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Procedia Manufacturing 12 (2017) 120 – 127

Procedia MANUFACTURING

International Conference on Sustainable and Intelligent Manufacturing, RESIM 2016, 14-17 December 2016, Leiria, Portugal

The fourth "R" - The reversion of objects as a way of reducing waste

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Abstract

Given the evident inefficiency of the policies and mechanisms established to deal with environmental degradation, it is essential to understand the reasons for their failures and to try alternative ways to mitigate the environmental problems associated with the replacement of objects. The ideas behind the so-called "3 R's" policy, born of a sequence of two defining moments in the definition of environmental policies in Europe, - Agenda XXI in 1992 [1] and the 5th European Environment and Development Program of 1993 - have produced encouraging results since their creation, but failed to halt the increasing degradation of the environment on a planetary level. One of the problems derives from the fact that any of r's is strongly dependent on the environmental conscience, or even ethics, of the citizens responsible for the decisions regarding the products in their different moments of existence - from their design and production to their use and subsequent destination. This dependence leads to a high fallibility of environmental policies, insofar as western society suggests, in the way it behaves, a direction opposite to that which they advocate. It is thus important to reflect on ways of designing and producing things whose environmental performance is less dependent on the environmental consciousness of the end user, so that this awareness is not so decisive in the impact resulting from the disposal of objects. The present work tries to analyse the response of a group of students of design to the introduction of a "4thR", that we call Reversion, and that is to think products of daily use whose form is conditioned by the necessity of its components can be, when dismantled of the system, seen as raw material directly usable for another purpose, easily determined by the user, and not as a technical component of an obsolete system. Functional prototypes will be realized in order to evaluate and validate the products regarding their effective performance in terms of production and use, as well as the possibility of reuse of their components in contexts other than those for which the objects were designed.

Peer-review under responsibility of the scientific committee of the International Conference on Sustainable and Intelligent Manufacturing

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doi:10.1016/j.promfg.2017.08.016

Keywords: Product design; reuse; reversion; sustainable production.

1. Introduction

Global waste production has created a serious problem in terms of its management, with very serious environmental consequences.

The evolution of societies, and especially Western societies, has led to a growing consumption of durable and non-durable goods, causing enormous environmental pressure, not only because of the increase of the extraction and transformation of raw materials and the consequent increase in energy consumption and pollutants emissions, but also by the inability of societies to accommodate the increased waste production.

The consequences of this overproduction have obvious consequences in some parts of the world, which are responsible for collecting a large part of hazardous waste produced in the West. The site known as Agbogbloshien in Accra, Ghana, currently receives 215,000 tonnes of e-waste a year, according to the site Worstpolluted.org, and is expected to double by 2020 if the linearity of economic growth remains. This deposition has serious consequences on the health and life of 40,000 people, only in this place. [2]

According to Annie Leonard, "In 1960, we made 88 million tons of MSW in the United States— that's 2.68 pounds per person, per day. In 1980, it had risen to 3.66 pounds each. By 1999, at which time recycling was a household word, we were at 4.55 pounds, just below our current rates. According to the EPA, Americans made 254 million tons of municipal solid waste in 2007. That comes out to 4.6 pounds per person per day!" [3]

This growth of garbage production can be analysed in terms of its typology, which has been radically transformed over the last decades. If at the beginning of the XXth century the urban waste produced was essentially coal ash, used for heating and cooking, and food waste [4], the present reality is quite different. The report "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2012" shows that the actual prevailing categories of waste focus on durable and non-durable goods, as well as packaging, accounting for about 75 % of municipal waste collected in the United States in 2012. [5]

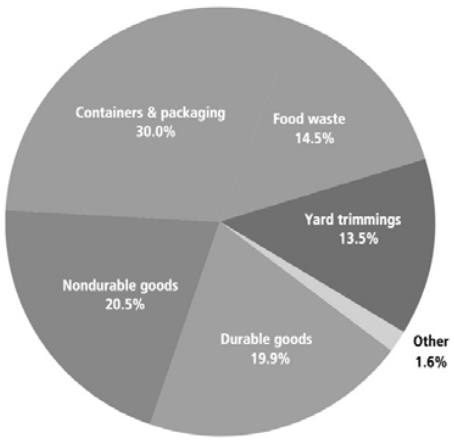

Fig. 1. Total MSW generation by product category, 2012

It can be seen that the highest percentage of urban waste is actually made up of products that were designed, manufactured, used and disposed of.

