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DESIGN ECOVISIONS

Research on design and sustainability in Brazil

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DESIGN ECOVISIONS

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ABSTRACT

DESIGN ECOVISIONS – Volume 2: Research on design and sustainability in Brazil presents the results of the panel discussions of the 6º Simpósio Brasileiro de Design Sustentável + International Symposium on Sustainable Design (SBDS + ISSD 2017), held in 2017 in Belo Horizonte. The event aimed at gathering researchers, students and design professionals, as well as representatives of the productive and governmental sectors, who seek to discuss the current and future framework of design in relation to various aspects of sustainable development. It was based on dynamics for exchange, sharing, and collaboration among design researchers engaged with sustainability, previously experienced in the 5th edition of the symposium, held in 2015 in Rio de Janeiro, and which results were recorded in the first volume of this series. The theme of Volume 2 is the tripod of sustainability, and it is addressed by reflecting on "design, territory and culture"; "social innovation and collaborative models"; "ecomaterials"; "environmental labelling"; "design and craftsmanship"; and "circular economy". The chapters reflect the researchers' contributions and their discussions, and are organized in three parts. The first encompasses design in the context of sustainable consumption and production, focusing on materials and environmental labelling. The second seeks to discuss design and emerging approaches through the concepts of local production, territory and collaborative models. The third part consists of reports of experiences from the event or from design practice. Thus, combining theory and practice, this book seeks to materialize the meeting as a relevant event for the area, and a fruitful space for debates on the theme of sustainability allied to design in Brazil.

FOREWORD

This work presents the results of round-table discussions which took place at the *Simpósio Brasileiro de Design Sustentável + International Symposium on Sustainable Design* (SBDS + ISSD) 6th edition 2017, accomplished in Belo Horizonte (MG), from August 1st to 4th, 2017.

The SBDS + ISSD is an important event and it has been settling itself through each edition as a fruitful space for debates about sustainability focused on design in Brazil. It is also important to highlight that, by the end of the event in 2017, the plenary made the decision of simplifying their name, which now can be called Sustainable Design Symposium (SDS), making its 7th edition already under this name in 2019, in Recife (PE). The main goal of this event is to reunite researchers, students and professionals of the design field, as well as representatives of the productive sector and government, who seek to discuss the design current and future situation, according to plenty aspects linked to sustainable development.

In 2017, the 6th edition was organized by the Programa de Pós-Graduação Ambiente Construído e Patrimônio Sustentável of Universidade Federal de Minas Gerais (UFMG).

The first edition of the event was accomplished in Curitiba (PR), in 2007, and it was organized by Universidade Federal do Paraná (UFPR). The second edition was organized by Universidade Anhembi Morumbi, in 2009, in São Paulo (SP). In 2011, was time for Recife (PE) to host the event, which was organized by Universidade Federal de Pernambuco (UFPE). In 2013, in Porto Alegre (RS), the event was hosted by Universidade Federal do Rio Grande do Sul (UFRGS), Universidade do Vale do Rio dos Sinos (Unisinos), and the Centro Universitário Ritter dos Reis (UniRitter). In 2015, for the first time, it was held in Rio de Janeiro (RJ) by the Pontifícia Universidade Católica of Rio de Janeiro (PUC-Rio), and only in the national version of the event (SBDS).

In this 6th edition, the organizing committee decided to try to internationalize the event and keep the last edition proposal to host round-tables made mainly by Brazilian researchers, willing to value these researchers professors of diverse of Brazilian universities to allow them to have meetings between themselves and with representatives of the productive sector and government, as well as seeking for the publishment of an organized book which results from those discussions.

The event was structured in six sections: 1) design, territory and culture; 2) social innovation and cooperative models; 3) ecomaterials; 4) environmental labelling; 5) design and crafting; 6) circular economy, with the purpose to contribute to the deepening and reflection over the triple bottom line (people, planet, profit) to sum up with a better conceptual definition and limits of acting, for the professionals of these fields.

The 2017 SBDS-ISSD opening ceremony took place on August 1st, at 7 p.m., at the auditorium of the Federação das Indústrias do Estado de Minas Gerais (FIEMG).

During the mornings of August 2nd and 3rd, 2017, there were technical sessions of the submitted works and evaluation in process of blind review.

Forty-four works were presented and, by the organization committee decision, all of them were submitted in English to have a better international range, which allowed the scientific committee to have 20% of foreigner researchers. On the whole of the 39 members, there were professors from plenty Brazilian institutions, three from Portuguese institutions, one from a Dutch institution, two from the United Kingdom, one from Australia and one from South Africa. Sixty-two works from 35 institutions from 9 different states were submitted, along with 10 foreign institutions, which were one from Colombia, one from Canada, four from Portugal, two from the United States of America and two from the United Kingdom. The SBDS + ISSD 2017 had an international reach never seen before.

The works showed in those technical sessions were published online in English by the book publisher Blucher, indexed from Digital Object Identifier (DOI) and they are available in: (https://www.proceedings.blucher.com.br/article-list/sbds-issd-2017-290/list#articles).

During the afternoons of August 2nd, 3rd and 4th, 2017, three concurrent sessions were dedicated to the round-tables, talking about the six topics mentioned beforehand. During these round-tables, representatives of the universities UFMG, UFRJ, Unisinos, UFSC, UFPE, PUC-Rio, and the institutions ICMBio, Mon Caviste, MateriaLAB, FSC, MDIC, ABNT Ambiental, iT Projetos, Mary Design, Trans.forma Design for Social, Sinctronics, Cooperárvore, Refúgio Engenharia Ambiental, FIEMG and designers who are actually working in the area, were present.

The morning of August 4th was focused on the ending plenary session.

In addition to the institutions previously mentioned, the event brought 35 Brazilian universities, including congresses and the scientific committee (Esdi-UERJ, FUMEC, IFB, IFSC, PUC-MG, PUC-Rio, PUC-RS, SENAC-SP, UEL, UEMG, UFAM, UFBA, UFCSPA, UFF, UFMA, UFMG, UFMT, UFPE, UFPR, UFRGS, UFRJ, UFSC, UFU, UnB, UNESP-Bauru, UNICAMP, Unisinos, Universidade Estadual de Maringá, Universidade Federal do Cariri, Universidade Estadual de Londrina, Universidade Federal de Pelotas, Universidade do Estado do Pará, Univille, USP, UTFPR) and 15 foreign institutions (Portugal: IP Portalegre, Instituto Politécnico de Tomar, Universidade de Lisboa, Universidade do Minho, Universidade de Aveiro; the Netherlands: Leiden University; United Kingdom: University for the Creative Arts, University of Sheffield, University of Warwick; Australia: University of New South Wales; South Africa: Cape Peninsula University of Technology; Colombia: Universidad Pontificia Bolivariana; Canada: Université Laval; USA: Parsons School of Design, Virginia Tech). To sum up, 120 people were present during the SBDS + ISSD 2017, keeping the same number of previous editions.

Six students from the design course and a doctoral student from UFMG were present, who summed up to the event organization committee in many activities. Being part of the event is important for the students' formation. Besides that, the SBDS + ISSD 2017 visual identity was developed by the students of the UFMG design course, Mariana Guimarães Jacinto e Stephanie de Figueiredo Silveira. The concept intended to bring some local aspects to the environmental visualization, inspiring itself on the elements of the church São Francisco da Pampulha, Belo Horizonte's essential key and The United Nations Educational,

Scientific and Cultural Organization (UNESCO) worldwide property since 2016. The Candido Portinari's composite panel was taken as the label background and the fish figure as the environmental indicator symbol, acting as the coming back of health and life to the rivers stemming from sustainability actions.

The event was supported by FIEMG, as in Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) funding agencies and Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG), the resources of the last one allowed this work to be published.

Hereafter, the following texts will reflect the round-table discussions and they will be divided into three sections: part I will bring you some works that make part of the ecomaterials field, the circular economy and the environmental labelling; part II will show you the discussion related to design, territory and the crafting culture, among other things like social innovation and collaborative models; finally, part III registers three reports by people who spent their time in the event and practice the design.

Andréa Franco Pereira
August, 2020.

FORECAST

PART 1

CHAPTER 1

DESIGN IN THE CONTEXT OF SUSTAINABLE CONSUMPTION AND PRODUCTION
MATERIALS AND ENVIRONMENTAL LABELLING

Andréa Franco Pereira

Since the 1999 international declaration on cleaner production, the worldwide community acknowledges that necessary measures to protect the environment must include better production practices and sustainable consumption (UNEP, 1999).

On the Earth Summit 2002, the Jonesburg implementation project established actions to promote the 10 Years Framework of Programmes on Sustainable Consumption and Production (10YFP), which has aimed to change the way society produces and consumes. The concept of sustainable consumption and production (SCP) (Figure 1) is defined as the usage of services and products which answer the basic needs and bring a better life quality, reducing the usage of natural resources and toxic materials, as well as the issuing of polluting and wastes over the product or services lifespan, so that not to commit the future generations' needs (UNEP, 2012).

Figure 1 – Sustainable consumption and production

Source: UNEP (2010).

The first meeting fully dedicated to the 10YFP development was held in Morocco, during the June of 2003, which resulted in the Marrakech Process, when the necessities and the regional priorities were identified, along with the Marrakech Task Force, aiming at the creation of a bond between the ones who felt interested, involving consumers, companies and the public sphere, focusing on (UNEP, 2011):

a) cooperation with Africa;
b) education for the sustainable consumption;
c) sustainable life-styles;
d) sustainable sightseeing development;
e) sustainable buildings and civil constructions;
f) sustainable products;
g) sustainable public procurement.

The results of this work were presented at 19th Commission of Sustainable Development (CSD 19), which happened in New York, 2011, addressing many countries most advanced SCP experiences, and it has included methodological manuals for promoting the ideas.

More recently, the Summit on Sustainable Development, held in September 2015 in New York, defined the 17 Sustainable Development Goals (SDGs) as part of the 2030 Agenda for Sustainable Development (Figure 2). This agenda also addresses the change in consumption and production patterns as the basis for economic and social development in SDG 12: ensuring sustainable production and consumption patterns (UN, 2015).

Figure 2 – 2030 Agenda

Source: UN (2015).

Through the Ministério do Meio Ambiente, Brazil releases its action Plan for Sustainable Production and Consumption (PSPC) in 2011, which has as purpose:

> *to foster policies, programs and sustainable consumption and production actions in the country, aiming to increase solutions for social environmental problems, along with the national policies, setting as target the elimination of misery, as well as the sustainable development and the international obligations which Brazil has taken, mainly with the Marrakech Process.*
>
> *Therefore, it will also contribute to the production and consumption pattern changing, leading us to a low carbon economy, which can guarantee the sustainability of the human societies' harmonious coexistence with the Planet (BRAZIL, 2011, p. 11, our translation).*

The Brazilian PSPC (https://antigo.mma.gov.br/responsabilidade-socioambiental/producao-e-consumo-sustentavel/plano-nacional.html) holds the following values:

- The sustainable development;
- The shared responsibility;
- The government leadership following the examples;
- The precaution;
- The prevention;
- The openness and society's participation;
- The cooperation;
- The environmental education.

Therefore, it is possible to highlight six PSPC's priorities which structure their actions (BRAZIL, 2011, p. 13):

Sustainable consumption education: To give birth and put in practice tools like researches, case studies, guides and manuals, aiming to sensitize and bring the consumer to bear for population behavior changing;

Sustainable public procurement: To boost the sustainable public procurement adoption in the public administration field, encouraging industries and companies to expand their product and sustainable services portfolio, leading them to the increase of activities which stands together with the low carbon or green economy;

Environmental agenda in public administration (EAPA): To consolidate the EAPA as reference for social environmental responsibility in the government (http://a3p.mma.gov.br/);

Solid waste recycling increase: To incentivize the recycling all around the country, either the consumer or the productive sector, promoting actions which walk along with the responsibility values, shared from the waste makers and the opposite logistic, as was previously established by the solid waste national policies (SWNP); and not to forget the importance of encouraging social inclusion in the recycling industry by inserting waste pickers;

Sustainable retail: To debate the retail sector view about the sustainable practices insertion in its operations and its role in the sustainable consumption promotion through actions which agree with the PSPC values;

Sustainable engineering: To induce the civil engineering sector to adopt practices that may increase the social environmental performance, since the project until the building itself, passing through insightful material selection and less harmful ways to the environment and human health.

In the context of the sustainable production and consumption, it is important to highlight that the environmental labelling has become one important too, as

its attribution allows the favorable assignment to environment, adopted during the products manufacturing, as well as better usages of the feedstock, the dangerous substances, the surface finishing and products building, likewise end-life strategies. This is clearly understood and applicable for the sustainable public procurement (UNOPS, 2009).

It is possible to see a demand increasing for quantified and qualified environmental information, based on scientific knowledge, which can be used as reference for the environmental performance of products and services. In this regard, environmental labels have become important tools for the sustainable public procurement (BIDERMAN et al., 2008; UNEP, 2011, 2012; UTTAM; ROOS, 2015; ZACKRISSON et al., 2008). They can be used as information to make the sustainable public hiring decision easier, for defining the specifications or, directly, as a requirement for the products (UNEP, 2012).

Biderman et al. (2008) state the requirement of environmental labels in the public bidding in some countries. However, it is still considered legal to specify that the product fulfils the standards set for a specific labelling system: "the environmental label can, thus, be used as a proof of the specification execution, nonetheless it may be possible to present another kind of execution about the standards fulfilling" (BIDERMAN et al., 2008, p. 64, our translation).

The Statute 9.178, published in October 23rd, 2017, disposes of standards fulfilling establishment, practices and guidelines for sustainable hiring made by the federal public administration, autarchic and foundational, and by the reliant state companies (BRAZIL, 2017, our translation). Sustainable standards and practices are defined in its 4th article:

> *I – low impact upon natural resources, like fauna, flora, air, soil and water;*
>
> *II – preference for materials, technologies and local feedstock;*
>
> *III – better efficiency in the natural resources as water and energy;*
>
> *IV – larger job creation, preferably with local manufacturing;*
>
> *V – longer useful life and lower maintenance cost of assets and work;*
>
> *VI – usage of innovation, which aims to reduce the pressure upon the natural resources;*
>
> *VII – natural resources sustainable roots used in assets, work and services;*
>
> *VIII – usage of logging and nonlogging forest products, which come from sustainable forest management or reforestation.*

The 8th article defines the "requirement proofs shown in public notice can be made through a certificate issued or acknowledged by one public or official

institution or through any way previously defined in the public notice itself" (BRAZIL, 2017, our translation).

From this perspective, sustainable labels aim to awaken and sensitize consumers and manufacturers about the comprehension over the sustainability of a product that receives the environmental labelling, the procedures of acquisition, use and waste of the natural resources in a permanent and balanced way and, finally, that they influence the behavior of consumers, manufacturers and public representatives.

CONSUMERS' PERCEPTION

The consumer's comprehension and environmental label adoption start to get important, although there is still lack of knowledge by the public side about the valuation and protocol parameters to the environmental labelling process.

The consumer behavior also contributes to the sustainable production and consumption, as far as the last user recognizes the product environmental quality.

For that matter, the environmental labels act as brands because they add value to their product, allowing a reliable interaction between consumers and companies. The brand is the graphic symbol that represents a company and its products, as an emotional value instrument for fast communication with the client. These brands show and represent emotional values to the client, who notices them, determining either the clients' behavior, approach and appropriation, or distance and denial. Yet, the client's behavior is a complex study field and it is reasoned by a huge theoretical basis (RESENDE, 2013).

Human perception is built by a couple of values and physiological, psychological and cultural factors, which give a notion about the environment that surrounds us. The stimulus coming from the outer world is organized according to each person's standard. This way, as far as our life experience increases, along with it, increases the perception over the world around us (PEREIRA et al., 2004).

So, the world around us can be considered a stimulus supplier, which induces an answer mechanism, structured by sensations (input), perception, process (cognition), action and result (output) (BONAPACE, 2000).

The perceptive process can be broken into two different parts: I) sensation, physiological mechanism by where the sensory organs register and share the external stimulus, and II) interpretation, which allows the organization and the giving of a meaning to these stimuli. The person has total responsibility over

the perceptive process. They do it in three different levels: a) selected attention or preperception, if there is the interest of this one person in acquiring that one product, they begin to easily realize all that is related to that one product; b) selected distortion, where the person realizes only the qualities of the object; c) selected retention, process in which information of desired objects is held in memory because of some other information (SERRANO, 2000).

By realizing the environment external stimulus, emotions are activated through chemical neuronal substances which dig into some specific brainly parts. The emotions are responsible for the perception changing, either behavioral or of thoughts parameter (NORMAN, 2008).

According to Norman (2008), the human behavior results of brainly structures made by three levels: the visceral level, which quickly judges; behavioral level, which refers to the action control; reflexive level, which is related to reasoning and comprehension, being linked to the contemplative brain area. All of the levels act simultaneously when the people who are looking for the product are in the choice process. To sum up, everything the person does has an affective and a cognitive component together (RESENDE, 2013).

The emotional branding (a marketing concept which refers to the value added to one's product/service) refers to the creation of a relationship between a brand and its consumers, adding values to the product thus far, established by the reliableness present in this relationship. The shopping made by essential needs, then, start to be made by one's desire, reaffirming positive shopping experiences. For that matter, those brands are directly linked to emotions, and these emotions are linked to human judgement, for being the result of emotional responses (RESENDE, 2013).

In this perspective, to Kotler et al. (2010), the consumer's behavior must be approached widely by understanding the cultural, social and psychological factors. Then, the so called "marketing 3.0" has been absorbing social and cultural values and the products start to have spiritual importance (philosophical experiences), aside from functional and emotional (RESENDE, 2013). In the 2000s, the marketing focuses on the differences and develop itself from concepts such as authenticity, co-creation and collaborative processes, as well as social and environmental responsibilities.

Thereof, the environmental labelling can be considered a marketing item, once it creates a new value for the product, in other words, refers to the products developed according to the environmental necessities and it differs from others. Consequently, the brand printed in the product can create bigger competition

and the companies may look for being different in the market. At the same time, shares with the consumers, basing their decisions, and contribute to the promotion of the government and companies' environmental actions (SILVA, 2014).

The European Union's concern for promoting the sustainability standards that are an important part of its Ecolabel can be clearly seen, and it can be noticed in its social media, leading the consumer to use the label and interact with the product acquired, but also with the labelling, which adds an even bigger value to this product. This virtual space allows the user to have their questions answered, share their satisfactions and dissatisfactions with the labelling system, and also to ludically learn about a product life-cycle evaluation process (RESENDE, 2013).

Notwithstanding, researches about decision taking by consumers show that themselves prefer to acquire products which have already been acquired. That is, they prefer what they are sure about, moved by a "satisfactory decision" (SIMON, 1965). Although that might be a cognitive shortcut, its disadvantage is that the consumer does not realize the variety of options which could be better (GOLEMAN, 2009).

This phenomenon is explained from the "cognitive inertia" concept, which is a cognitive version of the lesser effort phenomena (MEDINA, 2008). Goleman (2009) calls cognitive inertia the tendency of the human brain of searching the lesser effort of making a decision. According to Voltolini (2010), this concept explains why the consumers usually repeat their last shopping choice, for feeling safe and satisfied because the brand did not provide any negative experience.

To exemplify, researches that have been made by the nongovernmental organization Instituto Akatu (AKATU, 2018) show the panorama of Brazil's conscious consumption. In 2018, 1090 people from all around the country were interviewed, men and women of all social classes over 16 years old. The research evaluated 13 different behaviors, all of them related to the sustainability aspect in their routine. The first of them questioned: "carefully reads the label before buying any product".

For a matter of analysis, four levels of conscience were set (indifferent, beginners, engaged and conscious), from the behaviors and the declarations presented by themselves, which were "always adopt" or "have done" in the last six months. Comparing with previous researches (Figure 3), made in 2006, 2010 and 2012, there were decreasing of the conscious consumers segment (conscious and engaged), corresponding to 24% of the total in 2018. About the less conscious, there was an increase in the numbers of beginners comparing to 2010 and 2012,

being 38% of the total in 2018, while the rates of the indifferent kept stable, representing 38% of the total in 2018.

Figure 3 – Akatu research 2018: consumers conscience level

Source: Adapted from Akatu (2018).

In comparison to the less conscious consumers (beginners and indifferent – 76%), the more conscious consumers (conscious and engaged – 24%) are represented by an older and most female-centered group, which held better economic and educational qualification.

About the habit of reading labels, consumers who do it are placed in the segment of the engaged and present a group impact. However, there was a retreatment about this habit: in 2012 there were 69% of the consumers and in 2018 it turned down to 53%.

The research showed that Brazilians desire more the way of sustainability than the consumerism. Among the ten greatest desires, seven follows the way of sustainability, led by a healthy life focused on fresh and nutritive feeding.

Although 68% say they have already heard about sustainability, 61% of the interviewed do not know how to say what a "sustainable product" would be. Nevertheless, 39% of those who have any knowledge about what it would be, indicate that the main barrier for its consumption is the products price, followed by doubts about the quality (AKATU, 2018).

The cognitive inertia also shows that is here. According to the Instituto Akatu's research (AKATU, 2018), to 60% of the interviewed, the bigger barrier for the conscious consumption is about the necessity of a specific kind of effort, in which are included: changing in the one and the family's habits, cost, and requirement to obtain more information about the social and environmental questions, along with the difficulty of finding it in the market. In second place,

for 37% of the people, this barrier would be linked to distrust (in the government, the companies and in the communities). To the indifferent, handover pleasures and the costs are the major barrier. The beginners find it difficult to change habits and in the lack of confidence. The engaged miss more information. About the conscious, deployed and with major financial availability, the barriers are about questions like where to find, where to save and how to discard.

In conclusion, the research highlights the importance of emotional factors: "70% of the interviewed feel more motivated by the emotional factors" (AKATU, p. 46-47, our translation). The adoption of sustainable practices would bring benefits described as "emotional triggers", all preferred over the "concrete triggers" (Figure 4).

Figure 4 – Akatu research 2018: trigger for the adoption of sustainable practices

Source: Akatu (2018).

These data show the behavior change in a society that has been paying attention and appreciating environmental aspects.

According with Ottman (2012), this phenomenon is set as tendency and has been widespread by influencers. Sustainability aspects linked to the manufacture and social respect have been taken in consideration by the people at the moment of the decision of buying. Besides that, new technologies have been allowing that those environmental actions adopted by companies cause lower impact over the cost and price of products. Thereof, the companies that adopted those actions notice their brand acquiring more value, putting in practice policies based in a "green marketing" (TAVARES, 2014).

A research developed by Gomes and Casagrande Junior (2017) walks along with this tendency. The study has shown that the companies are looking for-

ward to adapting themselves to this new demand for products less harmful to the environment.

The following chapters look forward to discuss the several aspects linked to this tendency. There will be discussed factors which are referred to the productive scenario related to the environment topics, which were based in the critics established so far, and that concern the changes linked to the necessities of rethinking the linear way of traditional economy in the industry processes. Then, the concept of Circular Economy comes into play, which, even though it has its origins in past decades, it fits nowadays, in opposition to the "getting-using-wasting" model, and is characterized as a restorative and regenerating model, whose goal is to keep products, components and materials in their highest usefulness and value for an infinite period of time.

This discussion is also about the environmental labelling, its typology and public policies to putting it to work, as well as its importance to face inaccurate information, sometimes fake, which are presented by some companies, under the greenwashing. It is also discussed the effectiveness of the environmental labelling application, for instance, the acknowledgment by the general public about the Ecolabel of energy efficiency and the difficulties observed for adopting the environmental label by the companies.

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CHAPTER 2

THE SUSTAINABILITY ISSUE ABOUT PLASTIC MATERIALS

Vicente de Paulo Santos Cerqueira

This article retakes decisions presented in the round-table about "Ecomaterials", which took place in 2017 SBDS + ISSD, in Belo Horizonte/MG, eliciting aspects about the plastic polymers production scenario related to environment issues, in virtue of the critics established throughout the last decades. Surely these debates are shortened, because these themes, which involve the plastic production area and the environment, are either complex and long. Therefore, this work comments some data and information which may give the reflections a path to follow from the perspective of productive sustainability in plastic polymers, citing as references the productive and the environment scenario, as well as the integration programs.

With the advent of industrialization, it was believed that the natural resources would be infinite. However, just a little time later, this reality would change to this environment shortage and overload scenario.

Regarding this, Mano et al. (2005) eliciting the Brundtland Commission, highlight that the depletion of natural resources derived from the excessive production and consumption would indicate the necessity of rethinking all the developmentalist dynamic, especially over the relations which involve the society and environment. This scenario is where it is possible to establish the necessity

for reflections over the procedures that refer to the acquisition, usage and wasting of natural resources in a permanent and balanced way.

According to the Associação Brasileira da Indústria do Plástico (ABIPLAST, 2018), a city with three million people produces nearly 130,000 tons of solid waste per year. Part of this amount will be placed in any landfill or will be wasted in garbage dumps. It can be estimated that 48% of this total are residual materials which could be integrated, once again, to the productive systems and 18% of this amount are polymers (plastics and rubbers). The rest (52%) of the wastes is composed of varied organic materials. The mixture of industrialized and organic waste, derived from post-use, corresponds to the main environmental problem faced by big cities.

A huge part of the critics to the indiscriminate usage of the natural resources devolves upon the materials and their environmental relations — pollution rates. However, analyzing the life-cycle of the products, taking as a base the productive structures, it can be noticed the consumption of other natural resources, which happen seamlessly due to the difficulty of the quantity and quality measurement. Resources as energy, soil and water are essential for the operation of the productive systems.

Independently of the energy matrix, it can be summed up that around 20% of the worldwide energy is wasted with some technological problem or bad social habits. This loss comes from questions that involve industrialization, as 70% of worldwide energy production is settled in five microregions of the planet. Some data from the International Energy Agency (IEA) indicate that a huge part of worldwide energy is generated from nonrenewable sources (86%), while the renewable sources are only 14% of all production.

