

The dimensions of sustainability: concepts and strategies in the textile and clothing supply chain in Brazil

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Abstract Currently, one of the biggest sectors in the market is the fashion industry. This is due not only to the high volume of sales and quick succession of trends, but also to the number of people and companies involved with these products from their conception to distribution. This high production has a significant impact on the environment. The textile industry is considered one of the main causes of the world's industrial pollution, since several stages of textile processing are potentially causing environmental degradation on various levels. Thus, sustainability and all of its dimensions can be a tool for changing this scenario in which the fashion industry is a major polluter. In order to understand this phenomenon, we conducted a field study with companies from the textile and clothing supply chain to identify the perceptions and sustainability strategies within these companies. The data collected reveal a positive scenario: businesses that are aware of the need for change and are looking for sustainable modes of production, as well as actions already being implemented that are changing this situation and serving as an example to companies in other areas.

1. Introduction

In the industrial sector, the textile segment "is made up of various stages which can cause environmental degradation if the necessary precautions are not taken" [1]. In the 21st century, a paradigm was established about environmentally sustainable growth and its implications in the creation of products for fashion. The research article Eco fashion: consolidation of an trend in fashion (consolidation of an ecological trend in fashion) was the starting point for reflections about the fashion system and the principles needed for sustainable development: economically viable, socially just and ecologically correct [2].

The word sustainability is being discussed all over the world. In the last few years, people have become increasingly worried about the consequences of inadequate and exploratory uses of nature [3]. Sustainability and all of its dimensions can be a tool for changing the scenario in the fashion industry.

Responsible consuming will be a significant trend in coming decades, which is why “new design proposals, with longer life cycles for products and educational movements for smarter consuming will be crucial to reforming the fashion system” [4].

2. Sustainability: concept and dimensions

Sustainability is defined as a system of reasoning which proposes three pillars: simplicity, stability and objectivity. It is a type of societal configuration that maximizes production potential and efficiency while reducing the negative effects on the surrounding ecosystem to a minimum [5] [6].

Sustainability goes beyond simply designing, is linked to social integration, the economic, environmental and institutional aspects that provide opportunities to people involved, express their own identity [7]. Second [8,9] sustainability brings benefits such as better financial performance, positive corporate reputation, organizations as well as good human relations and greater competitiveness.

Sachs [10] proposes a system with seven dimensions of sustainability: ecological, economic, social, spatial, cultural, political and psychological (figure 1).

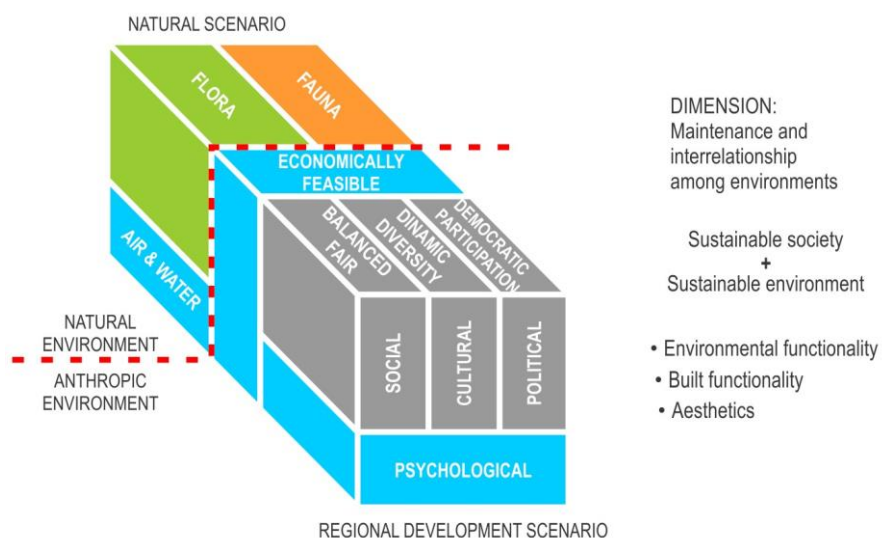


Figure 1: New sustainability dimensions. Modified from Sachs [10].

