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Packaging reconditioned household appliances

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Abstract

The contribution proposes a research and project activity developed in collaboration by three subjects, active in the academic, commercial and social fields, who have created the conditions to produce new packaging systems for regenerated appliances, in order to reintroduce them on the market.

The activity is developed within the Ri-Generation project, initiated by Astelav and Sermig (Turin, Italy), which aims to recover disused equipment in order to prevent the formation of waste in landfills, enhancing the used products still in good condition and at the same time guaranteeing employment opportunities for socially marginalized people.

The aim of the packaging project is to maintain the same spirit of the Ri-Generation operation: the protective system is in fact produced by transforming and assembling the used clothes recovered every day from Sermig. The resulting soft mattress can easily be used to wrap the regenerated washing machine and protect it during transport and sale.

Keywords: Packaging, re-use, Ri-Generation, social, new-economy

1. Introduction

This contribution describes a research and design action aimed at developing systems for the protection and communication (packaging) of used products that are recovered and replaced on the market, in particular with reference to the WEEE waste of large household appliances.

Obviously, the disposal of household appliances is an important issue in terms of waste materials produced. In Italy, in the last three years, the collection and treatment of WEEE have significantly increased and their weight has reached about 300,000 tons in 2017. The most impacting waste, with 32% of the total weight, belong to the R2 group "Large white goods" (which corresponds to large household appliances such as washing machines, dryers, dishwashers, ovens, etc ...) (AAVV, 2017).

These numbers also clarify that today we waste too much energy and material, and in doing so we contribute to the emission of too many greenhouse gases. Obviously one of the main reasons for this state of affairs is the dominant economic model, based on a linear logic of increasing consumption (Pauli, 2012).

Furthermore, it is estimated that only about 40% of the total number of used devices is processed correctly. The remaining 60% ends up in unauthorized landfills or is illegally exported to developing countries, both as working appliances and as a source of components and raw materials for recycling. This is an international problem, related to spheres ranging from economics to ecology, culture and public health.

Considering that the big appliance is a type of product with high purchase and maintenance costs, it has also been observed an increasing tendency of users to repair rather than buy a new one. According to some observers, this preference translates into a real "right to reparation", also seen as the behaviour of opposition to an electronic industry that, often, intentionally hinders us from repairing products, controlling repair plans and limiting the access to components that need to be replaced (Fowler, 2015).

All these elements confirm the value of an operation, which is the object of this paper, aimed at launching a virtuous system of recovery and reconversion of disused and potentially polluting products, providing an innovative response to the real market demand.

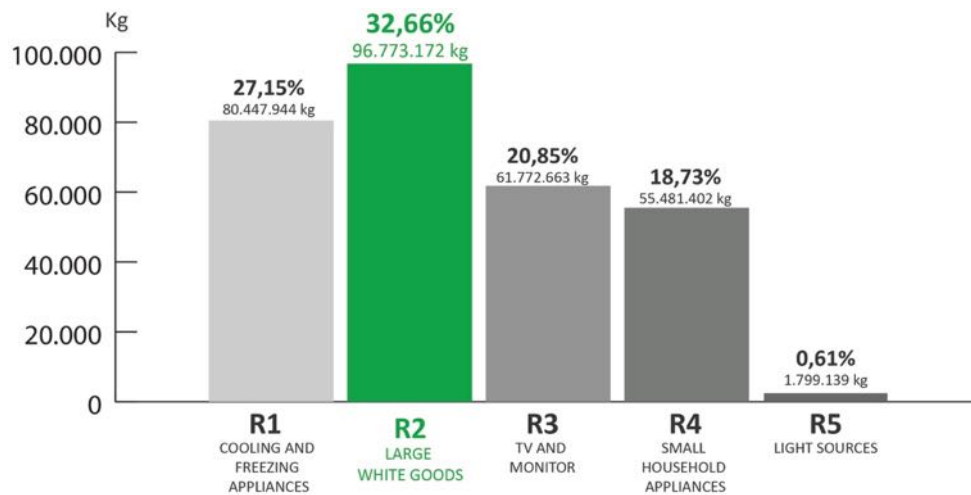


Figure 1. WEEE collection and treatment in Italy 2017 (source: Annual Report 2017, Centro di Coordinamento RAEE, Milano).

