

# Designing Electronics for a Circular Economy

At Teleplan, we are committed to helping companies advance the circular economy for electronics through innovative diagnostic, repair and value recovery solutions. As we support customers on their circular economy journey, we've found that many of them realize that optimal 'circularity' starts at the product design stage. This white paper outlines some of our observations of best practices in electronics design for a circular economy.

## The New Math of Increased Product Returns

**Traditionally, product design has focused on balancing use, attractiveness and manufacturing costs. Some companies also designed products for 'serviceability' to lower costs and shorten lead times for broken products returned through warranty claims. With increased interest in the circular economy, however, we see more and more companies throughout the value chain moving beyond just warranty support to actively collecting back all electronic products through approaches such as product-as-a-service and trade-in programs. While some collection actions are primarily driven by regulatory requirements such as WEEE in Europe, our clients are also finding that taking back products helps them increase value recovery, reduce risk and improve both their customer relationships and overall margins.**

Increased collection volumes significantly improve the "math" of product design for the aftermarket. As an example, refurbishing the finish of a set-top box console versus replacing the casing entirely with a new one can save up to 50% of the cost. "It used to be that the business case was based on the volume of failures, which were hopefully quite low", said Martin Fahie, Teleplan Global CPE Process Engineer. "But we're seeing more companies move to a leasing model or other product-as-a-service models. This means the replacement costs of a device are no longer based on just 5% of the products coming back, but close to 100% over time - or more than 100% in effect, as there can be more than two return/reuse cycles. At that point, the economics are even more compelling to initially design products for repair and refurbishment, as well as recycling."

## Hardware Design

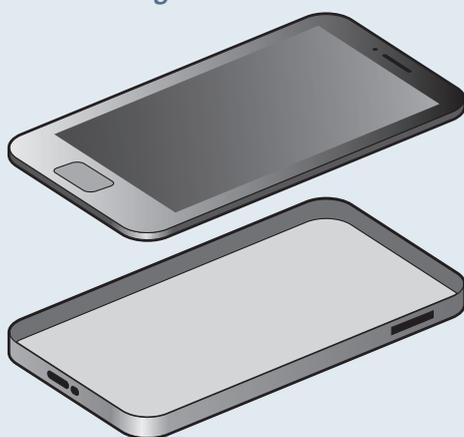
Here at Teleplan, we've found that in many cases, electronics are not designed for more than one use. "When you design products, plan for the product breaking and/or eventually no longer being used by the first customer," observed Karel Kotek, Teleplan Kiosk and Fulfillment Leader. "Today, most companies design products to be replaced, not upgraded, and that's simply a waste," adds Adrian Manson, Teleplan Technical Program Manager.

Examples:

- Glossy casing or varnish on the outside that easily scratches during customer use or return shipment
- Component materials that cannot be recycled into other valuable products
- Unlabeled parts or accessories that cannot be easily identified and thus, cannot be resold in the market

Whilst designing, products can of course require trade-offs, these are just a few general guidelines for ways design can improve the repairability, upgradability and recycling of electronics products

### Covers and Casing

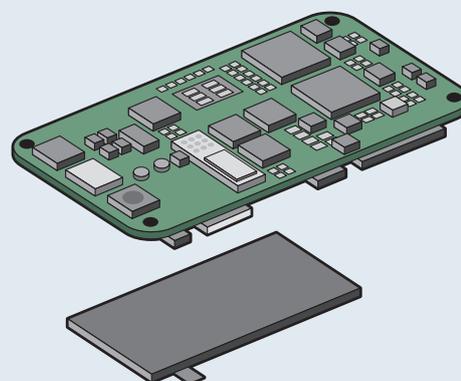


- 'Clip-on/off' or 'snap-on/off' covers and casing that do not break easily when manipulated, rather than screws. This facilitates access to components and reduces touch time associated with unscrewing and screwing back. If screws are necessary, the lesser the better, and it is advisable to use same or similar torque specification on all types of screws and standard screw types
- If painted, matte paint finish for covers and neutral colors such as grey that are less prone marking to reduce the level of cosmetic non-compliance and finish that can be achieved through spraying techniques. Paint should be recyclable (i.e. non-toxic), and should maintain its color integrity even under long-term light exposure
- Cosmetic parts made of nano materials (that can recover scratches by themselves)
- For products that will remain in one place, 'smooth' cover design that eases cleaning process and is not prone to trap and accumulate dirt