According to the Empresa de Pesquisas Elétricas (EPE) (BRAZIL, 2018), the energetic Brazilian matrix shows a framework more balanced, 43.5% of the energy generation is based in renewable sources, having as main the hydroelectric plants with 65.2%. The so-called “alternative” energies, as biomass, the solar and aeolian are 15% of the energy. It is estimated that 11.4% are wasted during the transmission and the consumption. The EPE indicates that the industrial sector showed an average of 6% of energy loss. The sectors of marketing and services show, together, 11% of the loss, while domestic consumption is around 15%. Nowadays, the Programa Nacional de Conservação de Energia Elétrica (PROCEL), established by the Ministério de Minas e Energia through the Presidential Decree No. 8/1993, is the main Brazilian program, which looks

forward to conscientizing the society about the reduction on the waste and consumption of energy.

Of all natural resources, the one that has the hardest measurement in productive structures is linked to the soil usage. Kon (2000) comments that soil has an essential role in the industrial scenario, because it refers to aspects of localization and regionalization and, therefore, all the necessary infrastructure for the productive activity. According to the characteristics of soil and subsoil, the economic relations of occupation and exploration change, conditioning specific regions to a specific development program. As reported by Embrapa (2017), a huge part of the Brazilian soil (63%) is composed of public and private native forests, 30% is destined to farming, of which 21% are pasture and 9% are destined to agriculture, and only 3.5% represent the urban areas occupied by most of the Brazilian population, which walks along with huge part of industrial activity.

Soil degradation happens for natural (climate and geologic phenomenon) or unnatural reasons (polluting agents visible through the deposition of solid wastes or invisible through chemical agents, saturation by metal and others), which causes damage to the surface and subsequent layers. The environmental impact caused by extractives, miners and infrastructural modify the characteristics of the soils. The main reason of the urban soil degradation is the disordered occupation of the environmental protection area, hillsides, river streams and lakes. These facts request even more preventive management and corrective over the soil, through waste management, in order to contribute with the gains and life quality.

The planet has a surface covered of 71% of water, of which 2.6% is freshwater and somewhat of this half is literally liquid. It is summed up that a quarter of this total shows some kind of contamination by organic material excess, heavy metals among other problems which request even more investment in treatments and purification, aiming to fit it to the domestic, agricultural and industrial consumptions. As reported by data of the Ministério do Meio Ambiente (2017), water consumption in Brazil shows 70% of its activities in farming and cattle, 22% acting in the industries and 8% for domestic consumption.

The main environmental problem about the water is related to its waste. Some technologies allow the reuse of water and some other need special treatment before its waste due to its high concentration of solid particles or chemical agents derived from its productive process. The main problems in the domestic consumption are the waste and the lack of treatment. It can be evaluated that 40% of the whole fresh water is wasted either by failures in the distribution

system or for wrong usage, just like 48% of the Brazilian houses have no sanitary treatment for wasting used water (BRAZIL, 2017).

Agricultural activities have as main problems in the usage of water resources to the contamination of the water table and of rivers by agricultural defenders, offsetting of waterways with the deforestation or the replacement of the native forest among others, despite the social economic production value.

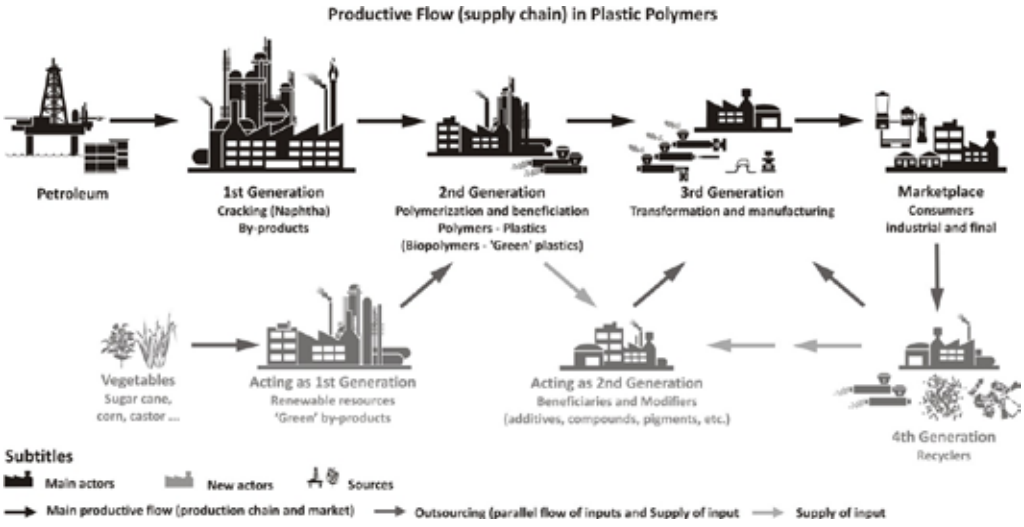
THE PLASTIC POLYMERS PRODUCTIVE SCENARIO

The productive structure in polymers is built by an unfolding in the petrochemical string from the supply of naphtha plots, or from the natural gas to the high-end industries (first generation). This segment is made of feedstock producers destined to the second-generation industries, formed by resin producers and some other derivative. Such products are destined to third-generation industries, constituted by companies which process manufactured products.

The existing relations in the polymers productive flow in Brazil does not present significative differences if compared to existing countries with higher rate of industrialization. However, the process segment shows some critic situations, if compared to other players. In general, the polymers supply chain string shows distinguished competences in its levels, determining specific actions in relation to the companies' stance. During the first stages, the competences are based in the access to basic feedstock in the massive production and in the cost reduction. As the flow develops itself, these competences turn to figure over other attributes, like: scope production, innovative capacity (including design), partnership formation, logistics and distribution, marketing actions, among some other aspects, granting to the included companies some unique strategic conditions (CERQUEIRA; HEMAIS, 2003).

It is possible to notice that, in the last decades, the plastic polymers supply chain presents new actors in the productive flow, from the supply of hydrocarbons derived from renewable sources to the production of the so-called "green plastic". It can be ascertained the occurrence of new enterprises destined to the modification of plastic property, the insertion of groups and social agents destined to the recycling, as well as the development of computational technologies applied to the materials and polymerics process, as it is shown in Figure 1.

Figure 1 – Representation of the plastic supply chain strings and new insertions in the productive system



Source: Elaborated by the author.

These insertions in the plastic productive system feed the idea of a productive network, incorporating actors that belong to other productive flows in an outsourcing way, since there exist many interrelation points in feedstock, products and service supply. This characteristic is easily noticed when analyzing the third generation, once it corresponds to the convergence in the whole productive system.

Among the variety of results taken of this complex structure, the work relation must be highlighted, because a huge part is settled in the process segment, where the economic profile is built by micro- and small enterprises.

Despite the mechanical process, this sector is characterized as intensive in labor; while the segments of first and second generation are focused in automation and are intensive in technology.

FROM DIVERSITY TO SPECIFICITY

For slightly more than a hundred years, the material science has studied the polymers in order to increase its productive and application performance. Polymers are organic macromolecular substances obtained by the minor molecules (monomers), which give birth to the "molecular chains" started by means of physical or chemical actions — polymerization (MANO; MENDES, 1999). Polymers form a group of materials hugely significant for industrialized econo-

mies, as it shows many properties and characteristics. They are plastics, rubbers, fiber, composites and cellars, which allow huge variety of applications, replacing the usage of traditional engineering materials (wood, metal and glasses).

Currently, plastics can be qualified in five evolutive stages: natural plastics, modified natural plastics, thermosetting synthetic plastic, thermoplastic synthetic plastic and bioplastics. The transitional period between thermosetting and thermoplastics made this diversity and expansion in these materials.

Since the 1960s, the focus on plastic development has been in the improvement of the plastic performance. This has happened through new synthesis processes, new modifiers agents' integration, as well as the upgrading in the productive processes, allowing gain of properties and rentability increase (LOKENSGARD, 2013). During the last decades of the 20th century, it could be noticed that a lot of plastics got in some kind of technological maturity, while some others were yet developing.

The diversity of plastic kinds took the way of convergence; in other words, less varieties with more applications, which resulted in the focus and consumption increase of some specific polymers, for example: polypropylene (PP), polyethylene (PE), poly(ethylene terephthalate) (PET) and polystyrene (PS). Some other plastics had their demand increased aiming to focus in specific segments in the market, as well as other plastics had their demands increased due to the focus on specific market segments, such as: the acrylonitrile-butadiene-styrene (ABS) in electronic equipment, poly(vinyl chloride) (PVC), in the civil engineering sector and polycarbonate (PC) in the automotive sector. These conditions made the stagnation or productive reduction of some polymers, such as styrene-acrylonitrile (SAN) and the poly(methyl methacrylate) (PMMA).

As a result of this evolutive scenario, there was an increase in the productivity rate, so that the basic resources loss and the waste of feedstock decreased considerably, establishing "clearer technologies". This technological development would make possible the expansion of the plastic market, not only geoeconomically, but, mainly, in new segments of products, resulting in a bigger consumption of plastic materials.

THE CONTINUOUS EVOLUTION

The polymers science established a bunch of classificatory values that approach physical, chemical and even economic aspects of these materials. Some groups influence directly the productive systems, such as: the classifying to-

wards the fusibility, the mechanical behavior, the structure, the composition and, furthermore, as can be seen in Mano and Mendes (1999), from the International Union of Pure and Applied Chemistry (IUPAC) definition. Yet, this work will approach only the aspects which guide the classifying towards the plastic occurrences and its evolutionary unfolding over natural and synthetic plastics.

Natural plastics

Natural plastics were an active part of the industrial production until the birth of synthetic polymers. This decline was caused by the growing demand and the technological evolution of the industrialized products, which used to request quantities and properties that were superior to the ones obtained from the natural polymers. These polymers are generated by spontaneous reactions (biogenesis) and are presented as fiber, plastics (resin) and some elastomers derived from vegetal species — polysaccharide, cellulose, latex, lignin — or that come from animals — proteins, casein, chitin, etc. (MANO; MENDES, 2013). Several of these polymers are processed in natura, while others went through chemical modifications, gaining mechanical properties in the transition range between elastic and plastic regions. From the 1980s on, there has been a resumption of interest for these materials with the intention to the "ecological footprint", mainly from those derived from vegetal resources.

Synthetic plastics

Synthetic plastic participation in the industrial activities has begun with the resin phenol-formaldehyde, also known as "bakelite" by the end of the 19th century. During the following decades, the plastic industry would be consolidated with the emerging of new materials. Since the 1930s, the plastic industry had a significant increase in its quality and quantity, with the incorporation of the thermoplastic polymers to the manufacture, which has replaced the natural and the thermosetting plastics.

Although synthetic plastics conquered the productive scenario, there is a bunch of critics about its environmental performance, mainly related to biodegradation, once the thermoplastics, even being chemically stable, has a slow degradation, either for physical or chemical reactions, creating "microplastic" particles.

New categories

Bioplastics form a plastic category which aims the friendship with the environment. The European Bioplastics qualifies biobased, plastics that are partially derived from renewable sources, and biodegradable, plastics that can be easily integrated to the environment. The IUPAC defines biobased polymers the ones derived from monomers obtained from the same biomass. The American Society for Testing and Materials (ASTM) says that the biobased polymers are materials "[...] whose carbon in its composition comes from renewable sources and not from fossil source [...]" (ASTM *apud* MEI, 2016, p. 31, our translation). Currently, bioplastics are applied in several disposable materials, loads of them using conventional technologies or technologies of additive manufacture. However, its demand is still limited to some market segments in virtue of its properties.

Plastics show qualitative subdivisions due to their properties, whatever they may be: general usage plastic (commodities), produced in large scale, and engineering plastics (pseudo-commodities or specialties) produced in smaller scale and destined to products that require better properties or higher performance. Advanced plastics include those that are structural composites applied for usage in extreme conditions and require strict environmental control during the whole process, as well as self-adapting intelligent plastics and nanoplastics, which are actually being developed technologically.

PLASTICS: SOLUTION OR ENVIRONMENTAL PROBLEM?

Nowadays, not considering the contribution of plastics to the worldwide productive scenario may be an immeasurable strategic mistake in social, economic and technological aspects. This is because the plastic industry is not limited to producing low-value products, which usually have short life-cycles. The industry also has its high-value segments, including the human segment, such as hospital equipment, besides producing a bunch of products destined to electronics; civil engineering, transport and some others segments, which contribute to social and individual well-being. Such insertion in almost all the market segments and products categories stemmed from the technological relation between the plastic material and the productive processes. This fact resulted from innovative actions, which made possible the reduction of costs, democratized the access to loads of goods, decreased the consumption of basic resources, among social benefits, making this group of materials a symbol of the industrial society.

However, the World Trade Organization (WTO), along with other international organs, shows the environmental damages made by plastic residues derived from the usage and wrong waste, which is possible to highlight the "invisible pollution", made by the degradation of plastics in the environment leading to the existence of "microplastic".

The World Wide Fund for Nature (WWF, 2019) developed the *Global Plastics Report*, which studied the worldwide plastic garbage in the environment and highlights that only 14% of the whole plastic produces is taken for recycling, while the rest is discarded, and a huge part ends up impacting the sea environment.

The growing demand for plastic products requires more consistent policies about the control of these materials. In the document *The State of Plastics*, made by the United Nations Environment Programme (UNEP, 2018), the environmental responsibilities are endorsed and have been discussed since the 1970s, which are: government actions by means of law about the consumption and waste of solid residues; companies actions by means of innovation programs, based in replacement, fitting or incorporation of less impactful to environment materials; and individual actions, related to the environment education, aiming at the conscientization for consumption and mainly the waste of plastics.

Especially in Brazil's case, it is highlighted by the WWF study that the relationship between recycling and transformation are not significant, conditioning Brazil to the 4th bigger plastic garbage producer. However, to face the numbers shown by WWF, it can be noticed that the plastic consumption *per capita* corresponds to the double indicated by studies by public and private institutions, such as ABIPLAST, CNI, IBGE, which determine that the consumption has kept itself in 83 lb/year, lower than the values shown by Argentina (97 lb/year) and by Chile (112 lb/year), and way too low if compared to the United States of America with their 326 lb/year and the 304 lb/year shown by Europe (ABIPLAST, 2018), as the national plastic recycling rate corresponds to 25.8% of the whole plastic transformed from short life cycle products. The results difference shown suggests the usage of specific methodologies for defining criteria and data collection by the organs previously named. Therefore, lies with the reader the responsibility of the reflection about the data above.

The misuse of the plastics in wastable products, electronic gadgets, packages, among others, have contributed for a mistaken view, partial and restrictive about the plastic usage. Besides that, the application of specific plasticizers,

colors and dyes, modifying agents or mineral chargers may contribute to toxic effects towards either the environment or the human being at all.

Aiming to avoid this kind of problems, various countries have established a restrictive law about the usage of these feedstocks, including Brazil, through their own law, which keeps control over the production, application and elimination of these feedstock in the plastic composition.

Another discussed aspect was that toxicity of plastics refers to petrol and the carbon liberation. However, the part which comes from petrochemical, in other worlds, the naphtha, corresponds to 4% of the whole refined petrol, destined to the production of polymers, besides detergents, wax, among other products.

ECOEFFICIENCY AND ECOEFFECTIVENESS

The plastic industry is a sector extremely dynamic and willing to change, because it is liable to the market demands and the productive government. This characteristic is present in all the productive line, but it highlights in the transformation segment because it can also be used in virtue of the specific requests of the upstream or by imposition of the downstream.

Currently, it has been noticed some environmental requirements established by client-companies towards the plastic transformers, attending the markets expectations. This condition obligates the companies to think about their strategic actions in general. In this sense, can be highlighted the guidelines of ISO 14000 series, for the development of "ecoefficient" programs. This concept has guided the productive activities from the Environmental Management System (EMS) looking for improving the performance and usage of resources and feedstocks (SEIFFERT, 2007). In general, the EMS actions are related to the energetic control, the waste reduction, the reuse of feedstock, to the replacement of polluting agents, the techniques normalization and to the social integration.

Therefore, even though EMS holds together important contributions to the productive routines, its proactivity is questionable when we talk about the reduction of the environment harm.

The plastic recycling

For the third plastic generation, ecoefficiency is shown through the energetic consumption, the reduction and losses and through the recycling itself. There are some considerations about this context, mainly with the aspects which refers to recycling. The Environmental Protection Agency (USA, 2017) defines recycling

as "[...] the collect, benefit, processing, commercialization and usage of the materials considered garbage". The recycling corresponds to a technological group which allows the recovery of materials from the industrial waste or derived from post-usage.

However, resulting from the taxes of shear stress during the transformation process, there is loss of molecular weight (*Mw*), which makes the recovered material need a certain quantity of new plastic or additives to recover part of its properties. This aspect makes the cost of the recycled product "better" than the "virgin" plastic. Therefore, the consumption of plastic products is the condition *sine qua non* to enable the technic and economic over the recycling, establishing a continuous production cycle and a fair and necessary value to the circular economy.

These plastic recycling systems might be aligned with the properties, composition and origin of the available technological resources. They will be classified by operational levels, just like primary recycling (in house), secondary (mechanical), tertiary (chemical) or quaternary (energic).

The so-called "R functions" in the productive context to reduce, reuse and recycle were associated with the function to reintegrate, rethink and refuse, determining a new level in the ecological perception of plastics. This group of activities was called eco-effectiveness, which encompasses a concept previously proposed by McDonough and Braungart (2014), who said that planned actions establish a continuous cycle of integration between production and recycling.

Certainly, plastic recycling has contributed with socioenvironmental actions, allowing not only the reintegration of solid wastes to the productive system, but also preserving the natural resources and stimulating entrepreneurial actions based in technological innovation.

SUSTAINABILITY IN PROCESS

Nowadays, the plastic transformation technologies form a range of options to the manufacturing of products or components. This range is a result of efforts that made the technologies even more dynamic throughout the productive line. The technological diversity allows a variety of forms, dimensions and production scales. All these aspects establish a productive scenario which is favorable to the production of tools and plastic products.

The current Brazilian scenario of transformation shows the following overview: extrusion 54.6%, injection 31.4%, blowing 8.9%, thermoforming 1.6%,

rotomolding 0.8%, lamination/pultrusion (composite) 1%, compression 0.4%, and other processes 1.3% (ABIPLAST, 2019; CERQUEIRA, 2018). In general, these technologies show energic consumption by transformed ton and other technologies, as well as the consumption of water. Despite this advantage, it can be noticed that the Brazilian industrial park was showing low values in productivity, as the average is around 85% of the productive capacity.

Huge part of these technologies shows different characteristics in process, some are totally automatized, while others are very dependent of human resources. The same way, there is a variety in the generation of process waste.

For thermoplastics, the injection channels, trimmings, wastes come back to the production (in house recycling). This is the reason why the conception and development of the project are important, considering all of these machine parameters, in terms of molds and matrices. Today, some projection programs allow a bunch of parametric analysis about the form and process of products with the goal of maximizing the efficiency of the process and with the lower consumption of resources and feedstock.

The thermosetting shows a lower number of processes; however, even with the inferior taxes, the conformation of this material group incurs in significant rates of wasting, mainly in feedstock per processed ton. Depending on the technology and the productive qualification, some processes may present loss in the order from 18 to 25% of the resources applied (CERQUEIRA, 2018). However, thermosetting plastics have a longer durability, for presenting a longer life cycle, decurrent from its physical and chemical properties. Nevertheless, the indication of this group must be very well analyzed in virtue of these significant environmental problems, because resins, in its majority, are processed using charges, which limit them to energic recycling.

CONCLUDING REMARKS

According to a research made by the Organization for the Cooperation and Economic Development (OCED), Brazil, despite being among the ten biggest worldwide economies, shows very low competitive rates. Among other reasons of this economic dichotomy, lies the lack of synergy between the actors who compound the productive structures, limiting the actions destined to social technology innovation.

While the country exports a huge volume of commodities in feedstock and agricultural derived, the results with the exportation of manufactured products

represents only 10.4% of national gross domestic product (GDP) (IBGE, 2019). This aspect has been aggravating in the last ten years, due to its subsequent falls in the Brazilian industrialization process, showing an average decline tax around 0.8%. This aspect shows that the Brazilian industrial productive structures are extremely fragile, either in the inner scenario or in their participation in the global economy.

Brazil shows supply chain and productive networks of significant importance for industrial development; however, the conjectural problems in the transformation industry can be noticed. This economic segment, besides sticking together part of the human resources (work posts), is what adds the most value to the productive line, because it establishes relations of all the consumer lines.

Specifically for the plastic polymers productive line, many initiatives destined to improvement of the productive processes in virtue of the environmental issues can be seen, which goes from the informatized systems adoption for the products development, to environment management systems, which involves government, social and companies' actions aiming to improve or, even better, to balance the industrial growth with the environmental conservation.

For this, the creation of integrated incentive programs to technological innovation and social action destined to the refinement of the whole plastic productive line is encouraged. From them, the following programs can be highlighted: (1) basic resources control with the goal of reducing or eliminating wastes during the productive process; (2) incentives to recycling, reverse logistic and plastic materials recycling, aiming at the replacement of the linear economy to the circular economy; (3) integration of bioplastics in products that have a short life cycle, just like packing, disposables and others; (4) strategic partnership formation for developing innovations about plastics along with sustainability values; (5) scientific and technological capacitation and for the professionals involved with projects of plastic management; (6) stimulus to social actions destined to generating income from the usage of plastic waste; and (7) environmental education for the conscious consumption and correct waste of plastic.

Researches focused on innovation of products and processes, besides contributing to individual wellness, have been giving satisfactory answers to plenty of environmental issues. This affirmation can be confirmed, directly, when identifying the plastic *per capita* consumption, which keeps relations with the human development index (HDI). According to the Plastics Europe Institute (2013), countries that show higher taxes of plastic products consumption tend to have a higher HDI, while countries with a lower consumption of plastic products

show lower development index. This condition also deserves respect as they are directly linked to the educational aspects of income equal distribution.

To conclude, it is important to have a different perception of the productive line and plastic production in the sustainability context. For this, it is necessary to have an environmental education, which may contribute to the constitution of a society more responsible and committed with ecological values, aiming the total social development.

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CHAPTER 3

A CASE STUDY ABOUT CIRCULAR ECONOMY AND SUSTAINABILITY IN A SMALL BUSINESS

Frederico Campos Viana

Sustainability is a term that has gained considerable notoriety in the last few years, being applied in many different ways, within a vast variety of fields. It is not rare to see ministers of finance talking about economic sustainability, or soccer teams affirming the need for sustainability in their efforts to expand their fanbases.

The truth is that the word possesses, one might say, an open enough meaning that it may be used in a number of different contexts. However, its fame and, therefore, the reason for its usage by the aforementioned parties derives from its origin, associated with ecology, with the environment and with industrial environmental management.

But what is the real origin of this term? How does it overlap with the previous concept of sustainable development? And, most of all, is it possible to apply this concept to the reality of the industry? Currently, it is possible to find well-structured actions towards corporate sustainability, but they are usually associated with big, multinational companies, which have a much wider array of resources. In this case, the question that remains is whether or not sustainability can also be integrated and incorporated by medium-sized and small companies.

Before presenting this case study, one must first go back a few years into the past in order to understand the creation of the concept of sustainability and its origins and principles, so that it is possible to understand the potentiality of its application.

THE EVOLUTION OF THE CONCEPT OF SUSTAINABILITY

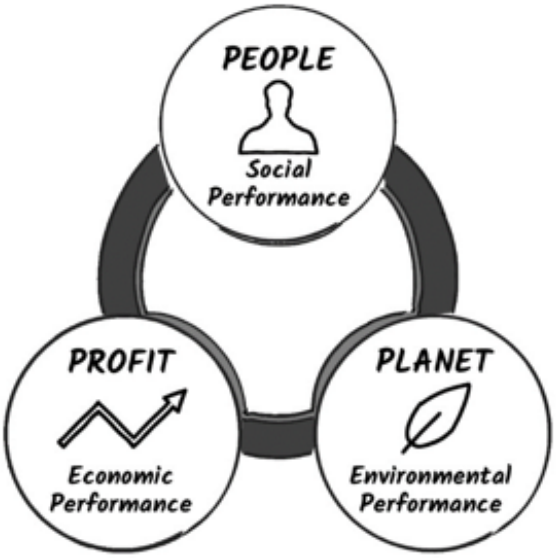
The inception of the concept of sustainability dates back to the end of the 18th century, when, in 1798, Thomas Malthus, a British economist, statistician, pastor and demographer, published the series of ideas later termed the Malthusian theory of population.

The Anglican scholar, after observing population growth between the years of 1650 and 1850, highlighted that the improvements in quality of life enabled by increased food production, basic sanitation and indoor plumbing, medical advancements towards combating illnesses, among other urban improvements from that period, caused the correlation to the means of subsistence to become unbalanced.

According to Malthus (1809), population grows in geometrical progression while the means of subsistence grow in arithmetic progression. Therefore, the author concludes that unless methods of limiting population growth were implemented, society would be on its way to collapse. This construct, which would later be named Malthusian theory of population, was indeed supported by World Commission on Environment and Development (WCED, 1987) through his affirmation that the planet could not bear economic development as it occurred then.

However, after countless international conferences and in the attempt to strike a balance between development at all costs and zero development, the first interferences based on the modern concept of sustainability emerged, which were later compiled and synthetized by Elkington (1994).

Figure 1 – Sustainability tripod



Source: Adapted from Elkington (1994).

In this context, it is important to highlight the actions taken by the United Nations and, most of all, by the World Commission on Environment and Development, which published, in 1987, a series of measures, guidelines and proposals, preceding the agenda 21. This document, titled the Brundtland Report or *Our Common Future*, was one of the first to rework the thesis of zero development into what we now call sustainable development.

It is possible to see considerable evolution from the scenario faced by WCED (1987) on the sustainability approach. According to Elkington (1994), sustainability must be seen three-dimensionally, which is to say that a developmental model or activity must not be measured by itself, but through the means of its execution. Nevertheless, one of the biggest challenges of sustainability as a managerial model was in its measurement or, in other words, it was not then employed as an indicator, but only as a support for legal requirements within organizations.

According to Callado (2010), sustainability is still seen, by some, as an ecological concept, far-removed from the reality of organizations, which only adhere to it with the aim of attending to the principles of social, legal and governance responsibility. However, the author states that the concept related to sustainability may also be understood as a new possible managerial and commercial approach, given that it promotes social responsibility and efficient consumption of natural

resources, preserving the planet's integrity and, still, maintaining the economic and financial rentability of the enterprise.

