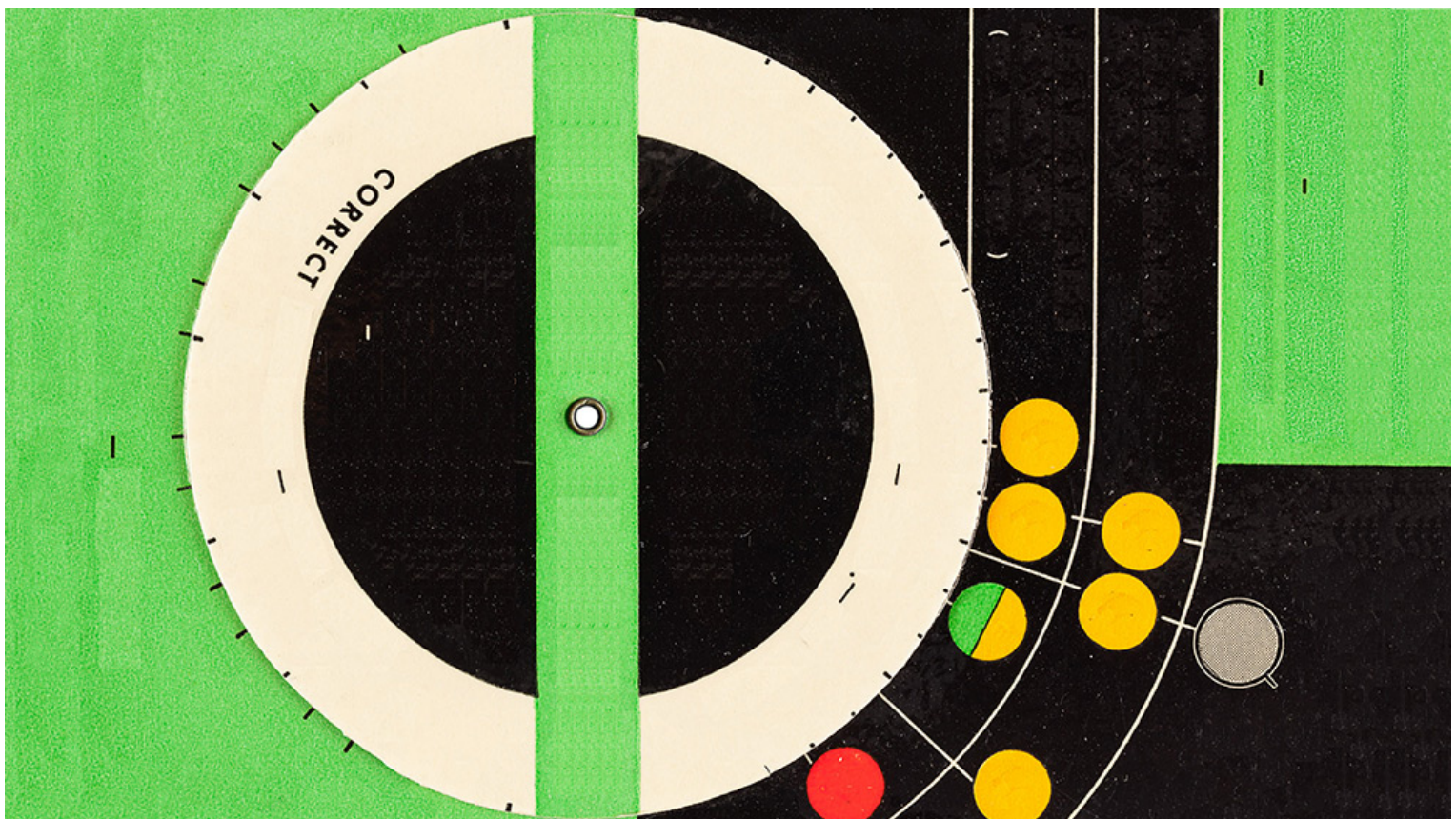


# **The Circular Business Model**

by Atalay Atasü, Céline Dumas, and Luk N. Van Wassenhove

From the Magazine (July–August 2021)



Andy Mattern

**Summary.** More and more manufacturing companies are talking about what's often called the circular economy—in which businesses can create supply chains that recover or recycle the resources used to create their products. Shrinking their environmental footprint,... [more](#)

**It's easy to see why** more and more manufacturing companies are talking about what's often called the circular economy—in which businesses create supply chains that recover or recycle the resources used to create their products. Shrinking their

environmental footprint, trimming operational waste, and using expensive resources more efficiently are certainly appealing to CEOs.



