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Towards synergies between local repairers, citizens, designers, and public actors: the REVALUE project

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Abstract

The on-going race towards innovation and growth, continuously sustained by new products, has shaped a "throwaway era" overwhelmed by waste. The European economy is surprisingly wasteful in its model of value creation and sustains a take-make-dispose system. To face with this challenge, the European Waste Framework Directive suggests a hierarchy for waste treatment based on the 3R: Reduce, Reuse, Recycle.

This paper aims to present the REVALUE research program. REVALUE contributes to the Reduce and Reuse objective as it proposes local and adaptive strategies articulated around repair workshops. It is based on the assumption that improving collaboration between producers, citizens, repair workshops and public actors enables the emergence of eco-innovative waste management at a local scale supported by adapted business models.

The overall objective of REVALUE is to develop innovative, self-sustaining repair networks at the city-level. This will be achieved by 1) defining the initial state of the urban waste management system (at the technical, financial, economic and organizational level), 2) stimulating the (co)design of innovative products and repair business models, 3) facilitating innovation by and for urban stakeholders through an online toolkit, 4) boosting the uptake of the online toolkit and best practices in Europe and beyond.
This project proposes a multidisciplinary approach bringing together complementary expertise in waste regulation, (circular) business models and strategies, engineering design, organizational change and social sciences.

1. Introduction

It is largely accepted that an ambitious waste management policy would be based on the "3R" concept: first Reduce the quantity of waste through prevention, second Reuse end-of-life products through repair and remanufacturing, and finally Recycle materials if the first options are not possible (e.g. Erkman, 2004). Although reduction of waste production and reuse are among the priority options promoted by the European Commission (EU 2008/98/CE), these strategies have been hardly developed in comparison to recycling. Reduction of waste at their source, design of long-lasting products, product repair and reuse are still largely disregarded (Fortin, 2010).

Consequently, investments into products longevity and reparability to-date have been hardly considered by industry and public policies, even if these strategies are recognized as the most environmentally friendly solutions among end-of-life options. On the one hand, still little emphasis is put on the design of long lasting products because of the few incentives for producers. The current trend is to hinder and prevent the possibility of self-repairing by definitive assembly or special tools (software dedicated for automotive diagnostics, specific screws etc.) in order to extend the business to maintenance service or to accelerate the renewal of artifacts even if repairable. On the other hand, very few products are repaired and reused when considered as obsolete (functional or fashion obsolescence). This is mainly due to the lack of dedicated structures in waste management systems, the low reparability of products, consumer's perception of second hand products and the lack of relevant business models for extended-life products.

The emerging REVALUE project proposes a transdisciplinary approach for system transition. It is based on the assumption that repair/upcycling workshops are at the basis of new sustainable consumption and production paradigms. This research program has the ambition to empower citizens, decreasing negative environmental and societal externalities while creating new business opportunities, innovative territorial organizations and innovative design methodologies. The REVALUE project assumes that the systematic introduction of repair and reuse in products' life cycles requires taking into account and sketching the path of several types of innovations: technical and organizational innovations of businesses, as well as social and institutional innovations. To do so, the following approach will be adopted:

(1) An identification of opportunities for organizational and institutional innovation in the life cycle management of products through an analysis of the roles, strategies and relationships of the actors involved;

(2) The development of tools and methods to support key actors (designers, local municipalities) to reduce waste through design and business models;

(3) The development of creative and collaborative platforms to redefine a territorial policy of prevention of waste and the development of innovative systems;

(4) Experimentations with new business models and design approaches where stakeholders are involved; based on clear methodologies, allowing for the identification of difficulties, a better understanding of end-of-life product systems and their practical implementation (e.g. guides, best

practices) as well as quick feedback.

2. Research issues

The core concept of this research project emerges from the successful stories of the repair operators. Indeed, interesting efforts to repair and reuse products come from the social economy and civil society: these organizations can adopt participative structures to facilitate empowerment for environmental preservation. Once reserved for the poorest, repairing and reuse of products is becoming increasingly popular and important. Traditional structures from the social economy such as Emmaus repair Cafés or self-help repair workshops from the emerging collaborative economy have acquired and developed innovative solutions for product life extension (e.g. table 1). Despite the great diversities in modes of organization, repair operators are characterized by decentralized structures, at small scale, disconnected from territorial waste management.