Seeking to better understand the correlation between environment and economic development, as promoted by sustainability, Alberton and Costa Junior (2007) evaluated the existence of a bond between financial performance and the ISO 14001 certification, which is considered one of the expressions of business sustainability.

For Alberton and Costa Junior (2007), the relation does not present itself as easily measurable, nor can it be simply associated with financial performance, as it is closer to providing productive and operational gains. Even so, the authors identified that the companies evaluated during the study showed gains in their financial indicators after the environmental certification.

The studies conducted by Callado (2010) include an attempt to develop indicators which could precisely measure the dimensions of sustainability. For the author, indicators can be considered essential tools in the monitoring of variables of interest to the company, as well as allowing for action planning and performance improvement.

Regarding the sustainability indicators, Veleva et al. (2003) highlight that the architecture is simple, given that they seek only to identify, objectively, the position of the organization in relation to the three-dimensionality of sustainability.

Complementing the aforesaid points, Lamborghini and Sukoharsono (2012) offer an understanding that sustainability indicators are the means through which the organization contributes or intends to contribute to the improvement of its own dimensions, economic, environmental and social, within the scope of three levels, local, regional and global.

Despite the importance of using these indicators, Callado (2010) highlights that most organizations apply them only quantitatively, thus reducing their analytical and descriptive potential. He, therefore, calls for the application of qualitative indicators as well, which offer a more holistic view into the process as a whole and into its causes and effects.

A series of studies were conducted on the formulation of sustainability indicators, later synthesized by Callado (2010), facing its perspectives and models of measurement. Callado himself conducts an extensive overview, ranging from the beginnings of sustainability to current days, in order to compile and assemble his line of indicators.

In this sense, it concludes that the evolution underwent by the concept of sustainability is associated to the growing perception of a need to establish limits, which were initially conceived for a macroeconomic context. From Malthus (1809) to Stockholm in 1972, the core of this issue was focused in nation level, not going down to corporate level.

It is impossible to dissociate the economic development of nations from corporate economic activity, given that the first is regarded as a composite; a sum of the units referred to in the latter. Even so, the field of debate unfolded generically, seeking solutions in terms of public policy and not specifically in the business environment. However, the approach proposed by Elkington (1994) results from a construct which has revealed itself as one of the pillars of modern sustainability theory. Known through its tagline, "acting locally, thinking globally", it demonstrates that macroeconomic governmental policies cannot be misaligned or unsynchronized with the business environment, since one results from the other. It is in face of this construct that the Elkington (1994) approach brings the sustainability level of action down, from that of the nations to that of business, showcasing, thus, the need for sustainability concepts and guidelines to be followed within the corporate arena. That way, the advancement of sustainability gained a new steam, becoming an issue of wide discussion by major administrative theorists, such as Kotler, Porter and others, who identified, in sustainability practices, a new administrative paradigm. Consequently, sustainability began to occupy significant space in the financial market, which started to see it as an instrument of distinction, creating rules, procedures, limits and specific checklists, bringing the sustainability approach closer to corporate governance and other management practices and creating, as a by-product, what is now known as corporate sustainability.

TRENDS AND MOVEMENTS TO CONTEST THE TRADITIONAL CAPITALIST MODEL

In the heels of the movements of contest to the traditional capitalist model, there have emerged several trends which have sought to balance the outputs of the conventional industrial process, such as the field of green chemistry, which seeks to reduce the complexity of chemical compounds, easing its degradation process. Cleaner production might have been a pioneer in gaining reach within the industry.

The notion of cleaner production and its central concept, based on industrial emissions, used to be referred to as end-of-pipe technique. This characterization was used to illustrate the by-products of the production process for which the industry could no longer find use or which it did not have the capacity to process.

Cleaner production was largely responsible for introducing the industry to the concept of emissions and for showing that such phenomena are, in fact, a mere portrait of its incompetence in guaranteeing the complete processing or utilization of resources. Cleaner production projects are nothing more than a way of reducing this imbalance, thus increasing the environmental efficiency of productive processes. Perhaps, what the concept lacked was expansion and integration with the other corporate processes, which could have led it to gain the coverage and seduction seen in the modern concepts of social responsibility and sustainability, which eventually supplanted cleaner production.

It is important to highlight that, among these concepts, the idea of circular economy is one of the large contestation movements, which has gained prominence due to the significant and relevant support of the Ellen MacArthur Foundation. It is fundamental to emphasize that while circular economy cannot be considered a new movement, its approach harkens back to the necessity of rethinking the linear format of the traditional economy of industrial processes. Basically, it predicates itself on an economic format capable of, indeed, interconnecting the ends-of-pipes, understanding that complete efficiency in any industrial process may be utopic, but its usage by another process does represent a unique possibility for reducing the exploration of resources and a better utilization of the outputs, of the residues, thus reducing the environmental impacts of the industry and of humanity as a whole.

Circular economy and sustainability are not competing trends, but rather complementary to one another, especially under the light of shared concepts of value, based on purpose. Still, it is important to highlight that significant cases associated both to sustainability and to circular economy are always connected to large enterprises, or orbiting around large industrial complexes. In this sense, the case-study presented below has enormous value because it deals with a simple, yet very significant model, presenting an example of the application of the concepts of sustainability and circular economy to a medium-sized company in Brazil's countryside.

THE SAMAMBAIA SERRARIA DE GRANITOS EXPERIENCE

The Samambaia Serraria de Granitos, a medium-sized granite mill, was founded in 1982 by Teodoro Samambaia, known in the region as Mr. Samambaia, a pioneer in the granite extraction and beneficiation field in the state of Minas Gerais and by his daughter, Norma Pereira.

The company, which used to act in the field of mining, is now geared towards granite beneficiation with the commercialization of polished granite slabs. Through the business to business (B2B) sales system, that is, by selling to marble factories and construction companies, it has been recognized in the market due to its products high quality and its operational delivery capacity.

Currently, the company's management is under the responsibility of Marcio Pereira, who has become an important partner and trusted advisor to Teodoro, who recognized potential in the young man, dating back to the company's mining days.

A PRODUCTIVE PROCESS WITH HIGH WATER CONSUMPTION

The granite beneficiation process is marked by its massive water consumption during both the cutting stages and the polishing stages. The granite is cut through multiwire looms, which gets this name from the set of diamond-coated wires that cut the slabs by moving up and down the block until the slab is formed.

For the cut to be made, in addition to the diamond-coated wire, a significant quantity of water is needed to guarantee that the cut is highly efficient and that the thread sustains as little damage as possible. In the past, simpler threads were used and the cut of a granite block took around seven days to finish, with work spanning three production shifts. Currently, with the multiwire looms, the process takes only seven hours. In some cases, depending on the material's hardiness, it may take less than it.

After the cut, the metal plates must go through a polishing stage, in which the material receives superficial treatment in automatic polishing machines and it is sawn with the aid of circular saws. The final product, cut slabs of granite, is used by the civil engineering sector, mainly in floors and building façades.

As a result, it must be noted that the productive process, besides its considerable water consumption in both stages, also generates two major kinds of industrial solid waste. The first, with a high content of water in its composition, is referred to as 'mill mud', and it is composed of granite dust, some wire residue

and, in some cases, a mixture of quicklime or another similar product which aids the cutting process. The second kind of residue is the result of the polishing stage, in which the slabs are cut, thus generating a material called *casqueiro*, comprised of small pieces of granite slabs that cannot be sold as full slabs.

Samambaia, in its constant search of managerial improvement, identified that the processes high-water consumption represented a considerable fragility, given that the 120 m³/day were a significant enough quantity that they could pose a high risk to the business continuity.

Such a way of thinking makes enormous sense nowadays, since this region has already endured an ill-fated crisis in water supplies. Samambaia Serraria de Granitos already held this concern in the beginning of the 2000s, almost 16 years ago. The company, through the principle of circular economy, sought to close the water consumption loop, reusing the water of the industrial process as much as possible.

The company's biggest challenge, however, consisted of the solids from the mill mud, as well as the quality of the water that would be reused, especially for the polishing process.

To reuse the water, it was necessary to separate it from the residues that compose the mill mud. Faced with this obstacle, the company chose to install a filter press, followed by an effluent treatment system. The effluent treatment system (ETS) implemented by the company is comprised of a fast-mixing zone, where the coagulant is added, and of a decantation tank, where the separation of solids and liquids occurs. The decantated mud is pumped to a lung tank, which temporarily stores it, and later pumps it into the filter press. The filter press extracts the highest possible fraction of liquid from the material and produces, at the end of this process, a mud containing approximately 85% humidity. The treated effluent returns, then, to the production process, alleviating pressure on the company's water consumption levels.

By the end of the process, Samambaia managed to reduce its water consumption by almost 80%, taking into consideration that, now, water is only used in order to make up for losses due to evaporation. Moreover, the volume of the residues generated was reduced by about 50% after the extraction of the water therein contained.

Such achievements would be sufficiently impressive, given that they allowed the company to see a significant productivity increase, as well as a significant reduction of its environmental impacts. Nevertheless, the path of environmental management is one way, as claimed by the entrepreneur himself. As soon as the

company finished the installation of its water reuse system, another aspect began to draw attention. What to do with the mill mud after pressing? Yes, the volume had been significantly reduced, but it was still there.

In this search, several solutions were evaluated and tested, such as passing it on to a business that performed mud extraction and which, therefore, could use the product for pit recompositing, further increasing the circularity of the production process. Through lab analysis, the residue was found to be neither dangerous nor inert, and therefore, it could be used as pit covering. However, after a few attempts, Samambaia realized that the selected partner did not share the same sustainability and management values, leading the company back to the drawing board in search of a new solution.

It was then that an idea emerged of manufacturing blocks for civil engineering and construction, a product also known as the ecological brick. For this end, the company acquired the Eco Premium 2600 machine, whose production capacity stands at 6,000 brick units every eight hours of uninterrupted work. The raw materials used to manufacture the bricks are: mud, sand, cement and water, in the proportion of four portions of mud, two of sand and one of cement.

After drying, the mud is sent into a grinding and sifting process. Afterwards, the material is mixed with sand and cement, and sent to be pressed in the Eco Premium 2600 equipment. Finally, the bricks dry in the open air for three days and then are sent for painting.

It is important to highlight that, for the implementation to work, it was essential that the process was economically viable, this being, indeed, one of pillars of sustainability. The costs of implementation, from equipment purchases to environmental regularization of the activity, was around R$ 75,000. There were no costs related to the acquisition or renting of a space for the activity, since it was conducted in an already existing space in the company. The manufacturing of bricks from the mud generated during the ETS prevented 966 tons of mud/year from being forwarded to the industrial landfill, generating significant savings.

Considering only the shipping fees incurred in transporting the material to an industrial landfill, or, in other words, not counting the costs of destination charged by the landfills, the payback period for this investment would be 12 months. Still, the market for the bricks was not that incipient, which represented a meaningful potential revenue stream for the business.

The average price for manufacturing each brick is R$ 0.40 and each brick is sold for R$ 0.52. The initial idea was to produce between 6 and 8 thousand bricks a day, depending on the demand for the product and, most of all, on the

generation of mud, connected to the company's productive activity. Thus, the projected revenue for the manufacturing of the bricks was, in a best-case scenario, R$ 4,160.00/day.

The company's initiative was not only successful, it was also evaluated and considered by the Federação das Indústrias de Minas Gerais (FIEMG), in partnership with Fundação Estadual do Meio Ambiente (FEAM) the state foundation for the environment, in 2016, as a good environmental practice, recognized at the state's Banco de Boas Práticas Ambientais.

THE EXPERIENCE AND ITS APPLICABILITY

The Samambaia experience is interesting because it illustrates that sustainability and circular economy as corporate practices are not restricted to companies listed at the stock markets. The movements of contestation to traditional economy and to the linear capitalist system must mirror themselves on and understand their applicability to small and medium-sized business owners, given that they not only represent nearly 90% of Brazilian businesses, but they also present themselves as proof of concept for the simplicity of the concepts themselves.

Translating the essence and the concept of these trends is crucial, not only to the companies, as John Elkington did with such success, but also to society as a whole, reflected on consumption patterns and certifications. It is also crucial that people are capable of translating complex contestation theories to small and medium entrepreneur, who are now considered some of the biggest engines to the current economy.

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CHAPTER 4

CIRCULAR ECONOMY IN INDUSTRIAL DISTRICTS IN MINAS GERAIS, BRAZIL

Guilherme da Mata Zanforlin
Ana Luiza Carvalho Fadel
Wagner Soares Costa

The circular economy got visibility after the creation of the Ellen MacArthur Foundation, in 2010. The term was said for the first time in 1966 by the economist Kenneth E. Boulding in his work entitled *The Economics of The Coming Spaceship Earth*, which pays respect to the integration of some areas to the maintenance of human life on Earth. Today, this concept aims to replace the current process of production-consumption-waste, known as linear economy, which has been calling the attention of some countries, companies and institutions. The European Union (EU), China and huge relevant corporations have already started the transition to the circular economy (CALIXTO; CISCATI, 2017).

The theme must be treated as priority, once that, in the last thirty years, demand of the consumers increased in 150%, whereas the technological development and increasing in the processes production raised the extraction of the feedstock economic value in only 40%, which was lower than the increase of the demand in the same period (CNI, 2018a). Therefore, alternatives for the current production, consumption and waste process must be worked and the circular economy is one way to face the problem of growing consumption and decreasing availability of feedstock.

In this concept, a lot of initiatives are possible in order to explore the pillars of the circular economy concept, involving new business models which prioritize the transition to the regenerative and restorative model in which the products, components and materials are kept in their highest levels of usage and value all the time (ELLEN MACARTHUR FOUNDATION, 2015). The Federação das Indústrias de Minas Gerais (FIEMG), through the Instituto Euvaldo Lodi – Núcleo Regional Minas Gerais (IEL/MG), in partnership with the Fundação de Amparo à Pesquisa de Minas Gerais (FAPEMIG), made a program to act in the industrial districts of the state to disseminate the concept of circular economy and propose collective business opportunities, which aim at the reusage and the implementation of resources from productive process in others, as well as the reduction of operational costs and the improvement of environmental indicators, the attraction of industries and investments to the region. In last instance, the goal of Programa de Economia Circular em Distritos Industriais is to contribute to the growth of cooperation between local industries and the competitiveness industries from Minas Gerais.

The concept of circular economy emerged in the 20th century, but only in the last decade of that period the idea started to be highlighted. In opposition to the current extract-use-waste, also known as linear economy, the circular economy is characterized as a restorative and regenerative model by principle, with the goal to keep products, components and materials in its highest level of utility and value for an infinite period of time. In this concept, the feedstock, products and residues produced are inserted in technical or biological cycles (ELLEN MACARTHUR FOUNDATION, 2015).

The technical cycles reinsert the products and their parts while the biological ones safely reinsert nutrients in the biosphere for decomposition, which consequently will be integrated in feedstock as value for a new cycle. This is one of the three principles that, together, work as guidelines to circular economy. The other two are, in their essence, focused on preserving and improving the natural capital through control of finite stocks and balance of the renewable resources flow and to a stimulus of the system effectiveness, revealing and excluding negative externalities since the beginning of the cycles (ELLEN MACARTHUR FOUNDATION, 2015).

This model presents huge economic advantage, once facing the commodities prices instability to the water shortage and the increasing cost of materials recovered and restored, as well as the reuse of feedstock derived from other chains. There was the implementation of the subject to the strategic map 2018–

2022 of the Confederação Nacional das Indústrias, in 2018, which affirms that the industry has an essential role in exploring opportunities within the subject (CNI, 2018a).

However, for the effective transition to circular economy, it is necessary to foment partnerships, once industry, society and environment are strongly related, and the cycles interpose one another, not being fruitful their isolation. Through these partnerships, an environment rich in opportunities of circular economy ideas application emerges.

In Brazil, a changing in the paradigm has been materializing itself through programs that, even not firstly recognized as circular economy actions, show convergence with the model values. It can be noted the initiatives in a bunch of industrial sectors. Some companies in the electronics sector have actions as reinsertion of equipment and printer supplies in the production of new equipment and solutions based in the reverse logistic, increasing the useful time of the components using the residue as resource. Besides that, the FIEMG's Programa Mineiro de Simbiose Industrial unites plenty of companies to reuse the resources, being an example on the usage of residues as resource (CNI, 2017).

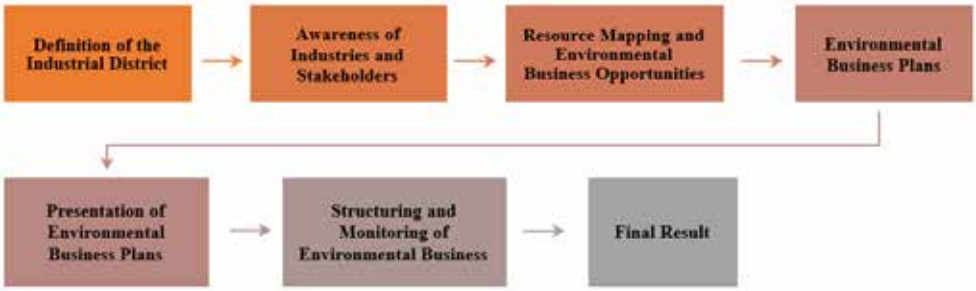
In 2017, it was also released the Programa de Economia Circular em Distritos Industriais, which is an initiative of FIEMG, with support of FAPEMIG, aiming to identify business opportunity in an industrial district increasing competitiveness of industries and promoting an environment of cooperation and sustainability (FIEMG, 2018). The initiative is an evolution of the Programa Mineiro de Simbiose Industrial, in which from 2009 to 2015 benefited more than 760 companies, that reduced almost R$ 9 million in costs with acquisition of feedstock and materials. In the environmental aspect, it reused almost 140,000 tons of residues, besides the economy of 195,000 tons of feedstock and the reusage of almost 14,000 m³ of water (CNI, 2018b).

In the legal sector, the main point for the circular economy in Brazil is the law 12,305, also known as National Policy of Solid Residue, or NPSR, from 2010. Ruled in the principle of shared responsibility, it requests that all the generating and treatment lines of residues contribute to diminish the quantity generated and the impacts brought by the life cycle of the products. The law urged the end of dumps and attributed to city hall the responsibility of making easier to return reusable residues to the productive processes. Such guidelines are limited to solutions for the products last waste, neglecting the opportunities brought by the circular economy for the innovation and preservation of the value added of the feedstock, parts and products, as well as the actions of incentive to change soci-

ety's paradigm about sustainable consumption. However, such policies are still recent and represent an opening for the companies to invest in circular solutions.

The methodology used for executing the Programa de Economia Circular em Distritos Industriais in the cities of Sete Lagoas and Uberaba consisted in three main stages (Figure 1): sensibilization of the interested parts, mapping of resources and opportunities and the elaboration and monitoring of collective business plan. The program was dimensioned to be executed in the period of one year. The stages of sensibilization, mapping of resources and opportunities and the business plan have scheduled duration of one, four and seven months, respectively.

Figure 1 – Stages scheme of the circular economy program



Source: Elaborated by the authors.

The stage awareness of industries and stakeholders has a goal to sensitize the associations and local universities, as well as the CEOs and decision makers of the mapped industries to participate in the program about the benefits of circular economy in the social, economic and environmental aspects. Once the partnerships between associations and local universities are made and the companies have already taken part of the project, the collaborators of participant companies are qualified in the theme of circular economy. In this way, companies are stimulated to apply the model concepts and identify the improvement opportunities inside their own productive process.

The first stage is finished with the official release of the program in the industrial district. The solemnity of releasing marks the beginning of the resource mapping activities, opportunities and actions, which already exist in the member industries. Such actions compose the second stage of the program, named resources mapping and opportunities identification. In this stage, undergraduate students of a local partner university support FIEMG in the quantitative and qualitative data survey relevant for the program, such as the generation of solid

and effluent residues, hot gas emission, feedstock usage, among others. Such mapping is made through questionnaires and visits to the industries. At this point, actions which fit the circular economy model already executed by the companies are surveyed.

The data surveyed are tabulated by FIEMG and the analysis of crossed information gives a start to the third and last stage of the program, named presentation and monitoring of collective business plans. The collective business plans (CBPs) are proposed by FIEMG and the partners in the program to the participant companies. Such plans involve more than two companies and aim at the reuse and implementation of resources derived from the productive process in others, as well as the reduction of operational costs and the improvement of the environmental indicators, the attraction of industries and investments to the region. Such actions are only examples of possible CBPs that, in last instance, contribute to the cooperation among the local industries and competitiveness of the industries from Minas Gerais.

The CBPs are executed by the companies by means of negotiations led by FIEMG and local partners. The decision and the terms of execution depend on the initiative of the participant companies. In this stage, the role of FIEMG and of the partner is to monitor and guide the companies, helping them in whatever they need. The negotiation must be set in the complexity of the plan, determined by the following main economic factors:

Existence of solution in the market – it is about the existence of a technology to provide synergy. Such existence will influence directly in the necessity of research and development of new processes, equipment and products, once it will imply a lower investment in tests, prototypes and analysis.

Acquisition of equipment or outsourcing services – it is about the necessity of acquisition of equipment for processing the resources or even the outsourcing of services, whether they are consulting, logistics, information technology or whatever the involved industries do not own for the concretization of the collective business plan.

Research and development – it is about the necessity of application of investments in research and development, in case there is no solution in the market for the concretization of synergy. The realization of tests, partnerships with consultants and such are collective investments.

Based on those factors, the level of investment and the deadlines for negotiating and concretizing the plans can be defined.

After the analysis of business plans and execution of the business rounds, the following results were obtained: in the industrial districts of both cities, Sete Lagoas and Uberaba, 44 companies took part of the circular economy program; 25 circular economy cases already applied by the companies were mapped; and 19 business plans in progress, which involved the negotiation of wood, composting, collective hygienization of wastes, metal scrap, effluents, collective quality water analysis, lamps and cardboard.

As result of the investments on the Programa de Economia Circular em Distritos Industriais by FIEMG, in two years of implementation, it can be noticed economic, environmental and social gains, either for the industries and for society. During the execution of the project, it could be noted: companies which raised their profit in 20%; the deviation of industrial garbage to landfills, increasing its useful time; total water reuse in processes; costs reduction with electric energy; reduction of greenhouse gases emission, such as CO_2, among others (FIEMG, 2018).

The results show the success of the program. However, it can be noticed, by the membership rate, the fear of some entrepreneurs in being part of innovative actions, by fearing the restrictions from law and tributary issues about the implementation of new business derived from CBPs, awhile the business core.

Thus, it is important that there are legal changes to encourage the development of sustainability actions and cooperation between companies.

The Política Nacional de Resíduos Sólidos (PNRS), main federal regulation for waste management, although it presents principles and guidelines common to the circular economy, neglects the opportunities for innovation brought by the model. It is necessary that the instrument be modelled to attend new trends and innovations and that it be translated into goals and tangible results for the sectors involved.

Besides the aforementioned, it is paramount to emphasize the importance of absorbing the culture of circular economy within corporations, so that actions transcend the reuse of waste and move towards new business models and product redesign to attend not only the needs of the production process, but also consumption. The final consumer can also benefit directly from circular economy, since products redesigned under this model can bring significant savings in the use of other associated inputs. For example, the decrease in the use of water in daily tasks, the reduction in the need for equipment maintenance and the incentive for the correct destination that allows the parts of the product to return to the high added value chain and not be discarded as waste.

The absorption of the concepts and the understanding of the model as an economic advantage are essential for the evolution of the productive process of industries within the circular economy model. At the moment, FIEMG's program focuses on solutions involving waste, effluents, supplies, utilities, in addition to the provision of collective services and attracting new businesses and investments to the region. However, the reverse cycle and ecodesign pillars are essential for the true transition to the circular economy, but they depend on the companies' culture to change to allocate capital for the development of new solutions within these concepts. Therefore, the medium- and long-term planning of the program is to return to the industrial districts worked to map opportunities for redesigning processes, products and associate production processes with reverse cycle strategies.

During the interaction with industries participating in the program, it was noticed that the entrepreneurs and collaborators have already been adapting to the reality of imminent rationing of water resources and other materials essential to the continuity of production. This was evidenced by the identification of 25 actions already in execution within the companies and also among them, focused on the circular economy concepts. In addition, it was noted the immediate interest of several actors in the subject, for identifying the economic opportunities within the subject. Therefore, it is expected that, over time, industries, which at first did not show significant interest in the subject or the program, will become partners and increase the range of collective business that can be implemented in the context of the industrial district and area of influence.

Finally, the analysis of the program execution proved itself as important for the development of improvement strategies to be applied in the next programs in other Industrial Districts of Minas Gerais. From the experience acquired throughout the three stages executed in Sete Lagoas and Uberaba, it can be seen that some adjustments are necessary to meet the expected indicators and, consequently, the success of the program.

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CHAPTER 5

THE ECOLABELLING TYPE I IN BRAZIL'S SUSTAINABLE PUBLIC PROCUREMENT

Antônio José Juliani

The production and consumption patterns in global society derive from industrial and technological development characterized by the supply of goods and services on a large scale. Modern Western societies' habits contribute to the excess consumption of unnecessary and often superfluous goods and the production of waste (CORTEZ; ORTIGOZA, 2007). The level of exploitation of natural resources to obtain raw materials is at a higher level than the capacity to support ecosystems that are proven by the phenomenon of global warming, the pollution of seas, rivers and springs, and the extinction of species of fauna and flora (VEIGA, 2005).

According to Stern (2007), the potential and irreversible impacts of global warming on ecosystems, societies and economies are beginning to be known and measured. Stopping the rising global temperatures requires an efficient transition towards a low-carbon economy, which can make climate issues a complex problem for humanity to solve. Since the 1990s, there has been a shift in the focus of discussions concerning environmental problems. Questions about the impacts of consumption patterns have taken place about approaches considered only problems related to productive activity (PORTILHO; RUSSO, 2008).

In this context, expressions such as sustainable consumption, conscious consumption, or responsible consumption have emerged to denominate the use of goods and services that meet basic needs, improve quality of life and the production of lower impacts concerning the environment. The understanding of sustainable consumption seems to materialize the very concept of sustainable development contained in the Brundtland report (PNUMA, 2001). Thus, it becomes necessary that the satisfaction of modern society's needs be in line with the rational use of natural resources to contribute to the change of production and consumption patterns in force to more responsible patterns.