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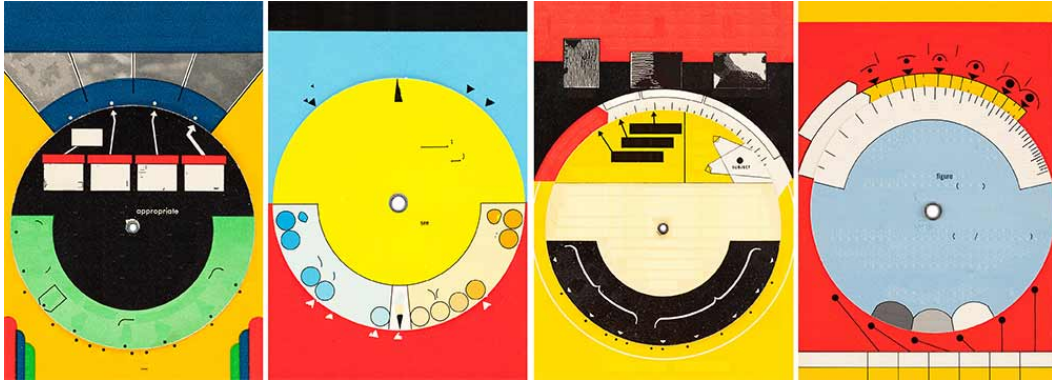
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But creating a circular business model is challenging, and taking the wrong approach can be expensive. Consider the case of Interface, an Atlanta-based commercial flooring company. In the 1990s its founder and CEO, Ray Anderson, declared that he wanted Interface to become “the first sustainable corporation in the world.” To achieve that, the company would shift its business model from selling to leasing. It launched the Evergreen Services Agreement (ESA) program, with installation, maintenance, and removal of its flooring bundled under one monthly fee, making it possible for the company to keep used flooring materials out of landfills and recycle the valuable raw materials in them.

This unprecedented move was intended to close the loop of the commercial-carpeting supply chain, and Interface pushed hard to make it work, even going so far as to develop a network of carpet distributors to service clients across the United States on behalf of the company. But after seven years of strenuous sales efforts, Interface had acquired just a handful of lessees. The overwhelming majority of customers preferred to buy rather than lease their carpets, because carpet maintenance fell under the general heading of janitorial services, rendering its costs invisible to them. They could not easily see the upside to paying fairly high monthly fees. The ESA program was simply not scalable.

Happily, that wasn’t the end of the story. In 2000 Interface shifted its focus from long-term leases to producing modular carpet tiles using sustainable materials, such as recyclable nylon fibers and recyclable vinyl backings. And as it turned out, manufacturing

the new carpet tiles emitted 75% less carbon than the industry average. Combined with a transition to renewable energy on production sites, these innovations have shrunk Interface's total carbon footprint by 69%, according to company reports. Unlike leasing, the focus on recycling has leveraged what Interface does best: manufacturing and selling carpets.



Andy Mattern

Interface's experience shows that creating a sustainable circular business model depends on many factors, but perhaps the most important is choosing a pathway that aligns with a company's capabilities and resources—and one that addresses the constraints on its operations. In the following pages we identify the three basic strategies for circularity and offer a tool to help manufacturers identify which is most likely to be economically sustainable for them. Our recommendations draw on decades of research and consulting with dozens of manufacturers across the world.

### Three Strategies for Circularity

Manufacturing companies—from the producers of products that serve the new economy to the more traditional companies that provide our clothing and furnishings—can create a circular business model in many ways. Most involve a combination of three basic strategies.

**Retain product ownership (RPO).** In the classic version of this approach, the producer rents or leases its product to the customer rather than selling it. Thus the producer is responsible for products when consumers have finished with them.