	Repair workshops	**Self-help repair Workshops**	**Online knowledge exchange platfor**
Type or organization	Conventional hierarchic organization	Physical mixed structures (an organization and a crowd of volunteers)	Virtual mixed structures (a provide crowd of contributors and users)
Examples	Charity organisations (e.g. Emmaüs, Goodwill, Oxfam)	Repair cafés self-help bicycle workshops	ifixit.com commentreparer.com repair wikis

Table 1 Typology of organizations involved in second life of products

The REVALUE project proposes eco-innovative strategies to support **the deployment at large scale of repair and reuse activities** thanks to the collaboration between targeted stakeholders (producers, repair workshops, public authorities and citizens). Therefore, it raises the following questions:

- **Is the emergence of a common language that allows a set of a priori heterogeneous actors to collaborate on different phases of the product lifecycle (i.e. product design, manufacturing and repair) possible?**

A main issue of this project is how a social innovation (reuse and repair initiatives), coming from an environmental concern (waste management and reduction) and a strong civic engagement (e.g. insertion of low skilled people), can become a collective action integrating different actors in a new form of community (technology-driven learning community) (Gobert, 2015). This community of learning and practice (Wenger 1998) may develop its own technical language, mix experts, lay knowledge and be able to elaborate common objectives through iterative meetings and trust building. From a sociological point of view, repair and reuse initiatives are analyzed as a field of social practices to identify misunderstandings, process of inclusion or exclusion (female, low-income people), ways of negotiating and bridging the gap between different interests and views.

- **How could the experience of actors involved in the second life of products be integrated into eco-innovative design methodology? How to develop relevant local business models to support actors involved in the second life of products? From this, how can we help local actors to go from a volunteer approach to a real sustainable entrepreneurship?**

The challenge of reducing waste and developing repair activities requires developing new products, services or uses. Therefore, industries require new eco-innovative methodologies to rethink their way of designing and manufacturing, especially to rethink their design process with repair issues (Tyl et al. 2014). From a broader point of view, the success of a repair-oriented eco-innovative design methodology depends on the ability to integrate experience of actors involved in second life of products as new way to stimulate designers and repair operators.

In parallel, novel business models must support repair activities, being a useful way to create 'systems change' (Boons et Luedeke-Freund, 2013; Bocken et al., 2013; 2014; 2015). However, companies still have difficulties to implement these business models for Business-to-Customer everyday consumption goods. From the social and solidarity economy or citizen's environmental organizations, a proliferation of repair workshops federates communities around different objectives (from the awareness to soft transport to social rehabilitation). Despite the structure and professionalism of these initiatives, they are still mostly based on voluntary work and regularly face considerable financial challenges. New business models are needed between these stakeholders supported by public authorities to further develop and advance the practice of repair in Europe.

- **How can we develop models to define urban metabolism, which measure waste flows in relation to repair activities, their economic benefits or drawbacks, environmental impacts and social implications? How to assess the success of transitions with a sustainability approach in a multi-scale/multi-actor perspective?**

As centers of population, culture, innovation and economic activity, cities must play a crucial role in climate change mitigation (Creutzig et al., 2015) and any other transition towards more sustainable societies. The term urban metabolism (Wolmann, 1965) is used to describe quantitative accounts of the overall inputs and outputs of materials and energy to and from cities (Weisz and Steinberger 2010). Developing repair activities in territories requires capturing, through a dynamic urban MFA (Material Flow Analysis) model, the dynamic interaction between stocks, flows and individual actors. Such model must not only allow to directly simulate the metabolic effects of interventions (e.g. business, policy) but also to identify potential co-benefits and trade-offs present in the system.

Therefore, imagining how local policies can support **organizational, social and technological innovations** is at the heart of the innovative nature of the project. In fact, this project supports product design and business innovations for companies, enables social innovation through the empowerment of workshops' stakeholders (workforce and citizens). It also supports organizational innovation with the creation of synergies between producers, repairers, citizens and local authorities (Brullot et Gobert, 2015). The project exploits the latent opportunities of increased repair in society, by supporting stakeholders through the cross-breeding of lay and expert know-how (Akrich, 2010) and the development of specific, expert knowledge and best practices targeted at both the business and product level. REVALUE offers multiple pathways to extend the life cycles of products, thereby directly contributing to waste reduction, as well as providing design methods and business strategies to address early product obsolescence. A reflexive approach will also be performed on the contribution of territorial repair networks on the system transition towards sustainability (Allais et al., 2015).