This finding leads us to the need to evaluate the policies associated with the recycling or reuse of these wastes.

An analysis of the evolution of the percentage of selective waste collection compared to the total waste collected in Portugal shows that the current waste treatment policies, while contributing to a greater awareness of the problem by the population, did not prevent an increase in the amount of garbage that is not recycled. [6]

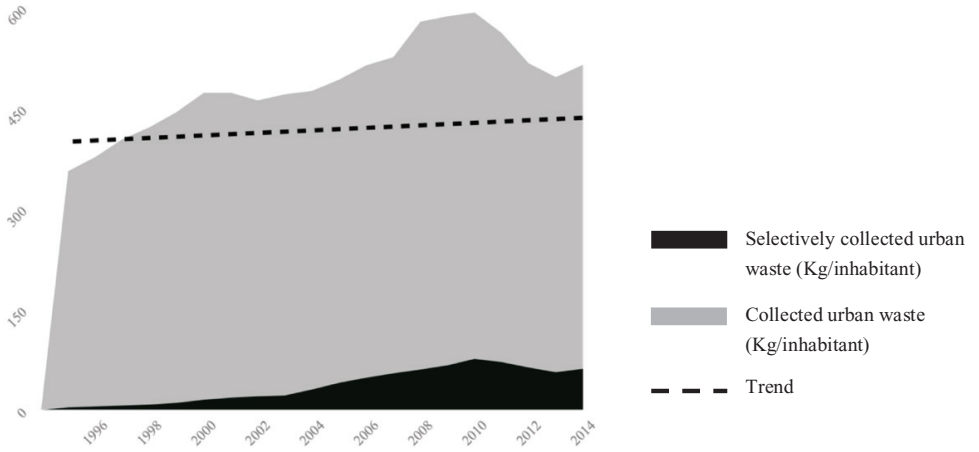

Fig. 2. Evolution of the collected and selectively collected urban waste in Portugal, between 1994 and 2014 - Adapted from Pordata

It is clear that urban recycling policies and systems, particularly in the Portuguese case, have not been able to solve the problem. This is not a total failure, as these policies have allowed to accommodate, albeit timidly, the exponential increase of consumption and disposal of durable and non-durable goods and packaging, contributing to a slowdown in the pace of degradation, which still tends to increase. On the other hand, recycling policies such as the one implemented in Sweden produce more significant results, as the waste that is left unused for recycling, about 50% of the waste produced, is used for energy production, allowing less than 1% of the collected waste to be landfilled. Even so, actions are taken to reduce the amount of garbage produced, by raising awareness of the production of more durable objects, as well as proposals for tax deduction to expenses incurred in repairing goods. [7]

The European Parliament's Directive 2008/98 / EC [8] establishes a hierarchy of waste:

1) Prevention and reduction
2) Preparation for reuse
3) Recycling
4) other types of recovery.

We can consider that an effective resolution of the problem must be found on the first two points, reduction and reuse, avoiding as much as possible the need of the third, recycling.

2. Implications of design

Considering, as previously mentioned, that 75% of the garbage collected in the United States are products, it is clear that design is strongly implicated in this problem, and is responsible to define design strategies oriented to the mitigation of the problem.

In the words of Nathan Stegall [9], “The field of design... has become a major focal point for sustainability, which is not surprising since poorly designed industrial systems, products, and buildings can greatly contribute to environmental and social degradation.” Victor Papanek, when he published "Design for the Real World", a work

that became a reference, already alerted to the need to rethink the practice of design, stating that "We will never say enough that, In the problems of pollution, the designer is more involved than most people "[10]

Design is thus responsible for trying out design strategies that can contribute to the reduction of waste production. The most common strategies nowadays focus mainly on issues related to the materiality of things, seeking to reduce the impacts caused by objects through a more careful selection of materials and manufacturing processes, in order to guarantee greater efficiency of the products in terms of energy consumption or recyclability.

