Closing the Loop

Insights on Takeback and Recovery from the Capital Equipment Coalition

U.S. Chamber of Commerce Foundation

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For an optimized circular economy, products that have reached the end of their first useful life must be able to be recovered, repaired or refurbished as needed, and put back into use. This essential step in keeping assets circulating creates new opportunities, requires companies to rethink how certain things are done, and remains an area of discovery and innovation across the capital equipment sector, from tech to healthcare to heavy manufacturing.

Some companies have set targets for product takeback and reuse, a core element of circular business models. Microsoft is aiming for (and on track to achieve) 90% reuse of all cloud-computing assets by 2025, and projects that this will translate to about $100M in savings. Dell Technologies has committed that, by 2030, for every product a customer buys, they will reuse or recycle an equivalent product. And GE has committed to supporting several wind turbine blade recycling projects to dismantle, shred, co-process and recycle the blades at the end of their lives.

Companies leading the transition to a circular economy are already taking a specific set of actions to enable greater levels of asset recovery. A recent discussion with the members of the Capital Equipment Coalition explored the current opportunities, challenges, and lessons learned through pilot testing and scaling takeback programs. Key themes are summarized here, with examples to illustrate key ideas.

Design for Circularity

Not all takeback strategies take place at the end of the asset's life. In fact, some important ones come as early as the design phase. Getting products back after their first useful life starts with designing them for reuse and recovery. Here are examples of ways that companies are using design to impact the whole life cycle of a product.

Get the right group of people involved in the design process from different parts of the company to design a product for complete circularity.

For their Hospital Patient Monitoring takeback pilot, Philips brought together team members from Sustainability, Experience Design, Innovation and Strategy, and experts from different departments within Engineering Solutions. This enabled a robust design process that benefited from a broad range of expertise and perspectives, while staying grounded in the practical requirements of the product.

Create product designs that anticipate accommodating reused parts and supporting multiple uses.

Microsoft calls this 'a plan for every part' and considers it the foundation of the reverse supply chain model that their Circular Centers operate. This means that before a component is used in a product, there is already a plan for what will happen to it when that product reaches the end of its life. Similarly, Cisco's Circular Design Principles include a focus on design for disassembly, repair and reuse so that components can be easily separated at end of first use.

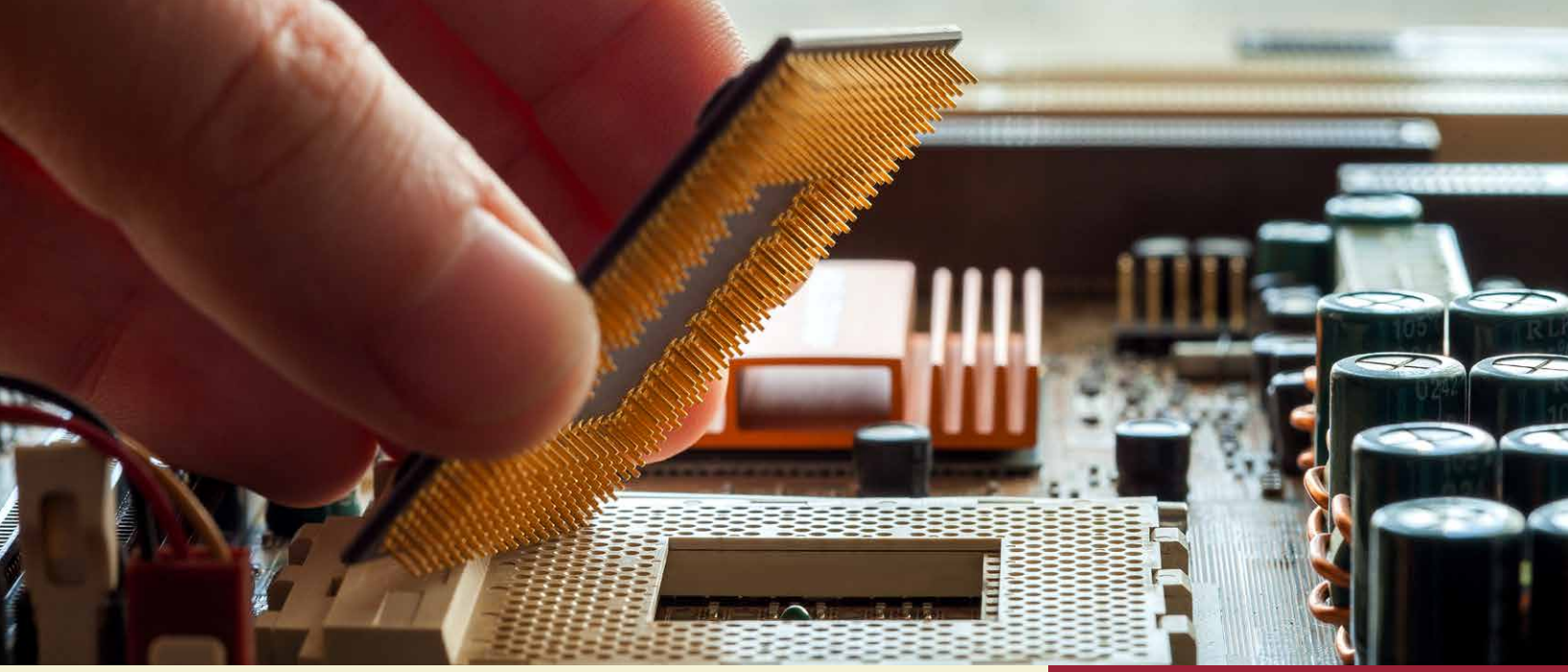
Take part in or create circularity networks.