The **ecological dimension** is the most defended by the majority of authors who write about sustainability, because it discusses nature external to human beings and the idea that the more nature is modified, the less ecologically sustainable it will be, and the less human interference there is with nature, the more sustainable it will be. The **economic dimension** revolves around knowing how to use the

planet's resources, as well as the efficient application of natural resources in a competitive setting. One of the basic pillars of sustainability is the **social dimension**, since environmental preservation and the conservation of natural resources are only meaningful and relevant when products are generated with renewable bases that can be enjoyed by various parts of society. The **spatial dimension** includes the organization of space and follows criteria imposed by territorial occupation and intertwined with a lasting natural network that attempts to restore quality of life, biodiversity and human scale in each fragment and neighborhood of the system. The **cultural dimension** is directed at modernization models and integrated rural production systems, with a focus on changing the core of cultural continuity and bringing the normative concept of eco-development into a number of private solutions that respect the specific characteristics of each ecosystem, culture and location. In the **political dimension**, sustainability is built through social agents who are active in their socioeconomic-cultural environment, and receive several opportunities from the government to control resources for political decisions. Finally, the **psychological dimension** encompasses the sensation of well-being that transcends the social aspect, because it contains emotion as an attribute that is part of an individual's subconscious [10,11,12,13,14,15,16,17].

In a new approach, Elkington [18,19] suggests the Triple Bottom Line (figure 2) and states that sustainability is multidimensional.



Figure 2: Triple Bottom Line. Modified from Elkington [18].

This concept emphasizes two key sustainability issues: the union of three components of sustainable development (economic growth, social equality and environmental protection) and the integration of these aspects in the short and long run [18].

In this sense, we can say that the social, economic and ecological (environmental) dimensions of sustainable development are the most integrated in studies about this topic. The social dimension is the category that brings together analyses about

society in terms of income distribution, the social well-being of the population, education and basic sanitation. Essentially, it is about social structure. The environmental is everything related to the environment, such as natural resources, degradation, preservation and pollution. Analyses of production, concentration of income, worker exploitation and economic expansion are part of the economic dimension.

3. The environmental impacts of the textile industry

The damage caused by the industrial sector affects our entire biosphere. As such, it is imperative that industries look for a way to make their productive processes more efficient to offset the harm caused to the ecosystem by gas emissions, water and soil pollution and wasting raw materials. There are consequences every time a human damages the environment. The extraction of resources and the release of harmful substances impact the ecosystem in a way it cannot absorb, compromising the survival of flora, fauna and human beings themselves [20].

Natural resources (sources of raw materials and energy that are vital to human progress) are divided into renewable (or reproductive) and non-renewable. Renewable natural resources have a fast reconstitution cycle, where the length of time for natural replacement is similar to that of the extraction period. Water, air, fauna, flora and soil are all renewable. Non-renewable resources are those that require a long time to reestablish themselves, for instance fossil fuels such as oil and natural gas [21].

The literature [7] States that the demand for environmentally friendly products grows every year, that's because the concern of the population and enterprises in relation to sustainability of the products is greater. The number of sales involving ecological fashion products grew, especially the organic cotton showing. So the use of tools that will reduce this environmental damage becomes necessary, incorporating new visions to the understanding of sustainability. Among them, we highlight the sustainability, sustainable design, eco design and intrinsically sustainable products or services corresponding to sustainable lifestyles.

As a result, the use of tools that diminish these effects on the environment has become necessary, incorporating new dimensions into the understanding of sustainability. Highlights of these new dimensions include sustainable design, ecodesign and products and services that are intrinsically sustainable and complement sustainable lifestyles.

It is understood that the design sustainability facing the Act of designing, systems and services that cause low impact to the environment and have a high social quality. Is a mean of finding tools and principles that support equality and

overcoming poverty, seeking services that keep the environment stable for future generations without compromising the ability to fulfill their needs [19]. For an industry to be sustainable, it must consider at least one of some basic principles for environmental sustainability to occur. Among them, [5,19,22,23] cite the basement based on renewable resources, while ensuring the renewal; optimize the use of non-renewable resources; not accumulate garbage that the ecosystem is not able to reuse; and each individual and community must act within the limits of their environmental space.

Develop environmentally sound products that consumers will buy, in addition to be quite challenging, brings great rewards as green products that they are intended to replace products considered non-green. As fashion products are products of consume, that are getting a bigger space on the people's priority list, we see the growth of the industrial market and next to it, their great need to adjust to the requirements that the environment imposes [24,25,26,27]. For [19] there is no doubt that the development of sustainable products is complex, and the same is attached to its life cycle and the amount of impact that this product will cause to the environment or nature. The same occurs when you question its functionality in the concept stage, determining all stages of the life cycle and supply chain companies, as well as optimizing sustainability impacts. This is due to environmental, social and economic impacts, the market demand, quality, customer requirements, also the technical feasibility and compliance with the legislation.

