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A SUSTAINABLE APPROACH TO PRODUCT DESIGN

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Abstract: *The next article intends to present the actual context and the urgent need for a comprehensive reevaluation and remodeling in consequence of all systems, techniques, technologies and approaches to industrial design considering the laws governing the sustainability. Article aims to answer the following questions: What is sustainable design? Which are the characteristics of a sustainable product? Explaining why implementation of sustainability in design practice is a priority. Trying at the same time a briefly exposure of the principles of sustainable design, sustainable approaches and strategies, enduring values that enhance product durability, ending up scoring reasons for an urgent transition from traditional methods to those considering sustainability in industrial and product development.*

Keywords: *sustainable design, enduring values, durable products, eco-attributes*

1. INTRODUCTION

There was never a more opportune time to be a designer, due to a pressing need for a better design and experiences. A global movement emerged in which design solutions are applied to social challenges that require resolutions involving creativity, experimentation, empathy, and system thinking. The desire to bring meaning into products drives designers toward the social sector, as opposed to the cycle of making objects fueling overconsumption.

The early 2000s were according to Trollbäck, [4] "the iPod moment," a time when designers "emerged as pop stars and the primary drivers of consumption." The facts of global population climbing toward seven billion, economic turmoil, resources depletion, the planet warming, and occurring natural disasters demand for designers attention on the hierarchy of people's needs and issues starting with the most radical: human survival on Earth. Within this frame of reference design should not be about "form follows finance" – or "form follows fevered ego," Sinclair stated [4].

The sustainable phenomenon represents nothing short for a revolution in design because, as McDonough states [4], "It means that everything has to be redesign, becoming the largest job creation in the history of design." A daring enterprise which requires a new philosophy, a set of principles and concepts worth following, an ethic dimension of the design practice (a religion), a proper aesthetic considering sustainability, a holistic approach to design equitably considering the economical, social and environmental perspective.

2. CONTENT

2.1. What is sustainable design?

Sustainable design "points towards holistic and inclusive approaches; A type of design more "sensitive to, and contingent on, context having improvisation as a reliable characteristic - 'to make do with what is available and use limited resources, [33] as well as a recyclability of materials and forms.

Designing for sustainability implies "ecological literacy". Designers must broaden their knowledge (of science, art, engineering, communication, and human interaction),

concerning themselves with nature and humanity, and promoting interrelated harmony.

Their competences are to be directed toward solving practical issues [27]. Product design is the stage from which to address environmental problems, for is where decisions are made regarding the types of materials and processes to be used, ultimately determining the waste streams. A design that encompasses the synthesis of usefulness, usability, desirability, appropriateness, balance, and systems that lead to better solutions, more opportunities, and better conditions. Design "should be aesthetic, meaningful and sustainable" [25] (Fig. 1).

Fig. 1. Sustainable design concepts

In order to be truly sustainable, solutions are needed durable and with a life after their normal use period (Designing for Reuse); Designing products to have uses past their intended use, "keeps their materials outside of the waste stream." Reusing a product's materials is one approach, recycling is an important tenant of sustainability, but in order to be effective, products need to be easily disassembled into component parts and separated by material [25] (Design for Disassembly).

The techniques applied in the process of separation of parts and disassemble products, are lessening the time required. This further reduces the costs associated with recycling, time being an expensive component of disassembling / assembling.

Shedroff proposed the following precepts: pure-material parts; fewer parts; parts that are easy to remove; standardized fasteners/ no fasteners/accessible fasteners; standardized components; part material labels; indicate separation points; indicate disassembly sequence. With consideration to the 'end-of-life design', products need to be designed "with easiness for repairing or disassembling in mind, with all the parts correctly labeled for recycling"[14]. "Every material and component, have an environmental story behind it - the 'hidden ugliness'.

Sustainable design is a concept that can incorporate greater levels of innovation (system innovation or new concept, product or business development) (Brezet, 1997); Ethics and the socio-economic dimensions (Charter and Tischner 2001); Ecological principles as the very 'materials of designing" [9].

Sustainable design is the 'people-centered' discipline ensuring that products and services match user needs, embody their values and connect to their aspirations and desires – as well as making products easy and pleasurable to use or experience [26].