RPO is an interesting strategy for companies that offer complex products with a lot of embedded value. A good example is Xerox, which has for a long time leased its printers and photocopiers to corporate customers. This strategy may require companies to invest heavily in after-sales and maintenance capabilities, which may be more expensive for them and, ultimately, their customers than a strategy of sell and replace.

RPO can also work with simpler products when they are relatively expensive and seldom needed. For instance, promgoers have been renting tuxedos for decades, and the rental model is becoming more prevalent in an increasingly status-conscious society. The online fashion subscription service Rent the Runway, for example, rents designer clothes to people in need of a smart outfit for a one-off event. Its clothes may have little intrinsic value—in terms of their raw materials, for example—but their brand value can be significant.

**Product life extension (PLE).** Companies applying this strategy focus on designing products to last longer, which may open up possibilities for markets in used products. Because a longer product lifespan means fewer purchases over time, this may seem like a bad idea for original-equipment manufacturers. But durability is a key competitive differentiator and provides a strong rationale for premium pricing, as we've seen with the outdoor-clothing manufacturer Patagonia and the luxury home-appliance company Miele. PLE can also help companies prevent their customers from defecting to a rival brand. Bosch Power Tools, for example, extends the life of its used tools by remanufacturing them, thereby enabling it to compete with new products from low-cost, low-quality producers.

**Design for recycling (DFR).** Companies applying this strategy redesign their products and manufacturing processes to maximize recoverability of the materials involved for use in new products. This strategy often involves partnering with companies that have specific technological expertise or that may be best able to use the materials recovered. Adidas's six-year partnership with

Parley for the Oceans is an example. Parley uses plastic waste to make textile thread from which Adidas manufactures its shoes and apparel. Their partnership reduces the amount of plastic waste in the world's oceans.

Determining which combination of the three basic strategies will unlock the most value for your company involves some practical and very specific questions, such as whether you can reclaim your product from the customer, whether it can be moved, and whether you can remanufacture it. Let's look now at how best to structure that discussion.

### **The Circularity Matrix**

A circular business model is sustainable only if value can be economically recovered from the product. It might be realized through reusing the product, thereby extending the value of the materials and energy put into the manufacturing process, or by breaking it down into components or raw materials to be recycled for some other use. Value needn't be tangible, of course; as demonstrated by designer clothing, it is possible to create a circular business model in which value is almost entirely intangible.

In general, the greater the value locked into a product—whether in terms of its brand cachet, the resources consumed in manufacturing it, or the premium customers might pay for an environmentally friendly product—the greater the potential for creating a circular business model around it. External factors, such as regulations, secondary markets in used products, or active markets in commodity components, will also determine how much value manufacturers can extract from a circular model.

**High-value products that are easy to access and to process are ideal for circularity: They require no**



## significant business model change.

It is, however, difficult to know just how much of that value a circular business model could unlock. The Slovenian white-goods company Gorenje attempted to lease its washing machines, which would seem to be a plausible strategy for the product. Washing machines can last a long time, and their useful lives can be extended with careful maintenance. But consumers were sensitive to the fact that they would pay more over the life of the lease than they would to own the machines, while the services they expected from a leasing contract cost more than Gorenje was willing to spend on maintenance.

Assessing the feasibility of a given circularity strategy requires a careful calculation of value and costs and a certain amount of experimentation and piloting. However, companies can clarify their thinking by answering just two questions:

