E-waste management and blockchain systems: can technology enable circularity?

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The problems with e-waste

Waste from end-of-life electrical and electronic equipment, known as e-waste, is a rapidly growing global problem (Perkins et al., 2014). The recovery and treatment (i.e. depollution, disassembly, shredding, recovery or disposal) of e-waste poses a challenge to waste management systems, due to its quantity, variety and composition (Cole et al., 2019). According to the Basel Convention, e-waste is classified as hazardous waste due to the presence of toxic materials such as mercury, lead and brominated flame retardants. But it may also contain plastic, precious metals such as gold, copper and nickel and rare materials of strategic value such as indium and palladium. Nevertheless, in most cases the electrical and electronic equipment sector still follows a linear economy model, where the unsustainable take-make-dispose paradigm is applied, and most value of products is lost at the end of their life.

E-waste has huge environmental and health impacts, both at the production and disposal ends. Vast amounts of energy and hazardous substances are required in the mining and manufacturing of products, and the demand for resources has been linked to dangerous working conditions (Financial Time, 2017; The Guardian, 2014; Ellen MacArthur Foundation, 2018). Disposal and recycling of electronics can expose people and the environment to toxic chemicals when used products are not treated in formal recycling centres (Perkins et al., 2014; Ellen MacArthur Foundation, 2018).

Technological solutions for WEEE management

For these reasons, the Pathfinder project “BlockWEEE” investigates the opportunity of using blockchain to implement an innovative tracking solution for professional EEE (*electrical and electronic equipment*) and WEEE (*waste electrical and electronic equipment*) management, which

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might also benefit the producers and help them in keeping control of the products until EEE end-of-life. After the consultation of some industrial actors, the partners of the project (*Ecodom, the largest Italian Household Appliance Recovery and Recycling Consortium; University of Bologna; Wuppertal Institute of Climate, Environment and Energy*) are now studying a suitable technological solution and an innovative business model, in order to prevent waste production and reduce the adverse impacts of professional WEEE. The overall objective is to boost the transition from linear to circular economy, in a sustainability perspective. While for household appliances good examples of end-of-life management practices already exist, professional EEE and WEEE management systems suffer from several shortcomings due to their complexity. Considering the scope of the eCircular flagship, the project is very interesting from the circular economy perspective, firstly for the waste prevention that blockchain technologies and its sensors could allow, and secondly considering the potential for the plastics obtained from WEEE, that could supply the electrical and electronic segment, which represents the 6,2% of the total demand of plastic according to the analysis of the European plastic converter demand (PlasticsEurope, 2019).

For more information about the project: http://www.ecodom-consorzio.it/en/european-projects/exploring-future-professional-eee-through-blockchain-technologies

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