According to [28] Eco-Design, or design for environment, is an ecological product development form, which can translate into project for the environment. One of the Eco-Design strategies, we find the use of materials with low environmental impact, clean production processes, avoiding toxic and hazardous materials, to maximize the efficiency of the energy used in production and product in use, as well as the design of a residue management and recycling [19,29].

4. Methodology

In order to achieve the research objectives, a data collection instrument was used to identify the sustainability strategies employed by Brazilian companies, analyze their focus within the different dimensions of sustainability, as well as understand the motivation of companies aiming for sustainable development. Companies from the textile and clothing supply chain in Brazil that somehow work with sustainable development were selected for this research. The data collection was made by questionnaire, found in attached file, that was developed and submitted via email to thirty Brazilian companies, which ten only were willing to answer. The ten Brazilian companies located in the states of Rio Grande do Sul (RS), Santa Catarina (SC) and São Paulo (SP), as seen in figure 3. This is an exploratory study that uses a nonexperimental qualitative, descriptive approach.

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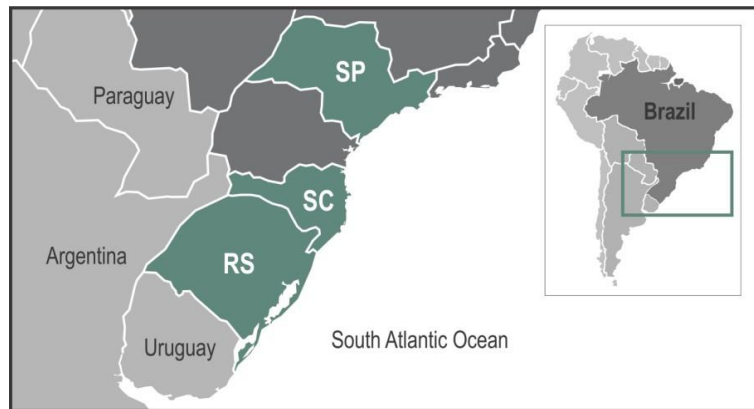


Figure 3: Location of companies interviewed.

5. Results and discussion

The textile and clothing supply chain is made up of various sectors; firstly, each company was classified into a segment. Of the ten interviewed companies, six include knitwear in their development, four work with processing, three have spinning processes, three are part of the clothing industry, three make raw materials, two are in the weaving business, two are distributors and only one is a laundry facility (of course, each company can operate in more than one part of the chain).

With regards to the dimensions of sustainability seen in the textile industry, the social, economic and ecological (environmental) facets of sustainable development are the most incorporated and understood by those interviewed. Only one of the respondents has a Sustainability Coordinator at their company, who says that “sustainability is economic, social and environmental development. The textile industry is directly involved with reducing inputs, waste and consumption as well as in the development of eco-textile products. It also linked to creating a safe environment for employees, quality of life at work and incentives for education and professional development.” Based on the responses given, it is easy to see that the respondents’ idea of sustainability is in accordance with the basic model of sustainability dimensions, based on only three aspects: social, environmental and economic.

When asked about the adoption of sustainable policies, all of the companies responded positively. The sustainability strategies implemented by companies include ten businesses that use ecologically correct raw materials, nine that report they appropriately treat the waste generated, eight reduce water consumption, volume of waste and pollution, seven research cleaner technology and have defined rules for environmental protection, six reduce energy consumption, and five

limit or substitute non-renewable resources for sources of clean and renewable energy in order to diminish the consumption of fossil fuels.

When describing how they focused on sustainability, companies cited the use of eco-friendly raw materials, reuse and responsible use of materials and attempting to educate employees on the subject. Generally, companies are concerned with the life cycles of their products at different stages. This concern helps to create solutions that optimize factors such as the use of non-pollutant materials with low energy consumption, efficiency and ease of product maintenance and reusing and recycling after disposal.

