

Design and durability: a contribution to sustainable development

João Carlos Martins¹, José António Simões², Teresa Cláudia Franqueira³

¹ *PHD Student in Design at Department of Communication and Art, Aveiro University*

² *Director of ESAD Matosinhos School of Art and Design*

³ *Professor and Director of Design Course at Department of Communication and Art, Aveiro University*

joaocmartins@ua.pt

Abstract

There is growing awareness that the planet we live in cannot support many more years of intensive use such as that which took place in the twentieth century. Having accepted that fact, the major question now is how to invert the situation, how to continue to satisfy today's needs and aspirations without jeopardizing the needs of future generations. The environmental impacts aggravated in recent decades by uncontrolled production and consumption have caused damage, some of it irreversible, to the planet and its populations. It is in this context that researchers and various organizations call on producers and consumers for an urgent change in behaviour. The United Nations has already warned of the need to change our consumption patterns or else we will leave a costly inheritance to the next generation. Environmental and social sustainability requires the transition from a society where the growth of production and material consumption were factors of progress to a society able to develop based on other factors. In this process, design can play an important role in defining sustainable solutions, ideas of well-being that allow us to live with a better conscience, consuming less and regenerating our physical and social environment, including the idea of social and environmental sustainability based on ethical principles. It is necessary to produce and consume differently, have more and better information about products – their social costs and environmental impacts. We sought to create guidelines for this new form of action. We researched the origin of the idea of sustainable development and the concept of durability, and then present an alternative path to the creation of more products, which implies increasing products' life-cycle as an important contribution to reducing the environmental impact, diminishing the waste and energy consumption almost always caused by the design of new products.

Introduction

The investigatory work to be developed in collaboration with companies and centres of investigation is set in the context of investigation applied in design which began in connection with the Doctorate in Design at the University of Aveiro and is currently in progress within the new Doctoral Programme in Design at the same university. Concerning practical results, it is hoped to be able to show construction of a model for the development of products with low environmental impact based on the theoretical hypothesis that long-lasting products will be better for the environment. Increased durability and the consequent extension of useful life could contribute to diminishing the impact caused by premature elimination (waste production) and new conception (consumption of raw material and energy).

The aim is to explore, consider, demonstrate and disseminate contents related to the investigation hypothesis, culminating in the design or redesign of products that synthesize the idea/concept and can be stated in the national and international context in order to promote Portuguese design with characteristics of innovation and ecological concerns. This work sets out from the principle that the focus will be limited by the set of project activities directly linked to design practice, "... understood in its broadest and most current sense, which applies not only apply to a physical product but to an integrated set of product, service and communication which companies present to the market" (Manzini and Vezzoli, 2002, p.19)¹.

Background

The January 2011 edition of National Geographic magazine estimates that in 2045 the world population will be nine thousand million, and asks if the planet will be able to cope with the pressure, forecasting that in the coming decades, despite the falling birthrate, the population will continue to grow. "If the thousands of millions of people who want to break out of poverty follow the path taken by the inhabitants of rich countries, this will have serious repercussions for the planet's resources" (Kunzig, 2011, p. 8)².

Since the period following the Second World War, the consumer society has become more pronounced. First in the USA and then in other countries, the model of mass consumption was stimulated by the improved living conditions of the middle classes, by the abundance of goods and services and by the immediate availability of credit (Whiteley, 1993, p. 15)³. At that time, Lebow (1955)⁴ called for consumption to be society's way of life, and for the rate of elimination, substitution and disposal to be ever faster. "As consumption took root in one culture after another over the last fifty years, it became a strong stimulus for the relentless increase in the demand for resources and the production of waste(...)" (Assadourian et al., 2010, p. XXII)⁵. The frantic desire for possession that current society seems to have voluntarily cultivated, becoming more pronounced in the second half of the twentieth century, and characterized by Lipovetsky (2008, p. 73)⁶ as "... a wave of phenomena of excess and lack of control, unstructured behaviours and pathological and compulsive consumption", has had damaging consequences for the environment. Climate change is perhaps the most debated consequence of recent years. The 4th Report from the Intergovernmental Panel on Climate Change, "Climate Change 2007", forecasts the consequences of climate changes up to 2100. Among them will be a higher average air temperature, rising sea-levels, the disappearing Arctic ice-cap, greater concentration of moisture and precipitation in some regions of the world, more frequent extreme climatic phenomena, increased threat of extinction of plants and animals, increased risk of large-scale

impacts with irreversible effects associated with changes in maritime currents, and increased risk of social conflict and population migration. According to Orsenna (2008, p. 45)⁷ “up to now, industrialized countries have been largely responsible for the high rates of greenhouse gases found so far stored in the atmosphere”. We gather, therefore, that concentrated effort by those countries to reduce the emission of polluting gases would help to solve the problem and would be a step along the path towards sustainable development, that is to say, “development that seeks to satisfy the needs of the current generation, without jeopardizing future generations’ ability to satisfy their needs” (WCED, 1987)⁸.