Although relevant, these strategies are very dependent on the end user to take effect, since this is who has the final word about the final destination of the products. This direction is pointed out by William Mc. Donough and Michael Braungart [11], although outlining a strategy that is highly dependent on specific characteristics of the materials and manufacturing processes, and therefore difficult to implement on a large and medium-term scale. On the other hand, this strategy focuses more on the recovery of waste, and not necessarily on its reduction. It is interesting that the sub-title of the book in the French version is "create and recycle infinitely".

One of the possible strategies to reduce this dependence, is to look for ways to minimize the amount of waste discarded, intervening in the definition of the product at a design stage, in order to increase the chances that it will be maintained by the user after the end of his useful life.

Hypothesis

The observation of the work "Things come apart"[12] allows us to understand the unintelligible technical complexity of the objects with which we coexist in daily life, a complexity that prevents us from foreseeing in them any possibility of reuse at the end of their useful life, or even how they can be recycled.

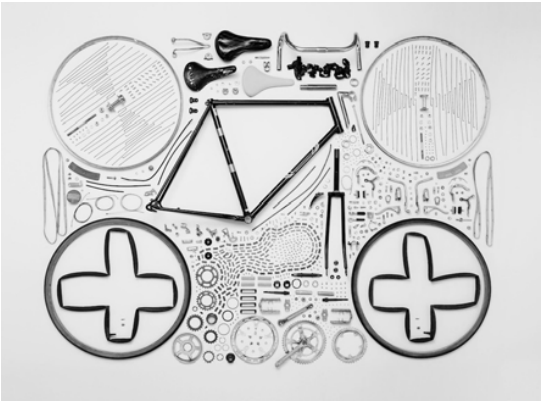

Fig. 3. Image from the collection "Things come apart" - Todd Mc. Lellan.

We realize that the complexity of the systems as well as the strong identity of their components contributes to make it difficult for users to understand them. This difficulty causes the absence of references that allow the user to understand how the object can be recycled or the possibly to use the most of its components. Many of the elements that make up many of the objects are familiar to most users, such as screws, washers or nuts, but their integration into a complex and difficult to dismantle system generally removes any chance of future uses.

The issue of the importance of dismantling is aptly addressed by Joseph Chiodo in the text "Falling apart: the Future":

“Most products are designed to be put together, not to fall apart in a controlled and environmentally useful or profitable way. When they cease to function or break apart prematurely, they become redundant. Such products designed with no consideration to what will become of them at the end of their useful lives create a cascading series

of problems – they threaten environmental sustainability, they exhaust resources, and they undermine jobs and economic stability." [13]

The idea of reversion appears here as a possibility to summon the user to the recycling process, by creating an interest in objects that go beyond their time of use. This concept is approached by Ron Arad, although in a lateral way, when referring to the armchair "Well tempered chair" [14], whose shape is reversible, thus allowing the use of the material that constitutes it in other applications, because its dismantling results in rectangular plates, bolts and nuts.

Fig. 4. Well tempered chair. Ron Arad. 1986

The importance of this kind of relationship between the user and the objects he uses was already firmly defended by Enzo Mari in 1974: "…whenever possible I try to involve people not only with words but "other" deeds. In 1974 I thought that if people were encouraged to build a table with their own hands, for example, they would be able to understand the thinking behind it" [15]

The aim of this exercise is to confront design students to understand, on the one hand, how the conditioning brought about by these ideas can influence their creative process at the level of generating relevant ideas, and on the other, perceive the comprehensiveness of the applicability of the concept of reversion in daily use products.

The challenge was set with the following guidelines:

Thinking about products of daily use whose form is conditioned by the necessity of its components to be, when dismantled of the system, seen as raw material directly usable for another purpose, easily determined by the user, and not as a technical component of an obsolete system.