The goal of sustainable design is "to make all products 100-percent cyclic, solar, and safe," within a framework 'compatible' with nature[14]. Sustainable designs should become a compelling alterative over unsustainable traditional designs"[15]. Sustainable design can counter ecosystems degradation, by examining how sustainable product design can foster the development of "low waste, no-negative-discharge product systems." The consumption behaviors elicited can be repeated over time without rendering ecosystems dysfunctional in the process"[17].

Minimalism and simplicity of design are dimensions of sustainability, also related to 'eco design' strategies'. Minimalism emphasizes 'economy of materials', 'absence of nonfunctional features and dramatic shapes' to create interest and impact, or a return to 'classic simplicity'. "Minimizing the number of separate components and different materials also eases the product's disassembly, repair and

refurbishing"[35]. 'Less is more', as a guiding principle, has an aesthetic implication.

Simplification enhances the product's pure beauty. To improve the users environmental awareness "simplicity allows a certain empathy with the object that is based on an understanding of what the object is made from and how it is constructed" (Ibid.).

In nature, forms and materials are perfectly fitted to the functions and everything has a permanent dynamic aesthetic. "One source that never seems to go out of style is the hand book of nature." Fields of design were recently established "based on cogitating nature to inspire and create multilateral solutions and designs."[23] 'Biomimicry' applies natural patterns and emphasizes natural values [6] in a process of "re-imagining design"[25]. It is "a science that studies nature's models and then imitates or takes inspiration from these designs and processes"[6]; a perspective that searches for new ways of creating sustainable materials, products, services, and other solutions by learning how nature already works (Fig.2).

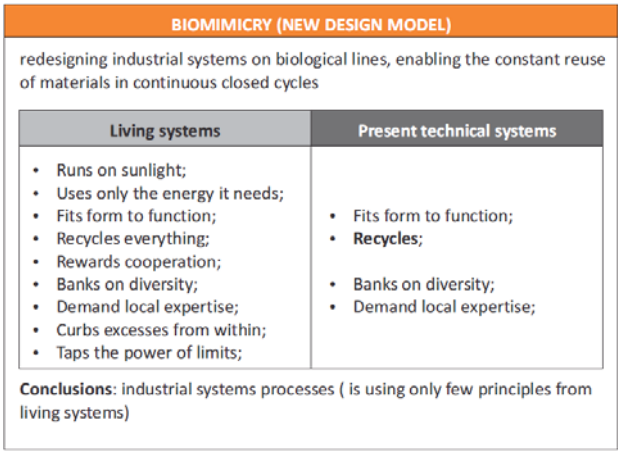

Fig. 2. Biomimicry, a new design model

The notion of 'Aesthetic Sustainability' emphasizes "the stable aesthetic values of nature that are rooted in cultures and traditions"[23]. Natural materials are recyclable, harmless (for humans and the environment) and their aesthetic can strengthen the user's relationship to the product [35].

2.1.1 Principles of sustainable design

The principles of sustainable design are:

- Low-impact materials (non-toxic, sustainably produced or recycled materials which require little energy to process);
- Energy efficiency (manufacturing processes and produce products which require less energy);
- Quality and durability (longer-lasting and better-functioning products will have to be replaced less frequently, reducing the impacts of producing replacements);
- Design for reuse and recycling (products, processes, and systems are designed for performance "in a commercial afterlife") [1];
- Design Impact Measures for total carbon footprint and life-cycle assessment for used resources;
- Sustainable Design Standards;
- Biomimicry ("redesigning industrial systems on biological lines, enabling the constant reuse of materials in continuous closed cycles")[18];
- Service substitution ("shifting the mode of consumption from personal ownership of products to provision of services which provide similar functions. Such a system promotes minimal resource use per unit of consumption")[13];
- Renewability (materials come from local source; sustainably managed renewable sources that can be composted when their usefulness has been exhausted);
- Robust eco-design (robust design principles are applied to the design of a pollution sources) [3],(Fig.3).

