Case study - eReuse: Building reuse circuits for social inclusion

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Project / Programme	eReuse
Region / Country	Spain
Website	https://www.ereuse.org
Circularity	Social and economic inclusion, refurbished computers, e-waste, innovation in servitised distribution model

Overview

Since 1995, the Technical University of Catalonia in Barcelona (Spain) has run a programme called Reutilitza (Reuse). Organised by the Centre for Development Cooperation, the programme has involved professors and students from several faculties preparing computers disposed of by the university for further use in social organisations. eReuse is a spin-off initiative that has scaled up beyond the university, supporting several social enterprises that collect and refurbish used computers and mobile phones donated by public and private organisations. These devices are delivered to vulnerable citizens, supported by sponsors that cover the refurbishing cost and assist users in their use for social inclusion.

About the project

Disposed digital devices (computers, tablets, mobiles) are a resource for local social inclusion and participation. Our vision is that public and private organisations act for the common good for a better, more inclusive and environmentally friendly internet, by donating their unwanted devices to social enterprises that repair and refurbish them. These can then be distributed to families that need devices to participate in education and socioeconomic activities using the internet. This second-hand market results in reusable devices at the minimal cost of refurbishment, and feeds a circular economy that improves local socioeconomic and environmental conditions.

The eReuse initiative started in 2013, reaching an important milestone in 2015 with the launch of a computer donation campaign. It has processed more than 10,000 computers[1] to date. In total,

about 100 entities such as schools, public facilities and NGOs have benefited from the programme, with 47 different donors contributing devices. Over 1,200 devices are circulating as shared property, as part of our “servitised” business model.

eReuse circuits

We currently work with about 15 social organisations, and have local “eReuse circuits” in Barcelona and Madrid. Local circuits are forums to coordinate different stakeholders in localities that can exchange complementary resources and skills to balance supply and demand, share costs and help each other. Device donors, refurbishers, citizen support organisations and recyclers work together as part of a common-pool resource system of second-hand digital devices in extended use.[2]

Refurbished devices are prepared by the workers in social enterprises or reuse centres, and sometimes by individual volunteers or students doing service learning.

The beneficiaries of our activities are citizens interested in second-hand computers, citizens in municipal social support programmes, schools, public facilities, and families supported by neighbourhood social support organisations.

In a typical circuit, a donor organisation (a public or private organisation) donates decommissioned devices that are collected by a social enterprise that brings these computers in pallets to a refurbishment facility operated by another social enterprise, or a reuse centre. There the devices are put in a rack and – using the eReuse software tools – are inspected, data wiped, tested and installed with (usually) a Linux distribution, all in parallel (Figure 1 illustrates the process). Those that do not pass the test are put in a cage for recycling and recorded in our system as prepared for recycling. Those that pass the test are cleaned, checked in more detail and sometimes upgraded (battery, RAM, storage), labelled and stored for sale or donation (cost sponsored by a third party, although it is recommended that the final beneficiary contributes something as a commitment).

The processing cost in Barcelona is in the range of EUR 20-120 for each device.

Social support or public organisations, as well as some individuals, acquire these devices with the commitment to return them to the intermediary organisation after use for another refurbishment or final recycling.

The servitised business model

We have also developed a “servitised” business model where users pay for computing as a service. For instance, when we install computers in a school classroom, actors in the circuit ensure the performance level of the computers, maintaining, upgrading and replacing them in exchange for a monthly or yearly fee. This ensures they have the computing they need, but ownership of the device remains in the circuit.

The eReuse software records all these transfers and can generate a complete provenance log for

each device about its lifespan, without revealing any personal details about the users. QR codes are placed on each device for traceability.

We have developed agreements with public and private donors of devices, social organisations working with end-users, and social enterprises in social inclusion programmes working on refurbishment and recycling. The recyclers we work with are specialised in e-waste, and can be either public, commercial or social enterprises. They can participate in supplementing the eReuse data by recording the devices they receive by scanning QR codes.

These agreements allow us to collect the data about devices (creating what we call a “chain of custody”), aggregate the data, and analyse the social usefulness (in computing hours enabled) and environmental impact (CO2e savings) of the devices. This generates datasets about the impacts and datasets about the durability of the devices we process.

eReuse also trains stakeholders in different aspects of device refurbishment and raises awareness on the environmental impact of information and communications technologies (ICTs).