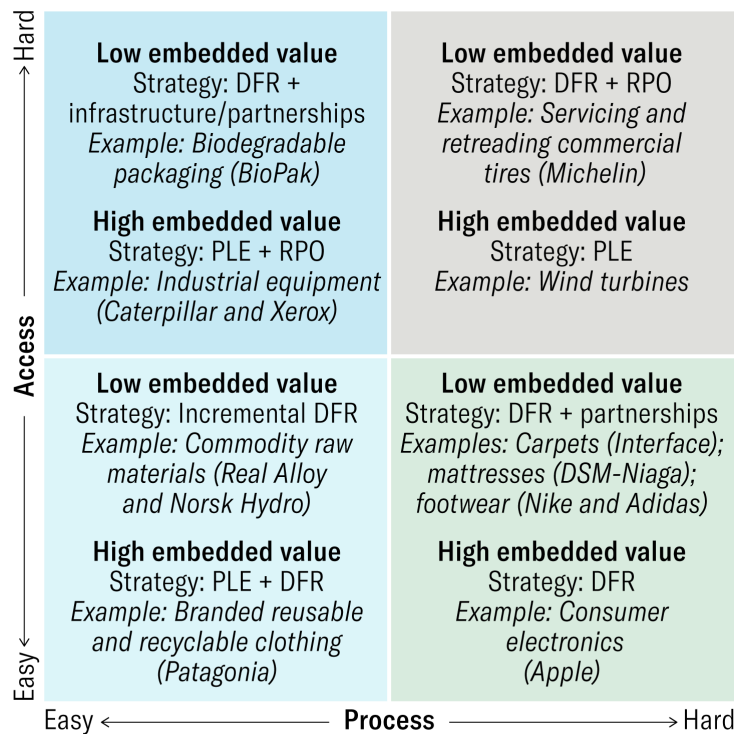
**1. How easy is it to get my product back?** In Norway more than 97% of plastic bottles are recycled. That's because Norwegians are unusually enthusiastic about recycling—and also because a large retail network (including reverse vending machines) exists for bottle collection, supported by a government-run deposit-refund scheme. In other words, Norway has two key elements for making reverse supply chains work: public participation and infrastructure. Without them, access to used products for circularity can be challenging, as indicated by much lower rates of plastic-bottle collection and recycling in other parts of the world. Another element to consider is the existence of secondary markets in used products and commodity markets into which extracted raw materials can be sold. Consumers will naturally be reluctant to relinquish used products with a high resale or exchange value (such as power tools and construction equipment), making it difficult for original sellers to close the circle. In those cases accessing used products might involve expensive buyback or trade-in programs, which is precisely why companies often consider a leasing business model: It is easier to recover products if you own them.

**2. How easy is it to recover value from my product?** Extremely heavy or bulky products and those containing potentially hazardous materials may be easy for producers to reclaim legally but difficult and expensive to move and recondition. In a reverse supply chain, moving a washing machine, for example, will clearly be much harder and more expensive than moving an ink cartridge. It is also difficult to recover value when products are intricately constructed. Advanced smartphones and laptops, for instance, are less easily reconstituted than coarser-grained, modular devices such as desktop computers. Finally, the feasibility of value recovery will depend on the availability of cost-effective solutions for reformulating products. If time-intensive manual labor is required, used products must have enough value left in them to justify the investment.

The answers to those two questions help identify where a company belongs in a two-by-two matrix that presents the strategic options for creating a circular business model. Let's look now at each quadrant.

# The Circularity Matrix

For companies looking to create circular business models for their products, the right model will involve one or more of three basic strategies: retain product ownership (RPO), product life extension (PLE), and design for recycling (DFR). The right strategy can be determined by how easily the manufacturer can get the product back and how easily value can be recovered from it. The challenges each company faces along each dimension will depend on its capabilities and competitive context and may change in response to innovations it and its competitors make.



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**Hard to access and hard to process.** Products in the top right quadrant may experience a level of wear and tear that precludes easy repair and remanufacturing, taking product life extension off the table, especially for products with relatively little value locked up in them. Those that are in good condition and still usable may also have a high resale value in customer-to-customer secondary markets, making it harder for the manufacturer to access them for reconditioning. To prevent the loss of the value embedded in them, we advise manufacturers to consider a combination of design for recycling and retain product ownership.



The French tire manufacturer Michelin seems to be heading down that pathway, although it has not explicitly linked the two strategies. Along with committing to use 80% sustainable materials in its manufacturing, the company has acquired Lehigh Technologies, a Georgia-based maker of environmentally friendly rubber powders produced from ground-down end-of-life tires. Meanwhile, it is pivoting to RPO in many B2B markets, promising commercial fleets performance enhancements and cost savings for leasing tires. To deliver those benefits, Michelin's leasing businesses rely on modern information technologies. Its Effifuel division, for example, installs digital sensors in vehicles to monitor carbon emissions, fuel efficiency, and other performance metrics.