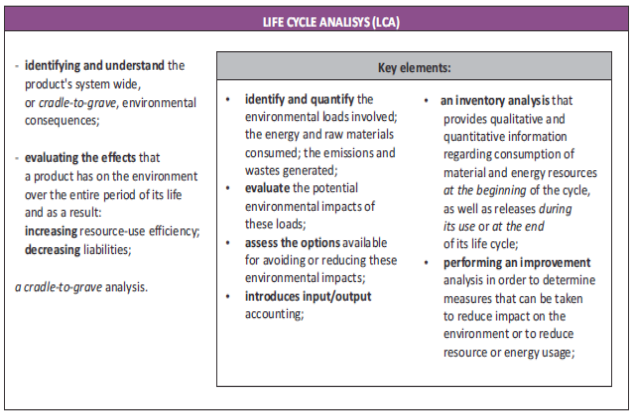

Fig. 3. Life cycle analyses

As opposed to traditionally used, unsustainable 'open-loop', 'cradle-to-grave'

model, product's life cycle is measured from creation to disposal. Philips launched *Econova* (2010) television based on the cradle-to-cradle principle.

Created in cooperation with EPEA, represents a future-oriented, environmentally friendly solution for electronic devices [7]. In the sustainable, 'closed-loop' model, identified as 'cradle-to-cradle 'by a products' life cycle is infinite [21]. When the product is no longer useful, it is reclaimed as the source of raw material for the next generation of the product or as the raw material for the natural life cycle. Their strategy is based on the principle that, in nature, "waste equals food: the waste of one living organism is the food of another".

McDonough and Braungart suggest that a similar ideology must adopt when managing the resources used in a new product. Instead of current "cradle-to-grave" system under which "products are made, used and then discarded into landfills", a new "cradle-to-cradle" methodology must develop: "products are designed so that, after their useful life, the materials they are made from become nutrients for new products or for living organisms."

Accomplishing this, means "distinguishing between biological nutrients" (materials that can biodegrade safely and provide food for living organisms) and "technological nutrients" (materials that can be reclaimed, completely recycled, and used again in a closed loop). "Any material that cannot exist purely in one or the other of these cycles cannot be used in a sustainable system" [21] (Fig.4).

Addressing aesthetics' is one of the features of the process of sustainable design [30] Aesthetic that supports long term use[24]. Aesthetics is also a considered aspect in eco-design [30].

Tischner [10] underlined that the aesthetic appeal of eco-products could be "a generating purchasing stimulus." Products aesthetic can affect the socio-cultural and economic dimensions of sustainability, through the notions of 'symbolic loading' [19] and 'image making'[8].

Mackenzie [20] argued that the emergence of 'new' styles is due to the high importance given to environmental considerations. Whiteley [34] proposed the term 'Green aesthetic'.

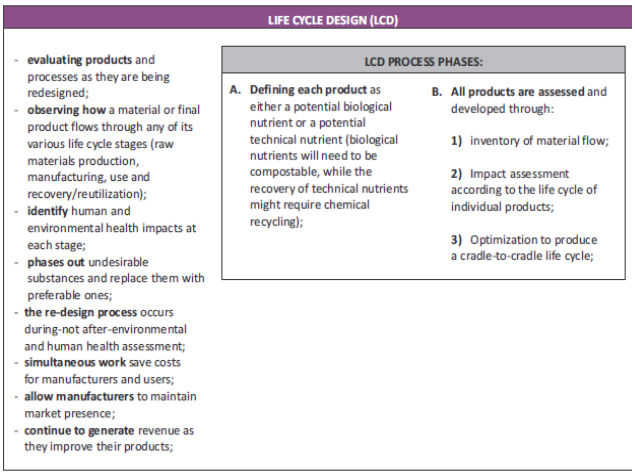

Fig. 4. Life cycle design phases

Papanek [23] highlighted the necessity of the 'New' aesthetic for design considering sustainability. Walker [33] stated and discussed 'Sustainable aesthetic' as the result of a sustainable production system. Datschefski [14] believed that 'total beauty' of sustainable products could be reached through 'perfect integration' [35].

Zafarmand, Sugiyama and Watanabe categorized the relevant keywords to aesthetics into seven attributes which are: 'aesthetic durability'; 'aesthetic upgrade-ability and modularity'; 'simplicity and minimalism'; 'logicality and functionality'; 'natural forms and materials'; 'local aesthetic and cultural identity'; and 'individuality and diversity'[35].