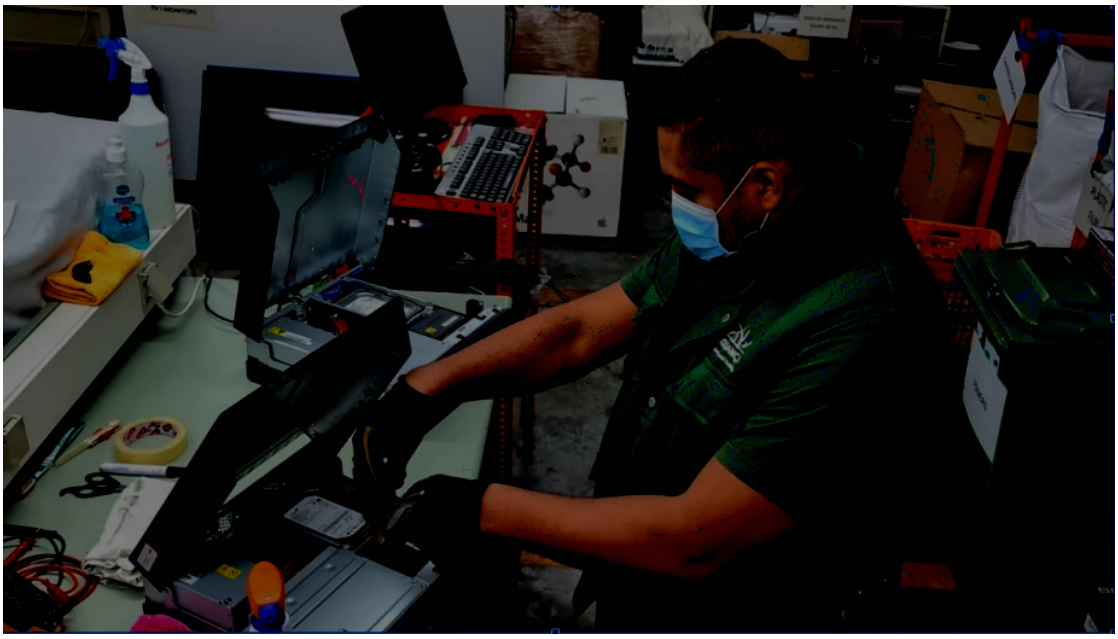

Figure 1: A refurbisher preparing desktop computers for reuse in the workshop of a social enterprise that forms part of eReuse.org.

Impact of the initiative

Project impact

The main overall impact and outcomes of the eReuse initiative are:

- A reduction in the environmental impact of ICTs, with CO2 equivalent impact estimates.
- The universalisation of access to computer devices, creating socioeconomic opportunities and being able to measure this through additional computing hours provided.
- The creation of jobs in computer refurbishment, including in device collection.
- The reduction of e-waste with more durable devices through reuse.

- The development of software tools that allow for more efficient (time, quality) processing of ICT devices. This implies less refurbishment time per device, and results in lower processing costs and a higher efficiency and salary for refurbishers.
- The collection of reliable open data to promote circularity, quantify and certify impacts, and promote environmentally friendly behaviour change. For instance, durability statistics about different models and brands assist in purchasing decisions when more durable designs can be requested.

The level of funding is a limiting factor in expanding the process to other regions. It implies initial training, the development and certification of good practices, the coordination of the tasks and the management of stable demand and supply. The development and maintenance of software tools and services also need to take place.

Circuits work as long as there are the minimum stakeholders involved (donors, refurbishers and users) with a minimally stable demand and supply to ensure efficient processing (ideally at industrial scale). The process must be economically, socially and environmentally sustainable. Maintenance and support for final users helps to overcome the barriers related to the behaviour change.

Conclusion

eReuse has built a model of reuse circuits that works in different cities and regions in a country like Spain. The model appears to be effective in being economically, socially and environmentally sustainable. The coordination across complementary stakeholders helps ensure the complete set of capabilities and skills to bootstrap a local circular economy of digital devices. The software tools allow us to improve the efficiency (processing time) and quality of the refurbishment. Collected data allows us to calculate impacts and report these to donors and the public in general. Open datasets are useful to activists and governments to encourage manufacturers and device owners to act responsibly. This helps us to meet the challenge of developing a circular economy of digital devices that make ICTs part of the solution to sustainable development (less inequality, less environmental impact) and not part of the problem.

Further reading

Franquesa, D., & Navarro, L. (2020). *eReuse datasets, 2013-10-08 to 2019-06-03 with 8458 observations of desktop and laptop computers with up to 192 features each*.

http://dsg.ac.upc.edu/ereuse-dataset

Franquesa, D., Baig, R., & Navarro, L. (2017). Sustainability and participation in the digital commons. *ACM Interactions, 24*(3). http://people.ac.upc.edu/leandro/pubs/2017-interactions.pdf

eReuse software: https://www.ereuse.org/software and https://github.com/eReuse

UPC Centre for Development Cooperation: https://www.upc.edu/ccd/en

From Global Information Society Watch 2020, see related country reports for:

Argentina: https://www.giswatch.org/node/6265

Bangladesh: https://www.giswatch.org/node/6266

Costa Rica: https://www.giswatch.org/node/6267

Democratic Republic of Congo: https://www.giswatch.org/node/6232

India: https://www.giswatch.org/node/6234

Nigeria: https://www.giswatch.org/node/6237

References

[1] Franquesa, D., & Navarro, L. (2020). *eReuse datasets, 2013-10-08 to 2019-06-03 with 8458 observations of desktop and laptop computers with up to 192 features each*. http://dsg.ac.upc.edu/ereuse-dataset