The environmental problem is undeniably associated with the question of waste, which has been highlighted by environmentalists as one of the most serious environmental problems nowadays, to the extent of being the subject of environmental education campaigns and programmes. In the case of urban solid waste, generally called urban waste, resulting from societies’ domestic and commercial activities, many objects acquired for their functional, esthetic or symbolic attributes at a certain moment, are thrown away after some time. Average use of certain material goods has been diminishing in so-called developed societies. In the USA, for example, 99% of products acquired in global terms end up in the rubbish after only six months (Leonard and Conrad, 2010)⁹. Let us suppose that the same amount again is acquired to replace them. This represents an efficiency rate of 1%. Various reasons explain the elimination of products. Manzini and Vezzoli (2002, p. 182)¹ highlight as the main ones, reduced properties or structural fatigue caused by extensive use; damage, due to natural or chemical causes; damage caused by accidents or inappropriate use and technological obsolescence, for products incorporating mechanical or electronic devices which are frequently updated, but also cultural esthetic obsolescence for fashion products, for example. Kazazian (2005, p. 45)¹⁰ also states that programmed obsolescence, where some products or components are projected aiming to influence their durability, with a view to their end and exchange for others with or without improvements in their attributes. Cooper (2004)¹¹ refers to two types of obsolescence: “relative obsolescence” (throwing away products that still function properly at the time of disposal) and “absolute obsolescence” (disposal of products due to breakdown). This waste has three major results: recycling, dumping or incineration. On this subject, Brown (2001)¹², states that “....waste is the manifestation of a more fundamental problem – the development of the world’s throwaway economy. (...) The challenge we face today is to replace the throwaway economy with the economy of reduction/reuse/recycling.

From the point of view of environmental sustainability, a high volume of waste caused by product elimination is more and more undesirable. But the multiplication of objects in our immediate environment seems set to increasingly reduce the duration of their use and increase the need to acquire. Contributing to this is the quantity and variety of articles currently available on the market. “Until the 70s, acquired goods and symbols of consumerism were above all for family use (...). Ultramodern times are characterized in turn by a new consumer revolution where equipment is essentially individual (...)” (Lipovetsky, 2008, p. 70)⁶. Included here are necessarily products that in general are disposed of sooner or later to be replaced by new ones such as the personal computer, mobile phone, i-pod, portable GPS, smartphone or games console.

Subject of study

Most acquisitions of goods are replacement purchases; new products are acquired to substitute those we have (van Nes and Cramer, 2005)¹³. We know empirically that replacement is not necessarily motivated by irreparable breakdown of the product we own. Witness the case of computers that are generally replaced by others which are faster, mobile phones that began to be replaced by smaller models are now replaced by versions with more functions, or coffee machines that we tend to replace with more esthetically pleasing ones. Here, it becomes necessary to differentiate the duration of a product's life or its life-cycle, from the duration of its use (Kazazian, 2005, p. 45)¹⁰. The former concerns a product's capacity to last over time, while the latter allows it to respond to users' needs and desires. In this context, what will be the role of designers in reinforcing consumption standards that take a more sustainable direction? That is to say, will it be possible to influence positively the frequency of substitution through product design and in this way reduce the environmental impact caused by elimination or the placing of new products on the market?

Different design strategies have been proposed to reduce products' environmental impact. Among the classifications of the strategic calls for eco-design described in the bibliography (Manzini and Vezzoli, 2002¹, Fuad-Luke, 2004¹⁴, Lindbeck and Wygant, 1995¹⁵, Yeang and Woo, 2010¹⁶), the optimization of product life is one which objectively approaches the subject of durability. Towards that optimization, two routes can be taken: increasing product durability or intensifying product use. A product which lasts longer than another which is identical generally has a lower environmental impact. If a product lasts less time, not only does it prematurely create more waste, but also creates indirect impacts from the need for it to be replaced by another, with environmental implications in production and distribution. It is nevertheless recognized that in some cases, the reduction of a product's lifetime is environmentally preferable. This is the case, for example, where a new product is more efficient in terms of energy consumption; it consumes less during its use or maintenance than the product we own. Intensive use of a certain product can also mean reduced environmental impact. As for products that fulfil their purpose just once, such as packaging, increasing their useful life can be an important strategy, with a view, for example, to their reuse.