The concept of recyclability is present in the works of Droog Design, focused "less on the creation of new objects and more on rethinking and reinterpreting an existing heritage" as encountered in the works of Tejo Remy, ArnoutVisser, and above all Richard Hutten [5].

They believed that "continually inventing new forms is a distraction when there are so many powerful old ones", preferring "fine tuning to give the archetypes contemporary relevance rather than relentless innovation for the sake of novelty" [28].

2.2 The sustainable product

Objects that have persisted in time are characterized as sustainable. The longevity of their production and use testifies to their enduring importance "in supporting human existence or in nourishing human culture" [33].

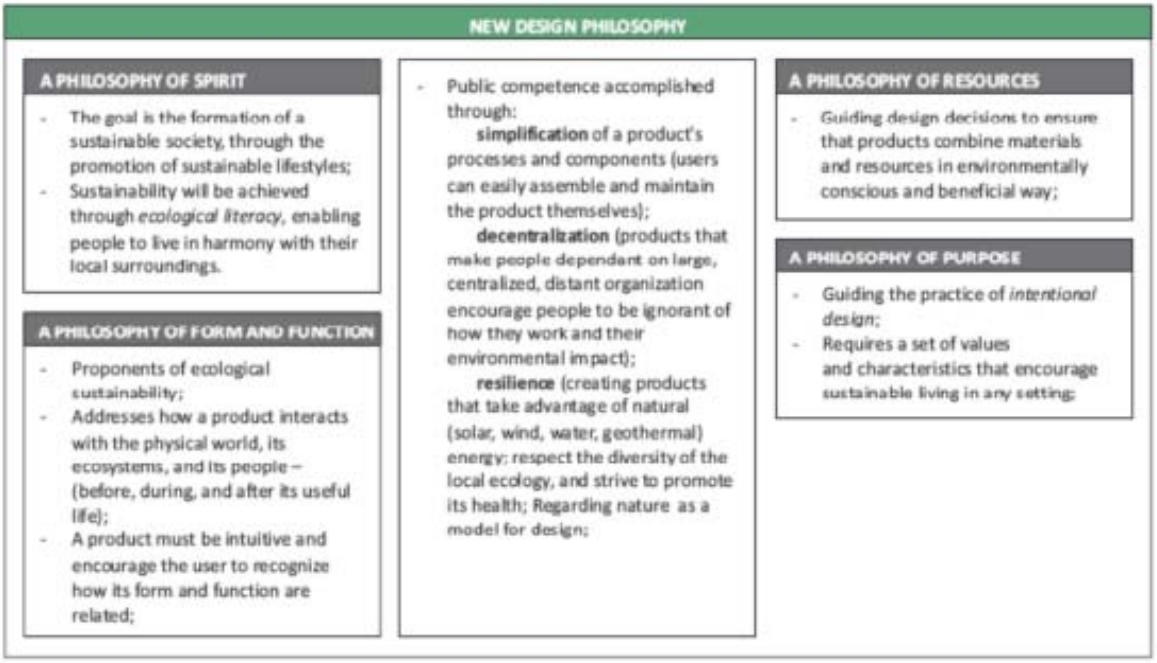

Fig. 5. Design philosophy

According to Shedroff [25] a sustainable product is the one designed for durability, upgradability, customization, reuse, and disassembly, with consideration to the 'end-of-life design'. In this respect, products need to be designed "with easiness for repairing or disassembling in mind, with all the parts correctly labeled for recycling" [14].

The five design requirements of sustainable products are that they be: Cyclic (product is made from compostable organic materials or from minerals that are continuously recycled in a closed loop); Solar: (product consumes only renewable energy that is cyclic and safe.; Efficient: (based on the need to maximize the utility of resources in a finite world by using less); Socially responsible: (the manufacture and use of sustainable products should support basic human rights and natural justice) [14].

Efficiency is an eco-friendly quality of sustainable product. For manufacturing, efficiency means using less materials and labor in producing the object. In form, efficient design uses simpler elements, which creates less labor during the manufacturing process. Lightweight objects that can be disassembled and packed flat create ease of transportation, and allow more pieces to be shipped at one time. Modular components rely on constructing objects from a single form. Individual modular pieces can be used in multiple formats, with the ability to interlock and create a diverse range of formations.