In addition, consumer behaviors and attitudes to repair are underexplored. Consumers lack avenues to access repair skills and lack incentives to engage with repair in general. Through the application of high-level design skills, REVALUE increases legitimacy and overhaul perceptions of repair through added-value activities, and compelling design and branding, demonstrating the opportunity associated with repair and upcycling. The REVALUE project and platform strive to create a counterforce for unsustainable production and consumption patterns (e.g. shorter product-life time). It aims to take a gender and minorities inclusive approach that includes males and females, low-income populations in repair activities by providing an accessible platform, tools and methodologies. The project seeks to turn repair into a formalized, ingrained and systemic activity through the common platform to be developed.

3. Proposal and methodology

3.1. Proposal

The REVALUE project proposes to:

1. Define the conditions of emergence of a **common language and interests** between actors of the product lifecycle (including producers, consumers and repair/upcycling workshops) in favor of a coordinated action on waste prevention through product repair, reuse and long-life-design.
2. Establish a clearer **link between waste prevention and product design** fostering feedback from local initiatives such as repair/upcycling workshop, corporate design teams and public actors. Thus, the project is built upon the experience of those involved in the second life of products (repair/upcycling workshops, repair cafés etc.) in order to design more sustainable and reusable products.
3. Create **inter-disciplinary design and business model concepts** for waste reduction: find consistency between the different actions of stakeholders' companies, associations and public policies, who are often trapped into contradictory logics (time, profit vs. well-being of citizens), while on the other hand, removing potential blockages across different levels.
4. **Develop and experiment with and for key partners** with innovative solutions for waste prevention. The research establishes local business models and waste management and mitigation policies and strengthens the community (public actors, producers, citizens and repair workshops) to share knowledge and co-develop adequate tools with implied stakeholders

Thus, the REVALUE project will propose a multi-level approach:

- A top-down approach (i.e. European and national regulations to territories). The project will result in a better application of the EU directives and will help to overcome the fragmented approaches of waste management.
- A middle-to-sides approach (i.e. territories to individuals and national and European regulations). The project supports and capitalizes territorial initiatives with respect to the local specificities. Organizational and institutional innovations emerging from these initiatives are adapted and deployed to another territories and contribute to new regulations at a national and European level.
- A bottom-up approach (i.e. from individuals and organizations to territories). This approach is oriented towards proactive, directly focused on citizens, repair workshops and companies eco-innovative design tools and eco-innovative business models incorporating the 3R philosophy. The eco-innovative tools allow companies to design innovative products and services with a high level of reusability and reparability. And the new business models are developed to sustain local initiatives and involve all the stakeholders in order to promote the development of circular economy across the urban territory.

To do so, the REVALUE architecture (fig.1) relies on resource flows from a source (i.e. suppliers of products to be repaired) to a sink (i.e. landfill/recycling) through elements. These flows are both tangible (i.e. artefacts) and intangible (e.g. environmental or social values) and are characterized by multiple dimensions (i.e. nature, stability, cost, design, etc.). These flows are modified by elements (i.e. repair operator, users, producers, third party) that have intrinsic characteristics (e.g. motivations, capacity, or competencies). Informational flows (e.g. regulation, design, business models) influence the circulation of resources between elements.

