Fostering sustainability in IoT solutions: the need for science-based ecodesign and for a holistic efficiency-sufficiency approach

Prof. David Bol
ECS group, ICTEAM Institute, UCLouvain

Internet-of-Things (IoT) solutions can be used in various economic sectors to improve automation and optimize processes. However, the deployment of numerous IoT electronic devices and the associated use of the existing ICT infrastructure (network and datacenters) come with environmental impacts along their life cycle. To this end, a range of R&D actors in academia and industry aims to design "green IoT" solutions with a limited environmental burden. Innovations in such IoT ecodesign efforts often revolve around a few common-sense ideas such as batteryless operation and the use of organic PCB. Although, such eco-innovations might lead to reduced environmental burdens in certain cases, these are not silver bullets and suffer from the typical pitfalls of ecodesign such as burden shifting, negative indirect impacts and rebound effect.

For an ecodesign effort to pay back in terms of environmental impact reduction, it needs first to be based on science. Life-cycle assessment (LCA) is the standard science-based methodology to evaluate the environmental impacts of a product or service. We argue in this talk that without LCA in the loop, eco-innovation efforts are likely to lead to burden shifting by missing the environmental hotspots and may thus be qualified as greenwashing.

Second, IoT solutions are often proposed to avoid GHG emissions in other economic sectors through positive indirect effects of optimization and substitution. However, the negative indirect effects of induction and obsolescence are rarely considered. We thus argue that both positive and negative effects need to be considered when evaluating the avoided emissions. Finally, an ecodesign of a product/service based on efficiency improvement can always lead to an increase of the usage of the product/service to various rebound mechanisms. We illustrate such a rebound mechanism in the field of semiconductor production. This motivates the need to adopt a holistic approach to eco-innovation that combines efficiency with sufficiency.

Biography

David Bol is a Professor at UCLouvain. He received the Ph.D degree in Engineering Science from UCLouvain in 2008 in the field of ultra-low power digital nanoelectronics. In 2005, he was a visiting Ph.D student at the CNM, Sevilla, Spain, and in 2009, a postdoctoral researcher at intoPIX, Louvain-la-Neuve, Belgium. In 2010, he was a visiting postdoctoral researcher at the UC Berkeley Lab for Manufacturing and Sustainability, Berkeley, CA. In 2015, he participated to the creation of e-peas semiconductors spin-off company, Louvain-la-Neuve, Belgium. Prof. Bol leads the Electronic Circuits and Systems (ECS) group focused on ultra-low-power design of integrated circuits for environmental and biomedical IoT applications with a holistic focus on environmental sustainability. He is actively engaged in a social-ecological transition in the field of ICT research with a post-growth approach. Prof. Bol has authored more than 150 papers and conference contributions and holds three delivered patents. He (co-)received four Best Paper/Poster/Design Awards in IEEE conferences and supervised the PhD thesis of Charlotte Frenkel who received the 2021 Nokia Bell Scientific Award and the 2021 IBM Innovation Award for her PhD. On the private side, Prof. Bol pioneered the parental leave amongst male professors at UCLouvain, to spend time connecting to nature with his family in a post-growth deceleration.