Aproduct must be intuitive and encourage the user to recognize howits form and function are related [27]. User competences are accomplished through: 'simplification' of a product's processes and components (users can easily assemble and maintain the product themselves) and 'decentralization' (products that make users dependant on large, centralized, distant organizations encourage people to be ignorant of how they work and their environmental impact).

Sustainable products are to be defined as "form and function alternatives that […] possess positive ecological attributes that are nothing more than enhanced waste management factors (eco-attributes) that have purposely been designed-in (embedded) through decisions

concerning how products are made/manufactured, what they are made of, how they function, how long they last, how they are distributed, how they are used, and how they are disposed of at the end of useful service life" [17] (Fig.5).

Embedding eco-attributes in products must not diminished product performance, or escalate unit costs. "Sustainable products must retain the level of primary attributes and cost structure that enable them to compete in markets where the rule is survival of the economic fittest"[16]; Being of little value in fostering environmental improvement if they become a 'no sale' item because they do not meet customer needs or costs/prices are not competitive.

By moving along the sustainable products continuum, businesses can experience progressively higher levels of resource productivity in the form of significant savings on raw materials, energy, terminal disposal, and regulatory and future liability costs. Also, eco-efficiencies can translate into factors that enhance customer satisfaction [25].

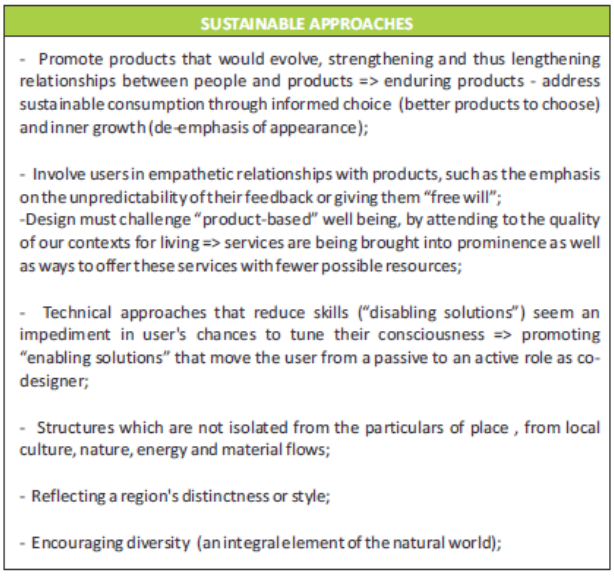

Fig. 6. Sustainable approaches to product design

Sustainable product uses different disciplines and processes, thus improving people's understanding not only of a widerange of subjects, but also of how different fields can cooperate inorder to solve practical problems more effectively [27]. All of these form and function guidelines are consistent with the ideas of "proponents of ecological sustainability" regarding nature not just as a set of limits but as a model for design. Orr [22] wrote: "Sustainability depends on replicating the structure and function of natural systems."

The form of natural organisms is reflective of their function [27].

Product-based well being stems from the idea of labor-saving technology, extended to comprising knowledge and skills into devices, reducing user involvement. Manzini calls these "disabling" solutions [29]. Others have noted this as a process of "de-skilling."

Seen in the light of "flow" and other elements of psychological wellbeing (e.g., creativity, participation, understanding), technical approaches that reduce skills seems to some extent, an impediment in users' chances to tune their consciousness. Manzini promotes "enabling" solutions that move the user from a passive to an active role as co-designer [29].

2.2.1 Enduring values and products

Source of enduring values are the vernacular design, craft and folk design traditions due to the interconnection "between material artifacts and the environment, cultural values and beliefs, and ways of life." Functional objects are invested with symbolic and meaningful values.

The challenge, consist in "bringing together the local and the global" to create designs suiting modern expectations; integration that also constitutes "the bridge between craft and design for industry [33]. A sustainable solution is one that posses 'enduring values' in terms of its meanings and characteristics, resulting in durable objects, "spanning diverse cultures, languages and understandings".

The extension of the product's life reduces resource and environmental impact by "delaying a premature replacement." This implies quality design, easily repairable products, modular assembles that allow some parts to be upgraded while others continue to be used, [25] making repair and replacement easy and effective.