2. Research Context

The research activity, which develops within this consumption context, is carried out by the research unit of the Politecnico di Torino - Design and is part of a research agreement activated with Astelav, a company based in Piedmont, in Nichelino (Turin), leader in the distribution of components and spare parts for household appliances, in collaboration with Sermig, a non-profit foundation based in Turin, committed to providing hospitality and helping marginalized people who experience social, economic and employment problems. The activities of Sermig in the social sphere are various, developed in the local area (e.g. hospitality to the homeless, activation of laboratories and training courses for people in need, organization of meetings and seminars on social issues, collection of used clothes and other goods for the redistribution to needy people, etc.), but also internationally - especially in developing countries - where Sermig activates cooperation programs to combat poverty and to promote actions for the livelihood of the local population.

The partnership, therefore, involves actors in the academic, commercial and social fields, with the aim of developing a project capable of relating individual paths and specific perspectives, for a common goal also in terms of the narration of identity.

Astelav recently launched the Ri-Generation project together with Sermig. This project involves the restoration of "white goods" abandoned (washing machines, dishwashers, refrigerators, ovens, etc.) Intercepting the WEEE chain - Waste electrical and electronic equipment, as well as acquiring donations from private parties or entering into agreements with retail chains for recovery of returned goods. At the same time, the project facilitates the development of new skills for people in conditions of social marginality, which are involved to assist technicians specialized in the regeneration of electrical appliances. The activity involves the replacement of damaged or malfunctioning parts, a sanitation process and the return of household appliances on the market. It is

an example of a circular economy (Geissdoerfer et al., 2017), useful for preventing waste dumping in landfills, offering previously discarded products a new life cycle and a new added value, creating new economies, job opportunities and rehabilitation for people in precarious economic and social conditions.

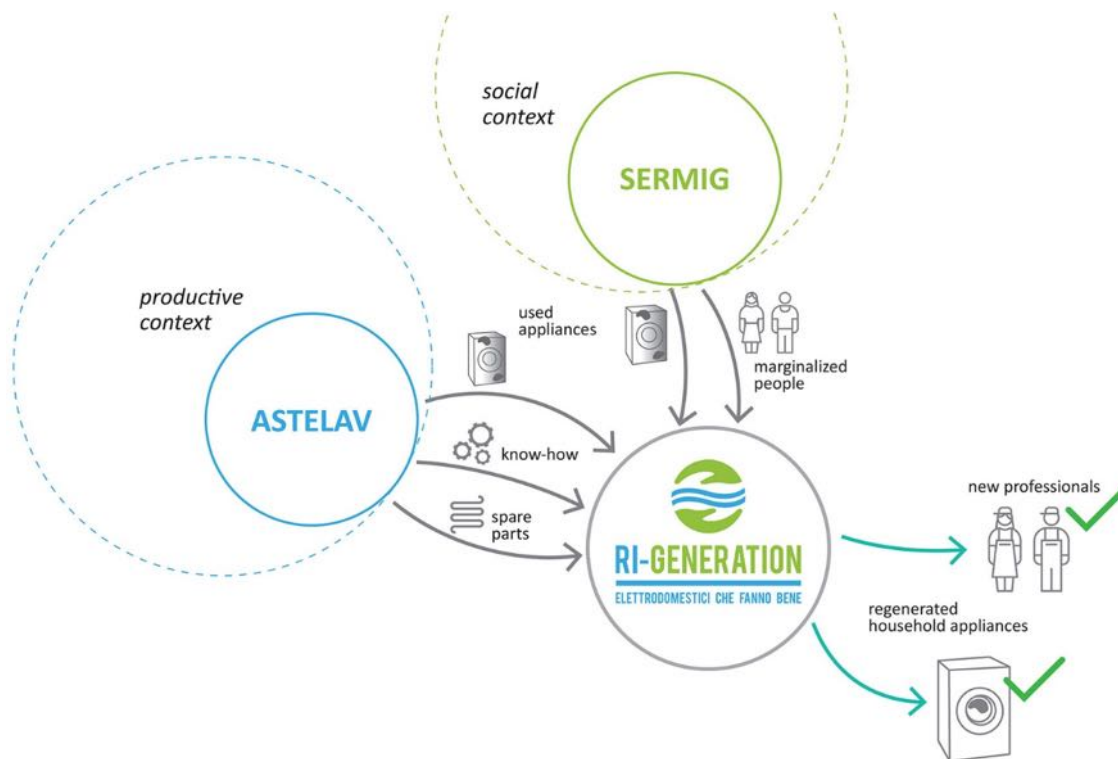


Figure 2. Ri-Generation working model: Astelav and Sermig roles for cooperation.