The distribution of products requires various partners to be involved in the circular ecosystem, and this can be enabled and optimized via processes across companies and extended product information. It is worth noting that collaboration with small and midsize companies becomes very important for this scenario. Catena-X is one large initiative in this area.

Highlighted Challenge

Anticipating Economics and Environmental Impacts for Sub-Scale Systems

Many companies acknowledged that while they recognize the potential benefits of circular systems, current operations are highly optimized within the linear business model context. Even with robust measurement, circular pilots are often too small to provide high quality data about how a circular operation would perform at scale, both from an economic perspective as well as environmental impact. This presents a challenge to companies seeking to make the transition to circular business models: how to design and execute circular pilots and programs that can inform and validate designs for similar programs at scale?



Life Cycle Optimization

Use the Reuse Hierarchy to optimize the economics and environmental impacts of circularity.

The Reuse Hierarchy reflects the cascading value of the 'loops' from the Ellen MacArthur Foundation's Butterfly Diagram, and guides companies to always aim to keep products circulating at their highest value. For example, Dell prioritizes reusing whole products before breaking down into components for further reuse. Similarly, refurbishing and remanufacturing are prioritized before recycling for materials.

Decision models can help answer important questions about when to take products back and what to do with them.

As equipment ages, companies often have to weigh the environmental trade-offs of continuing to maintain and operate it or replace it with more efficient equipment. More comprehensive data can provide more precise insights into when this tipping point is reached. For example, Microsoft's Intelligent Disposition and Routing System, IDaRS, computes specific disposition routes for every decommissioned asset adhering to security and compliance policies, calculating optimal value recovery with sustainable outcomes.

Highlighted Challenge

Anticipating the Remaining Life of a Product or Component

It is relatively straightforward to establish when an asset or a component has reached the end of its current life. But how can companies get better at predicting how much life a product or component has left? The age of the item is not enough information to be able to make a solid estimation; information about usage time, conditions of usage, and other factors all influence the remaining 'life' left in an asset. One company working on this challenge is Philips, which is working to develop greater intelligence in this area by testing recovered assets and parts and gathering more information about the life of the asset.

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Adopting Circular Mindsets and Implications for Business Models

Connect circularity to customers' goals.

Jabil shared that if they know their customers have targets to reduce GHG emissions, for example, then that factors into how they optimize product design and usage through greater material efficiency, use of recycled materials, and extended product lifespan.

Educate and engage both consumers and supply chain partners.

Getting products back in time to retain the greatest value requires agreements and incentives with users and supply chain partners who handle equipment at the end of its life. Dell has structured a trade in program where customers receive instant credit towards a new Dell product when they send in an eligible device of any brand, not just Dell.

Shift from an "ownership mentality" to an "outcomes mentality" with customers.

Consumers have shifted towards outcome-driven models with Uber and Office 365 as examples and that behavior is now moving into the commercial asset space. DLL shared their observation that some businesses are reconsidering how they acquire and utilize essential assets, and in response they have developed a "Pay-per-use" model for businesses who see the "outcomes" provided via the asset as more valuable and important than ownership of the actual asset. In another example, the IT industry has shifted to offering 'as a Service' business models for hardware, software, and networking in the same way multiple other industries are changing from "ownership" to "outcomes" or "pay per use" mentality. This shift gives companies and their customers new ways to think about repair vs replace, quality vs cost, and offers a new angle to view the products/outcomes from a company.