Choosing higher-quality materials, fasteners, and manufacturing processes that last longer, increases the durability of products Upgradability enables 'customization' and 'personalization' to be more effective [25]. Products designed for remanufacturing help increase product's life.

Products that fit a range of uses can sometimes outlast those with specialized uses; Products that are meaningful (that resonate with our values, emotions, and meanings) "are often the most satisfying and durable of all".

Examples of proved durability are to be seen in Hans Wegner's *Y-Chair* (1950) used by Pawson and Silvestrin as an example of 'atemporal' and 'absolute' design owning to the perfection of its execution and formal simplicity. The same was true of GioPonti's *Superleggera chair* (1952-57), or Gerrit T. Rietveld's *Steltman chair* (1963). The *Throw-away sofa* (1965) by Willie Landers went back into production and was publicized for its extreme simplicity; Max Bill's *Ulmer Hocker* (1954), his wrist watches, clock and kitchen timer for Junghans are still in production today.

Inside the sustainable scenario, designers promote products that evolve, strengthening the product-user relationship suggests a good enough approach to design that "will free us to focus on inner, spiritual development rather than strident ones, which put too much emphasis on themselves and their constant updating." Walker uses the notion of 'enduring' products to address sustainable consumption through both informed choice (better products to choose) and inner growth (de-emphasis of appearance) [29].

Chapman (2005) suggests that current relationships between products and users fail because although we grow and evolve, our products don't. He proposes approaches meant to involve users in empathetic relationships with products, such as the emphasis on the unpredictability of their feedback or giving them "free will".

Enduring objects, can be classified into three broad groups: Functional (designed to accomplish practical tasks; design considerations focus on effectiveness, safety and user comprehension); Social/Positional (non-utilitarian - used to express identity, to be decorative).

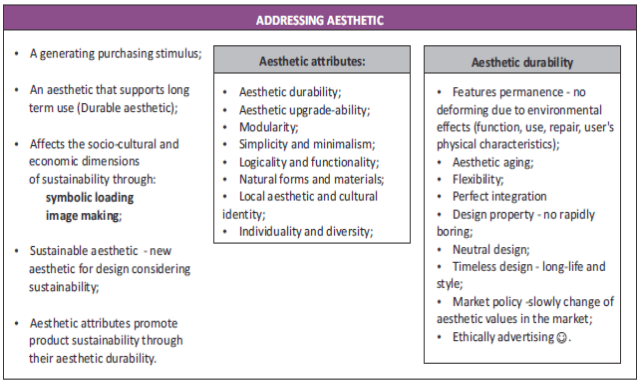

Fig. 7. Addressing aesthetics considering sustainability

Spiritual (refer to or convey inspiring, sacred or spiritual ideas; they are physical expressions of profound understandings and beliefs, and because of this they are considered deeply meaningful [33]. The 'social/positional' category comprises mass-produced goods promoted and distributed globally, driving consumerism. These objects become quickly outdated because their functionality and their positional value are intimately connected to advances in technology, and secondly, their positional value is tied to changes in fashion and styling" .

The product's aesthetic durability promotes sustainability. A product's aesthetic durability can be related to following principal factors: Features permanence; Aesthetic aging (flexibility); Design property (no rapidly boring due to a fashionable or neutral design); Timeless design (anti-fashion); Market policy (slowly changes of aesthetic values in the market); Long-life and style; Ethically advertising [35].

3. CONCLUSION

Applied in design, sustainability is a synthesis of usefulness, usability, desirability, appropriateness and balance. Cogitated systems lead to better solutions, more opportunities, and better conditions. Sustainable solutions are appropriate to situations (shapes meet the various conditions that factor into each set of circumstances), while addressing human, natural, and financial 'capital'.

Sustainable design is not something generated, as much as something that already exists 'in situ'. Sustainable design is aesthetic and meaningful design, following a minimalist philosophy, addressing formal austerity and essentiality. The norm, in the sustainable undertaken (a people-centered discipline), is an end product that mutually benefits the client, the public (products match user needs, embody their values and connect to their aspirations and desires, as well as making products easy and pleasurable to use or experience), and the environment.