Figure 3. Check and regeneration of the appliances in the Ri-Generation laboratory (credits: Ri-Generation).

The target for Ri-Generation is rather heterogeneous, but mainly consists of people with low income or living in "fragile" conditions, such as:

- *students from other cities*, looking for an appliance to share with their roommates for a few years, but not for a particularly long time;
- *young couples*, who have to furnish their first home with a limited budget;
- *separated or divorced people*, who need to furnish a second home where accessories and appliances are not necessarily first choice products;
- *recently immigrated families* from other countries, for whom home appliances are a need but are not a key priority.

In general, they are users who need a functioning appliance, even if it is not the most recent or the most performing; they are interested in the economic advantage offered by reconditioned appliances and, in many cases, they are fully aware of the environmental and social values of the initiative.

3. Design Objective

The objective of the operation, from the design point of view, is to develop new systems for the protection, transportation, presentation and sale of used, recovered and reconditioned appliances, in particular washing machines (90% of the products recovered from Ri-Generation), allowing their redistribution in the market and the communication of a clear identity during the marketing phase. A "sui generis" packaging project, also due to the fact that the products sold are different from each other while sharing common typological characteristics.

The design challenge regarding the packaging for Ri-Generation is addressed in terms of functional and communication response, but also in accordance with a broader cultural paradigm which envisages the development of a complex system of activities and relationships able to create, in line with the mission of the Ri-Generation project, innovation and sustainability at different levels:

- *social*, involving vulnerable people and social cooperatives in the production of the packaging element;
- *environmental*, recovering used clothing in bad condition to be used as filling material for the packaging and at the same time exploring the possibilities of reuse of packaging after delivery;
- *productive*, in the training of *ad hoc* personnel and in the organization of a new "chain" of handicraft production that involves marginalized people;
- *linguistic*, in the application of new ways and means of expression, exploring aesthetics that are far from the traditional context of the packaging of household appliances, triggered also by experimentation, particularly in the artistic field.