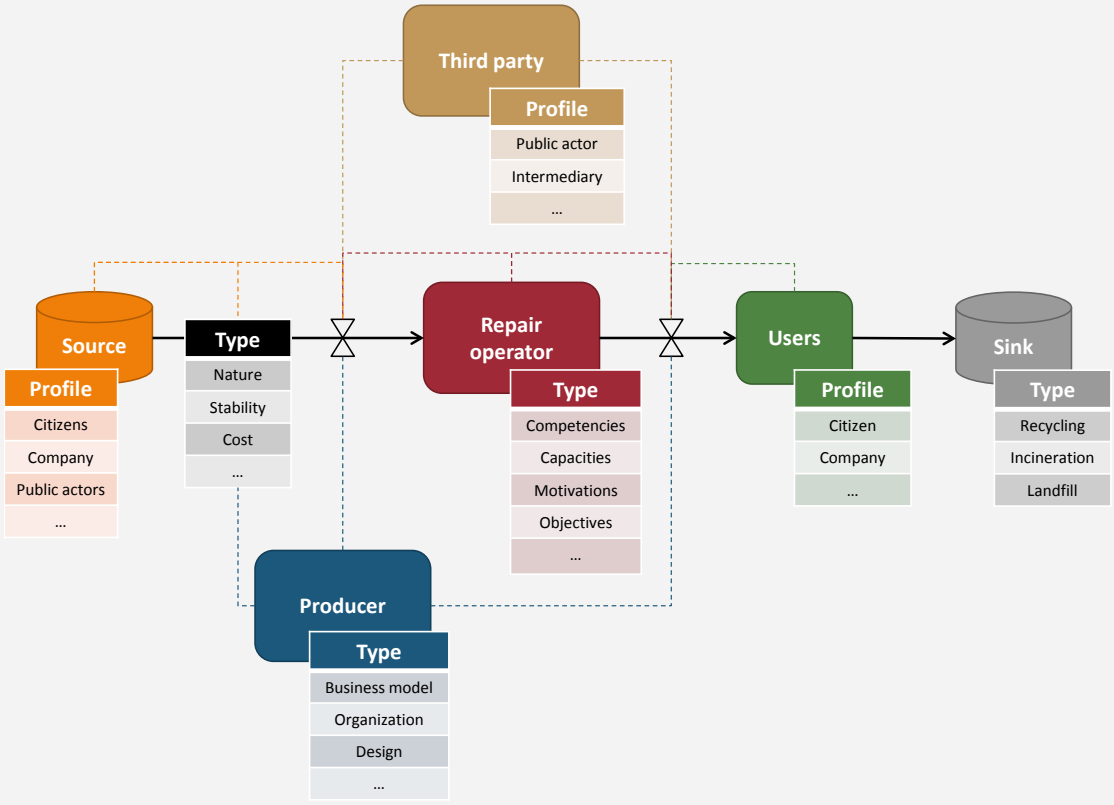

Figure 1 REVALUE Architecture

3.2. Methodology

To analyze and support the local system transition, different scientific disciplines are mobilized: sociology (sociology of sciences, sociology of translation, actor-network-theory), business economics (local business modeling, entrepreneurship), industrial engineering (engineering design, ergonomics) and urban metabolism. Built against observation and literature, the research methodology is based on multiple

iterations between knowledge creation/capitalization and experimentations of political design and business scenarios in experimental workshops.

The REVALUE methodology is built both on robust scientific bases and observations and experimentations in vivo. Innovative solutions emerge from multiple iterations between knowledge creation/capitalization and experimentations of political, design and business scenarios in experimental workshops. Once validated and formalized, the REVALUE methodology becomes widespread, firstly by the involvement of our REVALUE stakeholder network, and secondly by the public REVALUE platform.

The first phase, knowledge pooling, aims at understanding and characterizing current practices and limits for repair network development from literature reviews, large inquiries and interviews. A pool of generic knowledge will emerge from massive surveys, on-site observations and literature reviews on design for reuse, repair, recycle (Df3R), product upgradability, and business models and sustainable business models (BM/SBM). Based on this knowledge, generic scenarios will be designed to overcome observed limits: profiles and typologies of the elements and flows are created, barriers and levers identified regarding technical, financial, organizational and institutional dimensions and success criteria are defined. Cross-fertilization of empirical and theoretical knowledge enables a comprehensive understanding of the current system.

Based on this shared knowledge, innovative solutions regarding design, business model or organization are co-designed, then tested and improved thanks to multiple iterations. This iterative process requires constant adjustments and close collaboration between researchers and partners.

Once developed, the REVALUE methodology is validated and formalized on different media (e.g. web platform, paper methodology). This validation phase consists in implementing the methodology in repair workshops within their value constellation and territory. The evolution of each stakeholder's role, motivations and expectations, skills and know-how are observed, analyzed and assessed regarding success criteria. Thus, tools, methods, innovation mechanisms, business models, organizational or legal innovation, management tools and learning schemes will be tested, adjusted, validated and then integrated into the workshop management methodology.

4. Conclusions

In this paper, a new research program is proposed to develop sustainable solutions for waste prevention with a focus on repair networks, tools and strategies to increase the efficiency of material resources thanks to product's life extension.

Therefore, it is expected that the REVALUE research program results in high environmental and societal value from waste management, mainly based on decreasing volumes of urban waste thanks to a better management of its repairable parts and the development of territorial repair networks. REVALUE's main added value is to assist public actors, citizens, repair workshops and companies to co-develop a territorial repair network. This program provides methodological, organizational and institutional solutions to strengthen links between stakeholders and facilitate the repair activities. REVALUE makes the urban metabolism more circular and resilient with the creation of local value.

Current studies show that according "value from waste" approaches should target particular industries and their related waste streams. There is great opportunity from an environmental, societal and economic perspective with regard to electronics, textiles and furniture and dedicated approaches to reducing the volume of associated waste streams and second order effects such as greenhouse gas emissions (GHG emissions).

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