On the international scene, Agenda 2030, adopted by the United Nations in 2015, proposes the adoption of 17 sustainable development goals (SDGs), which are subdivided into 169 corresponding goals. Sustainable development goal No. 12 stands out, proposing sustainable production and consumption by promoting sustainable public procurement (goal 12.7) and following national policies and priorities. The United Nations recognizes that public procurement is essential in innovation and transition to a green economy since the need to meet sustainability criteria incorporated into the public bidding edicts drives the market towards the adopting innovation aimed at sustainability.

For the United Nations, public procurement creates synergy between innovation, economic development and environmental protection. Moreover, governments, in their role as leading consumers of sustainability, encourage change in society's production and consumption patterns by demanding environmentally responsible products and services. Thus, if initially the figure of the consumer was associated with the individual, the expansion of the theme resulted in the perception that public and private institutions are also expressive consumers of goods and services and can present more significant levels of consumption than individuals (PORTILHO; RUSSO, 2008).

In Brazil, according to the Ministério do Planejamento, Orçamento e Gestão (MPOG) (BRAZIL, 2010), government purchases move about 10 to 15% of the country gross domestic product. These values show the importance of government actors as consumers of products and services. They have stimulated countries to elaborate guides and action plans to implement environmental management mechanisms in public agencies.

In this context, sustainable public procurement (SPC) or sustainable bids is a relevant environmental management tool for government agencies. With public agencies as consumers, the SPC can stimulate the green market and the circular economy, leading companies to adopt sustainable practices in their production

processes, such as sustainable design, waste reduction, material reuse, recycling and the use of ecolabels.

In Brazil, several actions have been developed in order to constitute a Public Policy for SPC. Examples are the environmental agenda in A3P Public Administration. A specific thematic axis on sustainable bidding was inserted and the elaboration of sustainable public purchasing guides by the MPOG and the Ministério do Meio Ambiente (MMA). In 2007, the *Plano de ação para produção e consumo sustentáveis* (PPCS) was prepared, aligned with the Marrakech Process actions, to foster the adoption of sustainable production and consumption patterns in Brazil.

In 2010, Normative Instruction No. 1 was prepared, which provided the criteria of environmental sustainability in acquiring goods, hiring of services, or works by direct public administration, municipal and foundation. In 2012, decree No. 7,746 was published, to regulate art. 3 of law No. 8,666 of June 21, 1993, to establish criteria, practices and guidelines for the promoting national sustainable development in hiring by the federal public administration and establishing the Comissão Interministerial de Sustentabilidade na Administração Pública (CISAP).

Besides these actions, the federal government, through MPOG, has developed a computer-based purchasing system with a catalog of sustainable products that can be used by the various agencies as a reference for the inclusion of sustainability criteria in the specifications of goods and services in bidding notices.

Despite the relevance and the positive political, economic and social repercussions of these actions, there is still a necessity to improve the process of sustainable public procurement in Brazil to effectively be an instrument to induce changes in production and consumption patterns in the country.

Two priorities must be met to strengthen the sustainability variable in the national sustainable public procurement process life cycle. One is the creation of sustainability criteria for the acquisition of goods and contracting of services. The other is the improvement of the mechanism for verifying these criteria by the purchasing or contracting public agencies.

In the sustainable public procurement process, most of the criteria classified as sustainability criteria concern the product technical specifications. Public agencies verification is done mainly through self-declarations from manufacturers/suppliers that ensure that their products and services are sustainable and meet the required sustainability criteria.

THE HARD CHOICE OF SUSTAINABILITY IN THE PROCESS OF SUSTAINABLE PUBLIC PROCUREMENTS

Choosing the most sustainable product or service than similar ones on the market is one of the most critical steps in conducting a sustainable bidding process, given the proliferation of definitions of existing sustainable products. Some products are considered sustainable when they generate less waste in their production process or are recyclable or last longer. Others, when they do not consist of harmful or toxic substances to human health or when their production process is less energy-intensive, water-intensive or emits fewer greenhouse gases.

To decide which product is environmentally preferable, researchers and experts recommend comparing the environmental impacts of products by evaluating their life cycles. A sustainable product presents the best environmental performance throughout its life cycle with quality function and level of satisfaction equal or better, if compared with a standard product (BIDERMAN et al., 2008).

In practice, it is not always easy to find appropriate sustainability criteria for the purchase of a product or service; usually, they are not related to these products or services environmental performance. Moreover, the same server that works with sustainable public procurement has no practical training on the subject. One of the most common challenges for implementing sustainable product bidding is the lack of information and consumer experience (public agencies) to compare specific characteristics of a product.

In some cases, the consumer is overloaded with information about the products sustainability by the manufacturers themselves. This fact creates the necessity of checking the veracity of this information by the purchasing agency. There are practical tools that help overcome these obstacles. That is used in countries with practical and sustainable public procurement policies, such as the United States of America, England, Canada, South Korea, Japan and Germany. Such instruments are based on the life-cycle assessment (LCA) methodology, a holistic concept to evaluate a product or service environmental performance. The LCA considers the product environmental impact in its life cycle, that is, in all its stages, from the extraction of raw materials to the final disposal of the product to minimize negative impacts on the environment.

It should be noted that these instruments take into account the principles of the circular economy, which emerged from an industrial ecology model based on the idea of closed cycles that were used by environmental policies in Germany and Sweden in the early 1970s (YUAN et al., 2006). Circular economy is an

alternative to the linear production system to transform consumer goods, which would be discarded as waste, resources for other sectors of the economy, closing cycles in the industrial ecosystem and minimizing waste production. The innovative process seeks to replace linear production with resources that can be reused, repaired, remanufactured (STAHEL, 2016).

SOME CONSIDERATIONS ABOUT LIFE-CYCLE ASSESSMENT (LCA)

The definition of life-cycle assessment (LCA), according to ISO/TC 207, is "the compilation and evaluation of the inputs, outputs, and potential environmental impacts of a product system throughout its life cycle." The LCA is a tool developed to assist the continuous search for environmental performance. Unlike other techniques commonly used in environmental assessments, the LCA has a comparative approach and presents some specific characteristics. It is considered as a starting point for ecolabelling programs (SETAC, 2002).

According to ISO 14040, the LCA addresses all potential environmental aspects and impacts throughout the product life cycle, including extraction and acquisition of raw materials, and production, use, recycling and finally final disposal. The standards developed by the International Organization for Standardization (ISO) on LCA harmonize the procedures adopted in initiatives taken in various countries of the world by research institutes and companies interested in demonstrating the environmental performance and acceptance of products in the market.

Considering the different stages of the product life cycle, from obtaining the raw material to the final disposal of the product, makes the LCA an efficient tool for environmental improvement. The reason is the consideration of environmental impacts from one stage of the product life cycle to another or from one medium to another, without there being a liquid environmental gain (IPEA, 2011).

By implementing the life cycle approach in establishing environmental label criteria, the use of LCA can also present some difficulties and limitations. The great extent of the studies, the high costs involved, the difficulty in obtaining data that are not always available, and the long term for achieving results. The solution to the problem lies in the principle of considering aspects of the life cycle.

International Organization for Standardization (ISO) recommends in standard 14024 that specific environmental criteria consider the product life cycle,

without the need to conduct a complete evaluation of this cycle. It is done by assessing aspects of the product life cycle, identifying critical phases about the potential impacts that will be the subject of further studies.

Such an approach should include a meaningful assessment of the impacts to support selecting those to be used in defining the criteria. Stakeholder involvement in the requirements definition process is essential to ensure their legitimacy and adequacy. One of the ways used for this purpose is to set up committees with representatives of interested sectors to conduct the work.

An LCA conduct requires a considerable investment of time and resources, but both private organizations and public bodies use this tool to support decision-making. It can be used, for example, in the development of public policies for ecolabelling, which are essential market instruments in the country's sustainable public procurement process.

ENVIRONMENTAL LABELLING ASPECTS

The increase in society's awareness of environmental issues has had significant effects on consumer markets for products and services. These effects have presented themselves as growing demand for information on the environmental aspects involved in the production processes, which significantly influences the consumers' purchasing decision (BRAZIL, 2002).

This scenario has given rise to hundreds of initiatives to disseminate information on the socio-environmental sustainability of production processes and the use of various products and services. This information is usually unbelievable.

Many of these initiatives can be classified as ecolabelling. No agreed definition describes their basic concepts, nor a single discipline that thoroughly explains them. It is an interdisciplinary subject and can be understood as a label that identifies a product or service overall environmental preference within a specific product/service category based on life cycle considerations.

According to IPEA (2011), ecolabelling is the practice of informing consumers about a product characterized by better environmental performance than similar products. It consists of giving a seal or label to a product or service to inform its economic and social environmental aspects.

It is an economic instrument and a communication tool. It seeks to disseminate information that positively changes production and consumption patterns, increasing consumers and producers' awareness about the necessity of using natural resources more responsibly. It seeks, based on accurate and verifiable infor-

mation about the environmental aspects of products and services, to encourage the demand for those products that cause less impact on the environment.

Other expressions are also used to designate ecolabel, such as green seal, environmental label and environmental statement (IPEA, 2011).

Often, labelling and certification are also used as synonyms. However, environmental labelling (ecolabelling) generally relates to the characteristics of the product. It is aimed at final consumers, while environmental certification (ecocertification) is related to production methods and processes. It is mainly directed at resource-using industries, seeking to attest to one or more attributes of the production process (IPEA, 2011).

Due to the proliferation of many ecolabels and seals in global markets and the importance of establishing standards and rules for their proper use, ISO has developed standards for ecolabelling and classified the various types of ecolabelling into three main types: type I (ISO 14024), type II (ISO 14021) and type III (ISO 14025) (BRAZIL, 2002).

Ecolabel type I is conferred by third-party programs (not the manufacturer or the supplier). It is based on multiple criteria, is voluntary and considers aspects of the product life cycle. It is also known as a green label. Ecolabel type II corresponds to the informative self-declarations made by the manufacturers or suppliers themselves. Ecolabel type III is also conferred by voluntary third-party programs and provides extensive and quantified information based on a complete LCA. It is still under development, mainly in the academic sector (BRAZIL, 2002).

There are other types of ecolabels that are quite specific, but which have not been regulated by ISO. An example is organic agriculture certification, which certifies that certain agricultural products, such as food or textile products, come from productions that do not use chemical substances. Another example is the neutral stamps, which briefly inform the environmental characteristics to guide the consumer. It is the Procel label of energy conservation, which allows the consumer to choose a product with lower energy consumption compared to others of the same category.

These alternative programs generally focus on a single sector or address only one environmental problem and do not consider the product life cycle in their applications. They generally focus on just one criterion.

In a typical type I ecolabelling program, product categories and criteria are determined by an independent organization with a complimentary technical

consulting group. From the moment a category is chosen, some form of LCA is conducted. Companies that choose to submit their products/services to the type I ecolabelling program to obtain the corresponding label (logo) fill out a contract and present their products for conformity testing and verification done by a third-party organization (auditing).

Suppose the products are approved and fulfil the defined criteria. In that case, companies pay licensing fees to use the ecolabeling program logo for a certain period, with the need for a new evaluation (auditing) for renewal. The ecolabel is restricted to the approved product and the industrial site where it is manufactured and monitored by the management agency.

The ecolabel type I is considered the most appropriate to compose the sustainability system verification in sustainable public procurement. The idea is to ensure the necessary impartiality and credibility.

It is voluntary and considers aspects of the product life cycle. It does not consider only the technical specifications of the product. However, it evaluates its entire production process, besides being conferred by a third-party body that does not represent the producer, the supplier, or any other party interested in the commercial aspects.

TYPE I ECOLABELLING AND SUSTAINABILITY VERIFICATION IN SUSTAINABLE PUBLIC PROCUREMENT

Sustainable public procurement is a relevant instrument to contribute to the reorganization of the economy with new paradigms. In Brazil, they are inserted in a context of national agendas that guide actions and policies for sustainable development. From this perspective, public hiring represents the adjustment of hiring to what is called sustainable consumption.

According to Biderman et al. (2008), sustainable bidding is a solution to integrating environmental and social considerations into all stages of the purchasing and contracting process of public agents (governments) to reduce impacts on human health and the environment human rights. These bids objective is, by legal force, to ensure free competition and obtain the best product/service with the most advantageous proposal.

The most advantageous proposal for the public administration should take into account the lowest price and the cost as a whole, considering the preservation of the environment and the social welfare of the populations. According to

Costa (2011), the most advantageous proposal is not, nor should it be, interpreted as synonymous with lower prices. Furthermore, he notes that even in cases where a sustainable product has a higher price, many times, the corresponding maintenance and disposal costs are lower.

The introduction of the variable sustainability considering the economic, social and environmental dimensions in the public procurement process increases its complexity. Besides the concern with financial expenses, one must consider the impacts that hiring can cause to society's environment.

Public resources must be broadly and responsibly considered. The public manager's great responsibility is to maintain, besides free competition, the lowest financial, social and environmental cost to ensure that the most advantageous proposal is more advantageous for the whole society, which is the holder of the public good.

Even facing significant contributions resulting from the change promoted by law 12,349/2010, within the Brazilian federal government, the status of the first regulatory framework for the insertion of sustainability criteria in public contracts is attributed to Normative Instruction (NI) No. 1, 2010. Through the dispatch of this IN, the MPOG established instructions to be observed in the acquisition of goods and contracting services or works by the organs of direct federal, autarchic and foundational public administration.

With the publication of NI No. 1, sustainable public procurement expanded the concept of more advantageous procurement in public bids. They began to consider the purchase of products less harmful to the environment and not only those at lower prices (IPEA, 2011).

It was also recommended by the same standard the inclusion of sustainability criteria in sustainable public contracting. However, there is still no credible, practical and dynamic system for developing criteria and verifying the required sustainability. In many developed countries such as South Korea, Japan, the United States of America and Germany, this verification is done through type I environmental labelling.

It is also known that type I environmental labelling programs have sustainability criteria created for various categories of products/services that consider aspects of the life cycle of these products/services. A complete LCA of the life cycle is not made because it is a costly process that demands long-term execution, and whose methodology is still being perfected globally.

Following the instructions of ISO 14024, type I ecolabelling programs make LCA based on aspects of the life cycle of products/services. It means they do not assess the entire life cycle but identify the critical points in this cycle. The probability of impacts on the environment and human health is significant. The criteria are then created for these critical points to be assessed through the audit.

The relevance of these sustainability criteria created may be considered by the public managers responsible for sustainable public procurement and may be transcribed to the terms of reference of these bids. Thus, they may be evaluated by independent auditing of the type I ecolabelling program included in the public process. This fact brings more partiality and credibility to the public process. In countries where this practice is still not used and to promote type I ecolabelling in sustainable public procurement, it is not required that the product tendered has the type I environmental label. Obtaining the label usually requires fulfilling a reasonable number of criteria, making the process more costly for the producer/supplier. The requirement is that the tendered product fulfils one or two criteria considered the most important and represents the significant impacts on this product life cycle environment or human health.

In Brazil, this process could be adopted. The terms of reference for public procurement could merge sustainability criteria with auditing requirements and sustainability criteria supported by self-declaration from the producer/supplier. In this way, significant impacts of the products/services production processes could be verified through auditing. It is important to emphasize that such audit must necessarily be done by a body accredited by the Instituto Nacional de Metrologia, Qualidade e Tecnologia (Inmetro), which is the official accreditation body of the country through the Coordenação Geral de Acreditação (CGCRE).

The idea is to bring credibility to the sustainable public procurement process and guarantee that capable bodies would be responsible for the auditing.

Taking into consideration that the process of verifying the tendered product sustainability (auditing) is onerous, one can discuss the creation of a financing mechanism or subsidy for micro and small companies. The objective is to promote and encourage the search for environmental improvement of their production processes and provide fairer competition with larger-sized companies and higher economic turnover. The Serviço Brasileiro de Apoio as Micro e Pequenas Empresas (Sebrae) could discuss alternatives for micro and small enterprises, which already has financing lines for this type of company, and by the Banco Nacional de Desenvolvimento Econômico e Social (BNDES) for the viability of equal credit.

The elaboration of environmental criteria with sustainability verification systems by third party organizations and the creation of financing mechanisms for micro and small companies can constitute actions that effectively induce the improvement of the sustainable public procurement process in Brazil. Furthermore, with these initiatives, the Brazilian government can strengthen its leadership role as a sustainable consumer and significantly change current production and consumption patterns to standards considered more responsible.

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CHAPTER 6

ENVIRONMENTAL LABELLING
THE IMPORTANCE OF THE CERTIFICATION RELATED TO SEVERAL ENVIRONMENTAL APPEALS PRESENT IN THE BRAZILIAN MARKET

Vinicius Gomes Ribeiro

As environmental policies advance on the world stage, the growth of environmental appeals on product and service labels has been following this same trend. In 2014, the Market Analysis Institute released a study, conducted between 2010 and 2014, which found a 327% increase in environmental appeals on product labels (TERRACHOICE, 2014).

This increase in environmental labels or statements on product packaging can be explained by a change in consumer mentality. In the past, the main criterion for the acquisition of a product was, besides its quality, the price, not being concerned with the eventual impacts that such products could bring to the environment. However, it was found that consumers are increasingly willing to pay more for sustainable products. According to a survey conducted by Nielsen, about 66% were willing to pay more for products and services that come from companies that are committed to a positive social and environmental impact. This result shows a growth trend when compared to previous years, being 55% in 2014 and 50% in 2013 (NIELSEN, 2015).

In the midst of this reality, it was noted that many environmental labels or statements have not been made correctly, causing inaccurate and unverifiable information for the final consumer who, in turn, is unable to obtain reliable information to assist in their product purchasing process.

In order to provide clearer and more precise information about their products, organizations can pass these types of information through self-declarations or through certifications, following the principles foreseen in the environmental labelling norms NBR ISO 14020 (ABNT, 2002), NBR ISO 14021 (ABNT, 2013), NBR ISO 14024 (ABNT, 2004) and NBR ISO 14025 (ABNT, 2015).

ENVIRONMENTAL LABELLING

The ABNT NBR ISO 14020 standard defines the label or environmental statement as a statement that indicates the environmental aspects of a product or service, through accurate and verifiable information, and may appear in the form of text, symbol or graphic element.

From this standard, the International Organization for Standardization (ISO) established three types of standards for environmental labelling.

Type 1 environmental labelling

Type I environmental labelling is a voluntary third-party program based on multiple criteria taking into account the life cycle of the product.

The principles and procedures for the development of type I environmental labelling programs are defined in the ABNT NBR ISO 14024 standard.

Type 2 environmental labelling

Environmental labelling type II is a self-declared environmental program, in which an environmental declaration is made by the manufacturer or any interested party, without the need for an independent third-party certification.

The principles and procedures for the development of type II environmental labelling programs are defined in the ABNT NBR ISO 14021 standard.

Type 3 environmental labelling

Environmental labelling type III is a voluntary third-party program based on predetermined parameters based on life cycle assessment (LCA) data.

The principles and procedures for the development of type III environmental labelling programs are defined in the ABNT NBR ISO 14025 standard.

THE SEVEN SINS OF ENVIRONMENTAL LABELLING AND GREENWASHING

Although technical standards define the environmental labelling guidelines, it is very common to find products that deviate from these principles by providing inaccurate, unverifiable and sometimes false information to the final consumer.

This phenomenon is known as greenwashing. To identify greenwashing, it is necessary to evaluate if the product label presents at least one of the seven sins of environmental labelling (TERRACHOICE, 2010).

The seven sins of environmental labelling are described below:

1. Sin of lack of proof;
2. Sin of uncertainty;
3. Sin of the camouflaged environmental cost;
4. Sin of cult to false labels;
5. Sin of irrelevance;
6. Sin of the least worse;
7. Sin of the lie.

1. Sin of lack of proof

It occurs when the organization declares that its product is environmentally friendly, but does not present any evidence or certification from a third party that proves such requirement.

A good example is the personal hygiene products that declare that they do not perform tests on animals, but there is no evidence or certification.

2. Sin of uncertainty

It occurs when the organization uses any kind of broad and vague statement that will not be understood by the consumer.

A good example is the products that are said to be natural and induce the consumer to think that the product is environmentally friendly. As it is known, there are many natural substances that are harmful both to health and to the environment, such as heavy metals (mercury, lead, etc.).

3. Sin of the camouflaged environmental cost

It occurs when organizations suggest that their products are green based only on an environmental criterion and forgetting environmental aspects that may be even more relevant.

This kind of sin occurs very often in the cleaning products market when many say they are biodegradable, but do not consider aspects very important to their production such as water and energy consumption, for example.

4. Sin of the cult to false labels

It occurs when organizations make use of labels that refer to the idea of third-party environmental certifications, when in fact they are just labels created by the organization itself and that do not represent the reality of the company performance.

A good example of this practice are the labels with the design of a tree with the words "plant a tree". This kind of label is found on some products and does not represent an attitude of great part of the companies that use these labels.

5. Sin of the irrelevance

This sin occurs when an environmental statement, even true and environmentally correct of the product, actually concerns the obligations of manufacturers.

The main example is the aerosol packaging, which had the following sentence: "product free of chlorofluorocarbon (CFC)". It is known that CFC was banned from packaging by legislation decades ago. Therefore, the manufacturer is only fulfilling a legal duty.

6. Sin of the least worse

This sin occurs within product categories that have a great impact on the environment and people's health. Although these products refer to true statements, this kind of statement can distract consumers about the possible harm of the products.

A good example is the pesticides that claim to be environmentally friendly.

7. Sin of lie

It occurs when an organization makes statements about false third-party certifications or improperly uses certifications whose registration is out of date.

THE IMPORTANCE OF CERTIFICATION FOR THE CONSUMERS

The proportion of environmental appeals that present at least one of the sins of environmental labelling has been decreasing over the years. In 2010, nine out of ten calls in the category of cleaning and personal hygiene products incurred

some of the sins, while, in 2014, this proportion decreased to about six out of ten products (TERRACHOICE, 2014).

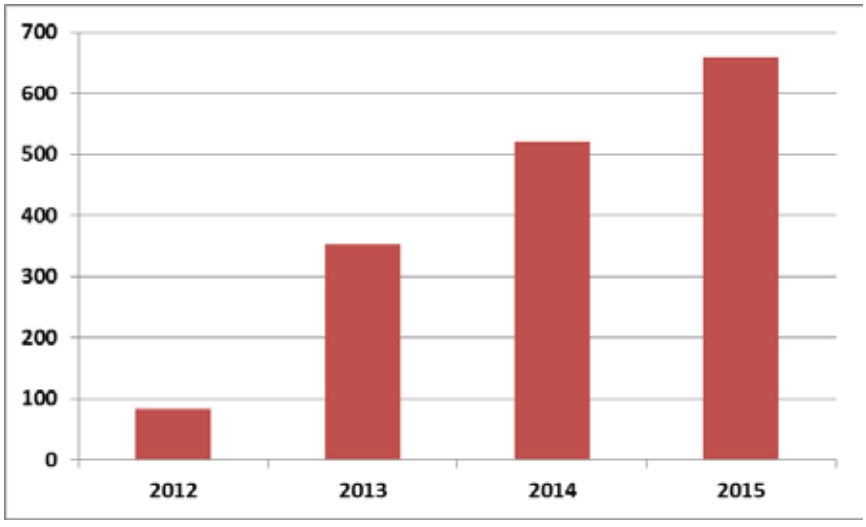
The certification is a process conducted by an independent and impartial third-party entity that assesses whether certain products or services comply with certain technical standards. This assessment is based on audits, sampling and periodic laboratory testing (ABNT, 2017).

When searching for a certification, the organization should look for competent certification bodies, recognized and accredited by Instituto Nacional de Metrologia, Qualidade e Tecnologia (Inmetro). When accrediting a certification body, Inmetro recognizes the entity competence to evaluate an object, based on pre-established rules, most of the time by Inmetro itself (INMETRO, 2017).

As opposed to a self-declaration, which can be issued by the manufacturer itself interested in declaring beneficial information of its products, the certification guarantees to the consumer that a certain product or service is continuously meeting the technical standards and has been evaluated impartially.

Facing this reality, both organizations and consumers started to notice the added value when searching for certifications. As an example of the search for environmental certifications, the number of certificates issued in Brazil for ABNT ISO 14001:2004 certification until 2015 was extracted from the Inmetro website (Figure 1), since in 2015 there was the publication of the new review of the rule.

Figure 1 – Certificates issued in Brazil for ABNT ISO 14001:2004 between 2012 and 2015



Source: Inmetro (2017).

CONCLUDING REMARKS

With the information gathered, it can be noticed that the consumers behavior and organizations towards environmental certifications has changed over the years.

It was verified that the acquisition process of the products has not been more defined by the price, as far as 66% of the interviewed were willing to pay more for sustainable products. This is because when considering the cost of a product, it is necessary to remember that social and environmental aspects are also part of the composition of costs, being, however, aspects of difficult valuation.

It is important to emphasize that the greater demand for sustainable products by consumers influences the market by stimulating greater supply of products with these characteristics.

At the same time, it was found that environmental information in more than half of the products sampled is not easily verifiable, accurate or true, characterizing the greenwashing.

This way, the search for certified products and services has been increasing over the years, as these are verified by an independent and impartial third-party entity, which has competence.

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CHAPTER 7

BUILDING LABELLING IN BRAZIL
A FOCUS ON ENERGY EFFICIENCY

Roberta Vieira Gonçalves de Souza

According to the Environmental Protection Agency the buildings in which we live, work and play protect us from nature's extremes, yet they also affect our health and environment in countless ways (EPA, 2017). As the environmental impact of buildings becomes more apparent, a field called "green buildings" has gained momentum in the last two decades. The agency defines green, or sustainable buildings as being the practice of creating and using healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition.

The question that arose from this new concept was how to recognize a green or more efficient building. Consumers should not rely only in the producer's own definition of sustainability or efficiency. The Instituto Nacional de Metrologia, Qualidade e Tecnologia (Inmetro) states that, in general, consumers do not have specialized knowledge about the products or buildings they intend to acquire in order to identify which are more cost beneficial, sustainable or economical. On the other hand, the Institute states that suppliers need to differentiate their products justifying the investment to be made by consumers or users (INMETRO, 2017b).