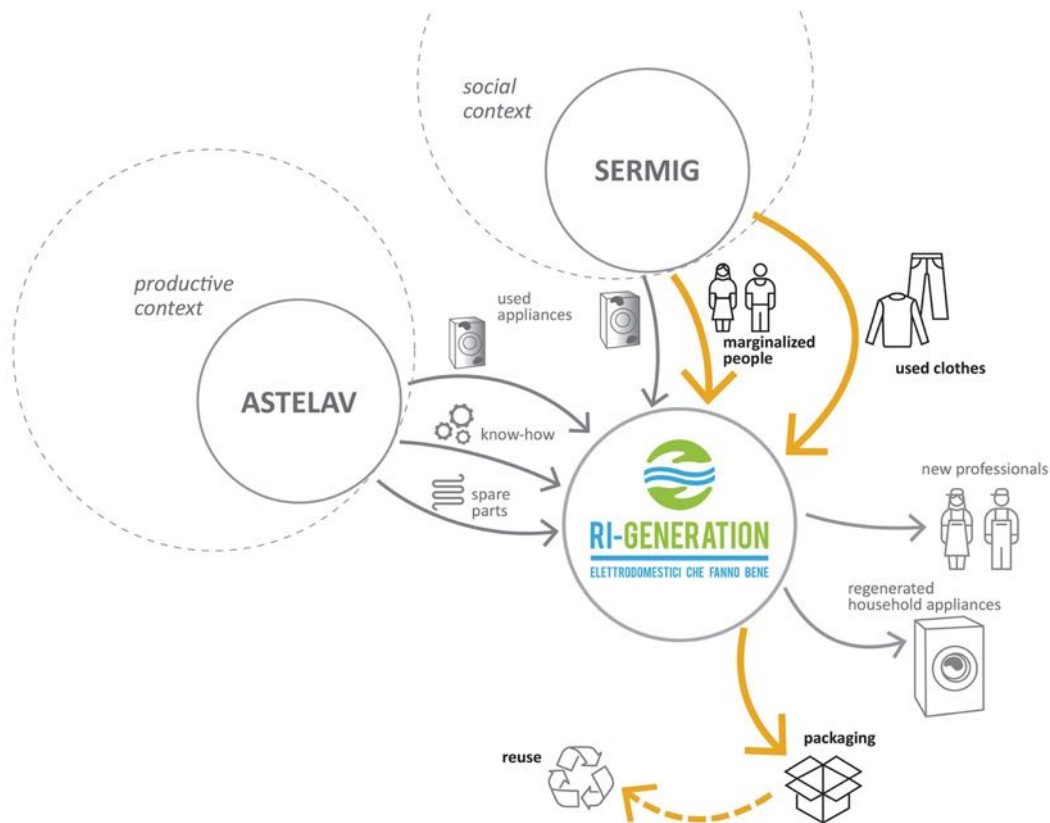


Figure 4. Packaging design concepts: reuse of faulty clothes collected by Sermig; creation of capabilities for disabled people; packaging reuse; narrative aesthetics.

The packaging is developed using the discarded part of used clothing collected by Sermig, otherwise useless because not suitable for donation to needy people, due to the fact that they are damaged, stained or too old.

Out of a total of about a ton of used clothes collected daily by Sermig, most of them are redistributed to needy people in Italy and abroad (especially in Romania, thanks to the collaboration that Sermig has established with the Somascan fathers), while a small part (about 3%) is not in good enough condition to be redistributed.

The packaging project for Ri-Generation foresees that these garments are collected and transformed into packaging following a “protocol”, designed “ad hoc” by the authors of this paper, which describes how to cut, overlay and sew these textile parts, and use them to pad a transparent PE mat with stitching. The packaging activity will be carried out by Cooperatives of needy or disabled people, who participated in the creation of the protocol, making this activity their future work. Moreover, the fabric, by its nature, has always been a suitable material to be reused to make other products. An example of this practice is “patchwork”, a technique that has been developed over the past few

centuries by the American pioneers who used to recover the parts in better conditions of the worn garments in order to repair other garments or to create new ones through the juxtaposition of remnants (Pulvirenti, 2009).

In this scenario, the project intends to face issues such as the valorization of poor materials and waste, the scarcity of renewable resources, the social value of manual labour (Pietroni, 2005). The value of reuse is further emphasized by the fact that the packaging can be reused by the end user once the appliance has been transported to the destination: the enclosed information materials and the graphics on the packaging suggest a "catalogue" of possible alternatives uses (such as giving protection to accessories and furnishings when moving, making car bumpers on garage walls, informal poufs, cushions for pets, base for picnic blankets, etc.). In practical terms, the sustainable aspect of re-use consists of delaying the disposal of packaging, with a consequent reduction of waste produced (Bozzola, 2014).

Furthermore, this ability to prevent waste through re-use (both the packaging and the product) (Dalisi, 2009), is in line with the possible actions recommended by the European legislation on sustainable waste management (Directive 2008/98/EC, implemented in Italy with Legislative Decree 205, 3 December 2010). In fact, the regulation considers some intervention priorities for managing the end-of-life of products in order to prevent waste, including re-use, recycling, recovery (eg energy recovery) and, ultimately, disposal.

If we consider the overall life cycle of packaging (Verghese et al., 2012), once the dual function has been completed (primary and secondary use), the Ri-Generation mat will be sent to a disposal path which provides two main options: landfill, or the separation of the two components (textile and plastic film) for the recycling of materials. In this case, the sewing technique can be optimized in order to make the separation of the two components as agile as possible.