When asked about the motivating factors for investing in sustainability, all of the respondents cited the positive impact on the company's image, the environmental conscientiousness of managers and concern with quality of life, biodiversity and the local population, 80% referred to the identification of new business opportunities, 70% pointed to cost reduction as a result of less waste and reuse of resources, 60% mentioned taking proactive action before being pressured legally or by society and 40% cited cost reduction due to the minimization of inputs. It is worth noting that the respondents were allowed to choose more than one answer (Figure 4).

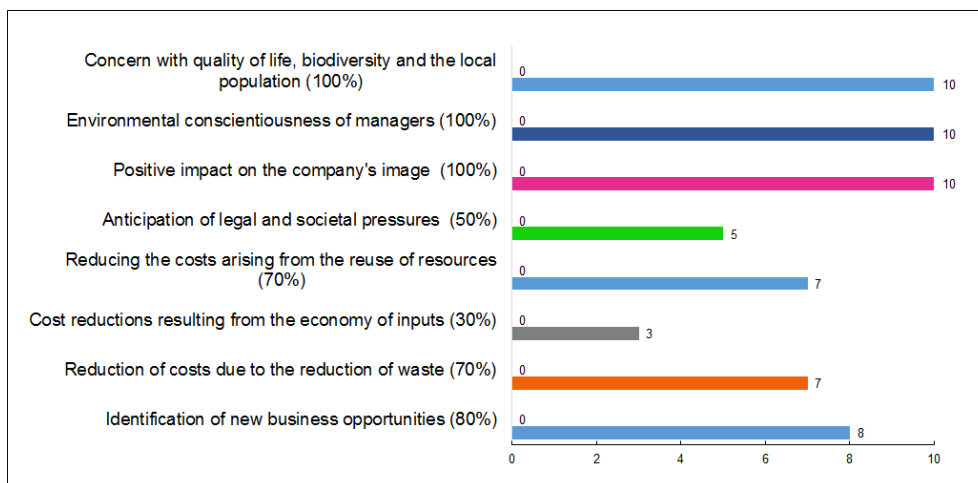


Figure 4: Motivational factors for investing in sustainability

With respect to communicating the sustainable policies in practice to suppliers and employees, only one respondent answered clearly, saying "we address sustainability as a prime goal and highlight that people who also agree with this idea will automatically be identifying with the product they are creating. This process is worked on weekly with the whole team. Since we have a cutting edge product, we automatically transmit our inherent principles and values to our suppliers".

Concerning modernizing products, 90% responded that they constantly invest in new instruments. One of the respondents even mentioned buying tinting machines that reduce water consumption, switching the boiler from oil to wood chips made from reforested trees and the use of ozone to treat effluents. Along with improvements in production, 50% of the companies said they invested in scientific and technological research. The cases described include a partnership with the United States of America that is testing membranes for effluent treatment and the use of a detergent and emulsifier made with frying oil.

In terms of the social dimension, 90% of the respondents said they develop or collaborate with a program. One of the companies highlighted that it has been accredited with the four social seals (seal recognized by the UN) and another reported it provided a daycare facility for children of employees, as well as offering lectures about resource management and improving quality of life.

As far as choosing raw materials, one of the respondents related that the cotton they use is organic, planted by their co-op and certified by IBD Certifications. The respondents also reported that all of the unused raw materials are sold as fabric or tow for cleaning, along with the rest of the remaining fiber.

The companies said that they generally use the phrase "ecologically correct". From the choices given, 80% of respondents stated that they use renewable raw materials handled in a sustainable manner, 40% use raw materials handled in a sustainable manner, 40% use some type of waste and 20% employ clean technology.

Another sustainable characteristic that was very apparent among the respondents was the implementation of the three Rs (Reduce, Reuse, Recycle). This is a starting point for reaping the financial, social and market benefits related to the development and application of environmental policies and practices. Additional aspects connected to sustainable development were mentioned during the interviews. For example, the reuse and treatment of natural resources such as water, air, flora, fauna and soil, the reduced impacts their products have on the environment, use of raw materials considered ecologically correct, promoting conscientious ideas to their employees and the community, production efficiency and waste reduction, innovation and pollution control.

In the responses about strategies used to advertise and motivate consumers to acquire ecologically correct products, it was evident that there is a great deal of focus on marketing aimed at publicizing these products, their advantages over the rest of the market and their benefits to the environment. One of the respondents explains: "the co-op constantly participates in events centered on the environment

and solidarity economy, which provide the opportunity to exchange experiences and disseminate conscientious consumption as well as sell products.”