The labelling of products and buildings then intends to provide consumers with useful and comparative performance information. It allows consumers to consider investing in better performance appliances or buildings which have reduced impacts, reduced running costs and that allow realizing savings that outweigh the difference in price. They also stimulate the industry competitiveness, which shall present products that are more efficient (EU, 2017; INMETRO, 2017a).

The application of labels can be mandatory, partly mandatory or voluntary. When buildings are addressed, the labelling can be partially mandatory only for a specific sector or for sale (not being mandatory for rental). The site Building Rating brings useful information about the existing labelling systems throughout the world (http://www.buildingrating.org/).

ENERGY BUILDING LABELLING

The implementation of energy efficiency strategies in buildings not only contributes to lower peak energy demand but can also reduce overall energy use and buildings impact on the environment (KNEIFEL, 2010; NIKOLAOU et al., 2015). The basic principle for improving a building energy efficiency is to use less energy for heating, cooling and lighting without affecting the health and comfort of its occupants (NIKOLAOU et al., 2011; PÉREZ-LOMBARD et al., 2009).

In the specific case of the building energy efficiency labelling, the focus tends to be linked to the country's goal of energy savings.

The energy efficiency building labelling usually considers the building constructive characteristics (walls and roof insulation, glazing type and insulation, external surfaces solar absorption) that are responsible for the building heat exchanges with the exterior climate along with the equipment and electrical systems installed, such as cooling, heating, lighting and water heating. Buildings are generally rated before construction, receiving a label that represents the rating of their systems and construction characteristics. The ratings are divided in building types and can be set for commercial (offices, hotels, shopping centers), public, institutional (schools, hospitals, etc.), or for single and multifamily residential buildings.

One of the questions risen by the World Energy Council (WEC, 2008) is that measures on buildings tend to be focused on new buildings. As new build-

ings represent a small share of the existing stock, building standards can only have a slow impact on the short term, which however becomes significant in the long-term. A more recent trend is to extend regulations to existing buildings and impose the introduction of energy efficiency certificates for the existing buildings each time there is a change of tenant or a sale (WEC, 2008).

Another issue is that the energy efficiency labelling of a new building generally cannot evaluate the energy performance of the actual building. The World Energy Council (WEC, 2008) also discussed that it seemed that the actual energy performance of new buildings was below what could be expected from the building regulations. According to the council, this could be explained by behavioral factors and by a noncompliance with the building regulations.

In this case, benchmarking evaluations seem to be a path to give more reliable information to consumers, stakeholders and owners about the actual performance of a building.

While benchmarking systems are developed by using the energy performance of a significant number of reference buildings, benchmarking results can be used to encourage poor reference performers (in energy-efficiency) to improve their performance (CHUNG, 2011).

Benchmarking of energy consumption in buildings is also important in their operation, since this benchmarking makes it possible to determine what energy saving goals and strategies can be set for existing buildings and also to check how estimated energy design behaves against similar existing buildings.

THE BRAZILIAN CASE

In Brazil, the building energy matrix is mainly composed by electric energy and the residential, commercial and government buildings accounted for 52% of total electricity consumption in 2019 (EPE, 2020).

In 2009, as a result of the actions that have taken place after the electric energy supply crisis in 2001, the Non residential Buildings Regulation, Regulamento Técnico da qualidade do Nível de Eficiência Energética em Edificações Comerciais, de Serviço e Públicas (RTQC) was published, followed by the publication of the Residential Buildings Regulation in 2010. These regulations were reviewed and complemented in 2010, 2012 and 2013 (BRAZIL, 2010; BRAZIL, 2012; BRAZIL, 2013). They are voluntary except for federal public buildings for which the labelling is mandatory since 2014 (BRAZIL, 2014).

The Brazilian energy efficiency label is given in two phases: Design and Constructed building and for the commercial, public and service buildings, it can analyze the whole construction of part of the building. New and existing buildings can be evaluated. In RTQ-C, the envelope, the lighting system, the air conditioning system and bonuses are evaluated. Bonuses are related to other systems efficiency, such as elevators, renewable energy or water consumption reduction. When all systems are evaluated a global label is emitted but a partial label can also be emitted provided the envelope is analyzed and only when the global label is emitted bonuses can be accounted for.

In new buildings, five years after the Design Label is published it is considered invalid if the Constructed Building Label is not obtained.

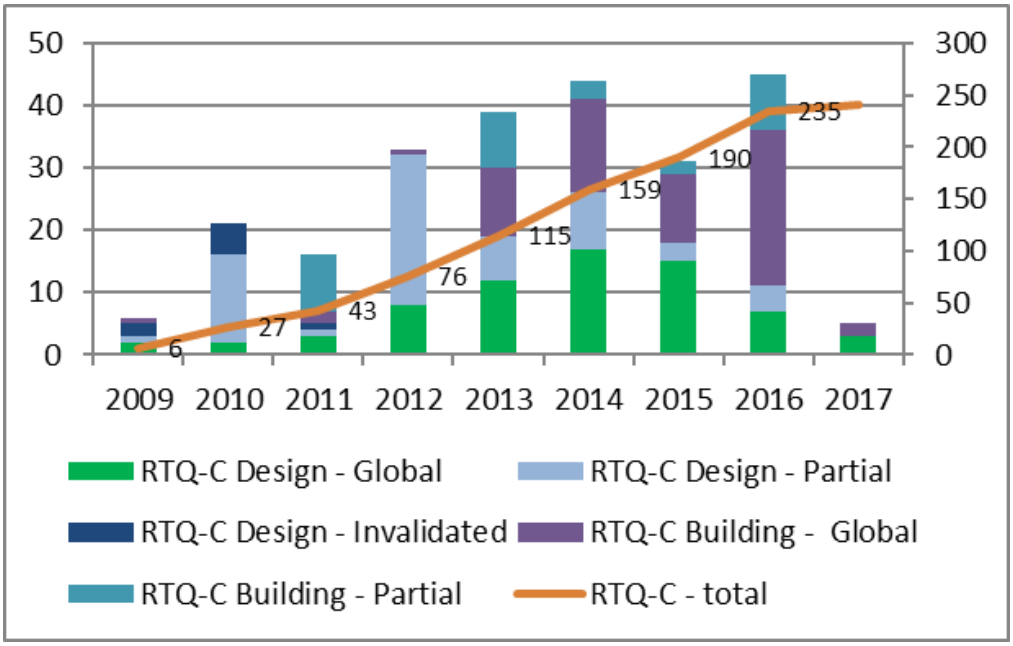
Figure 1 shows the label for the commercial, public and service buildings where it can be seen that buildings are classified from A to E, being A the best performers.

Figure 1 – Label for commercial, public and service buildings emitted in Brazil

Source: Brazil (2010).

Figure 2 presents the number of labels of commercial, public and service buildings (RTQ-C) emitted in Brazil from 2009 to July 2017 showing the distribution among design and constructed building labels.

Figure 2 – Number of labels for commercial, public and service buildings emitted in Brazil



Source: Data from INMETRO (2017a).

Since the regulation implementation building, design labels presented a growth tendency, but that started to decrease from 2015 on and this may be related with the Brazilian economic and political crisis. Despite the growth in the number of constructed building labels emitted in 2016 the general situation shows deceleration of the process.

Another figure important to stress is that the total number of labelled buildings in Brazil is still very small if compared to the built scenario in the country and that only two of the labelled buildings could be considered as pre-existing buildings before the labelling process. Many of the buildings that received the constructed building labels are new buildings.

The little number of labels emitted shows that there seems to be a small penetration of the energy efficiency concepts in the construction industry. That may be confirmed by the closure of two of the five accredited inspection organisms for the emission of the Brazilian building labels (INMETRO, 2017b).

The situation is a worrying one once some studies show a growth tendency in the energy use intensity (EUI – W/m^2) in new buildings in Brazil. This may be due to lack of consumers and stakeholder's awareness.

From the 76 buildings that received a global design label, 87% presented an A level and levels B and C level presented 5% of the labels each. There's no building design classified in the D or E levels. For the 68 constructed building labels, there are buildings classified from A to D, being 84% of the buildings classified as A and only 3% of the buildings received a D classification. This large number of A classifications is expected once the labelling is voluntary for most buildings and stakeholders will tend to invest in obtaining the label only when good classifications can be achieved. Studies to implement mandatory labelling for buildings are being undertaken as part of the 2019 *Plano de Aplicação de Recursos* (PAR)*,* a plan for application of resources from the Brazilian energy conservation program PROCEL (2019).

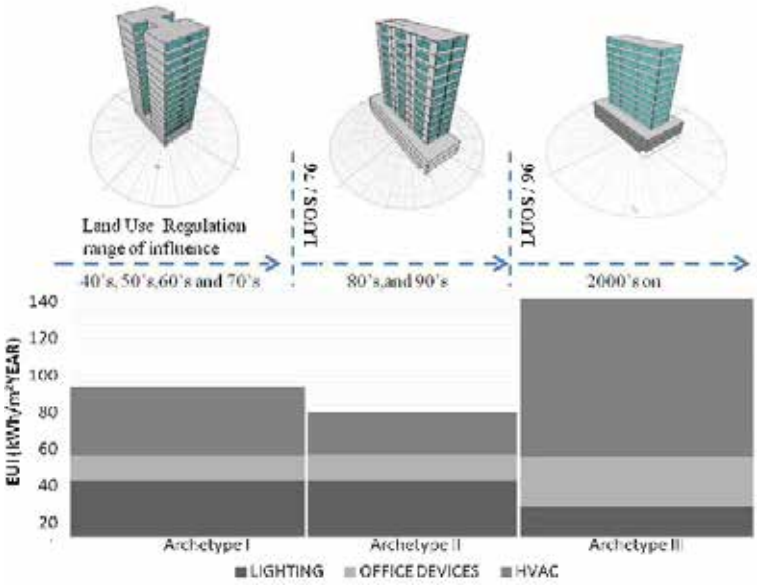
ENERGY CONSUMPTION ESTIMATION OF OFFICE BUILDINGS IN BELO HORIZONTE

Alves et al. (2017) in a theoretical study carried out for Belo Horizonte, Minas Gerais, determined typical office building characteristics according to the urban legislation development since 1940 and based in Google Maps surveys and on *in loco* visits. The authors proposed a division of office building towers in three archetypes according to the building time of construction (1940s to 1970s; 1980s to 1990s and from 2000 on) defining the main constructive characteristics and installed systems of each archetype. For each of these, energy models were created in order to assess the energy use intensity, EUI (kWh/m^2/year). The analysis of the EUI baselines highlighted differences between the archetypes, explaining the impact of the design conception based on land use regulation and of the technical choices on the overall electricity consumption.

Figure 3 shows the average resulting electrical energy consumption of the three archetypes in EUI in kWh/m^2/year. The study showed that new office buildings in the city, represented by archetype III, tend to be centrally conditioned with an average consumption of 140 kWh/m^2/year and consume up to 40% more energy than buildings from previous decades that operate in mixed air conditioning mode. The authors identified archetype III as being a tendency to the new office buildings in the city.

The older buildings, on the other hand, tend to have a higher EUI for lighting and air conditioning due to the usage of nonefficient equipment. It is important to stress that, in simulating archetypes I and II, the buildings were set to operate using HVAC (heating, ventilation, and air conditioning) when temperature was above comfort levels. But as Belo Horizonte presents a mild temperate climate, with hot summers and mild winters, for most of the year buildings can use natural ventilation as their main conditioning mode and only when it is hot cooling is turned on. Therefore, to diminish the city energy demand, buildings that allow natural ventilation should be strongly encouraged according to the authors.

Figure 3 – Energy use intensity of office building towers in Belo Horizonte, Brazil



Source: Alves et al. (2017).

ENERGY BENCHMARKING OF OFFICE BUILDINGS IN BELO HORIZONTE

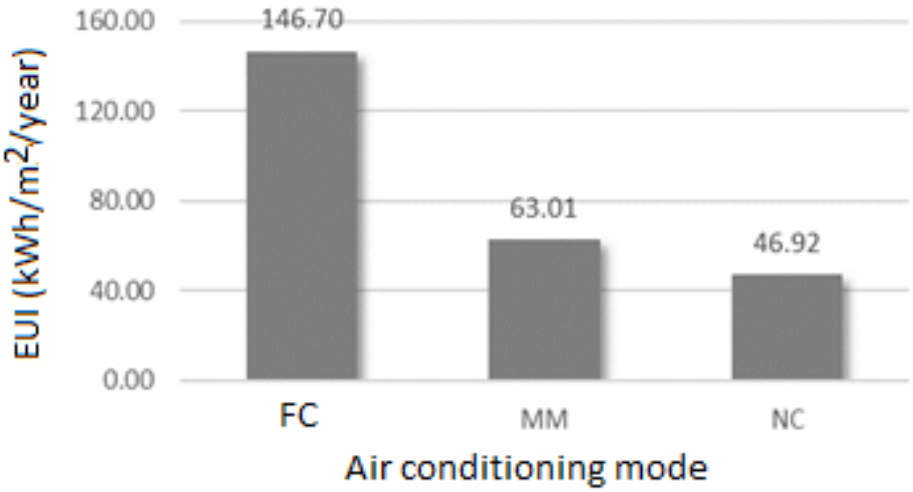
This study was corroborated by Veloso (2017) who proposed a benchmarking for 78 office building towers classification also in Belo Horizonte, according to their measured energy consumption. While Alves et al. (2017) produced computer simulations of prototypes for the city office towers, Veloso (2017) used measured energy consumption data obtained from the electric energy company

and building plans obtained from the City Hall of Belo Horizonte to obtain EUI information.

Veloso et al. (2017) had previously identified that the air conditioning mode is the most relevant feature in determining the energy use intensity of a building in the city. Therefore, in Veloso's (2017) study, the building towers were divided in three categories according to their air conditioning type: fully conditioned (FC); conditioned in mixed mode (MM) and not artificially conditioned (NC), as it can also be seen in Figure 3.

Figure 4 presents the average annual measured electric energy use intensity (EUI) of the 78 towers according to their air conditioning mode.

Figure 4 – Mean EUI (kWh/m^2/year) of 78 office building towers in Belo Horizonte divided according to their air conditioning mode



Source: Adapted from Veloso (2017).

It can be seen in Figure 4 that the values found by Alves et al. (2017) for the archetype III (centrally conditioned towers) present a close correlation to the energy consumption of fully air-conditioned towers with a measured energy use intensity of 146 kWh/m^2/year against a predicted consumption of 140 kWh/m^2/year.

The other categories though do not present such a close correlation with archetypes I and II as the archetypes consumption of building from the 1940s to 1990s is relatively higher than what Veloso found for towers that operate in

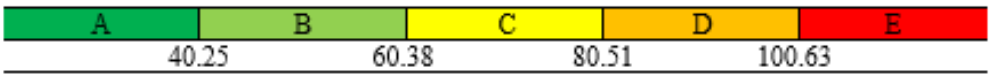
mixed mode (using split or window systems only in hot periods) or in naturally ventilated buildings. It is important to stress that MM towers consume 20% less energy than archetype II that would represent buildings that operate in mixed mode. The difference in prediction may be due to a simultaneity factor (that is, it is expected that not all individual air conditioning systems operate at the same time) that was not used in Alves research and that appears in Veloso's measured data.

For the benchmarking proposition, Veloso (2017) used a classification shown in Figure 5 based on the European methodology presented in EN 15217: *Energy Performance of Buildings - Methods for expressing energy performance and for energy certification of buildings* (ESO, 2007). This standard presents energy performance indicators and the methodology for the establishment of energy classes.

The European methodology established a building classification in levels from A to G and was therefore adapted to the Brazilian system that presents classification levels from A to E.

The reference classification index (s) proposed in this regulation, is defined as the ratio between the typical energy consumption value of the buildings (benchmark performance index, EUIR) and the energy performance achieved by 50% of the real estate stock (EUIs). Since there is no EUIR defined for Brazil, the value used in this ranking was of 0.50 as the *Plano Nacional de Energia 2030* (PNE) (BRAZIL, 2007), estimates a potential reduction in electricity consumption of approximately 50% with the implementation of efficiency actions and this was the figure used for this index. The EUIs value was estimated as being the median annual energy consumption per area of the sample towers corresponding to 80.51 kWh/m^2/year. The benchmarking limits are then presented in Figure 5.

Figure 5 – Benchmarking limits of electric energy consumption for office building in Belo Horizonte, Brazil



Source: Veloso (2017).

As it can be seen in Figure 5, with this classification most fully conditioned buildings would be classified within the level E. This may discourage designers

and stakeholders to improve energy efficiency in those buildings. Therefore, if an office building benchmarking classification is to be proposed to the city it must be discussed if different scales should be set for different conditioning modes.

DISCUSSION

The studies presented here lead to an interesting discussion of how to stablish indexes and ranges that can represent the energy efficiency of a building.

If Veloso's (2017) benchmarking proposition for office building towers is used, the towers with central air conditioning tend to present lower classifications once their energy use intensity is higher than in the towers that operate in mix mode or that are naturally ventilated, a condition that is possible in the city of Belo Horizonte once its climate is fairly mild (Koppen's Cwa).

This is the case of one building in the city that presents central air conditioning and that received an A classification in the Brazilian labelling system. As this building consumes 119 kWh/m^2/year it would receive an E classification in the proposed benchmarking.

This may turn to be an awkward situation and a solution would be to separate buildings according to their conditioning system, but in this case, consumers, stakeholders and specially designers would not be aware of the impact the air conditioning mode choice has in the final consumption of a building.

This is not a discussion that can be finalized here but it is expected that it can open an interesting subject for debate. Are the fully air-conditioned buildings receiving green building labels as efficient as they could be? Are these the buildings to be featured as exemplary?

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CHAPTER 8

ENVIRONMENTAL LABELLING EFFECTIVENESS FOR PRODUCTS

Andréa Franco Pereira

Environmental labelling has become a vehicle for companies to communicate with consumers, favoring competitive advantages for manufacturers and expanding choice references for users. Traditional tariff barriers have been replaced by technical barriers to free trade due to the demand for certifications and/or environmental labels for the marketing of products and services, becoming a critical factor of economic and commercial competitiveness (THAI et al., 2010; HOUE; GRABOT, 2009; GOTTBERG et al., 2006; TEISL et al., 2008).

Despite the existence of several ecolabels (MUELLER et al., 2009; CASTKA; CORBETT, 2016), environmental labelling systems have been defined by the International Organization for Standardization (ISO) in its ISO 14020 series standards, being: ISO 14024 — type I labelling — Environmental Labelling Programs (ABNT, 2004); ISO 14021 — type II labelling — Environmental Self-declarations (ABNT, 2017) and; ISO 14025 — type III labelling — Environmental Product Declarations (ABNT, 2015). Among these, the type I labelling is that which is configured as the environmental seal of a product.

On one hand, environmental labelling has been useful in indicating (COBUT et al., 2013) that certain environmental criteria have been taken into account priori in the design and production of goods and services offered on the market.

On the other hand, the quantitative parameters (HOUE; GRABOT, 2009), and also qualitative, used to analyze each of the environmental criteria of the eco-label can be used systematically as a tool in the process of ecodesign, allowing a better environmental decision regarding the life cycle of the product, even if obtaining the label is not the goal of the company.

Nevertheless, an analysis of some labelling programs (type I) situation demonstrates the difficulties of companies in adopting such environmental labels.

These are some of the issues:

- The low number of companies participating in the labelling programs could be linked to the requirement of safety and use performance tests, and the difficulty of maintenance of the auditing structure by the certification bodies, ISO 14024 — type I requires that the products which request the label must respect not only environmental criteria, but also criteria related to use and safety;
- How can a product not covered by the product categories of existing labelling programs be audited and given a label?
- Investments may be inhibited due to a certain lack of credibility, due to the enormous variety of labels with different levels of demand; credibility is linked to factors such as who controls, who checks, who is accredited, what it covers, what it requires, etc. (MUELLER et al., 2009; CASTKA; CORBETT, 2016)?

Another complicating factor refers to the obstacles in interpreting the procedures for obtaining labelling, requiring the help of specialists (HOUE; GRABOT, 2009; ESPINOZA et al., 2012), which can be an obstacle for the participation of small companies (CLIFT, 1993).

COMPARISON BETWEEN ENVIRONMENTAL LABELLING PROGRAMS

Research conducted in 2014[1] (PEREIRA, 2014) sought to investigate labelling programs (type I labelling), preferably linked to the Global Ecolabelling Network (GEN). Six programs were analyzed:

- ABNT Ecolabel – Associação Brasileira de Normas Técnicas ecolabelling (http://www.abnt.org.br/rotulo/en/);

[1] Research conducted under the author's postdoctoral program carried out, in part, while visiting the University of New South Wales (UNSW) in Sydney, Australia.

- NF Environnement label (French norm for the environment) (http://www.marque-nf.com/);
- Japanese Eco Mark (http://www.ecomark.jp/english/);
- GECA Australian label – Good Environmental Choice Australia (http://www.geca.org.au/standards/);
- North American label – Green Seal (http://www.greenseal.org/GreenBusiness/Standards.aspx?vid=ViewStandardDetail&cid=0&sid=5);
- European Union Ecolabel – EU Ecolabel (http://ec.europa.eu/environment/ecolabel/).

Within the scope of this research, a comparative study was carried out between the ABNT Ecolabel (Brazil) and Good Environmental Choice Australia (GECA) labelling programs for the furniture product category, due to the availability of procedures in both programs for this category, as well as the use of the products in commercial and domestic environments.

The ABNT Ecolabel evaluates products in the furniture category under two procedures: Ecolabel for Chairs and Office Furniture (PE-165) and Ecolabel for Wood Panel (PE-205). The products include workstation, cabinet, chair, drawer, tabletop, sliding shelves for files, folding screen and partition, MDF/MDP (medium density fiberboard) panels.

Good Environmental Choice Australia evaluates products in the interior category, considering products such as tables, furniture, chairs/benches and office equipment, workstation systems, partitions, recomposed wood panels, public use furniture, educational furniture (schools and libraries), outdoor furniture, chairs/benches for domestic use, residential tables, recycled furniture. These products are analyzed by the Furniture, Fittings and Foam procedure.

The amount of labelled furniture, raised in 2014, by type of product, by ABNT Ecolabel and by GECA is shown in Table 1.

The ABNT Ecolabel has existed since 2012. In 2014, nine companies have received the label for the furniture category. More than 88% of the 149 certified products have been office furniture and the rest have been also products for use in offices, such as partitions and wall systems. No residential product has received the label and the program does not yet have procedures for home furniture.

The GECA label for furniture has been awarded since 2006. In 2014, 70 companies received the ecolabel, counting 1269 labelled products. Only 130 products, about 10%, were for residential use, the majority was for commercial use. About 79% of the labelled products were specifically directed to products

for use in office environments and about 11% for products used in commercial and public outdoor areas, educational, school and library furniture.

As shown in Table 1, the products labelled the most by ABNT are office furniture/equipment, drawers, cabinets (60 products), 40.3% of the total labelled furniture, involving 6 suppliers in Brazil. Next are office desks (29.5%), wall partitions/systems, recomposed wood panels (11.4%), office workstation systems (10.1%) and office chairs/benches (8.7%).

The products labelled the most by GECA are office chairs/benches (387 products), 30.5% of total furniture, involving 30 Australian suppliers. Next are office furniture/equipment, drawers, cabinets (20.6%), office desks (14.7%), residential chairs/benches and desks (10.2%), educational, school and library furniture (9.8%), office workstation systems (7.9%), partitions/wall systems, re-composed wood panels (5.3%), commercial and public outdoor furniture (0.5%), outdoor furniture (0.4%) and recycled furniture (0.1%).

Table 1 – Comparison between labelling programs: ABNT Ecolabel and GECA

TYPE OF PRODUCT	QUANTITY OF LABELLED PRODUCTS		TOTAL OF SUPPLIERS	
	ABNT	GECA	BRAZIL	AUSTRALIA
Furniture/equipment for office, drawer, cupboard	60	261	6	33
Office desks	44	187	5	32
Wall partitions/systems, recomposed wood panel	17	67	7	16
Working station systems for offices	15	101	3	28
Chairs/bunches for offices	13	387	1	30
Furniture for commercial and public external use	-	6		2
Educational, school and library furniture	-	124		8
Furnitures for external use	-	5		3
Chairs/bunches for houses	-	130		15
Recycled furniture	-	1		1
Total	149	1269	-	-

Source: Elaborated by the author from ABNT (2014) and GECA (2014).

It was observed that office chairs/benches were the most contemplated type of product in Australia, involving most suppliers, while this type of product was the least contemplated in Brazil, comprising only one company.

Good Environmental Choice Australia involved 30 suppliers, 43% of the companies, manufacturing the type of product that received the most labels: office chairs/benches. ABNT Ecolabel involved six suppliers, 66% of the companies, manufacturing the product that received the most labels: office furniture/equipment, drawers, cabinets.

Two companies have more than 100 labelled products and seven have between 54 and 70 (all Australian). Twelve companies have between 22 and 44 labelled products (three Brazilian). Thirteen companies have between 10 and 19 labelled products (three Brazilian) and 45 companies have between one and nine labelled products (three Brazilian).

In Brazil, all products have been labelled by ABNT since 2012 and, in Australia, 640 products have been labelled by GECA since 2006 for 38 companies, and 629 since 2010 for 32 companies.

THE COMPANIES AND THE ENVIRONMENTAL LABELLING

In 2018, continuing the research[2], semi-structured interviews were conducted with companies in the furniture sector in Minas Gerais, as well as with ABNT.

The specific objectives were, on one hand, to understand, along with the furniture industry, its perception about what are the environmental label scopes, which environmental actions adopted, which limitations for the implementation of the ABNT Ecolabel. On the other hand, to understand, next to the labelling organism, which are the observed limitations.

For this, it was sent, via e-mail, open questions to 19 companies that have the ABNT ecological label, obtaining answers from five companies (Table 2). In the same way, with the support of the Sindicato Intermunicipal das Indústrias do Mobiliário de Ubá/MG (INTERSIND) (municipality with the largest number of furniture industries in Minas Gerais, approximately 300 companies), it was sent, via e-mail, open questions to 79 companies that do not have the ABNT Ecolabel (Table 3). Of these, only three companies answered.