Methodology and work development

The work was developed during a 30-hour workshop, held with students of the Master in Product Design from the Caldas da Rainha Superior School of Arts and Design.

The working group consisted of 22 students from Portugal, Italy, Romania and Ecuador. Groups of heterogeneous origin were formed, thus seeking some balance in terms of knowledge and expertise, naturally diverse in a group of students trained in different courses, schools and countries.

In order to allow clearer conclusions, it was a fundamental condition to prototype the objects. As a result of relatively short time to work, preference was given to proposals that could be easily produced with the technological means available in the school.

The construction of approximate models, "quick-and-dirty prototypes"[16], was started very early, because of the ease they add to the process of visualization and identification of valuable elements and meanings. Enacting the

functioning of the models also gives a better understanding of the product values. This procedure made it possible to a faster identification of solutions, since the actual visualization of the ideas allowed to accelerate the decision-making process in the different phases of the projects evolution.

The way the statement was put led the participants to focus their reflections on issues related to the processes of linking components, since their dismantling was a fundamental aspect to consider. They generally sought solutions that circumvented the need to use definitive bonds, such as glues or welds, or even more conventional bonding systems, such as metal connectors. This search has brought to the project an interesting dimension of inventiveness in several of the presented proposals, having promoted the exploration of ideas more related to usage issues, such as the possibility of adapting the objects to the specific needs of the users or taking advantage of the greater flexibility provided by reversible links.

Prototyping took place in the school workshops, and at this stage the effectiveness of some of the ideas previously explored was verified. The use of the material corresponding to the final object, unlike the previous phase, led to formal adjustments, often in the sense of subtraction of material from the initial form. Thus, the importance of the experience of the material in the understanding of the product is verified, as well as in its definition.

A significant proportion of the proposals were made in wood. This decision is, of course, due to the fact that a well-equipped workshop is available in the school to transform this material. But it was also possible to understand the choice in terms of affinity. Wood is ultimately viewed as an easy-to-process material for most people. In fact, this is perhaps the least "intriguing" material used in the production of objects, as most people can identify it, and at some point have already transformed it. Donald Norman talks about the importance of the affinity, or affordance, in the use of objects: "… the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used… A chair affords ('is for') support and therefore affords sitting. A chair can also be carried. Glass is for seeing through, and for breaking, wood is normally used for solidity, opacity, support and carving…Affordances provide strong clues to the operation of things". [17] This dimension was therefore fundamental in the formal definition of the different pieces, since it was necessary that the dimension of affordance be considered not only in the final object, but also in the different elements that compose it.

Upon completion and experimentation of the prototypes, the objects were photographed under two different perspectives. One of the images should show the object in use, while the other should show a mapping of the different components that make it up. These visualizations made it possible to compare the object (which was intended to be clear as to the type of use that should be made of it) with the different components that constitute it, which should have a formal neutrality that distances them as far as possible from the image of technical components of a system.

In the following figures we can see sets of images referring to some of the work done.

Fig. 5. Coat stand. Inês Bruto da Costa

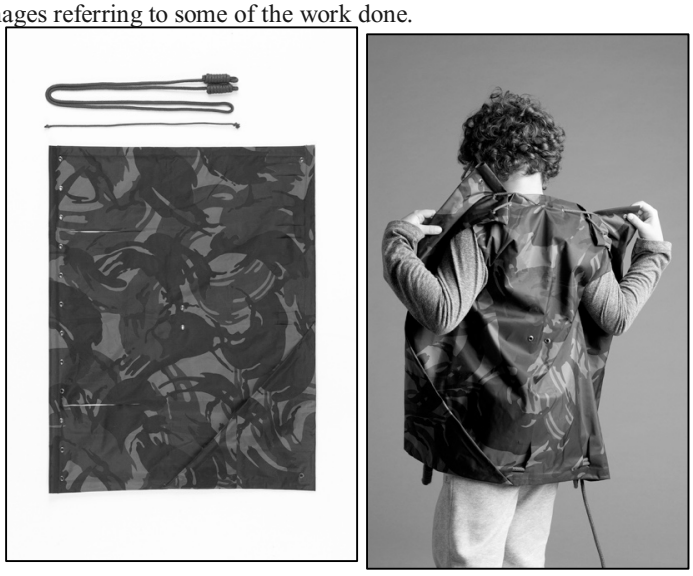

Fig. 6. Vest with jump rope. Diana Fonseca + Joana Barros.