Highlighted Challenge

Addressing Misaligned Incentives

The sales process for refurbished or remanufactured items can still look quite different from the one for new items, for example the payment of similar commissions on refurbished compared to new items. These sorts of misaligned incentives will undermine the ability of a company to transition to a circular business model if they are not addressed. Companies may also have concerns about cannibalizing their business for new products with their own remanufactured items, though some companies avoid this by targeting different market segments. For example, DLL has found that often companies can find secondary markets for their refurbished assets as a way to keep assets in use, but that the value proposition must be differentiated from new items. The shift in mindset toward outcomes/performance over ownership discussed above can also help align the supplier's and customer's interests and alleviate these concerns.

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Rethinking What Happens Where

It may not make sense, economically or environmentally, and it may not be possible legally to bring a recovered asset back to where it was originally manufactured in order to refurbish or remanufacture it. This raises new questions for companies about how to plan their circular business model activities.

Can or should remanufacturing happen at the same plants and on the same lines as new manufacture or does it need to happen at a dedicated plant?

Philips' recent Hospital Patient Monitoring pilot surfaced challenges with using the same equipment for remanufacturing, leading to exploration of a model which would use dedicated remanufacturing facilities distinct from primary manufacturing ones and disposition capabilities.

New ways of thinking about value and impact.

Jabil shared their approach of using "Value-Added Service Mapping" to get a better understanding of where things occur, where are our partners, where different expertise is currently located, what the carbon footprint is today, and what the implications are of implementing circular business models. What they found is that things will need to be moved around to better optimize operations as a circular system.

Centralized vs Decentralized Models.

One question raised by the optimization of circular operations is whether centralized or decentralized models are more efficient. While some degree of decentralization may end up being necessary due to restrictions of transboundary transport, the value of centralized circular operations with concentrated expertise and capabilities for remanufacturing and disposition may outweigh the added transport impacts, but this is a question companies continue to study and test.

Highlighted Challenge

Minimizing GHG emissions in a complex circular system

Circular business models for capital equipment raise a number of challenges in properly accounting for and allocating the lifetime GHG emissions of an asset. Factoring in reverse flows for remanufacturing and disposition, and the need to geographically optimize operations, further complicates the calculations of climate impact.

Legal and Safety Issues

A constant question in reuse and refurbishment, especially in healthcare and other heavily regulated sectors, is ‘how can we be sure this is safe and legal?’ In most parts of the world, the regulatory frameworks governing safety protocols and testing have not yet been updated to reflect the needs of the circular economy, creating challenges for businesses seeking to make the transition.

Testing.

Assuring the safety and performance of recovered or refurbished parts or devices will likely require new types of testing and certifications. As Patient Safety and Quality are highest priority in Philips, thorough quality assessment and controls for the re-use of equipment and parts are required and embedded in the circular initiatives for refurbishment and parts recovery.

Privacy protections.

One way that companies can protect user data is by enabling them to erase it themselves at the end of useful life. For example, Dell uses a lifecycle controller system to enable customers to sanitize their data from their own hardware prior to disposition. In some cases, there may be a need to be able to provide customers for each ‘life’ of an asset with assurance that their private data will be protected, while at the same time being able to retain and access certain types of data that will be needed for life cycle optimization and intelligent disposition. This is a topic that may be addressed at least in part by the concept of Digital Product Passports, which have been proposed as a requirement in the EU.

Understanding and updating regulatory approaches.

Where there are regulatory barriers to using refurbished or remanufactured items, it will be important to conduct reviews and ask for clarifications of policies governing circular business operations so that businesses have the clarity they need to be able to plan their circular operations.

Highlighted Challenge

Restrictions on transboundary movement of materials

Restrictions on transboundary movement of materials, especially “waste” materials or materials with certain substances, can create challenges for takeback and refurbishment as companies need to move items between recovery and remanufacturing or recycling facilities. Policy will need to evolve to accommodate these sorts of movements, while continuing to protect against inappropriate material dumping or other abuses.

Looking Forward

Making decisions about and optimizing takeback requires good data, which means timely, accurate, data captured according to a common standard. Recent movements towards the implementation of Digital Product Passports, such as the EU's release of recommendations at the end of March, are a potential enabler of improvements and optimization across the life cycle for capital equipment, including design for recovery, takeback and end of life/ next life planning. This has the potential to be a gamechanger, but data is still just one piece of the puzzle. Companies need to continue to study, pilot, and innovate business, sales and manufacturing processes, while addressing potential barriers of mindsets and legal and safety issues.

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