[2] Study conducted with the collaboration of the fellow student of the UFMG Design Course, Thainá Laura Sousa de Almeida, under the guidance of the author, within the scope of the Scholarship Program of Scientific Initiation / Conselho Nacional de Desenvolvimento Científico e Tecnológico (PIBIC/CNPq), Public Notice of Pró-Reitoria de Pesquisa da Universidade Federal de Minas Gerais (PRPq/UFMG Notice - 05/2017).

Despite the low return on the part of the companies, it was found that some companies that already have the environmental label claim that the great difficulty is in finding suppliers of inputs that meet the requirements, without the acquisition of them generating impacts on the price of the final product. All companies have stated that the great benefit concerns the management and control of waste, in addition to considering the ABNT Ecolabel a differential in the face of competition, because it provides a brand value. All companies intend to continue to renew the label, because of the numerous benefits that it provides. According to one of the companies, public organs are demanding more and more a label. The companies that make exportation guarantee that the ABNT Ecolabel prints brand relevance on the foreign market, in special in Europe, the United States of America and in some Latin American countries.

Table 2 – Interview with companies which hold the ABNT Ecolabel

QUESTIONS	COMPANY 1	COMPANY 2	COMPANY 3	COMPANY 4	COMPANY 5
Does your company have the ABNT Ecolabel? What were the difficulties /limitations faced in obtaining it?	*"[...] it was already certified in ISO 14001, so we already met several requirements [...]. The biggest difficulty was in material adjustments, where we had to replace raw materials."*	*"[...] already certified all its product lines with ABNT and had obtained the ISO 14001, FSC and CERFLOR certifications. Thus, there were no difficulties [...]."*	*"Finding suppliers that have the products that attend the technical demands in the furniture manufacturing, and that at the same time attend the label requirements [...] due to the low offer in relation to these products, the cost of some raw materials go up and bring a limitation in cost too."*	*"The main difficulties were the interpretation of the norm, since in our region there is no course available for it."*	*"Adjust the stock of wood products with the formaldehyde category established in the ABNT standard, because the existing suppliers in the market, either did not have the material in this category or sometimes the value was exorbitant, which increased too much of the value of the final product, no longer competitive."*
What benefits were achieved after obtaining the ABNT Ecolabel?	*"The main benefit is the market gain. [...] maintaining the ABNT ecolabelling is due to the requirements of this ecolabel in bidding and also for sale closing with large companies."*	*"Today all the emissions are controlled, the feedstock is certified, risk analysis are made [...]. The environmental impact of the products tends to diminish more each time and the environmental conscience of the team is always improving. The company also had access to new clients [...]."*	*"[...] in the plant operation with well positioned disposal points in the process, general cleaning of the plant, recycling waste disposal, compliance with legal requirements. The economic benefits happen due to recycling, brand valorization and waste reduction."*	*"Better waste control; daily indicators on the waste part; better understanding of the environmental part."*	*"Differential of the competition; better waste management."*

Does your company intend to seek the renewal of the ABNT Ecolabel? Why?	*"[...] The company has a strong market interest for the maintenance of this certificate."*	*"It is important to maintain environmental certifications because they are important management tools. [...] these certifications contribute to the corporate development of the company, to the improvement of its image in the market and to the valorization of the brand."*	*"[...] brings benefits in relation to the organization of the company in legal matters, CETESB – City Hall, and others. It brings benefits in the management of internal processes in relation to waste management, recycling and others."*	*"Yes. We are in the third year of certification. The company works with bidding and this is a requirement of our customers."*	*"Yes, due to market necessity."*
Can you tell if there are difficulties for the renewal of the ABNT Ecolabel?	*"We did not have any difficulty in the ABNT label renewal. [...]"*	*"Once the requirements are fulfilled there is no difficulty. [...]"*	*"There is not, the label maintenance process is well managed by ABNT [...]."*	*"We found no difficulty during the renewal."*	*"There is no difficulty."*
What is your company perception of the impacts of ABNT Ecolabel on sustainable public procurement?	*"positive perception of the demand for a green label in sustainable bidding. This pushes the market towards a production process committed to the environment. [...] also has FSC Chain of Custody certification [...]."*	*"The impact has been considerable. Some public agencies and companies are demanding labelling for their purchases. [...] is undoubtedly an important factor in improving the environmental policies of companies in the furniture sector."*	*"The company does not have a performance in public procurement, so we do not have this experience to share."*	*"It is a great control for companies regardless of size, because you can track and get an idea of how the company treats its environmental part, even not having the ISO 14:001 certification."*	*"Equalization of committed companies that seek continuous improvement of their processes and services. In the case of public agencies, they are sure of the purchase of suppliers of furniture, where the whole chain was structured to generate the least possible impact on the environment."*

Does your company export products? In a positive case, do you consider that the environmental labelling can bring benefits to the foreign market?	*"[...] exports to Bolivia, Paraguay and Uruguay [...]. Our biggest demand for the ecological label is national, but sometimes we manage to justify through the ecological label, the fulfilment of requirements of other certifications. On the international market, we have verified an increase on the Greenguard certification exigency."*	*"It is starting sales in the foreign market and no doubt the labelling helps in the process, especially for the USA and EU."*	*"We do not export."*	*"No."*	*"We do not export."*
Other observations	*"We realized that the great demand for environmental certifications comes from public and private bids and also from large companies. Smaller companies commonly do not require certifications, and are more focused on quality and price."*	–	*"The ecological label serves in relation to the correct environmental image of the company, avoiding green washings and bringing a differentiated positioning of the company in relation to sustainability."*	–	–

Source: Elaborated by the author.

In relation to the companies that do not have the ABNT Ecolabel, they informed to have little knowledge about the subject, alleging, yet, that the label obtaining is something bureaucratic and of high cost. One of the companies emphasized the low recognition of the final consumers in relation to the actions adopted by the companies, including the efforts to obtain the environmental labels.

Table 3 – Interview with companies that do not have the ABNT Ecolabel

QUESTION	COMPANY 1	COMPANY 2	COMPANY 3
Nowadays, even more products must be manufactured taking into account their impacts on the environment. Does your company consider these factors in the production of the products?	*"We certainly look a lot at the environmental part of the products manufactured by our company."*	*"Yes, we use wood and fabric cutting planning software to generate the least possible residue. And these leftovers are reused in other processes, minimizing the maximum environmental impact."*	*"Yes, for some issues, such as the reduction of waste generated, reduction in consumption of materials and consequently reduction in costs."*
Environmental labels, or green labels, have become one of the most common ways of showing the public the environmental actions implemented by companies. Does your company have any kind of green label?	*"No label, despite doing a lot for the environment and having already won several awards for our environmental actions, we still do not have any label."*	*"No, our company is up to date with the environmental licenses, complying with the requested conditions."*	*"Unfortunately, we still do not have any program that can evaluate and issue this label, but it is a wish that we can start using a label to have more visibility and highlight in the market."*
Do you consider that having an environmental label can bring benefits to your company?	*"I believe that yes, it can help, but it will not be a determining factor of the purchase yet, we have to evolve a lot yet."*	*"It could, but it is not that important. Due to the risk degree of our company. The truth is that the consumers or population does not value these actions that the companies do, they only remember when a tragedy occurs."*	*"Yes, I believe that the problem is that for the company to prepare itself to have a label, it will have some costs that many consumers do not value and are not willing to pay more for it."*
In your opinion, what are the difficulties/ limitations for obtaining a green label?	*"The bureaucracy is still big, due to some wanting to circumvent the requirements and get the seal even without having done anything, there is a series of bureaucracies that make it impossible to get the seal."*	*"Costs, excessive bureaucracy, excessive controls and the own benefit this would bring us."*	*"I have no technical knowledge of what criteria are required to have the label."*

Does your company know the ABNT Ecolabel?	*"No."*	*"No."*	*"We have no knowledge about environmental labelling, but what we know are high costs that ABNT charges for services and other certifications".*
Why does your company not have the ABNT Ecolabel?	*"We do not know it."*	*"[...] the excess of bureaucracy and low benefit. Consumers do not give value to this type of label. The conscience in fact is ours, company, in generating less impact as possible, without intention of using this for marketing."*	*"Really for not knowing the program, and which requirements should be attended, in addition to the possible adaptation costs that we believe are high and the other stricter conditions that the company will need to have the label."*
Does your company export products? Do you consider that the labelling can bring benefits to the foreign market?	*"It is still little demanded and where it is demanded, it would not be buying markets of our products."*	*"We do not export."*	*"No."*
Other observations	–	*"Nowadays, the industries are the ones that worry and are charged for the environmental control, the population is the one that pollutes the most, with sewage, garbage, use of chemical products in the day to day, they are not aware of this fact and no control [...]."*	*"ABNT is an institution that validates companies and issues certificates and labels, but the costs are too high to be associated and high costs for technicians to provide the surveys, it is immoral. (unfortunately, this is the reality)."*

Source: Elaborated by the author.

For ABNT (Table 4), the environmental labelling program is an important tool to guide more demanding customers, being more focused on the B2B (business to business) market. The label has been promoted by the government, which has used ABNT Ecolabel as one of the requirements for sustainable public procurement. However, ABNT also notes that environmental labelling is still seen "as something superfluous by a large part of the Brazilian market". According to the institution, actions have been taken to allow its Ecolabel to be better known by final consumers.

Table 4 – Interview with the ABNT Certification Management

Questions	ABNT
Environmental labels, or green labels, are becoming one of the most promising ways of showing the public the environmental actions implemented by companies. What is ABNT perception about the scope and reach of the ABNT Ecolabel with companies?	*"ABNT environmental labelling program is an important tool to guide more demanding customers who aim to acquire products that have less impact on the environment and people's health when compared to other products that only follow the legislation. ABNT Ecolabel has been leveraged by the government that uses ABNT certification as one of the requirements for purchasing sustainable products. Thus, our engagement is much more focused on the B2B market, but ABNT is interested in certifying products that are directly linked to the final consumer and has been taking actions to become a better known and closer seal to final consumers."*
What is ABNT perception of the fact that only 11 companies in the Brazilian furniture sector are part of ABNT's Environmental Labelling Program?	*"Currently, we have 16 companies that have the ABNT Ecolabel certification with the objective of meeting requirements demanded in public bids. Thus, we see the importance of the government in requesting this type of requirement in order to develop the awareness of acquiring products that impact less on the environment and people's health."*
What is ABNT perception of the fact that only large companies seek to obtain the ABNT Ecolabel?	*"Although we have large companies that have ABNT certification, such as Samsung, ArcelorMittal, Gerdau, the greatest demands in search of ABNT Ecolabel come from medium and small companies. This is due to the fact that small companies are in search of market insertion through differentiated products that have less impact on the environment. On the other hand, we see that many large companies are not interested in ABNT Ecolabel, because they have products that do not fit the criteria of ABNT, which is more restrictive than legislation."*
What is ABNT perception of the difficulties encountered by microenterprises in being part of the ABNT Environmental Labelling Program?	*"We see a lot of willpower on the part of small companies in obtaining certification. When we talk about small companies, the main aspect, almost always, will be the financial due to the demand of ABNT Ecolabel. Nothing should be talked about prohibitive cost of the certification, since the certification of ABNT has values well accessible to any kind of company."*
Is ABNT interested in increasing the number of products/ companies that have its Ecolabel? Which actions are made in this sense?	*"Yes. However, the great challenge of ABNT has been to show the real benefits that certification can bring. Unfortunately, an environmental certification is still seen as something superfluous by a large part of the Brazilian market."*
Is there any public policy to encourage an increase in the number of products/companies with the ABNT Ecolabel?	*"The only public policy we are aware of are the bids that have been requesting the certification of environmental labelling in some calls for tender and some parallel projects between the UN environment and the Brazilian government to encourage the practice of environmental labelling."*

What is ABNT perception of the impacts of ABNT Environmental Labelling Program in relation to sustainable public procurement?	*"In fact, by acquiring products that have the ABNT Ecolabel, we have an unquestionable improvement in relation to the environmental quality of these, since we managed to reduce the quantity and concentration of substances harmful to health and the environment. As an example, we can talk about the restriction to formaldehyde, a substance proven to be carcinogenic which is used in wood panel adhesives. The products certified by ABNT present lower contents than the ones commercialized in the Brazilian market".*

Source: Elaborated by the author.

CONCLUDING REMARKS

According to the testimonies of companies that have the ABNT Ecolabel, collected in this study, it was possible to observe that, in fact, the environmental label brings benefits, indicating that environmental criteria were taken into account in the conception and production of goods and services offered in the market, giving differential in face of national and international competition, since the label provides brand valuation.

In this sense, as placed in the statements of the companies and by ABNT itself, the labelling can favor competitive advantages for manufacturers, especially because the environmental labelling has been configuring itself as a vehicle of communication focused on the B2B (business to business) market, besides becoming, increasingly, a tool used/demanded by governments as one of the requirements for sustainable public procurement.

However, the low adherence of companies to environmental labelling programs is observed in several countries.

The comparative study conducted in 2014 for the ABNT (Brazil) and GECA (Australia) labelling programs explains the small number of companies involved, considering the furniture product category. In Australia, between 2006 and 2010, 38 companies received the GECA label and from 2010 to 2014 there were 32 more companies, totaling 70 companies that year. In Brazil, from 2012 to 2014, 9 companies received the ABNT label and, according to information from the institution, currently there are 16 companies that have the ABNT label certification.

In spite of the low return by the companies, according to the testimonies of those which do not have the ABNT ecological label, collected in this study, it is possible to verify the great disinformation. Some companies allege the high costs and the bureaucracy of the process as the obstacles to obtaining environmental labelling, although they admit their lack of knowledge on the subject.

Another impeditive factor would be linked to the low recognition by final consumers in relation to the actions adopted by the companies, including the efforts to obtain the environmental labels, argued by one of the companies, but also observed by ABNT, which understands that great part of the Brazilian market still sees the environmental labelling as dispensable.

In view of this and although it is notorious that many ecolabels can amplify users' choice references, such as product energy efficiency labels, it is possible to conclude that the understanding of environmental labelling as a vehicle for companies to communicate with final consumers is still a fragile approach, which requires greater dissemination and research.

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PART II

CHAPTER 9

EMERGENT AND LOCAL APPROACHES IN DESIGN
LOCAL PRODUCTION, TERRITORY AND COLLABORATIVE MODELS

Chiara Del Gaudio

The 2nd and 3rd part of this book provides an account of three of the panel discussions that took place at the *6º Simpósio Brasileiro de Design Sustentável (SBDS) + International Symposium on Sustainable Design (ISSD),* held in in Belo Horizonte, Minas Gerais, in 2017: design and craftmanship; design, territory and culture; and, social innovation and collaborative models. They represented and still represent either areas of consolidated interest in the context of Brazilian design, or areas that have grown in relevance and gained space at national level for the last decade.

Specialists that are considered experts on the topic of the panels either in the academic or in the professional realm were chosen. They were invited to present reflections on these themes through sharing something of their own research and/or work trajectory. The hope was to both give visibility to the work undertaken in Brazil and to bring for discussion crucial issues that animate the minds of those who research and practice in these areas.

The discussions between the researchers and the audience were rich and insightful. Considering the potential value of those contributions to the Brazilian design scientific community, later, the specialists were invited to write a chapter for this book. Several of them accepted. The chapter had to present reflections or

research results on the theme of the panel in which they took part. It could be the same contribution presented during the event, advancements of the same, or even a work inspired by the discussions held there. This decision was grounded in the understanding of the relevance of sharing and making accessible the results of academic and professional work done in Brazil to all researchers, students and professionals that are interested in the relationship between design and territory, design and craftsmanship, and design practices that promote social innovation and explore collaborative creative models.

The works presented in parts II and III of this book highlight the voices of Brazilian researchers and designers whose practices embraces the social dimension of design, looks at and explores how to interact with the variety of people and beings that make up the daily reality. Design practice and research in design that engage with social practices and take place in the different realms of life and life systems.

The works presented in part II are about: design, territory and culture; and social innovation and collaborative models. Chapter 10 by Laura de Souza Cota Carvalho Silva Pinto, Ph.D., opens this part of the book. *Design and sustainability in practice: valuing the territory as a possibility* introduces the discussion on the socio-economic and environmental unsustainable scenario being experienced, and asks questions about the possibilities brought forward by design. In doing so, it presents a review of the related main concepts and their evolution and discusses some of the key elements to achieve more sustainable scenarios. Those elements need to guide designers' practice: valuing the territory, a sensitive and humanized perspective, and the ability to establish a true dialogue. In this regard, Kátia Andréa Carvalhaes Pêgo, Ph.D., in chapter 11, *Systemic design for extended sustainability*, corroborates on the relevance of an in-depth understanding of the territory but she does that from the perspective of systemic design. The latter is an approach developed by Professor Bistagnino from Politecnico di Torino. Bistagnino, aware that to achieve sustainability designers he has to look beyond the product, designed a methodology that promotes the creation of economic systems *ad hoc* designed by specific contexts. The way in which this approach succeeds in valuing local know-how, resources, and identity, and the community of that specific territory is exemplified through the author's doctoral research. In this, this approach is applied in Brazil, in one of the multiple territories of Estrada Real. The exploration of how the relationship between design and territory can take shape in Brazil is at the core of the work by Marcos Eduardo Coutinho, Ph.D. The author in chapter 12, *Productive chains of Amazonian sociobiodiver-*

sity and ecodesign opportunities: Brazilian crocodilians as a working model, reflects on the use and protection of wildlife as a mechanism for conservation and sustainable development. Through a case study that took place in the Reserva Extrativista Lago do Cuniã, the author shows how the application of ecodesign concepts, techniques and methods are crucial for the socio-biodiversity.

Another chapter of this part of the book in which the practice of design in the Brazilian territory is at the core of the research is the 13th, *Design & Health: a field of sympoietic practices*, written by Barbara Szaniecki, Ph.D., Talita Tibola, Ph.D., and Camille Moraes, Ms. The authors' goal is to discuss collaborative models for practicing design in the territory with the aim of promoting social change. They present design possibilities to contribute to the health field and how this can be done through "sympoietic design". The latter, representative of their perspective on collaborative design practices, is inspired by scholars such as Donna Haraway. A design experience with patients from the Clínica da Família da Penha exemplifies this approach. The reflection on the need to rethink and innovate design practices is central in the work by Ione Maria Ghislene Bentz, Ph.D. In chapter 14, *Paradigms transition in design: what is its potential to sustainability and innovation resignification?*, the author points out how the propositions presented by systemic theories and the theories of complexity allow to redefine the concepts of social innovation, sustainability and collaboration and, therefore, design practice of design in this field. Finally, the discussion about the potential of design to contribute to changes in social dynamics and the relevance of this for collaborative design practices also receives the contribution of Chiara Del Gaudio, Ph.D. Del Gaudio in chapter 15, *Design and social utopias: the open-ended design of heterotopic movements*, reflects on the need to rethink the role of utopian visions in design and for design, and on the potential of the concept of heterotopia to promote more plural and democratic practices and outcomes.

Part III of this book presents a different kind of contributions: reports on both the symposium experience, and on some designers' activities in the fields discussed in Part II. In fact, experts from the field were invited to the panels due to having an innovative and inspiring practice on the topic of the panel itself. This part opens with a report in chapter 16 by Virginia Pereira Cavalcanti, Ph.D., from Universidade Federal de Pernambuco (UFPE). The author describes the experience of the "design and craftmanship" panel, how it was organized and the discussions held. Then there is the work of Christian Ullmann, Ms., from iT projects. In chapter 17, *Report: nomad workshop, look for what, find out what? Look for and find what the collective knows*, he presents its own trajectory and

learnings in the field of design and craftsmanship achieved in over 30 years of experience. As Chapter 18, *Rethinking design from other lenses: peer-to-peer open design,* by Samara Tanaka, Ms., contributes to the theme "social innovation and collaborative models". The author presents the experience of P2P open design, describes the activities done, and shows which concepts have inspired her design practice and how they were adapted for the local context.

Finally, a strong reflection on theoretical perspectives and methodological choices and how they had been contextualized in Brazil emerge from all these chapters, being them state-of-the-art, or theoretical proposition, or reports of experiences. In this regard, the works that report on local experiences distinguish themselves for the variety of practices and for constant and in-depth attempt to a true dialogue with the local reality. Dialogue, care and systemic perspective emerge as guidelines for future works.

CHAPTER 10

DESIGN AND SUSTAINABILITY IN PRACTICE
VALUING THE TERRITORY AS A POSSIBILITY

Laura de Souza Cota Carvalho Silva Pinto

Since the industrial revolution, the consumption of objects by society has only increased. We are now facing an unsustainable scenario, since "sustainable development is, of course, incompatible with the unrestricted play of market forces" (SACHS, 2009, p. 55). In this sense, there is a great question about which path to follow. Does it make sense for designers to continue designing without a more critical evaluation of how we consume? What is the current goal of design? What is its current purpose?

In order for us to truly move forward in terms of sustainability, a deeper change of paradigm and behavior is necessary. But for that, it is necessary to leave our comfort zone. This in itself is an arduous task, since "it is natural in man to be free and want to be free; but it is also in his nature to keep certain habits that education gives him" (BOÉTIE, 1982).

We are living an unprecedented globalization and urbanization process. Since the great navigations, when all parts of the world started to communicate (MORIN; WULF, 2003, p. 22), there has never been such a possibility of world-wide connection. We are one click away from almost any kind of information and people.

Such a reality has printed a change in the lifestyle of society and in the organization of culture. The advent of new technologies and media, such as digital social networks, for example, has allowed the redesign of human relationships, creating the possibility of new presence modes. According to Castells (apud LOMNITZ, 2009, p. 17), the globalization process has created "a new dominant social structure, the networked society; a new economy, the global information economy and a new culture, the culture of real virtuality".

In the midst of this increasingly connected and codified world, some concepts and understandings are lost, and we always incur the "danger of unique history" (ADICHIE, 2009). For Nigerian writer Chimamanda Adichie, as human beings, we always incur the danger of believing that there is only one version to a story. A single story that tries to establish itself as the **story**, which contains the **truth** about a certain fact. However, it is up to us to create new descriptions and new designs of the world. What is not lacking today are models that need to be rewritten and/or reinvented.

Despite all access to information and living in times of sustainability, Morin and Wulf believe that we know little of everything and that the world readings have been done in a superficial way, which consequently creates a lack of awareness of the whole. For these authors "the paradox is this: we live in an era in which everything in the world is interrelated, and there is no pertinent consciousness that is valid if it does not have at least the world as a horizon for all major problems" (MORIN; WULF, 2003, p. 27). In this perspective, the need for a new design of the way we see the world and act is imposed. A global vision and action on world problems is effectively lacking, but one that does not ignore local specificities.

In recent decades, we have experienced an apex of discussions about necessary environmental, economic and social changes in favor of a more sustainable lifestyle. However, for these changes to occur, it is necessary to implement them and not just propose them. We believe that this can be done through small actions that are well structured and that effectively generate impact. As Gansky (2011, p. 5) states, "we are being forced to rethink what matters to us".

For the French economist and philosopher Serge Latouche (2009, p. 34), it is the adopted growth model that is bankrupt. The unmeasured logic of our economic system cannot be sustained. It is therefore imperative that we find alternative paths to the current model in the search for greater balance.

In the current model "small civilizations are being eliminated and we do not know how to preserve them [...]. We cannot confine them, as in zoos, to protect

them, but if we open them, we run the risk of disintegrating them by integrating them" (MORIN; WULF, 2003, p. 34).

> *The industrial civilization process is thus a continuous process of the objectification of science as a technique in social relations, which leads not only to the construction of a 'second nature', but also to the self-construction of an 'artificial man', who generates himself in the objectification of scientific knowledge as a '... spontaneity transformed into objective regularity' (BARTHOLO JUNIOR, 1986, p. 16).*

What we see is a real necessity for change in several aspects. And in this sense, the proposal of the decrement model suggested by Latouche (2009, p. 6) is pertinent: "Your goal is a society where you will live better working and consuming less. It is a necessary proposal to reopen the space of inventiveness and creativity of the imaginary blocked by economic, developmental and progressive totalitarianism".

The challenge of decrement is to learn how to share resources. This invariably implies a cultural change. As the author states, "what is needed is much more radical: a cultural revolution, no more and no less, which should culminate in a political re-foundation" (LATOUCHE, 2009, p. 40). In other words, it is not a simple action, much less a short-term one.

What we see is that new structures have emerged in response to the current scenario. The so-called social businesses, for example, an alternative way to the traditional business model of the second sector and to the assistance model of the third sector, have been established in several countries in the search to 'do it differently', creating companies that effectively bring positive impact to society, not only aiming at profit in their actions. On the other hand, collaborative networks have grown and multiplied through the Internet, such as the well-known virtual encyclopedia Wikipedia.

We believe that a fundamental point in this discussion in favor of change is guided by the concept of solidarity presented by Rorty. Solidarity is linked to an expansion of our sense of community. It can be defined as an action that respects context, culture and diversity.

For Morin and Wulf (2003, p. 33), if we are able to exercise self-criticism, we will be able to understand others as diverse and different, respecting them. And, from this, we will be able to understand the other as one of us. But, for this exercise it is important to be open to new possibilities of speech, it is essential to understand otherness, because "[...] to speak about otherness is to speak about difference, and the recognition of what is different and of borders" (SANTOS, 2008, p. 65).

We believe that solidarity can contribute to the survival of different cultures in the midst of globalization, collaborating for diversity. What we need is to develop translation and language apparatuses. This is because "the problem of knowledge is basically a translation problem" (FLUSSER, 2009, p. 73), of language adequacy. And this is not an easy task, because being open to dialogue is an exercise in recognizing otherness and accepting vulnerability before the other.

DESIGN IN THE 21ST CENTURY

The 21st century has been marked by several dichotomies, such as: local × global; craft × industrial; personal × impersonal; consumption × sharing. In addition, immediacy and reductionism have been very present characteristics, there is a lot of information available about almost everything, but there are equally uninformed people. This is a problem when we talk about sustainability, since sustainability implies information. It implies being informed and understanding that the various actors in society are related to each other in a complex system.