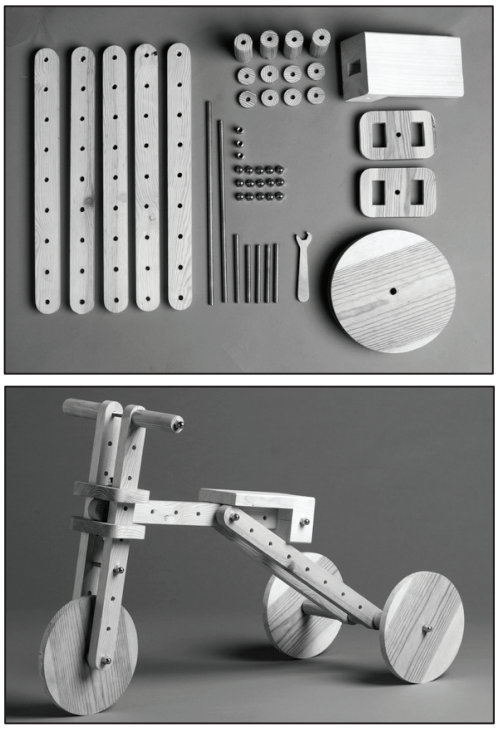

Fig. 7. Modular vehicle. Ricardo Leandro + Rute Carreira.

Fig. 8. Modular bookcase. André Dias + Carolina Calheiros.

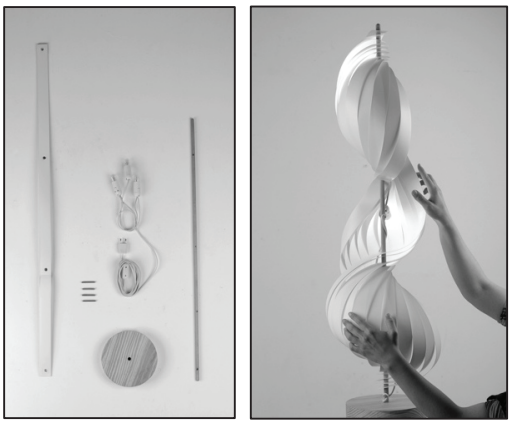

Fig. 9. Lamp. Andrea Orna + Karen Jaramillo + Samantha Silva.

Fig. 10. Table. Lenin Calvopiña + Marco Herrera.

Conclusion:

Instead to what might at first be expected, the strong conditioning of the project to the results to be achieved has proved to be a stimulus of the creative process. The fact that we have to think about the objects in an inverted perspective, insofar as the product is strongly conditioned by the way the component is intended, has also led to a very rational and pragmatic approach, turning decisions away from purely aesthetic considerations, although this component was not neglected in determining the shape and details of the product.

On the other hand, since the project was centered and conditioned by a post-functional moment of the object, the reflections were very focused on the possible action of the user at that moment. This approach naturally involved students in a user-centered design methodology, leading decision-making to be guided by affinity, perception, gesture, fit, handling, assembly, use, and so on.

The idea of reversion leaded to a simplification of components, contributing to simpler, less processed, more economical, and potentially cleaner objects. Simple shapes allow us to foresee a greater number of uses than complex forms, increasing the possibilities of being reused.

Although with a temporal duration that still does not allow the necessary deepening, this initial reflection shows an interesting potential for the exploration of the idea of reversion in design. The results obtained focus on household objects, mostly furniture, usually associated with an idea of prolonged duration. It would make sense to continue this study, orienting it towards objects of more ephemeral duration, much more involved in the environmental problem

The actions arising from the use of an object at all moments of its life cycle are determinant for its environmental performance. We can conclude that the definition of its forms is probably a critical moment for the accomplishment of this performance.

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