### Overall Product and Packaging

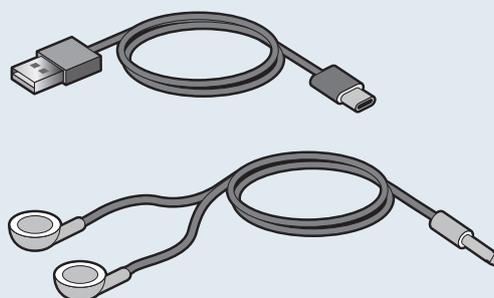
- Light and compact designs that will reduce freight costs
- Standardized device shape and dimensions to maximize protection of device when returning
- Standardized packaging boxes for all models, easy to open and close again for re-use (e.g. in the case of a remorse return – especially common in direct sale channels)

### Components



- Similar screws, requiring similar force to unscrew and other standardized components (nonproprietary)
- Disassembly requires as few tools as possible
- No glue
- Components should be easy to identify
- Removal of lithium-ion batteries should be quick and easy before recycling or transport, as governments often classify broken products as waste and batteries as hazardous material
- Standardize accessories across models (e.g. chargers)
- Removal of PCBA board

### Accessories



- Modular approach and/or easy access to key components, especially highest failure rate components
- Standard cables that can be re-used and/or resold
- Part numbers on all parts

## Software for a Circular Economy

Although it's not often discussed, electronics design is not just about the hardware; software design can help increase product circularity, too. Our engineers provided the following best practices for software design for electronics circularity:

- Pre-loading diagnostic software onto the product to save on repair time, allowing technicians to make decisions as quickly and as close to the customer as possible to avoid 'no fault found' returns.
- Ensuring regular upgrades can be completed even with network interruptions and not "break the product, thus requiring its return/repair.
- Where applicable, designing products such that upgrading and replacing software and firmware can be done through a port, rather than direct connection to the memory, saving time and labor costs.

Software can even give a product an entirely new 'lease on life' in the market. Developing generic firmware that could be loaded onto a product after its initial "branded" uses can avoid the need to directly recycle a product after it is considered obsolete by its initial customer (this requires removable logos on the hardware, too), and thus increase the lifetime value of the product.

## When to Design for Circularity

Teleplan has found that design feedback for repair, refurbishment and recycling is most helpful during the initial product conceptualizing, but quick fixes can still be found during the prototyping phase. One checkpoint is provided by Hugo Wentzel, Director of Value Recovery Services: "Write up the testing and repair process at the time the product launches - that will give you a good idea of what you'll be dealing with upon product return." In particular, for most companies, the marketing team for the company owning the product brand has a large amount of input into initial design, but with some training they can help advocate for initial marketing and re-marketing requirements. For those companies who are not the brand owner (or the Original Design Manufacturer, or ODM), contractual obligations should be included by each party in the value chain to ensure the initial design accounts for product reuse as much as possible.

## Call to all Product Designers

Design for a circular economy helps electronics companies increase value recovery, reduce risk and improve both their customer relationships and overall margins. Aftermarket services providers – such as Teleplan – can usually help brand owners, ODMs, and retailers realize entirely new circular economy product design opportunities. "It can be hard to create optimal circular flow (and the associated benefits) for a product that wasn't initially designed for circularity. Engage designers to consider the entire circular flow from the start, and the benefits will soon follow," advises Xavier Hubert, Teleplan Global Director Market Offering.

For more information visit [www.teleplan.com](http://www.teleplan.com) or email [tellmemore@teleplan.com](mailto:tellmemore@teleplan.com)

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