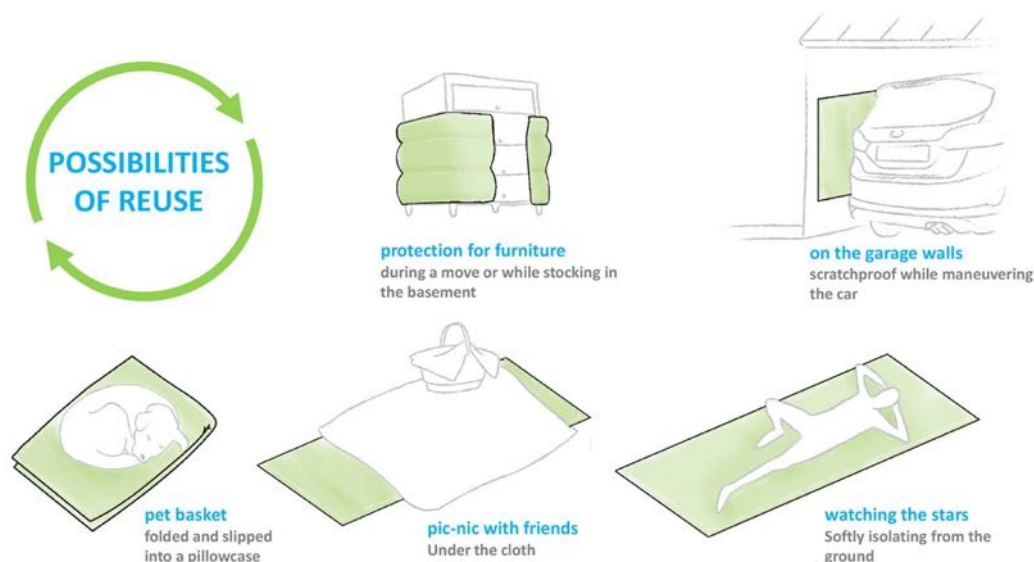


Figure 5. possible reuses of packaging.

The design approach contextualizes the operation in the area of eco-design, in particular in relation to the use of recovered materials and the enhancement of their end-life: the Ri-Generation project promotes the reuse and regeneration of products and materials (both the appliance and its packaging). The action also follows some of the principles and methods of social design, in designing not only products but also strategies to promote social inclusion processes, providing tools to help designers work with abstract entities such as services and communities rather than with objects (Chen, Cheng, Hummels and Koskinen, 2015).

4. Methodology

The research and development process has been organized in phases, according to a working method that allows facing the product design activity (usually performed by the designer) within a different production and relations system. The methodological approach consists in the articulation of some specific steps, each of which involves the different actors (Politecnico di Torino, Astelav, Sermig) organized in different configurations and with different roles:

- **Scenario analysis:** an analysis of the context related to the research object. This tool allows an interpretation of the social and cultural context, as well as the technological and market framework. Furthermore, it activates the development of critical knowledge on specific topics, such as the identity of the partners, the social enterprise models, the WEEE products and the characteristics of the appliances, the packaging methods of the appliances, the sustainability issue in terms of production, management and use, the target market, the state of the market, the socio-cultural scenarios in terms of conscious and sustainable consumption, etc. This informative documentation was the point of reference for the subsequent design process and a fundamental component to outline approaches, solutions and opportunities in order to realize a conscious evolution of meta-design (Dal Palù, D., Lerma, B., Bozzola, M., & De Giorgi, C., 2018).

For example, during the scenario activity, a comparative study was conducted by the authors on the types of packaging most used for household appliances: it showed that a "multi-material approach" is mainly used, in which polystyrene is grouped with other plastic components. such as polyethylene film and straps; sometimes these elements are also accompanied by cardboard and wood parts: a wide range of very different materials that are not always easy to separate and recycle. These systems, although efficient from the performance point of view, still have some ecological problems. The most significant environmental problem for packaging is in fact related to the need to prevent waste already before its production (Badalucco, 2011).

But the same study has also focused on some interesting cases developed on a "service" approach, such as the "Free Pack Net system": the manufacturer provides the company with expanded polypropylene packaging, which is recovered (and restored) after each use and then supplied again, allowing the company to "rent" the package to use it multiple times and save money.

Similar operations have also been explored in the recovery and regeneration of household appliances for sale (such as “Envie” in France, “Environcom” in Belgium or “Rreuse” in Belgium): it was noted that these companies currently do not present “ad hoc” packaging systems, but instead use traditional industrial packaging systems such as shrink wraps or polystyrene. This is a missed opportunity to strengthen corporate identity and communicate specific values during the distribution and sale phase.

