, Repeat)

Recykal

Regeneration.VC

Rockwell Automation

Rwanda Environment Management Authority

Schneider Electric

Sidley Austin

Siemens

Sitra

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Trane

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Endnotes

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