Holistic and inclusive approaches are integers of sustainable design. Statements are made with fewest resources and minimal working. A type of design is encouraged that is sensitive to, and contingent on, context (being open to outside influence), similar to the idea of adapting objects for new purposes.

It is about the economy of recycling a form, and improvisation (making do with what you have at hand, and use limited resources). The 'waste nothing' sustainable principle instigates to: reusing, recycling; avoiding specification of scarce materials.

Natural resources are considered to have intrinsic value in their natural state, sustainable designs making almost exclusive use of natural materials that are harvested from controlled sources.

The tendency towards simplification, miniaturization and dematerializing in the sustainable approach is informed by the developed awareness of environmental issues, social motives, annoyance at the glut of objects and visual stimuli in our society, and criticism of our overdesigned surroundings.

Sustainable concept incorporates ethic dimensions. Producing less means a positive contribution to sustainability. Decreasing the flow of products could also have a favorable effect on the visual pollution. Our culture is geared to rapid, superficial renewal, largely ruling out the possibility of a bond growing between products and users.

The concept of durability applied in design focus less on the creation of new objects and more on rethinking and reinterpreting an existing heritage. Continually inventing new forms is considered a distraction when there are so many powerful old ones, preferring fine tuning to give the archetypes contemporary relevance rather than relentless innovation for the sake of novelty.

A systemic approach reconsiders design as not to be limited to the designer but extended and involving industrial partners and the users of the objects themselves.

Design is a form of persuasive communication in which products serve as arguments for how people should live (changing behaviors). A design philosophy is needed to ensure that products combine materials and resources in environmentally conscious and beneficial ways while ensuring that the values communicated promote sustainable lifestyles.

Designing for sustainability implies "ecological literacy". Designers must concern themselves with nature and humanity, and promoting interrelated harmony. Sustainability will be achieved when every individual possesses a fundamental set of skills that he calls 'ecological literacy', enabling people to live in harmony with their surroundings.

4. REFERENCES

1. Anastas, P. L. and Zimmerman, J. B., 2003.Through the 12 principles of green engineering.*Environmental Science and Technology*, **1**, 95– 101.
2. Beard, C. and Hartmann, R., 1997. Naturally Enterprising Ecodesign, *Creative Thinking and the Greening of Business Products*. European Business Review, **97**(5), 237 – 243.
3. Ben-Gal, I., Katz, R. and Bukchin, J., 2008.Robust Eco-Design: A New Application for Quality Engineering.*IIE Transactions*, **40**(10), p.907 – 918.
4. Berger, W., 2009.*GLIMMER: How Design can Transform Your Life, and Maybe Even the World*. New York: The Penguin Press
5. Bertoni, F., 2004.*Minimalist Design*.Basel, Boston, Berlin: Birkhäuser
6. Benyus, J.M., 1997. *Biomimicry: Innovation Inspired by Nature*. New York: Harper Collins