[2] Franquesa, D., Baig, R., & Navarro, L. (2017). Sustainability and participation in the digital commons. *ACM Interactions, 24*(3). http://people.ac.upc.edu/leandro/pubs/2017-interactions.pdf

Appendix 2: The triple-layered business model canvas for eReuse

This a basic triple-layered business model canvas (BMC) for the eReuse federation of several social enterprises, donors and users of second-hand computers. The model is described in detail in a journal article[1] and introduced in a blog post.[2]

		Designed for:		*Designed by:*		*Date:*		*Version:*
Economic BMC		eReuse.org circuits		Leandro@ereuse.org				
Key partners	**Key activities**		**Value propositions**		**Customer relationships**		**Customer segments**	

Network of agents and partners that make circuits work: Regulators (permission), manufacturers (deployment), government (policy), locations, related initiatives, libraries, schools (education) and universities (research), funders, sponsors	Data cleaning, transport, registration, preparation, allocation, transfer	**Products and services that give value:** Device usage, preparation for reuse, inventory management, traceability, certification, reduction of digital divide	Agreements with volunteers, public admin, professionals, institutional donors, investors, incentives, disincentives, reputation, etc.	**Groups of people or organisations to reach and serve**: Citizens and organisations, manufacturers, recyclers, repairers, governments (as users or donors)
	Key resources		**Channels**	
	Tech: Inventory, tools and services **Human:** Organisations, participants **Financial:** Contributions **Physical:** Storage, warehouse		Word of mouth, web campaigns, mobile app, QR codes, meetings, partner organisations, social events, campaigns	

Cost structure	**Revenue streams**
Initial investment: In facilities and development of software tools and services, operational expenses **Human resources**: Preparation, coordination and support	**Contributions received from each customer segment:** Fees from participants, donations (per device, per service)

		Designed for:		*Designed by:*		*Date:*		*Version:*
Environmental life cycle BMC		eReuse.org circuits		Leandro@ereuse.org				
Supplies and outsourcing	**Production**	**Functional value**		**End of life**		**Use phase**		

Refurbishment tools Storage space Transport for devices Supplies: batteries Cleaning products Label printer to tag devices	Repair and replacement of parts 0.5%	1 operational refurbished computer per person (user) for up to 5 years (device custody model) 1 operational refurbished computer per person (user) for a yearly fee (device servitisation model)	Device returned to an eReuse partner to be refurbished again or recycled if does not have enough performance for a new user	Energy from usage 10 %
	Materials		**Distribution**	
	New battery 1% Changes in second-hand components 0% New HDD or SSD 10%		Transport (collection from donor) 5% End user takes care of transport of own device 2%	

Environmental impacts	**Environmental benefits**
7/10 carbon footprint from initial manufacturing cost of new devices 2/10 CO2e from usage (electricity) 1/10 CO2e from final recycling ~0/10 CO2e from refurbishment	CO2e footprint savings from refurbishment and reuse of device CO2e footprint savings from final recycling CO2e footprint accounting per device along complete life span CO2e footprint savings for donor organisations as positive impact

		Designed for:	*Designed by:*	*Date:*	*Version:*
Social stakeholder BMC		eReuse.org circuits	Leandro@ereuse.org		
Local communities	**Governance**	**Social value**	**Societal culture**	**End user**	

300,000-500,000 computers for school students (users) Refurbishers in socioeconomic inclusion programmes (social enterprises) Device donors (public and private organisations) Recyclers (non-profit, for-profit)	Commons: - Federation of social enterprises - Device donors	Offers social inclusion (sustainable income, jobs) from device refurbishment Improves digital inclusion of citizens Help citizens participate in digital society without contributing to increased environmental impact Feedback/measures of environmental impact savings	Culture of low environmental impact Culture of solidarity among donors and receivers Commitment to circularity Culture of collaboration to manage volumes of devices	Citizens work/learn/interact remotely Reduction of environmental impact (computer use) Reduction of burden (servitisation: computer as a service)
	Employees		**Scale of outreach**	
	- Employed by social enterprises		Social bonds between donors, receivers, refurbishers, recyclers Education around circularity	

Social impacts	**Social benefits**
Volunteers: Responsibility when devices fail Professionals: Issues with scale and diversity of second-hand devices Health and safety Voluntary effort, overhead, contributions not directly accountable	Lower-cost computing Transparency from social impact (jobs created, computing hours delivered to users) Digital sovereignty Sense of community Social inclusion

[1] Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. *Journal of cleaner production, 135*, 1474-1486. https://www.sciencedirect.com/science/article/abs/pii/S0959652616307442

[2] Joyce, A. (2015, 17 April). The triple layered business model canvas – a tool to design more sustainable business models. *SustainableBusinessModel.org*. https://sustainablebusinessmodel.org/2015/04/17/the-triple-layered-business-model-canvas-a-tool-to-design-more-sustainable-business-models

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