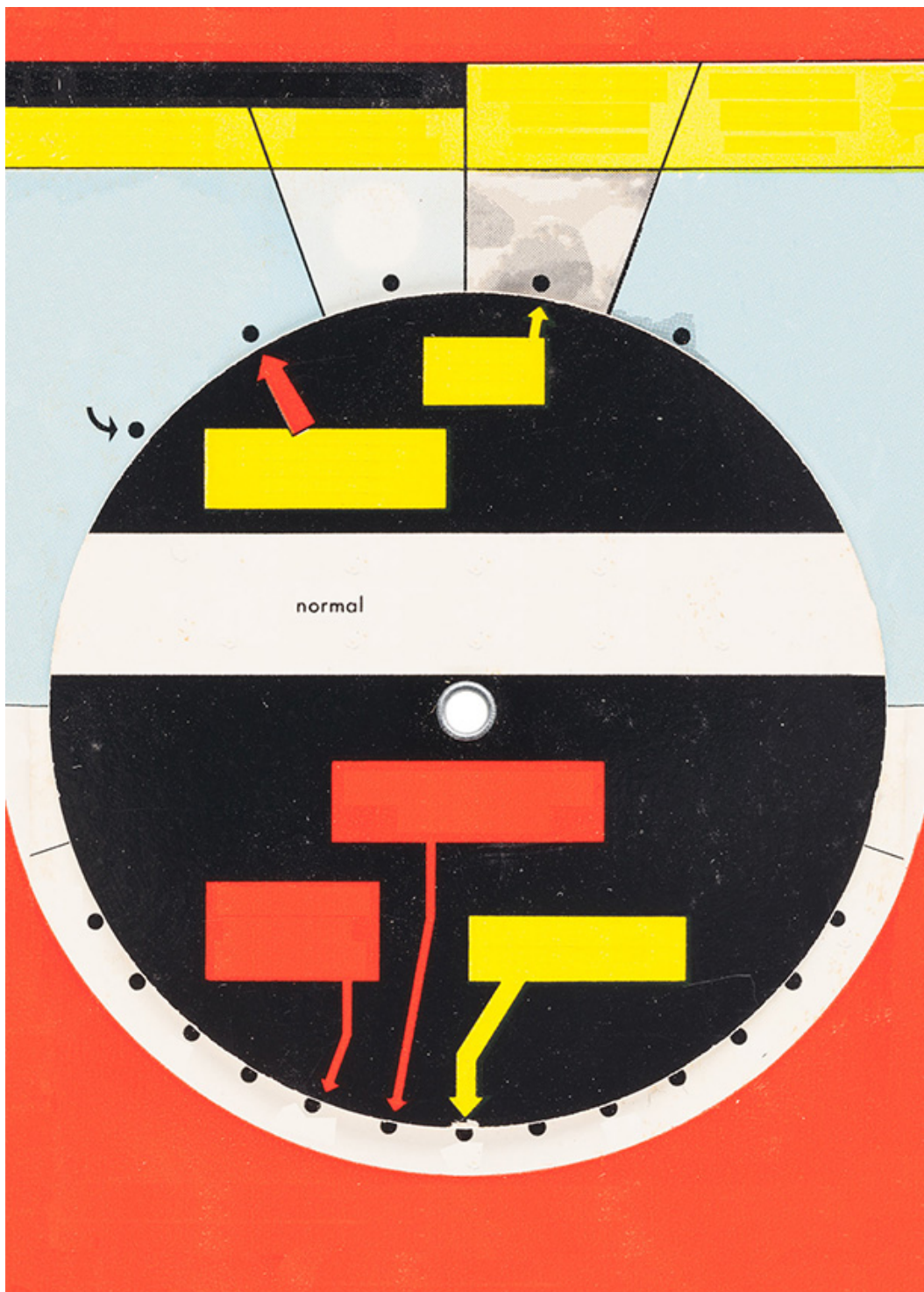
For companies in this quadrant, going circular may have low value potential even with expensive products containing lots of valuable ingredients. Wind turbines provide an extreme example: Although a lot of value was expended in creating them, their remote locations and size make them very difficult to access, while their composition and complex architecture make it hard to extract reusable materials or components. That's why we see wind turbines piling up in desert landfills.