Concept definition: it’s the identification and development of the design guidelines in terms of product and process organization. Starting from the Ri-Generation model, the goal was to develop useful and functional packaging, able to enhance the identity of the regenerated appliance. In fact, since the packaging is both a functional and a communication product, it has to express the intrinsic values of the project and reinforce its specific identity. This is why the developed proposal was based on the same principles as the main Ri-Generation project: the concept is based on the recovery of waste materials that Sermig receives daily in the form of private donations: in particular, among the used clothes that are collected and selected for redistribution to people in economic and social difficulty, those that are defective, stained, torn or consumed can be reused and transformed into efficient padding for packaging systems. At the same time, the production process has been organized so that social cooperatives belonging to the Sermig circuit can create job opportunities for marginalized people through the organization of clothing transformation activities.

The **concept development** focused on the creation of the mat, carrying out technological and functional tests and experiments, also with the partners who participated in some preparation workshops, aimed at drafting a shared protocol useful for the management and control of all the necessary actions to produce the packaging. The product development process involved the management of Sermig and its staff (three managers and five guests), the Astelav management and employees (four people), and two social cooperatives (two staff members and ten guests). These subjects collaborated in some participatory activities coordinated by the Politecnico Research Unit in workshop mode, aimed at testing the production methods and evaluating the incoming and outgoing skills of the people involved in the production of the packaging elements. The assembly was carried out by social cooperatives identified by Sermig, appropriately trained through the aforementioned activities of direct experimentation and partial co-design.

The production phase mainly involves a social cooperative that has been identified by Sermig to produce the packaging. The fundamental aspect is the preparation of the working area, where the people of the social cooperative will create the mats, working around very large tables where the scraps will be cut, assembled inside the polyethylene tubular films and finally sewn with a special sewing machine.

At this time, the production of the “zero series” has been almost completed: this should soon lead to testing the handling and transport of “wrapped” appliances. Once feedback has been received from the test activity, a quick optimization of the production will take place, in order to proceed with the final production of about thirty mats-packaging per week.