7. Borries, F., and Grätz, I., 2011.*Apple Design*. Ostfildern, (D): Hatje Cantz
8. Bragd, A., 1997. Learning from the Introduction of Green Products: Two Case Studies from the Gardening Industry. *The Journal of Sustainable Product Design*, (3), p.14.
9. Brezet, H., 1997. Dynamics in Eco-design Practice.*UNEP Industry and Environment,* **20**(1–2), 21 – 24.
10. Charter, M. and Tischner, U., 2001. *Sustainable Solution: Developing Products and Services for the Future*. Sheffield: Greenleaf Publishing
11. Charter, M., 1998. Special Feature: The Next Step Event 98. *The Journal of Sustainable Product Design*, (6), 60.
12. Chapman, J., 2005. *Emotionally Durable Design: Objects, Experiences and Empathy*. London: Earthscan
13. Chris, R., 2006. Dematerializing Consumption through *Service Substitution* is a Design Challenge. *Journal of Industrial Ecology*.**4**(1).
14. Datschefski, E. 2005. Looks Good, Feels Good, Is Good? In: Brower, C., Mallory, R., Ohlman, Z. *Experimental Eco-Design, Architecture, Fashion, Product*. Switzerland: RotoVision, p. 08-09.
15. Danko, P., 2005. A New Frame of Mind. In: Brower, C., Mallory, R., Ohlman, Z. *Experimental Eco-Design, Architecture, Fashion, Product*. Switzerland: RotoVision, p.16-17.
16. Fuller, D.A. and Ottman,J.A., 2004. Moderating unintended pollution: the role of sustainable product design.*Journal of Business Research*, 57(11), 1231 – 1238.
17. Fuller, D.A., 1999. *Sustainable marketing: managerial–ecological issues*. Thousand Oaks (CA): Sage Publications
18. Hawken, P., Lovins, A.B.andLovins, L.H., 1999. *Natural Capitalism: the Next Industrial Revolution.* London: Earthscan Publications Ltd
19. James, P.,1997. The Sustainable Cycle: A New Tool for Product Development and Design.*The Journal of Sustainable Product Design*, (2), 56 – 57.
20. Mackenzie, D. et al., 1991. *Green Design: Design for the Environment*. London: Laurence King Ltd, London
21. McDonough, W., and Braungart, M., 2002.*Cradle to Cradle: Remaking the Way We Make Things*. New York: North Point Press
22. Orr, D.W., 1992. *Ecological Literacy: Education and the Transition to a Postmodern World*. Albany, New York: State Univ. of New York Press
23. Papanek, V., 1985.*Design for the Real World: Human Ecology and Social Change*, 2nd ed. Chicago: Academy Chicago Publishers
24. Rams, D., 2001. Waste Not Want Not. *The Journal of Sustainable Product Design*, **1**(1), 131.
25. Shedroff, N., 2009. *Design is the Problem: The Future of Design Must be Sustainable.* New York: Rosenfeld Media, LLC.
26. Sherwin, C., 2004. Design and sustainability: a discussion paper based on personal experience and observations.*The Journal of Sustainable Product Design*,**4**, 21–31.
27. Stegall, N., 2006. Designing for Sustainability: A Philosophy for Ecologically Intentional Design.*Design Issues*, **22** (2), 56 – 63.
28. Sudjic, D., 2009. *The Language of Things: Design, Luxury, Fashion, Art: How We Are Seduced by the Objects Around Us*. 2nd ed. London: Penguin
29. Thorpe, A., 2010. Design's Role in Sustainable Consumption**.** *Design Issues*, **26**(2), 3 – 16.
30. Tischner, U., 2001. Toolsfor Eco-design and Sustainable Product Design. In: Charter, M. and Tischner, U., *Sustainable Solution: Developing Products and Services for the Future*. Sheffield: Greenleaf Publishing, pp. 119, 132 - 133.
31. US Environmental Protection Agency (EPA). [online]. [viewed 16 November 2011. Available from: <http:// www.epa.gov/>
32. Vallero, D.A. and Brasier, C., 2008. *Sustainable design: the science of sustainability and green engineering.* New Jersey: John Wiley&Sons
33. Walker, S., 2006.*Sustainable by Design: Exploration in Theory and Practice*. London: Earthscan
34. Whiteley, N., 1993. *Design for Society*. London: Reaktion Books Ltd
35. Zafarmand, S.J., Sugiyama, K., and Watanabe, M., 2003. Aesthetic and

Sustainability: The Aesthetic Attributes Promoting Product Sustainability.*The Journal of Sustainable Product Design***3**,173–186.

O ABORDARE SUSTENABILĂ A DESIGNULUI DE PRODUS

Rezumat:
Prezenta lucrare îşi propune să prezinte pe scurt contextul real şi necesitatea urgentă a unei reevaluări cuprinzătoare şi remodelarea în consecință, a tuturor sistemelor, tehnicilor şi tehnologiilor privind abordarea designului de produs, luându-se în considerare legile care reglementează sustenabilitatea. Lucrarea îşi propune să răspundă la următoarele întrebări: Ce reprezintă un design sustenabil? Care sunt caracteristicile unui produs durabil? Explicând de ce implementarea sustenabilității în practica de proiectare este o prioritate. Se încearcă în acelaşi timp, o expunere pe scurt a principiilor de proiectare sustenabilă, abordări şi strategii sustenabile, valorile fundamentale care îmbunătățesc durabilitatea produsului, încheind cu motive instigatoare la o urgentă tranziție de la metodele tradiționale la cele sustenabile în dezvoltarea produsului industrial.

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