Faced with this reality, design, as a dynamic discipline, redesigns itself and gains new contours and new approaches, aiming to become more current and appropriate to the present moment. If in the beginning design was created to meet the demand of a growing industry, we have learned over the years that, in fact, design meets society and its complexities, and is transformed and rewritten with it. Design is a product of culture and as a product of culture it follows the fluctuations to which it is subjected, such as: beliefs, tastes, values and technological advances. It follows that design needs to be as dynamic as society in order to continue to exist. This is because the possibilities and restrictions of each time imply different ways of acting when faced with problems given to design.

Design is a projecting discipline. And projecting is an inherent activity of the human being. Systematically or not, we have been projecting things (objects, actions, constructions, etc.) for many years. But there is not only one way to project. Different ways of projecting have been developed and improved with the development of society itself. Design, as a discipline, acts directly on the conception of objects and, in fact, this activity is much more than just aesthetic issues, given that objects carry in themselves scientific theories and meanings.

We understand that the discipline does not only serve the interests of the industry, but is committed to the world we live in. In times of virtual social networks and 3D printers, it is no longer appropriate to talk only about industrial

design. We are living an unprecedented globalization and virtualization process and design cannot and should not be out of it. But how does design walk in a world that dematerializes and connects even more?

It is necessary to rethink the object in the world we live in and the function of those who imagine these objects. Thus, we understand the need to rethink the designer's performance in face of the new context that presents itself.

Some possibilities already started are service, interaction and business designs. In all of them, the professional starts to design immaterial elements and not only the materials, as before.

However, it is vital to understand that design is not only neutral but also a future-oriented activity, that is, objects are loaded with intentions and we are able to design things for a world in which we wish to live in. Design, if you wish, can be an agent of transformation and change, but for this a critical and responsible positioning from professionals in the area is necessary. As Margolin states, "design will change as its professionals develop a new consciousness" (MARGOLIN, 2014, p. 130).

The constant challenge of design is to do so seeking to meet and overcome contemporary constraints, which today are: virtualization, dematerialization, high connectivity, the demands for a more sustainable way of life, economic, social and cultural inequalities, among others. We cannot get stuck with the original motivation: industrialization and the project of market-oriented objects. It is necessary to rethink the role of design in the world, it is necessary to extend its limits and, fundamentally, a change of attitude is indispensable. As Margolin (2014, p. 132) says, "Designers have the ability to design and shape material and immaterial products that can address human problems on a broad scale and contribute to social welfare [...]. This goes far beyond green design or ecodesign [...]".

But, as far as sustainability is concerned, how are sustainable projects executed? If the solution was simple, we would already have an answer to the question. However, articulating the various dimensions of sustainability (environmental, economic, social and cultural) in a project becomes a complex challenge that should not be disregarded. Perhaps the best way to arrive at an answer to the question is to think how we can minimize negative impacts and increase positive impacts in a project.

In this sense, the proposal of working on the design with focus on the valorization of a territory may be a possibility. This is because, from the perspective of design and territory, we seek to understand all local peculiarities in search

of solutions more appropriate to the context, which articulate producers of the territory and value local products.

TERRITORY AND ITS DIMENSIONS

The human being is a territorial (situated) and relational being, he is a being-in-the-world. As the Moroccan economist Hassan Zaoual states, as beings situated in time, space and the imaginary, we need meaning and direction (ZAOUAL, 2008, p. 100). In other words, we need to belong to a place.

For Zaoual (2006, p. 36), "men do not behave in the same way at all latitudes and at all times". We are extremely diverse. Each region, each society, each culture has its own way of organizing itself, has its stories, its customs, its way of living. According to Morin and Wulf (2003, p. 43) "cultures are particular forms of worldview, particular interpretations of the world". These places to which we link and from which we act are called by Zaoual as symbolic places of belonging.

However, this "necessity of belonging cannot be understood by the rationality of market economic logic, in which utilitarian values prevail and does not take into account the multiple dimensions of human existence" (ZAOUAL, 2006, p. 17). Zaoual's theory of sites is born of the failure of traditional economic models and seeks to understand how another form of economy can be thought of, one that understands and respects the diversity of human contexts without seeking to homogenize them. For the author it is fundamental to understand humans as they are, in their universality and diversity, instead of reducing them to a simple *Homo economicus*, pasteurized and homogenized.

According to Zaoual, we are *Homo situs*, that is, we build our ethics, identity and rationality *in situ*. In this way, despite being global and connected, we keep our local baggage, we continue to search for elements that make us belong to places. This is because, as undetermined (contingent) beings, we, human beings live in search of elements that gives us roots and fix us, allowing us to more easily say "I am...". Thus, we live the local × global dichotomy, we are belonging and being foreign at the same time. We belong to one symbolic place, but we are foreigners in any other.

From this perspective, the contingencies of a territory determine that a product is one way and not another (RORTY, 2007). This is because territories are particular places, the result of the sum of natural characteristics and knowledge developed by the population living there. This results in specific products that

incorporate such characteristics, such as food, which is often the result of their territories of origin and represent a place.

Although the concept of territory, popularly, is related only to a delimited geographic space, a portion of land, the understanding of territory in a broader way, contemplating human influences on space, was spread with the ease of access to imported products and also to information in books and on the Internet that contemplated the term *terroir*. The French term that stood out positively in the 60s in that country gained strength in Brazil and has been associated with some products to raise the perception of quality.

In the midst of this high connectivity, massification and uniformity universe, people have sought points to fix themselves, to differentiate themselves. This reflects directly on consumer actions, increasing the priority for the purchase of products that contain meaning, that are effectively differentiated (ZUIN, L; ZUIN, P, 2008, p. 111). In this sense, products identified by their location are often acquired exactly because they represent a reference and the tradition of a particular place, even if it does not have a certification of origin.

Thus, traditional products, those that "constitute and are part of the social history of a particular culture [...] until a few years ago, considered as symbols of the socioeconomic backwardness of an individual, a region or a country [...]" (ZUIN, L; ZUIN, P, 2008, p. 111) have gained prominence and value. Precisely because they represent a link to a territory. This strategy has been worked on for some years in Europe, mainly with food products.

For all this, it was expected that traditional foods, strongly linked to the culture and history of a place, would be effectively valued. However, what is happening in the field in Brazil is that small producers of traditional foods face great difficulties in valuing and marketing their products, remaining on the margins of the market or at their mercy.

This fact, besides resulting in a financial problem, generates much greater impacts on producers and their regions of origin. It impacts the sustainability of the rural environment and its survival. Besides affecting the urban environment, since in many cases the final solution found is still the rural exodus.

In Brazil, the commercialization process of small rural producers is deficient. Besides having restricted access to the market, when they do so, in most cases it is informal and unstable.

The uncertainty of this commercialization process makes it impossible to perpetuate the business and, consequently, the permanence of the family in the

countryside. Thus, the construction of strategies and new tools that allow a better flow of production and the sustainability of the family in the field from its main economic activity becomes crucial.

In scenarios like this, the designer's immersion in the territory becomes a fruitful path for the development of solutions more appropriate to the local reality and that minimize negative impacts and enhance the positive ones. This is because the immersion makes it possible to understand the local specificities and to design solutions with greater potential to be assertive, a path that analyzes and respects the specificities of each site. Otherwise, the designer ends up developing generic projects that contribute little to the sustainability of a given population. In Zaoual's words, they would be "projectiles, thrown at sites about which there are no visions from within, because it has always been assumed that local actors are 'idiots' and that they need to learn to act according to a superior and scientific rationality decreed" (ZAOUAL, 2006, p. 28).

THOUGHTS

Living in an extremely connected and industrialized reality, getting out of the homogenization pattern is a huge challenge for the designer, who, inserted in this context, often has difficulties to get away from it to observe other distinct realities. Therefore, the recognition of otherness is an important ability for professionals in the area to identify differences and respect them.

This is because the practice of design needs to be contextualized so that it makes sense to the various actors impacted by the project. The possibilities and restrictions of each time imply different ways of acting when faced with design problems. It matters when, where, how and for whom it is designed.

In this sense, the territory is a context that needs to be understood in its specificities and particularities. The proposal of working design and territory demands another way of looking at the environment to design. A more sensitive and humanized look that is able to capture the nuances of a site to develop solutions that can be more sustainable and respect local conditions.

By immersing oneself in the territory, seeking information about people, culture, the place itself, the local economy, productions, know-how, traditions, among other important aspects to be observed, it is possible to understand the ways of life, production and consumption of a place. These elements are fundamental for a design project with a view to sustainability, especially of small

local productions, which are often not valued and do not find a market to sell the production.

The proposal of design and territory is fundamental for the development of projects with small local producers. This is because such enterprises present an economic, productive and marketing reality very different from a large company that, most of the time, does not have its production so dependent on the territory.

In his theory, Zaoual believes that only by respecting the farms will we be able to preserve our diversities. On the contrary, in the logic of truth and unique history that seek pasteurization, we have implemented a unique solution to serve everyone without considering their peculiarities, which results in inequalities and annihilation of cultures.

To achieve a more sustainable path, we need to understand the importance of preserving and respecting diversity, not only environmental, but social, economic and cultural. The understanding of this diversity is guided by the recognition of otherness and the exercise of redescription. This is because, in the exercise of accepting the other as another, we also redescribe ourselves, reinventing who we are.

However, for this to occur it is necessary to establish true dialogues in favor of multiple stories, avoiding the danger of the single story (ADICHIE, 2009). In other words, we need to change the way we understand and relate to the other.

The proposal of the symbolic sites of Zaoual moves towards identifying the local diversities to respect and preserve them. In this way, it contributes to the search for more sustainable solutions, since sustainability can be achieved if we seek to preserve the diversities. This is because homogenized ways, such as a monoculture, unbalance the system and do not contribute to its preservation/sustainability.

Globalization has highlighted the local × global dichotomy and the clash between preserving diversity and pasteurizing everything and everyone. While the preservation of sites and their singularities grows in the sense of safeguarding local knowledge, artisan and traditional products, pasteurization walks in the industrial logic of more of the same per unit of time, eliminating heterogeneity.

In view of this, design focused on the territory is configured as a way to preserve the local singularities, seeking to generate value for this diversity, making it known and recognizable. In order to be executed, it is necessary to immerse oneself in the local reality, trying to understand the context to design

solutions that make "visible" the stories of the place, its products, inhabitants and knowledge.

As a professional who designs objects for the world, most of the time in industrial logic, the designer needs to understand that there is no invisible hand of the market that coordinates everything and everyone. It is decisions and actions in favor of a different world that will effectively make a difference in building a more sustainable society. The market represents the society itself, is made up of several actors, including the designer, and reinvents itself every day. If the designer projects in accordance with systems that are often perverse, why not project for a better world?

One possible path to sustainability is the construction of a more dialogue-based society that can preserve the diversity of sites. This can be done through respect for others and their otherness, and through solidarity that allows listening and dialogue. As long as we remain in a discursive model we will not truly move forward in sustainable terms.

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CHAPTER 11

SYSTEMIC DESIGN FOR EXTENDED SUSTAINABILITY

Kátia Andréa Carvalhaes Pêgo

"The land can offer enough to satisfy the needs of all men,
but not the greed of all men."
Mahatma Gandhi

In the field of design, environmental issues have always provoked concern and actions. The text presents approaches of several researchers, theoreticians and professionals in the field of design, as well as in the area of economy, ecology, geography, sociology, philosophy and physics, to confront such a thorny and complex[1] theme as sustainability[2]. At this point, a project methodology that deals with this issue in a broader way is highlighted, through the adoption of a model based on a holistic[3] and nonlinear[4] vision, called systemic design.

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1 "Complexity is a fabric (*complexus*: what is woven together) of inseparably associated heterogeneous constituents: it poses the paradox of the one and the multiple" (MORIN, 2015, p. 13).

2 The concept of sustainability is defined in the report *Our Common Future*, or Brundtland Report, as one that "[...] meets the needs of the present without compromising the ability of future generations to meet their own needs" (COMISSÃO MUNDIAL SOBRE O MEIO AMBIENTE E DESENVOLVIMENTO, 1988, p. 4).

3 Holistic vision: which understands the universe as an indivisible and dynamic whole.

4 Nonlinear view: guided by cyclical models of flow and information — feedback loops, in which the goal is to establish cooperative relationships that promote the harmonious integration of the systems involved.

One of the first to address environmental issues in design was Papanek (2011), through the renowned publication design for the real world. In this work, the author strongly condemns useless products, which waste natural resources and aggravate the environmental crisis, programmed obsolescence and consumerism, besides dealing with the social and moral responsibility of designers. Maldonado (1922–2018) also denounced the degradation of the environment and criticized the culture of consumption associated with the production of objects with cosmetic bias and low quality. Gillo Dorfles (1910–2018) warned that, in addition to the design of the objects, significant restructuring was also needed in distribution. For Bonsiepe (1978) design is a discipline that, among other skills, should be directed to improving environmental quality. In his work, *Teoría y práctica del diseño industrial*, the author encourages these professionals to commit themselves to society and the future.

The advancement of understanding of environmental issues during the 1990s led to the development of tools and methods that could help understanding, controlling and reducing the negative environmental impacts[5] generated by the production of goods and services. In this field, life cycle analysis (LCA) stands out, which, according to Chehebe (1997), is a technique for evaluating environmental aspects and potential impacts related to a product, involving its entire life cycle, i.e., from the 'cradle' (extraction of raw materials) to the 'grave' (final disposal of the product). According to Pereira (2003), one of the first experiments of evaluation of ecological factors in product development, in the field of design, were conducted through the LCA. The author considers that the concept of ecodesign emerged in this context.

Ecodesign aims to reduce the negative environmental impacts arising from the life cycle of products, through the insertion of environmental parameters, by means of specific tools. The great majority of these are grouped in the so-called design for "X" (DFX), in which "X" is the characteristic that is intended to be highlighted, such as design for assembly (DFA) or design for disassembly (DFD), and so on. For Barbero and Cozzo (2009), besides the design of the object itself, in all its complexity, ecodesign is an opportunity to renew production processes and behavioral habits.

Braungart and McDonough (2013) offer another concept of "life cycle" in *Cradle to Cradle*, published in 2002. Unlike the LCA, which is based on a

[5] Environmental impact is any change in the environment caused by activities, products, or services, and can be "positive" (when it leads to improvement) or "negative" (when it leads to damage).

linear production system[6] "from cradle to grave", the authors propose a circular production system "from cradle to grave", in which all waste is considered as "nutrients" of a new cycle. For the authors, "garbage, pollution, raw products and other negative effects [...] are not the result of corporations doing something morally wrong. They are consequences of an obsolete and unintelligent design" (BRAUNGART; MCDONOUGH, 2013, p. 47). Therefore, they emphasize the importance of developing products in an intelligent way from the beginning, considering their disassembly safely and eliminating the use of hybrid materials that make reuse, recycling or incineration after disposal impossible.

Recently, some authors[7] concluded that to act under sustainability criteria and obtain more effective results, it is necessary to extend the possibilities of innovation beyond the product. From this perspective, a combination of products and services was suggested so that, together, they could be capable of satisfying a user's certain need. Through this approach, entitled Product-Service System (PSS), the consumption of physical products is disconnected from consumer satisfaction by promoting, according to Vezzoli et al. (2018), the generation of environmental, social and economic benefits for all those involved in the process.

In the midst of discussions at the United Nations (UN) Rio+20 conference, the United Nations Environment Programme (UNEP) released an economic model to grow 'green', more and better, called the green economy. This, according to UNEP, provides for the improvement of human welfare and social equality, while significantly reducing environmental risks and ecological scarcity[8]. Although widespread, this approach has also been heavily criticized in several aspects, such as (i) presents abbreviated and misleading concepts; (ii) provides quick and technology-based responses; (iii) needs government subsidies; (iv) induces the 'greening' of the economy; (v) encourages the practice of 'green marketing'. According to Fatheuer et al. (2016), besides spreading a false promise of efficiency, the green economy is not about rebuilding the economy, but about redefining nature, subordinating it to the logic of the market. According to the authors, their great mistake is to correct the failure of the market with more market.

For Johansson et al. (2005), environmental and socio-economic unsustainability is closely related to our centralized, large-scale production model.

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6 Linear thinking comes from the mechanistic, rational model, based on the cause-and-effect relationship, typical of industrial production.

7 GOEDKOOP; VAN HALEN; RIELE; ROMMES, 1999; MANZINI; VEZZOLI, 1998, *apud* VEZZOLI *et al*., 2014.

8 Available from: https://nacoesunidas.org/agencia/pnuma/. Access on: 17 Feb. 2017.

Therefore, they proposed an alternative called distributed economy. This is based on the organization of flexible units that are synergically connected to each other, where certain activities are systematized on a small scale. In this perspective, selected part of the production is distributed to other flexible units where, in parallel, a series of other manufacturing support activities are being organized. For the authors, distributed economy promotes local development, income generation and an increase in the quality of life of the population, the maximization of social capital and collective spirit, as well as a drastic reduction in the use of fossil fuels.

Günter Pauli, one of the founders of the Club of Rome[9], also fights the current economic model, mainly because of the use of scarcity as a foundation for both production and consumption. His proposal is a new business model, called the blue economy, which aims to transform the society from scarcity to abundance. It is a pragmatic redesign, supported by the functioning of ecosystems and the common physical processes of the natural world. The author reminds us that "There is no unemployment or waste in ecosystem. [...] waste of one product becomes the input to create a new cash flow, as in a cascading system. [...] The waste of one is food for another" (PAULI, 2009, p. 1 and 41).

In his publication *The Blue Economy: 10 years – 100 innovations – 100 million jobs*, Pauli (2009) highlights the advantages of connecting and combining seemingly disparate environmental problems with open-source scientific solutions to create solutions that benefit the environment and promote broader social and financial gains. According to the author, it is necessary to learn from the whales how to use energy to move hundreds of liters of blood in millions of kilometers of arteries and veins; with the tuna, how to conserve heat; with the flour larvae, how to produce antifreeze naturally; with the beetles of the African deserts, how to collect rainwater. In Brazil, some concepts and practices of the blue economy have already been used, for example, in the project of the engineer João Alberto Vieira Costa, who carries out research with Spirulina algae to absorb CO_2 from burning coal. In this project, the algae absorb the gas and still produce proteins that can be used in food and can also be used as biofuel.

[9] "Club of Rome" is a nongovernmental organization formed by scientists, economists, entrepreneurs, civil servants, and former heads of state. It was founded in 1968 with the objective of debating issues concerning the future of humanity and the planet Earth, mainly concerning social problems, environmental destruction, and inequality between countries, and has sponsored several reports such as: *The Limits to Growth*, *Mankind at the Turning Point*, *Rio: Reshaping the International Order*, *Goals for Mankind*, among others.

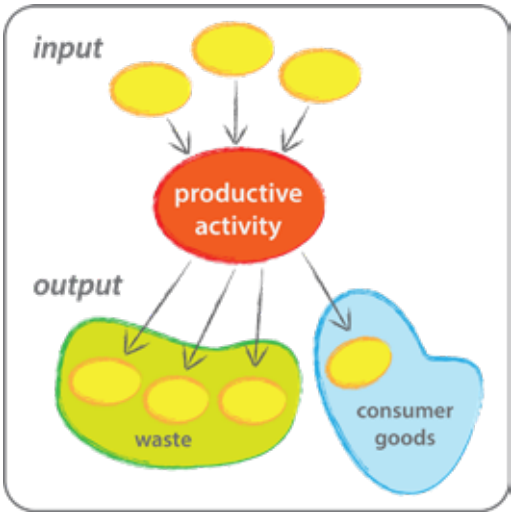
Bistagnino (2009) corroborates with Pauli (2009) reinforcing that it is not necessary to invent anything new, because the solutions are found in the natural systems that surround us. As an example, the author cites the lotus flower, which is cleaned by itself, without the aid of detergents. This natural technology has already been studied and replicated in the field of architecture by a German industry, for the production of varnish that keeps the facade of buildings clean during the rain. Bistagnino (2009) reminds us that, in nature, there is no production of waste, because their systems work in a cascade of nutrients, matter and energy, i.e., the substrates of one system are always used in other system(s), in one or more of the five kingdoms (plants, fungi, animals, Protista and Monera). For the author, the reference model is nature.

It was in this perspective that Bistagnino (2009) developed the methodology of systemic design, characterized by its holistic, or systemic, and nonlinear structure, in opposition to the mechanistic thinking [10] of Cartesian–Newtonian science.

In the mechanistic approach, a complex phenomenon is divided into small parts to understand the behavior of the whole, from the properties of its parts. At this juncture, the focus of designers is restricted to the product and/or service, or to the solution of a specific problem, as they tend to respond to customer demands without question. Such positioning prevents them from perceiving the relationships that can be established between the various parties involved, that is, in a linear manner. Therefore, the scope of a project in the traditional productive scope are the consumer goods, from the classic point of view — the one that will be commercialized in the points of sale or delivered to the consumer. On the other hand, the productive process generates an exacerbated amount of waste, because it considers the consumer goods as the only output of the system, all the others are qualified as waste, without any value, and should be eliminated (Figure 1).

[10] Reductionist-mechanistic thinking was inherited from the philosophers of the 17th century Scientific Revolution, such as Descartes, Bacon, and Newton. Briefly, we can describe this thought as rational, composed of linear chains of cause and effect, based on the analytical method (process by which a complex phenomenon is broken down into small parts to understand the behavior of the whole from the properties of its parts) and in which the world is seen as a perfect machine, typical of industrial production.

Figure 1 – Linear approach



Source: Elaborated by the author.

Moreover, in the systemic approach, the functioning of the system is evaluated as a whole, considering the context and its relations, since it cannot be explained only by the sum of its individual elements separately. As put by Aristotle (384 BC-322 BC) in his work *Metaphysics*, "The whole is greater than the simple sum of its parts".

According to Bistagnino (2009), acting under a systemic vision in design implies designing systems, placing man at the center of the project. This means creating relationships between social actors and the productive reality, according to the environmental, social, economic and cultural[11] context. From this perspective, production allows the creation of economic systems focused on specific and contextualized markets, which go against globalized products, because it recognizes and values the know-how, local resources, identity and community of the territory. It is a new approach that considers the application of natural mechanisms in the productive sector, supported in *Blue Economy.*

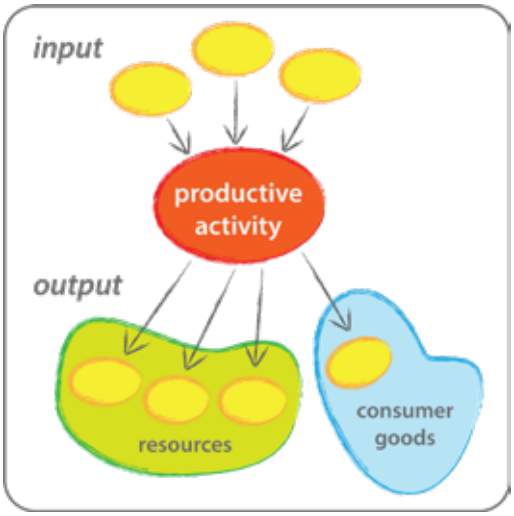
In this model, the various activities of life and production coexist in a participatory manner and have their essential function in the system, none prevails over the other, but each exists thanks to all the others. According to Bistagnino (2009), the practice of systemic design enables, through the positive use of material and immaterial resources, the emergence of a network of new relationships

[11] Culture, welcomed as the fourth pillar of sustainability at Rio+10, is for Boff (2015) a fundamental dimension so that, together with the other three (social, environmental, and economic), development can be considered sustainable.

and an autopoietic[12] macrosystem, composed of all local territorial microsystems, which lead to positive change in the environment and territory. As a result, a new economic-productive model is generated, capable of sustaining itself for long periods. In this scenario, all materials have value, all systems are relevant and strongly interrelated, as well as a network: it is in the set of all knots that their strength and effectiveness reside.

The essence of systemic design resides in a simple principle, but it definitely breaks with our linear thinking: the output (waste or discards) of a productive system must be transformed into input (resources: matter or energy) for other systems, in a systemic and continuous way (BISTAGNINO, 2009). In other words, 'waste' is considered as dynamic elements in production processes, because it is transformed into resources ('raw material') generating value, including economic (Figure 2).

Figure 2 – Systemic approach



Source: Elaborated by the author.

[12] According to Bistagnino (2011), autopoiesis is the quality that all living systems have of continuously self-organizing and redefining themselves according to the relationships (the organization of the system) that exist between the elements that compose it (the structure of the system) and based on the reciprocity that govern the relationship with its environment. An autopoietic system is open to context, its value is greater than the sum of individual contributions. The goals (of equilibrium or evolution of which it tends) will apply to all components. The latter are mutually interdependent, as are all the strategies necessary for the management of the flows of matter and energy, in input and output, the processes of production and endogenous transformation.

It is important to emphasize that this approach contemplates not only the quantity of output of the systems, but, above all, its quality[13], because, as the output of a system will feed others, these must have certain characteristics that fully satisfy it, according to the needs, limits and constraints of the system that will receive it. Therefore, the 'wild' competition between companies, as occurs in the linear approach, gives way to collaboration between the actors involved, because the interest ceases to be individual and becomes collective, since the good of one means the good of all and vice-versa.

The designer, when applying systemic design, does not limit himself to projecting a product, or a line of them, quite the opposite, such artifact is simply a natural consequence of the process and has a specific reason to exist, fully contextualized. In this circumstance, the product is the last of the values to be considered, because the production of an object totally loses its meaning if it fails to attend what is really necessary for the existence of the actors involved and if the values that are important for human life are not taken into consideration in advance. This gives strength to the values correlated to 'being', and not to 'having', reversing the priority of relationships, besides favoring the fulfilment of social and productive demands. Thus, the designer mainly projects relationships, through flows of matter and energy between the productive systems, fundamentally in the same territory.

The objective of systemic design is to promote the rebalancing between production, environment and society, through the development of products, systems, services or processes that tend to zero emission[14]. To this end, its methodology was divided into four stages:

1st) understanding the territory: investigation of the locality in question in the environmental, social, cultural, commercial and productive dimensions, as well as its relations — holistic relief;

2nd) to systematize and analyze the productive systems: verification of all inputs and outputs of local productive activities — conceptual productive scheme;

3rd) to project: development of the material and energy flows between the productive systems of the territory — conceptual scheme of the network of relations between them;

[13] In the linear system, quality is defined by the norms of the International Organization for Standardization (ISO). In the systemic approach, however, it is defined by the actors involved.