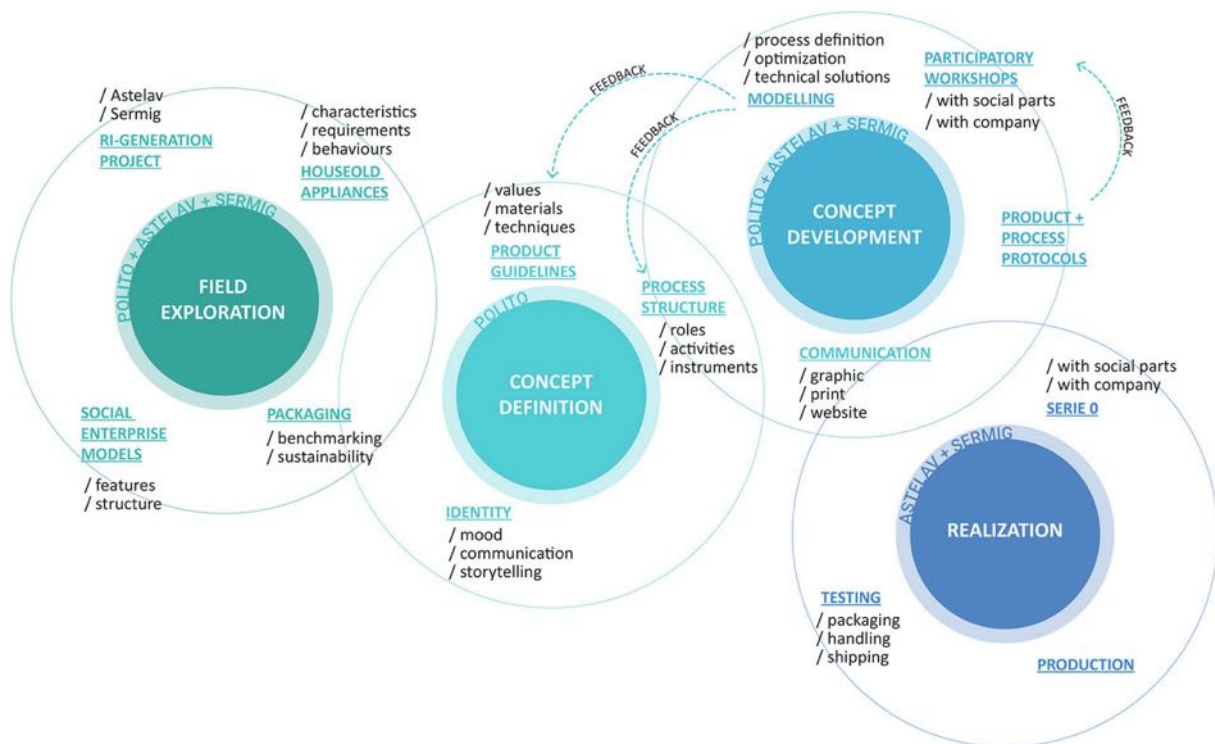


Figure 6. Methodological framework and roles.

5. Outputs

The packaging element, therefore, consists of a sort of waterproof "padded sheet" that is strong enough to wrap and effectively protect the regenerated household appliance during transport, storage and sale, also providing the customer with some information on the renewed life of the product. The padding is made with used clothing, which is cut and assembled according to a specific protocol, then positioned, fixed and sewn inside polyethylene tubular films.

The production protocol was developed by the research unit of the Politecnico di Torino with the contribution of the subjects involved in the Ri-Generation operation (Sermig, Astelav and social cooperatives) in order to provide all the information necessary to set up the work and produce the packaging product. These instructions have also been translated into a graphic panel which the staff can refer to, during the manufacturing process. In particular, it explains which tools are needed and the characteristics of the working area, the correct positioning and the right way to cut the plastic film, how and where to trace the sewing lines, the average size and shapes of the fabric remnants, how to cut the clothes, the way to insert the cut garments into the plastic film and then the possible sewing techniques.

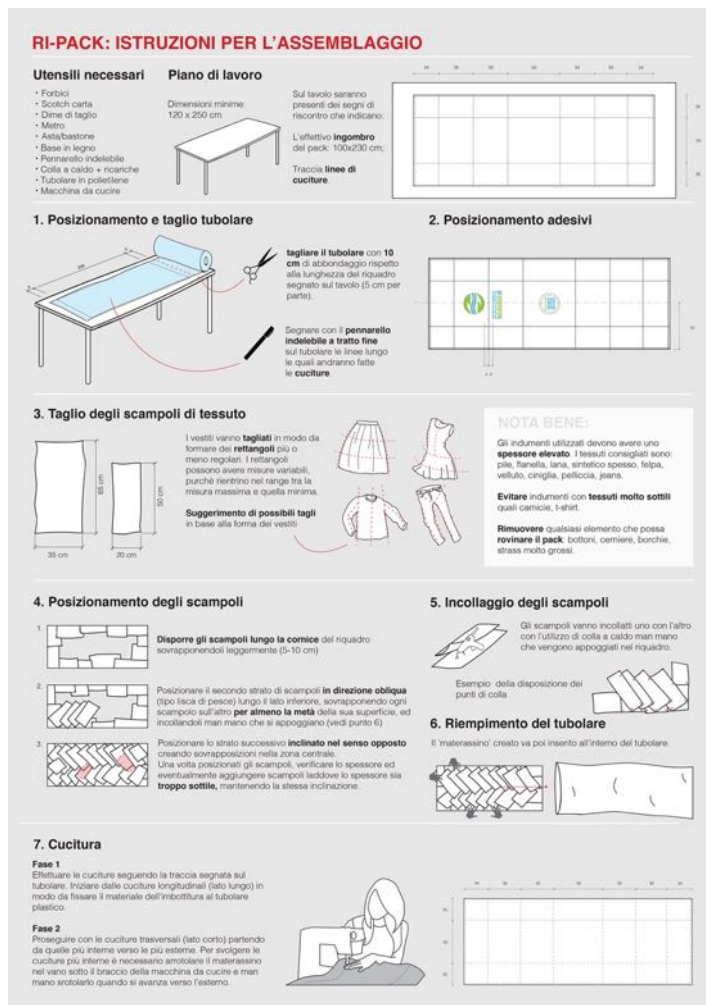


Figure 7. Realization instructions translated into a graphic panel to refer to during the different phases of the production process