Study objectives

With the general objective of contributing to the field of technical-scientific knowledge in the area of design, with development of products with a high potential for durability in a defined social, cultural and economic context, supported in design methodology and contributing to diminished environmental impact, the investigation hopes to achieve the following:

- Characterize the current social, cultural, technological and economic context and hypothetical future scenarios where design will act;
- Identification, referencing and reflection on investigation already carried out in the field of the stated topics (state-of-the-art);
- Analyze the theoretical framework of reference on sustainable development and design's contributions;
- Analyze studies made of the environmental impact of certain industrial products and design's proportion of responsibility;

- Identify methodological and process questions that contribute to affirming and valuing design as a driving force for sustainable economic, social and environmental development;
- Identify the factors (human, technological, cultural, social, economic...) that frame needs and determine choices for consumption of material goods; the importance of the brand (culture, attributes, benefits...)
- Construct a measuring instrument of reference/table for converting the durability of industrial products; recognize and classify long-lasting products;
- Develop methodology for assessing industrial products, aiming to identify the causes/reasons for extending their useful life, serving as inputs for conception of a model stimulating new product durability and serving as a work instrument for designers and industries;
- Conceive one or more products with high potential for durability in industrial areas to be defined (furniture, metallurgy, electronics, others) with application of the conceived model;
- Develop methodology for assessing and checking the suitability and effectiveness of the product(s) and the model applied;
- Make the project(s) and results known.

Methodology

The investigation methodology was based, at the first stage, on gathering bibliographic material on the development of environmental concern in the world and empirical material related to production and consumption options, and models of sustainable development.

So as to establish a theoretical reference framework, the aim is to carry out a literature review, aiming to update and systematize distinct concepts: sustainable development, environmental impact, sustainable design or eco-design, product durability, innovation and consumption. Once this stage is complete, we propose to systematize information referring to design and industrial production in different countries, in order to analyze international case studies related to long-lasting products or product system. This systemization should give rise to instruments of analysis that help to define properties for new products.

In the case of finding insufficiencies resulting from these approaches with regard to the aims proposed, we foresee opening up new areas of work identified as appropriate, based on a new selection of bibliography, instruments and methods. We also foresee the carrying out of a series of surveys and interviews with specialists in areas involved in the design process, so as to gather information of a qualitative and quantitative nature.

Based on the case studies, the instruments constructed and on relationships with industrial partners, a methodology will be put into practice with a view to obtaining orientation for design or redesign of products in certain industrial area(s). Assessment

and interpretation of the results obtained will allow us to review the questions for investigation and make final conclusions.

Conclusion

If we accept that the consumer society gives rise to social and environmental imbalances, it is also true that consumption is inevitable and even necessary for the dynamics and maintenance of economic systems. In this context, the solution of this apparent paradox can appear at various levels and at various stages, from product conception to their production, consumption and disposal. From the preliminary study, we conclude that the idea stage is one of the most important, since it is here we start to trace behaviours and handling strategies, and product use and duration. This does not exclude, however, knowledge of the various types of intervention taking place at later stages. As for consumption, there seems to be consensus about the need for programmes to educate and mobilize societies towards change in consumption habits which should be more responsible, critical and demanding. It is hoped that actions of various types encourage consumers, for example, to find out more about the environmental impacts of their choices and behaviour, which may result in acquisitions that promise greater durability, reducing consumption and choosing sufficiency rather than efficiency.

Durability is a strategy that allows the extension of products' useful life, less renewal and therefore conservation of natural resources, in this way limiting the negative impacts of products on the environment. Durability, a characteristic that describes the length of the relationship between the user and the product can originate a relationship of trust between the user and the product, between the user and the company. To increase product durability, different approaches seem possible according to the stages of its life-cycle: seeking appearances that are less subject to fashion, using materials that age well, favouring repair and maintenance, proposing updating to delay obsolescence or creating an affective relationship between the user and the object. Understanding of the various types of obsolescence may lead to better project decisions and influence the durability of products in design.

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