When asked about sustainability in Brazil, the answers were diverse. One respondent said the country “suffers a great deal because of fake ecological products. Opportunist business people take advantage of the weak controls over product origin and sell non-ecological products as if they were ecological, at lower prices than companies who respect the standards. They ruin an honest and visionary market in order to benefit themselves.” Another company that is slightly more optimistic reveals that “in May of 2012 the IBOPE (Brazilian Institute for Public Opinion and Statistics) published research about Brazilians’ relationship with the environment, which included very relevant data. For example, it states that a large part of the population is worried about environmental issues, though taking care of and preserving the environment is a joint action between the two spheres.” It is evident from the answers that the respondents do not consider Brazil a trendsetter for sustainability, and that it is often used incorrectly for personal gain. Though this still occurs occasionally, the Rio+20 conference shows that Brazil is advancing and looking to increasingly educate itself on the subject. The main topics of the event will be a green economy in the context of sustainable development and the eradication of poverty, as well as institutional structures for sustainable development.

6. Conclusion

The results of the study showed the perceptions and sustainability strategies used by companies in the textile and clothing supply chain that focus on sustainable development. It is clear that the majority of them have a limited vision of sustainability issues, since most of the companies only consider the Triple Bottom Line proposed by Elkington in 1993.

Regarding the motivating factors for sustainable operations, more than 50% included aspects such as: identifying new business opportunities, cost reduction due to the minimization of waste, cost reduction due to the reuse of resources, taking proactive action before being pressured legally or by society, positive impact on the company’s image, environmental conscientiousness of managers and concern with quality of life, biodiversity and the local population.

Since the product is fashion, is inserted in the textile chain and is becoming increasingly important to people as a consumer product, we see the growth of this industrial market, and along with it a greater necessity to adapt to the demands the environment imposes.

These factors show sustainability's importance to humanity, hence the need for tools that reduce environmental wear. For this to happen, the population must be conscious of how much fashion influences environmental issues, and it is the duty of the fashion designer to have a minimum amount of knowledge of the subject. After all, we as designers decide what our consumers can buy. If we do not change this reality, who will?

It is our intention to get deeper into this study, in another moment, interviewing by questionnaire and conducted interviews, companies from other States of Brazil, as well as a thorough study with companies from different countries. Also is important to realize how much designers and fashion professionals opinions influence the choices of consumers, and how much bargaining power we have with the textile industry. The choices of these designers will mold the industry. Today, the percentage of ecologically correct textile products is very small compared to the rest, but with a market that is becoming increasingly focused on sustainability, this reality will certainly change. For this change to begin, we must leave the indulgent comfort zone we are in.

References

- [1] Santos, Milton. O espaço do cidadão. 7.ed. São Paulo: EDUSP. (2007)
- [2] Schulte, N. K.; Lopes, L. D. Sustentabilidade ambiental: um desafio para a Moda. In: Actas de Diseño, n.6, universidade de Palermo. (2007)
- [3] Souza, Paulo Fernando de Almeida. Design Orientado ao Ambiente: Uma questão de prioridade. In: Anais 2002 - Vol. 5 - Tema: Eco design. p. 1503 - 1508. (2002)
- [4] Aguiar, Cristina Nunes de; Martins, Emanuelle; Matos, Rodrigo Nunes. Importância do Consumo Consciente no Mercado de Moda. In: Intercom – Sociedade Brasileira de Estudos Interdisciplinares da Comunicação e XXXIII Congresso Brasileiro de Ciências da Comunicação. Caxias do Sul, p. 01-12. (2010)
- [5] Manzini, Ezio; Vezzoli, Carlo. Design for Environmental Sustainability. Springer. (2008)
- [6] Silva, Matheus Palauro; souza, José Eduardo Rodrigues de. Gestão Estratégica e Sustentabilidade. In: Anais do XV Encontro de Iniciação Científica da PUC-Campinas. ISSN 1982-0178. (2010)
- [7] Lo, Chris K.Y.; Yeung , Andy C.L.; Cheng , T.C.E. The impact of environmental management systems on financial performance in fashion and textiles industries. Int. J. Production Economics 135, pp. 561–567 (2012)

