

CIRCULAR PRODUCT DESIGN FRAMEWORK

STRATEGIES TO DESIGN TECHNICAL PRODUCTS THAT LAST

WHY DO YOU NEED IT?

Decisions made early in the manufacturing process crucially impact how products and services are used and later, handled at end of life. Design has typically been part of the problem, but it has the potential to be part of the solution¹. The practice of design has evolved rapidly in recent years, with sustainability playing an increasingly important role². Multiple concepts have emerged regarding the place of sustainability in the design process: 'green-design', 'eco-design', 'sustainable design', for example. These approaches ultimately aim to decrease damage to the environment and consequently, society as a whole¹. Design also sits prominently at the heart of the circular economy³.

Yet confusion over the aims and goals of circular design may shape different understandings of the concept. Even once there is a clear understanding of circular design, it may still be challenging to initiate change. Where problems in the linear design process may be based on simple relations, circular design is rooted in complex problem solving and it is based on a systems thinking approach⁴. Each set of elements and patterns is unique; this complexity makes identifying a starting point for action challenging.



WHAT IS IT?

The Circular Product Design Framework proposes a list of 14 strategies for creating technical products that last. These are clustered into four groups: design for reuse, design for refurbishment, design for remanufacture and design for recyclability based on the 5R Framework. The strategies can be plugged into a comprehensive circular product strategy applicable to different industries and at different scales.

WHO IS IT FOR?

This framework aims to inspire individuals and organisations involved in the product design process to integrate circular design. As a circular design beginner, this framework provides insights and introduces key strategies. For users already familiar with the basics, this framework will showcase further options for a 'deep dive' into circular design.

The design profession has been evolving rapidly over recent years, resulting in a variety of roles, departments and sectors under the umbrella of design professionals. The shift towards a circular economy is, however, a holistic approach, meaning that anyone involved in (re-) creating materials, products, services, business, strategy or policy can benefit from using circular design methodologies.

This framework, therefore, applies to any individual looking to change the current status quo and redesign their products to last. This could be a consumer electronics designer looking to find the right strategy to connect to their consumers to reuse a product, or a furniture designer eager to redefine the lifespan of a product for an everlasting experience.

HOW CAN IT BE USED IN PRACTICE?

The framework's strategies can be used to identify and understand opportunities for circular design. It is especially useful in conjunction with other frameworks to provide direction for complex problem-solving.

- The product as a whole:

Once a design strategy has been selected, the Circular Product Design Framework can be used alongside the Circular Product Strategies Framework (coming soon) which provides a holistic set of strategies to render your product more circular. The Circular Product Strategies Framework is based on the [Key Elements Framework](#), of which Design for the Future is one of the elements. The Circular Product Design Framework and the Circular Product Strategies overlap in the Design for the Future element.

- The strategy at different innovation levels:

The Circular Design Framework can also be used to study the effect of strategies at different innovation levels, pointing towards multiple starting points for circular projects. These different innovation levels and their brief descriptions are:

- Material level: Create new materials and the components made from these materials, or redesign existing materials.
- Product level: Improve existing products or develop completely new product solutions.
- Service level: Go beyond individual products and towards combinations of products and services.
- System level: Consider the interconnected set of elements that are coherently organized to achieve a function or purpose⁵.

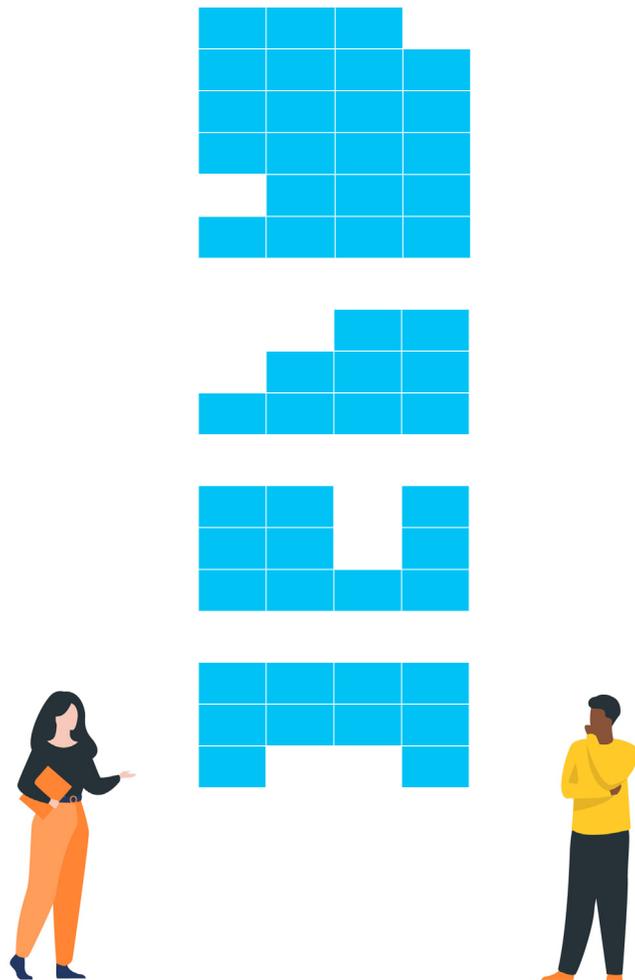
All four levels are intertwined, yet each has its focus areas. This means there is no hierarchy and design decisions on one level can impact outcomes on other levels.