The resulting product is characterized by a strong expressive charge, according to an approach that highlights the semantic value of packaging (Germak, 2013): fragments of garments of different colors and types of fabric envelop the household appliance, almost a block of clothes that, from one side, disorients and intrigues, and, on the other, tells a story on several levels: the garment, that symbolizes the product (the washing machine) and emotionally declares its function, but also tells the story of the recovery of waste items, the heart of the Ri-Generation project.



Figure 8. Main packaging element: protective mat made with used clothes contained in polyethylene tubular film.



Figure 9. The appliance packed ready for transport and sale.

The packaging, therefore, appears coherent with the appliances that it protects: ideally, the clothes "come out" from the drum of the washing machine to wrap and protect it during transport to its new owner.

6. Participatory Activities

As already mentioned, the product development process involved staff of Sermig, Astelav and social cooperatives during some participated workshops coordinated by the Research Unit of the Politecnico di Torino, aimed at testing the production methods and the potential of the activity to become an economic opportunity. In particular, three sets of workshops were organized and developed with different people and with different aims:

- The first set of workshops involved the managers of Sermig and Astelav who worked with the researchers of the Politecnico di Torino in order to identify the possible bodies suitable for the production of packaging.
- The second set was carried out at a volunteer center affiliated with Sermig. The goal was the optimization of tools and processes.
- The third set was developed with a social cooperative identified by Sermig, in which disabled people participate in activities for the final production.

In this context of direct experimentation and partial co-design, the role of design transcends the traditional task of interpreting needs and identifying opportunities, instead, becoming a facilitator of the process, triggering actions of mediation between the parties. This means that the designer does not only deal with the design activity, identifying product performance, meanings, materials and production techniques but also interfaces with other figures that in some way intervene in the design and development process (in particular marginalized subjects, disabled people and educators). Its role changes from being proactive to adopting a position of observation and organizational behaviour.

In particular, the third experimentation laboratory intended to lead to a pre-series of twenty units. This activity is ongoing at this time and will be tested during transport and sale to end users. The feedback gathered from this activity will allow us to optimize packaging production methods and the operation of the entire sales chain.



Figure 10. Participatory workshops with volunteers and people from social cooperatives.

A communication system has also been developed, with the aim of completing the packaging in terms of visual and communication functions. The graphics on the packaging state the possibility of reuse and the attached brochure illustrates the history of the entire Ri-Generation project, including the potential alternative use of packaging.

7. Future developments

The defined packaging system, regardless of its specific application in the context of the distribution of reconditioned household appliances, can be considered, to all intents, as a new semi-finished product which, when suitably reshaped, can also be used in other product sectors. First of all, in the context of the donation of goods by Sermig (recovered electronic products, educational materials for school education, medicines, technological systems, etc.), which are daily sent in the Third World and in the developing countries.

Among the possible developments, some of which are underway while others are in a start-up phase, we point out some potential actions aimed in particular at the diffusion of the activity, in order to transform it into a replicable or re-interpretable best-practice and to enhance the cultural content of the project, such as:

- *Creation of a special section on the Ri-Generation website:* definition of texts, images, animations, etc., able to describe the partnership with the Politecnico di Torino, the design process and the scientific-cultural value of the packaging-design operation and further suggestions on possible reuse by end users. Another idea would be to propose a contest with

awards dedicated to the theme "take a picture of how you reuse Ri-Pack", generating the interest of the client in the competition (an online vote/evaluation of the most useful and original way to reuse Ri-Generation packaging) able to further participate in the dissemination and communication process.

- *Definition of content and editorial project per single publication/story*: the case history of a sustainable packaging project can be the subject of a story conveyed by a small and agile typographic product, to be distributed during specific events aimed at spreading the initiative and promote the activity of Ri-Generation.
- *Curating and design of possible exhibitions*: definition of possible exhibit concepts for the participation in fairs and events on the theme of sustainable packaging, or for the creation of a specific "ad hoc" event dedicated to the Ri-Generation case history.

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