- [8] Baskaran, Venkatesan; Nachiappan, Subramanian; Rahman, Shams. Indian textile suppliers' sustainability evaluation using the grey approach. *Int. J. Production Economics* 135, pp. 647–658 (2012)
- [9] Nagurney, Anna; Yu, Min. Sustainable fashion supply chain management under oligopolistic competition and brand differentiation. *Int. J. Production Economics* 135, pp. 532–540 (2012)
- [10] SACHS, I. *Transition Strategies towards the 21st Century*. New-Delhi: Interest Publications (1993)
- [11] Sillamy, N. *Dictionary of Psychology*, Encyclopedic Universe Publishing, Bucharest (1996).
- [12] Rattner, Henrique. *Liderança para uma sociedade sustentável*. São Paulo: Ed. Nobel. (1999)
- [13] Caporal, Francisco Roberto; Costabeber, José Antônio. *Análise Multidimensional da Sustentabilidade: Uma proposta metodológica a partir da Agroecologia*. *Agroecologia e Desenvolvimento Rural Sustentável*. Porto Alegre, v.3, n.3. (2002)
- [14] Frey, Klaus. *Democracia e sustentabilidade das cidades na era digital*. In: *Encontro da Associação de Pós-Graduação e Pesquisa em Ambiente e Sociedade*. Indaiatuba-SP. (2002)
- [15] Leff, Enrique. *Saber ambiental: sustentabilidade, racionalidade, complexidade, poder*. 6. ed. Petrópolis: Vozes. (2008)
- [16] Mendes, Jefferson Marcel Gross. *Dimensões da sustentabilidade*. *Revista das Faculdades Santa Cruz*, v. 7, n. 2, 1781 – 1790 pp. (2009)
- [17] Bommel, Harrie.W.M. van. A conceptual framework for analyzing sustainability strategies in industrial supply networks from an innovation perspective. *Journal of Cleaner Production* 19, pp. 895–904 (2011)
- [18] Elkington, J. *Cannibals with forks: the triple bottom line of 21st Century Business*. Oxford, U.K. Capstone Publishing Limited. 416 p. (1998)
- [19] Ljungberg, Lennart Y. Materials selection and design for development of sustainable products. *Materials and Design* 28, pp. 466–479 (2007)
- [20] Peltier, Fabrice; Saporta, Henri. *Design Sustentável: Caminhos virtuosos*. Tradução de Marcelo Gomes. São Paulo: Ed. Senac São Paulo. (2009)
- [21] May, Peter H.; Lustosa, Maria Cecília; Vinha, Valéria, organizadores. *Economia do Meio Ambiente: teoria e prática*. 4. ed. Rio de Janeiro, RJ: Editora Campus, 318 p. (2003)
- [22] Sharma, Arun; Iyer, Gopalkrishnan R. Resource-constrained product development: Implications for green marketing and green supply chains. *Industrial Marketing Management* 41, pp. 599–608 (2012)
- [23] Caniato, Federico; Caridi, Maria; Crippa, Luca; Moretto, Antonella. Environmental sustainability in fashion supply chains: An exploratory case based research. *Int. J. Production Economics* 135, pp. 659–670 (2012)

The dimensions of sustainability: concepts and strategies in the textile and clothing supply chain in Brazil.
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- [24] Spangenberg, Joachim H.; Fuad-Luke, Alastair; Blincoe, Karen. Design for Sustainability (DfS): the interface of sustainable production and consumption. *Journal of Cleaner Production* 18, pp. 1485–1493 (2010)
- [25] Ottman, Jacquelyn. *Green Marketing: Opportunity for innovation*. Chicago : NTC Business Books (1998)
- [26] Leerberg, Malene; Riisberg, Vibeke; Boutrup, Joy. Design Responsibility and Sustainable Design as Reflective Practice: An Educational Challenge. *Sustainable Development Sust. Dev.* 18, pp. 306–317 (2010)
- [27] Rex, Emma; Baumann, Henrikke. Beyond ecolabels: what green marketing can learn from conventional marketing. *Journal of Cleaner Production* 15, pp. 567–576 (2007)
- [28] Santos, Petras Amaral. *Sustainable innovation: ecodesign applied to the design of new products*. Monograph submitted to the course of specialization in technological innovation agents. University of Caxias do Sul (2001)
- [29] Moon, Karen Ka-Leung; Youn, Chorng; Chang, Jimmy M.T; Wai-hon, Alex. Product design scenarios for energy saving: A case study of fashion apparel. *Int. J. Production Economics* 146, pp. 392–401 (2013)