

Sustainable Innovation 2019

22nd International Conference

Road to 2030: Sustainability, Business Models, Innovation and Design

4th – 5th March 2019

University for the Creative Arts

Business School

Epsom, Surrey, UK

www.cfsd.org.uk

The Life Cycle of Smart Devices in 2030: The Effect of Technology Trends and Circular Economy Drivers on Future Products.

K Schischke, N F Nissen and K Lang

Fraunhofer IZM and Technische Universität Berlin, Germany

Smart electronic devices feature extremely short innovation cycles and in 2030 a smartphone will look different than today. Technology innovations in the microelectronics domain, but also in related fields along the product life cycle, such as recycling and refurbishment technologies, will have a dramatic impact on product design and the product life cycle. In parallel, emerging Circular Economy concepts, business models and policies will influence, how technologies are developing. This interaction between technology innovation and circularity drivers will be discussed on the example of smartphones, backed by evidence from Life Cycle Assessments.

Analysed aspects include, e.g.

- latest material trends in smartphone design such as the potential come-back of tantalum use due to shortages in supply of multi-layer ceramic capacitors,
- changes in memory technology with an impact on reusability of memory components,
- the potential of new printed circuit board technologies, such as embedding, for a modular redesign of devices,
- the need to design semiconductor components for a 2nd and 3rd (reuse) life and related rework processes, and
- emerging sophisticated recycling technologies, such as deep level automated disassembly and innovative material separation technologies, and their potential to get hold of “spice metals” from end-of-life devices.

The paper highlights latest research results of the EU funded Horizon2020 project sustainablySMART along the product life cycle of smart mobile devices, which includes new product design concepts, in particular modularity of the device as such and on the printed circuit board level, and robotics-assisted disassembly technologies, rework of semiconductor components and repurposing of electronics in other devices. These technologies innovations are taking place in a volatile policy environment, where the Ecodesign Directive implements increasingly material efficiency aspects and the related standardisation under mandate M/543 as regards ecodesign requirements on material efficiency aspects for energy-related products in support of the implementation of Directive 2009/125/EC. Standardisation and policy are currently framing Circular Design and will have an impact on products and product lifecycles similar to the impact energy efficiency labelling and energy consumption thresholds under the Ecodesign Directive have had on power consumption. However, some of the Circular Design approaches are contradicting each other. The presentation will point out selected conflicts and will discuss these, such as

- the conflict between water and dust proof designs (high IP classes), usually realised through the use of adhesives, and reparability of devices,
- modularity of devices for enhanced repair and upgrade versus manufacturing overheads for connectors, and
- risk of over-stock of spare parts for long-term reparability.

Under these complex technical, political and economic circumstances the change of products and product concepts will be exemplarily forecasted for smartphones. The presentation will thus give a visionary outlook how in a Circular Economy products might and will change by 2030.