

# eReuse.org: an ecosystem for traceable reuse of digital devices in a circular economy

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Many digital devices —such as desktop, laptop, tablet or mobile computers— from businesses and public organizations are dismantled and recycled when amortized or out of guarantee despite being nearly up-to-date and in perfect condition to use. Reuse of digital devices ensures recycling and effectively contributes in generating circular economy, preventing waste generation, reducing the risk of WEEE (Waste Electric Electronic Equipment) such as leakage to landfills or illegal exports, creating jobs, and strengthening digital skills [1]. Reuse can also contribute in reducing the digital divide, and strengthening institutions and projects for social change. However, why is it a minority practice? When companies, governments, or individuals need to get rid of their digital devices through reuse, they don't know where to turn. This scenario results in most EEE being recycled (dismantled) too early despite of the explicit demand for reuse coming from social and charity organizations.

Although the volume of e-waste is growing three times faster than other types, recycling plants collect less e-waste. This paradox is mainly attributed to pillaging in collection points or by home collection done by unauthorized operators [2]. Our pilots show that in public institutions more than 80% of the devices to be recycled can be operational. There is a demand for these devices even without any upgrade or repair. Recycling of digital devices with reuse potential is ineffective, and more serious in countries under economic crisis given the lower social value and higher environmental cost of recycling a device that could be reused. In Europe only 33% of EEE Waste is reported as collected and treated. The remaining is a leakage: 13% goes to EU landfill and 54% to substandard treatment inside and outside the EU (illegal trade to 3rd countries) [3]. According to the International Environmental Technology Center of the United Nations Environment Program (UNEP) [4], e-waste is the fastest-growing type of waste, particularly in some developing countries, where the volume is expected to grow by up to 500 times over the next decade. Out of which, 80% is estimated to go into landfills and incinerators.

For the reuse sector to flourish, donors, receivers, and reuse centers need support services and technologies to gain effectiveness, efficiency, and traceability to reach the goal of extending the life of such devices, and to ensure their final recycling. Our proposal is to enable direct donations of reusable or repairable devices, and to guarantee that any reused device is eventually recycled properly. Devices are prepared for reuse with traceability in donors' locations, as depicted in the poster at the end. This system minimizes losses because there is no need to transport or centralize the EEE. Social enterprises (preparators) active in reuse and repair are also included in this

ecosystem. In our pilots, donors mostly delegate preparation for reuse tasks (hardware rating and testing, deletion of data, inventory, labeling and packaging) to reuse centers. Preparators take only products that need to be repaired or refurbished and recycled if they are authorized collectors.

The main challenges to overcome are: access to enough volume of good quality used devices, quick preparation of those with more potential for reuse, enablement of direct donations, guarantee for reused devices are finally recycled, communication of reuse's social and environmental value, reward for donors, and commitment to receivers of reused devices with recycling.

This poster presents eReuse.org: a set of open source tools based on a distributed platform ecosystem that support direct donation of devices and its traceability. Devices are prepared for reuse in the donors' location, and receivers collect them. Malicious users are discouraged by a reputation scheme to reward cooperative receivers that reuse devices and track them until disposed to recycling agents. This system reduces costs, and minimizes EEE losses as there is no need for central logistics or centralizing the engagement of donors on charity projects. The initiative follows an open model (unrestricted), as the goal is to bootstrap the reuse process, to generate local efficiencies, to guarantee final recycling, and to ensure traceability. Pilots already performed for more than four years on two thousand devices validate the model with 80% traceability of device components. The result is a global ecosystem for effective, efficient and traceable reuse of digital devices with final recycling.

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