That doesn't mean turbine companies should give up on circularity, but they should begin by considering how they can unlock value from the product through a strategy of product life extension. By investing in durability and modularity so that products will last longer and can be more easily maintained, companies could potentially open the door to an RPO model, whereby turbine manufacturers, rather than power companies, would retain ownership of and responsibility for the turbines. In the longer term they might be able to adopt a DFR strategy, making the turbines less reliant on nonrecyclable materials and easier to dismantle.

**Easy to access but hard to process.** The bottom right quadrant includes relatively low-embedded-value products such as carpets, mattresses, and athletic footwear. On the one hand, ease of

portability and the absence of a lucrative secondary market create a strong likelihood that these products can be recouped from the consumer. On the other hand, they can't be easily reconditioned, and extracting materials from them is complex.

In such cases, going circular will involve product design for recycling. DSM-Niaga, a Dutch start-up founded in 2014, developed a fully recyclable mattress consisting of six modular components, and carpets made from pure polyester rather than the industry-standard materials, which contain an indissoluble complex of chemicals including many known carcinogens. The mattress is easy to disassemble, allowing for easier maintenance (for example, the mattress covers are removable and washable), and the raw materials can be recycled at the end of the mattress's life. The homogenous design of carpets significantly facilitates material recovery and reduces the water and energy needed in the production process. The new carpets are also lighter, making transport and handling easier.



From about 1940 to 1980 Kodak produced thousands of “Kodaguides” meant to help photographers take better pictures. Andy Mattern digitally obscured the technical numbers and explanatory text of these once ubiquitous guides, leaving them as springboards for interpretation. Andy Mattern

When products have relatively low value, companies—even very big ones—may need to find partners to make circularity work. Adidas, as noted earlier, provides one example. Its archrival Nike also works with partners: Nike Grind takes used athletic shoes and recycles them into materials for entirely new products, such as

AstroTurf's playing fields and Future Foam's carpet padding. We see similar initiatives in other industries, from consumer goods to electronics.

Products in this quadrant include many small high-tech devices, such as smartphones, which have a lot of highly integrated components, toxic materials that are difficult to extract, and very short life cycles. These products typically have busy secondary markets, which is positive from an overall environmental perspective but impedes original manufacturers' access to them.

That is less a problem for the main manufacturers of high-tech consumer electronics. They often become the anchors in an industry ecosystem that creates exit barriers for device owners, thus lowering access barriers for the manufacturers. Apple is perhaps the definitive example. Customers buy, repair, and trade in their devices at Apple's own retail outlets, and their activity on those devices generates data that Apple owns. Of course, iPhones and iPads have an active secondary market, which normally would limit the company's recovery of them—but the speedy rollout of next-generation products and trade-in rebates incentivize consumers to relinquish their old Apple devices in exchange for discounted upgrades.

The easy access afforded by the dynamics of their ecosystems enables large-device manufacturers to invest heavily in DFR as their pathway to circularity. In 2018 Apple introduced Daisy, a robot capable of disassembling up to 200 iPhones an hour to recover valuable materials such as cobalt, tin, and aluminum for use in brand-new phone components.

**Hard to access but easy to process.** The top left quadrant includes products whose use makes them difficult to retrieve. Takeout food packaging, for example, may contain easily recyclable materials but very often winds up in landfills because of the food residue on it, which is costly to remove. Here the strategy should be DFR, with a focus on the recovery infrastructure. The solution devised by the Australian food-packaging company BioPak was to introduce not only fully

compostable packaging but also a composting service extending to more than 2,000 postal codes across Australia and New Zealand, in partnership with local waste-management businesses. Customers can toss compostable packaging together with food scraps directly into an organic-waste bin for collection. BioPak claims that 660 tons of waste have been diverted from landfills as a result of the service.

