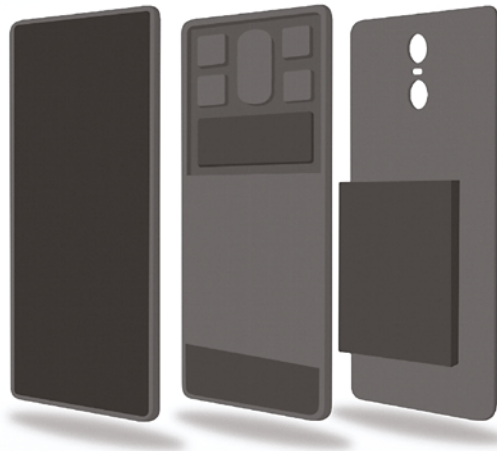


## MoDeSt

### Product circularity through modular design – strategies for long-lasting smartphones



#### Resource-efficient Circular Economy – Innovative Product Cycles (ReziProK)

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Modular smartphones have the potential both to reflect technical progress through upgrades and to meet changing consumer needs. This enables a longer service life, which reduces the number of devices and their environmental impact. In order to develop the positive potential of modular design and minimize undesirable consequences, “MoDeSt” develops technical, social and economic pre-conditions and solutions for modular concepts.



#### Extended use-time

According to Bitkom, at least 57 million people in Germany use a smartphone in 2019. Smartphones contain a variety of valuable metals, but also conflict resources. Most of the environmental impact is caused by the production of smartphones.

Modular smartphones require specific user skills, such as knowledge about repair options. This enables users to absorb technical innovations through upgrades, which pave the way to longer use-times. In order to exploit the positive potential of modular design and minimize negative effects such as increased consumption, the „MoDeSt“ project is investigating the technical, social and economic prerequisites for modular concepts and developing solutions for circular and socio-ecologically sound modular technologies.

#### Holistic approach

The innovative project involves a broad, transdisciplinary consortium. The integration of research and practice as well as technical and social science competences form the basis for a holistic approach to the research task.

The project is split into five closely interlinked work packages. First, conventional and modular smartphones are investigated and evaluated in the technical analysis with regard to various aspects of a circular economy. In the next step, life cycle assessments will be carried out

which, by means of scenario building, depict different usage, repair and disposal practices and evaluate them with regard to material and resource efficiency. Thus, user expectations and practices are investigated qualitatively and quantitatively. Existing business models for modular products are analysed and new approaches are developed.

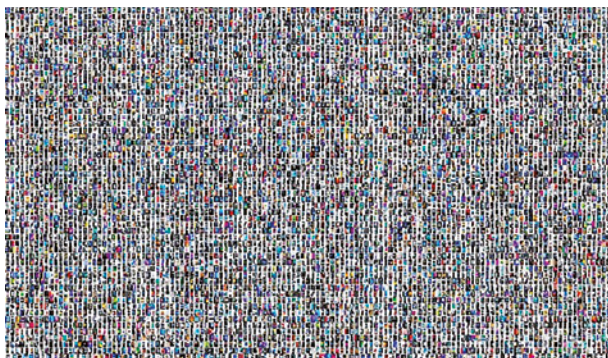
The modular approach will be further developed based on these joint findings on environmental, usage and business model-related issues. Concrete technical revisions as well as the development of general eco-design criteria for modular smartphones are aimed at.

#### First results

A review of the smartphone market since 2000 was conducted. This showed the enormous variety of models and manufacturers on the market, reaching its peak in 2014 with a total of 839 new models. Despite this multitude of different devices, a clear trend is visible regarding technical features. Besides the continuously increasing amount of memory and storage, higher display resolution and battery capacity seen in most devices, the market has developed towards significantly larger displays. This was the result of a better utilization of the front (screen-to-body-ratio), as well as larger, but flatter devices. Removable batteries, while being the norm a few years back, have become a niche product.

Smartphones are increasingly taking over features from other objects (e.g., alarm clocks and sound systems). Smartphones are thus modular in their role, but rather static from a technical point of view. Even sufficiency-oriented users are constantly discovering new features, then proceeding to integrate them into their everyday practices. Expectations regarding performance and features are generally high. Even ecologically-oriented users replace their devices if performance is not optimal anymore. Value-based communication, therefore, is not enough. Modular product service systems (PSS) should focus on the functional expectations and use patterns of different user groups.

Generally, different modular smartphone architectures are possible. These must be aligned with use patterns and business models. Similarly, PSS must also be designed in a modular manner to offer complementary services to prolong the active use time of the devices. Modularity has various advantages for all actors in the value chain. But ecological advantages are not a sure-fire success, but must become an overall strategy. Modular designs and PSS must also be supported by policymakers by taxing resource consumption to create conditions for a greater modularization of devices in supply chains and value creation models.



The variety on the smartphone market is enormous

## Involved partners and results

The transdisciplinary consortium comprises four scientific partners, Fraunhofer IZM, TU Berlin and the CSM of Leuphana University and IQD of Johannes Kepler Universität Linz (associated), as well as two industrial partners, SHIFT GmbH and AfB gGmbH.

The results of the project will be used to increase the distribution of modular devices on the market. They can serve manufacturers of smartphones as important development indicators. The results of the business model design can be used by manufacturers, sales partners and circular service providers to implement economic potentials of modularisation strategies and thus provide impulses for a longer service life. The methods applied can provide important impulses for participatory market research in the technology/ICT sector and promote the development of integrative circular economy strategies. Within the framework of scientific publications, the results are made available for the further development of the discourse on the transition to an integrative circular economy.

### Funding measure

Resource-efficient Circular Economy – Innovative Product Cycles (ReziProK)

As part of the FONA Field of action 6:

The circular economy – efficient use of raw materials, avoiding waste.

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P. 1: SHIFT 2019

Maksym Yemelyanov-stock.adobe.com

P. 2: TU Berlin 2020

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Page 1 picture: A view into the future: modular smartphones.

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“ReziProK” is part of the research concept “Resource-efficient Circular Economy” of the Federal Ministry of Education and Research (BMBF) as part of the FONA Field of action 6: “The circular economy – efficient use of raw materials, avoiding waste” and supports projects that develop business models, design concepts or digital technologies for closed product cycles.

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### PROJECT PARTNERS

SHIFT GmbH; TU Berlin, Fachgebiet Transdisziplinäre Nachhaltigkeitsforschung in der Elektronik; Leuphana Universität Lüneburg, Centre for Sustainability Management; AfB gemeinnützige GmbH; Johannes Kepler Universität Linz (JKU), Institute for Integrated Quality Design (associated partner)