- Examples of Use Cases:

Most recently, the framework was used in our Circularity in Depth workshops. These were facilitated for several Small and Medium-size Enterprises in Cornwall, in partnership with the Cornwall-based initiative [TEVI](#), which focuses on economic and environmental growth. The framework will also soon be integrated into our Circle Workshop Suite's business innovation and design workshops.

HOW WAS IT DEVELOPED?

Circle Economy's Key Elements of the circular economy framework, and specifically the Design for the Future element, were the starting point for this framework. Through extensive benchmark research in three main areas—design definitions, design principles and design strategies—commonalities and differences between other existing frameworks were identified and aligned under a renewed framework. Then, they were divided by circular design strategies and intervention levels. These outcomes underline the general relevance of the design strategies, which also allow for flexibility of interpretation among different design professions.



DISCUSSION

The concepts of design and the circular economy provide opportunities, but they're not answers. The field of circular design is continuously evolving: strategies are not absolute or exclusive, and they are subject to change. Understanding this ambiguity is important in adopting solutions that are fit for a sustainable future.

The strategies in this research have focused on the technological cycle of the circular economy, not on the biological cycle. In order to gain an holistic perspective of material flows for product design, further research should provide perspectives on the interaction between technological and biological cycles in product design. The strategies in this research have focused on products that 'last', as opposed to products that flow, further research should provide perspectives on the overlap between these two product categories as well.

Further, having established circular strategies for product design, the relation and impact of the relationship between products and users is yet to be defined; by further questioning how to create the best solutions that ensure that products that last are used until exhausted and rightfully discarded at their end-of-life.

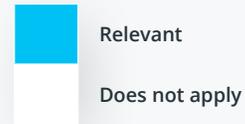
Design is as much of an activity, a discipline, a profession as it is an end result. Industry specific definitions in the field of the design see further segregation in useful approaches and applications. Respecting the individual fields of expertise, the above design strategies are to facilitate a consolidated, common ground.

WANT TO GET INVOLVED?

This framework is under constant iteration. We are always looking to improve based on feedback from practical use of the framework. Please let us know your feedback!

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DESIGN STRATEGY RELEVANCE ACROSS INNOVATION LEVELS



DESIGN FOR REUSE

- Reuse by another consumer of discarded product which is still in good condition and fulfils its original function.
- Designing products to be reused for the same or different purposes in multiple lifecycles.

	SYSTEM	SERVICE	PRODUCT	MATERIAL
Design for maintainability	Relevant	Relevant	Relevant	Does not apply
Design for repairability	Relevant	Relevant	Relevant	Relevant
Design for collaborative consumption	Relevant	Relevant	Relevant	Relevant
Design for product attachment, emotional durability	Relevant	Relevant	Relevant	Relevant
Design for physical durability	Does not apply	Relevant	Relevant	Relevant
Design for adaptability & flexibility	Relevant	Relevant	Relevant	Relevant

Design for maintainability

Design for repairability

Design for collaborative consumption

Design for product attachment, emotional durability

Design for physical durability

Design for adaptability & flexibility

DESIGN FOR REFURBISHMENT

- Restore an old product and bring it up to date.

	SYSTEM	SERVICE	PRODUCT	MATERIAL
Design for upgradeability	Does not apply	Does not apply	Relevant	Relevant
Design for standardisation and compatibility	Does not apply	Relevant	Relevant	Relevant
Design for disassembly	Relevant	Relevant	Relevant	Relevant

Design for upgradeability

Design for standardisation and compatibility

Design for disassembly

DESIGN FOR REMANUFACTURE

- Use parts of discarded product in a new product.

	SYSTEM	SERVICE	PRODUCT	MATERIAL
Design for modularity	Relevant	Relevant	Does not apply	Relevant
Design for minimal waste	Relevant	Relevant	Does not apply	Relevant
Design for resource efficiency	Relevant	Relevant	Relevant	Relevant

Design for modularity

Design for minimal waste

Design for resource efficiency

DESIGN FOR RECYCLABILITY

- Designing products to remove any barriers to recycling and enable easy recyclability.

	SYSTEM	SERVICE	PRODUCT	MATERIAL
Design with regenerative materials	Relevant	Relevant	Relevant	Relevant
Design with recycled materials	Relevant	Relevant	Relevant	Relevant
Design with mono-materials	Relevant	Does not apply	Does not apply	Relevant

Design with regenerative materials

Design with recycled materials

Design with mono-materials

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