As embedded value increases, secondary markets tend to appear; these can make access to products more difficult for the original manufacturer. RPO gets around the access problem, but it often proves challenging, even for companies whose products may seem well suited to an RPO strategy. One washing-machine producer we worked with abandoned its plans to offer a leasing option because of the expense of retrieving and transporting used machines to a company facility for remanufacture and reconditioning. Companies in a similar position often use traditional purchase plus a comprehensive service guarantee to extend product life.

The greater the embedded value, the more common are PLE and RPO combinations, because RPO both facilitates access to parts that would be extremely costly to rebuild from scratch and promotes consumer trust, thereby improving participation in trade-in and remanufacturing programs.

Caterpillar, the heavy-equipment company, provides multiple PLE options. Its Cat Reman program offers “same as new” parts and components over time, with an eye to extending the on-site life of each piece of equipment sold. Cat Certified Rebuild is a service whereby customers may return equipment at the end of its serviceable life for restoration to same-as-new condition. On CatUsed.com, customers can buy used equipment from licensed dealers, an excellent example of how a company can prevent high-value products from slipping beyond its reach via the secondary market. On the RPO side, Cat Financial provides various loan and lease options as alternatives to outright ownership. All these business models are supported in part by

Caterpillar's ability to monitor the condition of its products remotely, using digital technology and AI, so that it can intervene as necessary—a practice known as installed base management.

Xerox's business model actually encompasses all three basic circularity strategies. Its pay-per-use model both discourages frivolous usage, thereby prolonging the life of the machine, and allows Xerox to retain ownership of its products. The modular design of its copiers' inner workings, most of which are standardized for all models, also furthers PLE. Across product generations, Xerox recycles, reuses, and refurbishes standard components while changing the core imaging technology—thereby keeping machines in action longer. The company complements these approaches with an ambitious material-recycling program (DFR): It claims to be reducing its virgin-resource inputs by hundreds of tons a year, and the internal components of its machines are made from 100% recycled plastics.

**Easy to access and easy to process.** Products in the lower left quadrant are usually items or components for which a well-oiled recycling infrastructure already exists, as it does for plastic bottles in Norway. Many commodity raw materials also fall into this category. According to the Aluminum Association of the United States, almost 75% of all commercial-variety aluminum ever produced remains in use today. In countries that lack a formal infrastructure for retrieving and returning the metal to manufacturers, enterprising citizens often fill the gap, collecting cans and other discarded aluminum items to exchange for small amounts of cash.

Appropriate circularity strategies for this category will be based on expanding and streamlining processes that already work well. In the United States, Real Alloy, a leading producer of secondary aluminum, is experimenting with minimizing the amount of the metal that is lost to industrial by-products. Norsk Hydro, based in Oslo, one of the largest aluminum companies in the world, is attempting to address the same problem by reducing the quantity



of by-products generated in the production process. Incremental DFR innovations like these can make recycling systems even more efficient and profitable for companies.

High-value products that are easy both to access and to process are ideal for circularity, because they require neither a significant business model change nor efforts to facilitate material recovery. This category includes relatively lightweight products whose value lies in their brand rather than in what they're used for or what they're made from. Here there is plenty of scope for companies not already in the circular economy to contemplate entering it.

Patagonia, for example, has parlayed its famed sustainability principles into a used-clothing line for socially conscious consumers. Launched in 2017, the Patagonia Worn Wear initiative invites customers to send in their used Patagonia gear in return for store credit; the clothing is then repaired and resold on the Worn Wear website. Recently Patagonia Worn Wear added a line of hand-sewn clothing called ReCrafted, made from returned items the company considers beyond repair. The approach combines PLE with DFR. At this intersection "same as new" becomes a selling point, allowing Patagonia to tap operational efficiencies while burnishing its brand.

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The circularity matrix does not guarantee access to the circular economy. Success or failure with circularity will continue to depend heavily on the receptivity of top leaders, their commitment to sustainable business values, and the willingness of managers at every organizational level to change and adapt. Moreover, your direction will alter as you acquire new capabilities and as new technologies and regulations remove past constraints or impose new ones. But the matrix can help you identify at any one time the strategy best suited to your company's resources, capabilities, and competitive environment.

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