[14] Zero emission is understood as the elimination of all emissions, whether in a liquid, solid, or gaseous state.

4th) to confront: comparison of the current (existing) approach with the systemic one (proposal) — comparative quality-quantitative.

The application of this methodology facilitates the exponential increase in capacity of the territory in question and, consequently, the generation of work and income for the local population. The perspective is a sustainable system.

In this context, a broad understanding of the territory is fundamental for building the network of relationships. Krucken (2009) reminds people that this term, coming from the French word *terroir*, means a territory characterized by interaction with mankind over the years, thus constituting a system of interactions of the natural, physical and biological environment with human factors. For Dematteis (1996), territory means identity, understood as the product of reciprocal interactions within the framework of relations that occur between society and nature. Raffestin (1981) states that territory is a field of forces, a web or network of social relations that projects into space. With the visa, although the distance between the mentions of these three authors is more than a decade, the concept is quite close. For Carmo and Comitre (2010), the notion of territory is built in parallel and as a counterpoint to globalization, because it recognizes, gives visibility, highlights and values local and regional specificities. Although globalization has massified and standardized products, sociologist Otávio Gianni observed that this irreversible process is producing an apparently paradoxical phenomenon: the valorization of local culture (GIANNI, 2004). Albagli (2004) corroborates this approach, since, for him, the winds of globalization and the transformation of the technical-productive base have brought, on the other hand, the revaluation of the territory and provided the territoriality with factors of dynamism, distinction and competitiveness. For Vale (2004), territorial attributes and cultural practices constitute differentiating elements of products and services that, increasingly, have individualized insertion in markets. These new consumption patterns, which open up market spaces, are demanding in both tangible and symbolic quality, associated with the cultural values of the place where the products and services are generated.

The most interesting and innovative aspect of systemic design is that it approaches sustainability in a broader way because, in fact, it is a new economic-productive model based on projects of open industrial cycles, which are formed and self-determined according to their output and input. Moreover, this methodology can be applied in several productive sectors, such as the transformation industry, food chains, services and handicrafts.

As a practical example of this approach, we can cite a doctoral research[15], in which the objective was to apply the systemic design methodology in one of the multiple territories of the Estrada Real (ER), generating several connections between its productive systems, through the recognition of the cultural values (material and immaterial) of the local traditional craftsmanship.

Estrada Real was established in 1999 as one of the most important tourist areas in Minas Gerais, based on the importance of the historical origin of the ancient paths traced by the Portuguese Crown in Colonial Brazil. Besides Minas Gerais, it covers part of the states of São Paulo and Rio de Janeiro. It is more than 1,630 km long that rescue the traditions of the trail, value the identity, the products and the beauties of the region. It can be said that each region of this complex has intrinsic peculiarities that emphasize its quality, and that demonstrate an essential strategic potential for the differentiation and valorization of the identity of its territories.

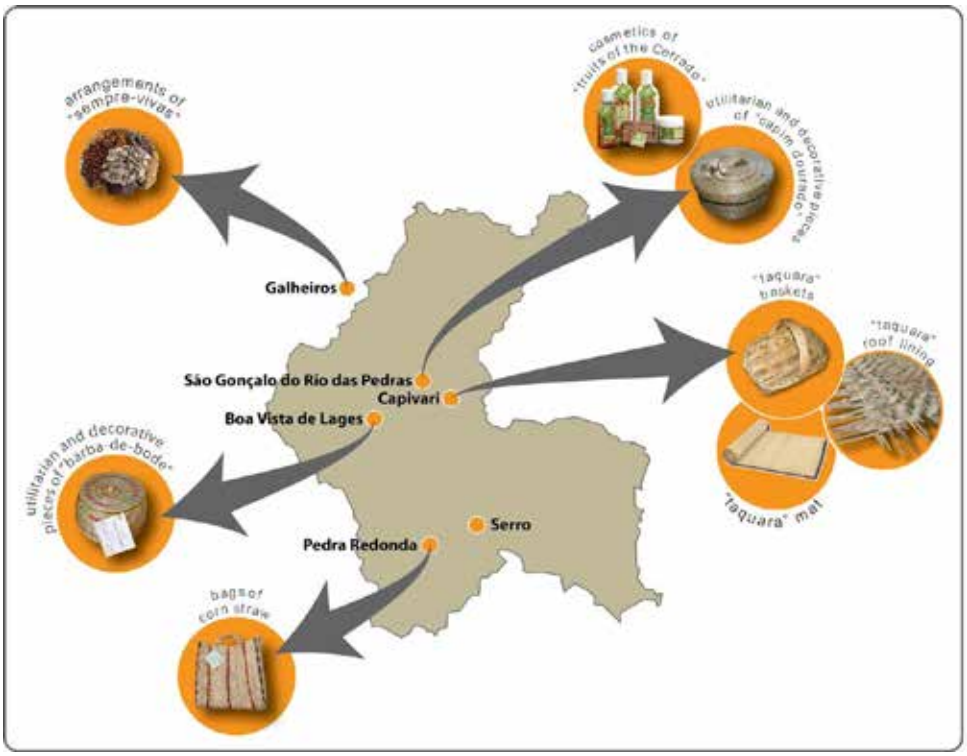
Guided by the methodology of systemic design, the research started from the construction of the holistic relief of the territory addressed in this thesis, called Serro territory. For this purpose, a field research was carried out, in which the craftsmen answered a semi-structured questionnaire and the production sites visited. These actions allowed to understand the operation of the nine production systems, as well as their various problems.

The Serro territory (Figure 3), contemplates the communities of Boa Vista de Lages (Serro village), Capivari (Serro village), Galheiros (Diamantina village), Pedra Redonda (Serro village), São Gonçalo do Rio das Pedras (Serro district) and the city of Serro. The artisan productive systems involved cosmetics[16] of Cerrado fruits (macaúba, amesca, mutamba and pacari); utilitarian and decorative pieces of *barba-de-bode* grass; utilitarian and decorative pieces of golden grass; bags of corn straw; arrangement of everlasting flowers; basketry, mats and taquara roof covering.

[15] Study carried out as part of the doctoral research conducted by the author, with Politecnico di Torino between 2013 and 2016, entitled "*Approach of the systemic design in material and intangible culture of Estrada Real: territorial Serro case*". *C.f*: PÊGO, 2016. Available at: https://doi.org/10.6092/polito/porto/2644209. Access on: 18 June 2017.

[16] The cosmetics are: shampoo, conditioner, soap, and massage oil.

Figure 3 – Serro territory



Source: Elaborated by the author.

Among the main problems, which, according to the systemic design, are considered as levers for change, are highlighted: 1) long distance transportation — acquisition of components for the production of artifacts in other regions, resulting in the generation of work, income and taxes for those regions to the detriment of the site, in addition to all the adversities widely spread over the use of fossil fuels; 2) use of chemicals — causing various negative impacts for mankind and the environment; 3) very little use of local resources — lack of knowledge of the intrinsic characteristics and potentialities of the resources, minimizing too much the production and its proceeds; 4) the imminent "death" of material culture (handicraft) and immaterial culture (know-how) in the region, because, according to the craftsmen, young people are not interested in continuing these activities, since they do not offer sufficient financial return. This causes migration to the big urban centers, generating another series of problems, well known to all.

Based on the analysis of this context and in-depth studies regarding the intrinsic characteristics of natural resources and local know-how, material and energy flows were projected between the production systems, both existing and proposed, thus emerging in the various new activities and products.

Finally, when confronting the current approach and the systemic proposal, it is possible to state that the result was positive and particularly surprising. On the productive system of the cosmetics of macaúba, for instance, there was one activity and four products. With the systemic design approach, 14 new activities and 24 new products emerged, resulting in an increase of 1,300% of activities and 500% of new products.

The results of the other productive activities involved in the work were similar: 1) Amesca: 900% increase in activities and 1,000% in consumer goods; 2) Mutamba: 1,300% increase in activities and 470% in consumer goods; 3) Pacari: 1,000% increase in activities and 430% in consumer goods; 4) Beef-goat grass: increase of 500% activities and 120% consumer goods; 5) Golden grass: increase of 500% activities and 38% consumer goods; 6) Corn straw: increase of 400% activities and 1,300% consumer goods; 7) Evergreen: increase of 1,000% activities and 430% consumer goods; 8) Taquara: increase of 500% activities and 430% consumer goods.

In this context, the creation of a Coexistence Center in a work cooperative system was idealized, which is concomitantly a place of work that: a) work for the artisans, offering the opportunity to exchange experiences and knowledge, since currently each one works alone in their residence; b) training for young apprentices, ensuring the perpetuation of know-how; c) training for the artisans themselves, where they can learn new techniques and/or improve the current ones; d) development of new products and/or services, with or without the help of designers; e) holding workshops and lectures that involve culture, craftsmanship and sustainability; f) experience tourism, where craftsmen can offer tourists the opportunity to experience the entire production chain of local craftsmanship pieces, valuing both the activity and the territory; g) shopping center, where all craftsmen can acquire more adequate inputs at a lower cost depending on the volume of purchases; h) stock of products and inputs; i) commercialization of consumer goods.

In this sense, a question that has attracted much attention during the study in the Serro territory was the extraordinary potential that the region has for the use of its native plants in the development of phytotherapeutic and phytocosmet-

ic products, because the Serro regions are in the second largest South American biome — the Cerrado. This is certainly a field of immense possibilities.

For this, it is believed that one must, first of all, involve the interested people of the community, who have the will to belong to the proposed new system, because they are precisely the ones who will act under such approach to generate a cohesive relationship network. From the formation of this network, it is important to develop partnerships with: universities, in order to generate an interdisciplinary research group; city halls and local politicians, in order to verify the possibility of donating land for the construction of this center, besides the search for fiscal incentives; agencies that promote research as well as scientific and technological innovation, aiming at part of the financing of the project; the Instituto Estrada Real[17] as a structuring and logistic support.

As could be observed, the systemic approach entails: i) in the economic sphere (increasing activities, jobs and income generation in the community); ii) in the environmental sphere (sustainable management of natural resources); iii) in the cultural sphere (valorization of local culture and know-how); iv) in the social sector (improvement of the quality of life and maintenance of the inhabitants in their territory).

In the academic field, it is possible to foresee, in the short/medium term, a distinct approach to problems in the design field, application of the methodology in research and extension projects in Brazil. dissemination of this methodology in the country. In the medium/long term, the creation of a research center dedicated to systemic design at the school of design of the Universidade do Estado de Minas Gerais (UEMG) has been projected.

It is highlighted that, as this study has a defined and delimited theme as a result of a doctoral thesis, many possibilities are open, both for continuity and deepening, and for the development of new projects with a systemic approach in diverse territories and/or other productive sectors.

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[17] "Created in 1999, the Instituto Estrada Real aims to organize, foster and manage the Estrada Real tourism product. The Institute is linked to the FIEMG System and has a multidisciplinary team, which has made the destination recognized in Brazil and worldwide". Available at: http://www.institutoestradareal.com.br/estradareal. Access on: 18 June 2017, our translation.

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CHAPTER 12

PRODUCTIVE CHAINS OF AMAZONIAN SOCIOBIODIVERSITY AND ECODESIGN OPPORTUNITIES
BRAZILIAN CROCODILIANS AS A WORKING MODEL

Marcos Eduardo Coutinho
Laura de Souza Cota Carvalho Silva Pinto
Cristiano Andrey Souza do Vale
Andréa Franco Pereira

Human population growth has increased the demanded to adopt intensive production systems, which associated with other socio-economic (development) activities have determined the elimination or modification of natural ecosystems and the subsequent loss of biological richness. Formal attempts to overcome such problems began in the mid-19th century, when the establishment of national parks, reserves and protected areas in Europe, North America and, subsequently, around the world began. At the same time, at the national and international levels, laws for the protection and control of the environment were developed, aiming at the conservation of resources. However, the trend has not been reversed; the human population continues to grow, natural habitats continue to disappear and natural wildlife populations continue to decline. There was then a need to develop new wildlife conservation strategies.

The idea of "conservation through intelligent use" originated in Europe and North America at the beginning of the 20th century (GILBERT; DODS, 1992). Despite the limitations of scientific knowledge, it was believed that wild populations could be conserved if they were used for the benefit of society at a rate

lower than their respective growth rates. More recently, the idea of "conservation through sustainable use" has been widely disseminated and is recognized as an important strategy to promote the conservation of natural habitats and the preservation of biodiversity (GRIGG et al., 1995). Wildlife production systems are now conceived as part of a global sustainable development policy that considers environmental conservation as a component of socioeconomic development (IUCN/UNEP/WWF, 1980; 1991). The idea is that species that bring tangible benefits to society will have a greater chance to being properly managed and, consequently, conserved. On the other hand, resources not valued by society will have a greater chance to be destroyed or replaced by other forms of land use.

Wildlife has been used for different purposes, including commercial, recreational, scientific, aesthetic and for spiritual reasons. If the major goal is the conservation of biodiversity contained in natural ecosystems, it is necessary to incorporate the different types of use into conservation strategies. There is a consensus that, in one way or another, society has always made, has been making and will always make use of wild species. However, there are controversies about which forms of utilization are compatible with conservation and whether the results of a certain type of management are effectively working as a conservation tool. The controversy is particularly accentuated when the arguments to stimulate conservation are based on economic justifications since, in this specific case, utilization and conservation are not related in a simple and direct way.

Those who advocate that commercial use of wildlife can work as a conservation mechanism argue that: 1) the system offers opportunities to increase land productivity through diversification of means of production; 2) it is consistent with traditional indigenous culture; 3) it helps conserve genetic heritage; 4) it creates new agricultural markets; 5) it helps stabilize markets of fauna products; and 6) it represents an opportunity to redirect land use, especially in areas considered inappropriate for traditional agricultural systems, bringing benefits to local communities and promoting rural development (HUDSON et al., 1989). On the other hand, those opposed to the idea argue that commercial activity involves many interests and it is more likely that management will reflect market interests rather than ecological or conservation issues (GEIST, 1993; THORBJARNARSON, 1999). Furthermore, based on historical experiences, natural resources are almost always overexploited and conservation purposes are difficult to achieve due to the complexities and peculiarities of biological systems (each new problem means learning about a new system), the difficulties in obtaining optimal levels of exploitation, which in most cases are only obtained through trial and

error, and the prospects of rapid enrichment that lead to overexploitation (GEIST, 1985; LUDWIG et al., 1993). The arguments in favor and against commercial use as a conservation mechanism should be seen as hypotheses that need to be tested under rigorous field experimentation, where biological and socioeconomic factors are necessarily included in the evaluations.

MANAGEMENT FOR CONSERVATION AND SUSTAINABLE USE OF BRAZILIAN CROCODILIANS

Brazil is in a privileged position to promote the use of wildlife as a mechanism of conservation and sustainable development. The large areas of tropical wetlands, the vigor of populations of species of recognized economic value and the socioeconomic scenario favoring environmentally intelligent products are some of the main factors that contribute to the country assuming a prominent position in the world production of wildlife products (COUTINHO; CAMPOS, 2011).

Crocodilians are widely distributed throughout the Amazon region and may reach high densities in some preferential habitats (MARIONI et al., 2013). The sustained use of these natural stocks has the potential to add value to the land, generate income and jobs in the countryside and in the cities and act as an incentive for the conservation of natural environments, as well as representing opportunities for the redirection of land use, especially in forests and floodplains, as well as in areas inappropriate for the implementation of intensive agricultural production systems.

The Brazilian Amazon was in the near past responsible for the production of millions of crocodilian skins, which represented an important source of resources for the country and especially for local communities. Currently, even having one of the largest crocodilian stocks on the planet, Brazil participates with a small portion of the international market and the volume of legal business in the domestic market is still inexpressive.

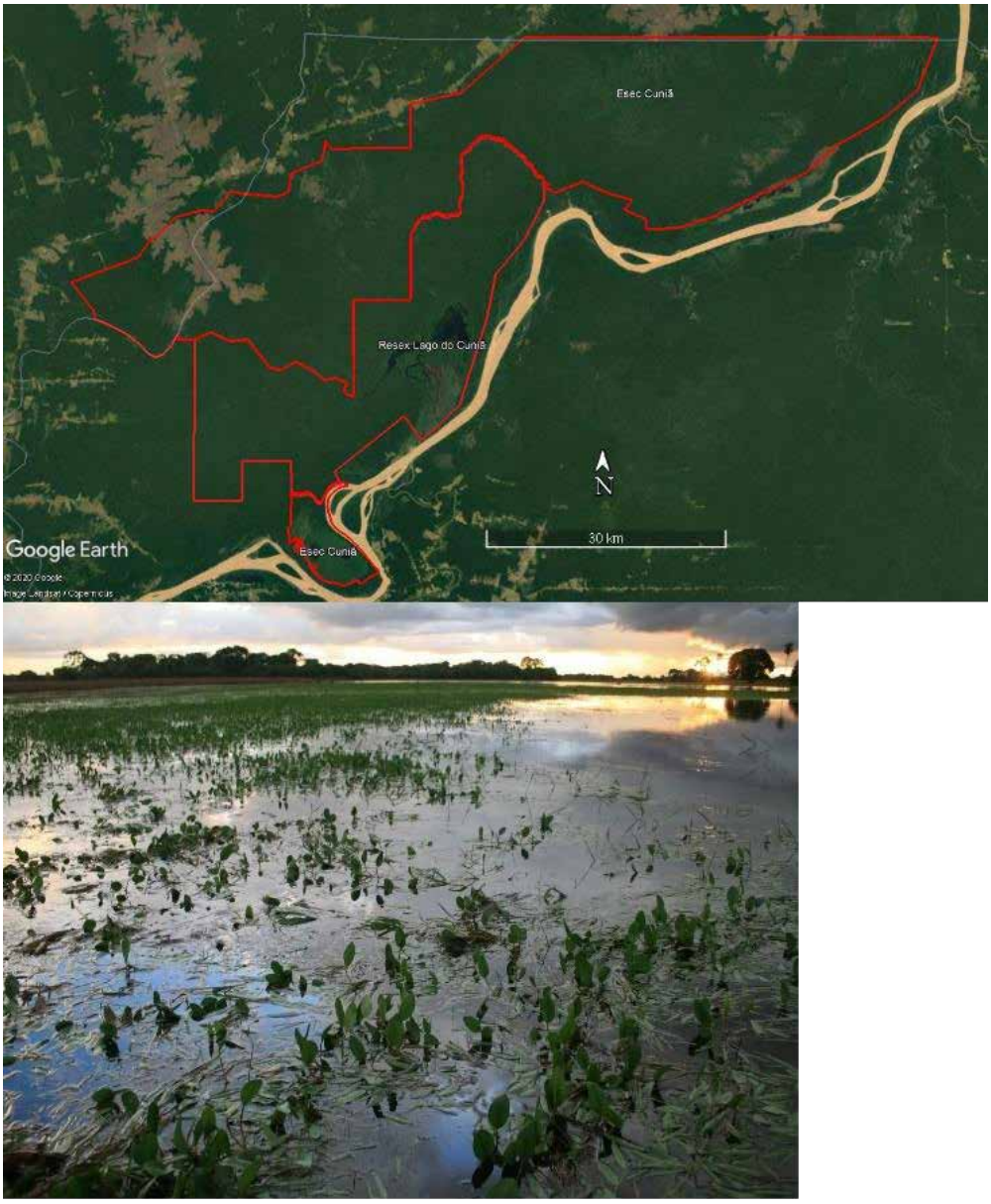
In order to reverse this situation, government and civil society entities are investing great efforts to organize and develop the production chain of the Brazilian crocodilians, promoting management programs that are economically viable and ensuring that conservation goals are achieved. However, this is not a simple task. It is necessary that all stages of production chain be examined in an integrated way. The production, the processing, the inputs, the marketing of the products and the monitoring system must be articulated from a research

and development perspective. In this context, particularly in the promotion and development of products, the participation of ecodesign professionals assumes a highly relevant role (PEREIRA et al., 2019).

CASE STUDY: LAGO DO CUNIÃ EXTRACTIVE RESERVE – STATE OF RONDÔNIA

The Lago do Cuniã Extractive Reserve (Resex Cuniã) is a sustainable use reserve located in the municipality of Porto Velho, in the left shore of Madeira River, state of Rondônia (Figure 1). Local communities are composed of 90 families, distributed in four distinct residential areas within the reserve. The main sources of income are fishing, Brazilian nuts, açaí, andiroba and copaíba fruits and familiar agriculture. Natural crocodilian populations of black caimans (*Melanosuchus niger*) and jacaretinga (*Caiman crocodilus*) are robust, reaching high densities (> 100 individuals/km of shoreline).

Figure 1 – Resex Cuniã's map, Rondônia, highlighting the high availability of water environments



Source: Google Earth image and Coutinho (2002).

In March 2004, the first meeting was held with the Cuniã communities to address the management of caimans as an additional alternative for generating employment and income, in addition to promoting the conservation of species

and their respective natural habitats. The meeting was attended massively by members of the communities and, as a result of the discussions, there was consensus that the main objective of crocodilian management in the Resex should be oriented towards sustained commercial use as an alternative for socioeconomic and environmental development.

As a result of this decision taken unanimously by the communities of Cuniã, it was necessary to implement a set of integrated actions, aiming at the organization and development of a new value chain in Resex. In order to attend this demand, a program was conceived according to the perspective of research, development and innovation, where commercial management, research and monitoring activities could be conducted in an integrated manner, aiming to guarantee the bases for the sustainability of socio-biodiversity productive chains. Among the different lines of work are the training of community members, the implementation of standardized production techniques, processing and marketing of products and, especially, the generation of bioeconomic bases for the practice of good crocodilian management in Resex. Moreover, the idea is that the experiences acquired in Cuniã can be replicated in sustainable use conservation units serving as an example for future projects in other national biomes, with aptitude for crocodilian management (Figs. 2 and 3).

In 2011, the production activities began and the Cuniã management became the first initiative that culminated with the environmental license to harvesting crocodilians in a sustainable use conservation unit in the Amazon. Cuniã warehouse was also the first industrial crocodilian processing plant in the Amazon, certified by the Service of Sanitary Inspection of the city of Porto Velho, Rondônia. According to the guidelines provided in the Normative Instruction of the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio No. 028/2012), besides extractive reserves, harvesting crocodilians in natural habitats can also be implemented in federal national forests and reserves of sustainable development.

The project has the participation of a multidisciplinary team from several institutions, such as the ICMBio, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA), Empresa de Assistência Técnica e Extensão Rural do Estado de Rondônia (EMATER-RO), Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA), Universidade Federal de Minas Gerais (UFMG), Fundação Biodiversitas (FBio), which establish the project as the first in Brazil to manage natural populations of crocodilians in the Brazilian Amazon.

Figure 2 – Resex Cuniã communities members' training meeting and the group specialized in capturing crocodilians within the reserve

Source: Coutinho (2002).

Figure 3 – Research related to crocodilian management, conducted by Resex Cuniã communities members

Source: Coutinho (2002).

MANAGEMENT PRODUCTS AND ECODESIGN OPPORTUNITIES

The main products obtained from crocodilian management at Cuniã Reserve are meat and skin. The skins are then processed to become leather.

The meat is directed to local markets, being totally consumed in the region. The presentation of the product in the market opens an opportunity for the application of ecodesign concepts for being a product characterized as organic, coming from sustained management and without the addition of any chemical agent.

Unlike the meat, the life cycle in the leather line is more complex, requiring considerable investments of financial and technological resources (Figure 4).

Initially, the skins go through the curing process in Resex itself, which consists of the removal of residues remaining from skinning work, and subsequent addition of sodium chloride, bactericides and fungicides, aiming for the best conservation of the skins. Then, the hides are sent to national and foreign tanneries, where they are submitted to tanning and finishing processes.

Figure 4 – Meat selling in a Porto Velho supermarket and skin conservation work made by Cuniã communities' members

Source: Coutinho (2002).

The use of crocodilian skins began in the middle of the 18th century with the development of tanning techniques in France and Italy (ROTH; MERZ, 1997). Despite the long tradition in its use, this material is difficult to tan due to the presence of intradermal bone plates (osteoderm), which attributes relatively greater difficulty to the processes. Thus, the full use of skins by the tanning industry requires knowledge about the calcium content inside the skin, which in turn is closely linked to the animals' diet and different types of management (JACINTO et al., 2008).

In addition, the tanning process includes the use of several toxic agents with high polluting potential. Therefore, the treatment processes of waste generated by the tanning industry require the application of advanced technologies to treat organic compounds and heavy metals.

Regardless of the issues related to the production and processing of hides, the natural characteristics of the leather give it a high commercial value for ensuring the manufacture of sophisticated and high-quality products (Figure 5). In this matter, the use of ecodesign concepts is of great relevance.

Crocodilian leather is still considered the "diamond" of hides. Its classic use has been associated to the most sophisticated brands of the international fashion environment. The main products are bags, shoes, belts and various clothing. Likewise, the international furniture industry applies leather in several articles, among them, armchairs, stools, tables and chairs.

However, the use of Brazilian crocodilian leather can assume a much more comprehensive dimension. The resistance, durability, comfort sensation and its unusual visual aspect open a wide perspective for the development of new products and alternative uses for the leather coming from the sustained management of crocodilians. In this sense, the partnership between the Laboratório de Estudos Integrados em Arquitetura, Design e Estruturas of the Escola de Arquitetura from the Universidade Federal de Minas Gerais and the Centro Nacional de Pesquisa e Conservação de Répteis e Anfíbios from the Instituto Chico Mendes de Conservação da Biodiversidade has generated very fruitful results regarding the evolution of the uses of leather of the species of native Brazilian fauna, as well as the training of specialized technical staff (PEREIRA et al., 2019). It is worth highlighting here the urgent need for clarification of public opinion about the importance of wildlife management as a mechanism of conservation of natural environments.

In synthesis, the application of ecodesign concepts, techniques and methodologies represent an important tool to guarantee the success of socio-biodiversity productive chains. These, in turn, promote the conservation of traditional knowledge and cultures, territories and natural environments. Thus, ecodesign is an effective tool allied to the maintenance of forests and floodplains and of all Brazilian biological richness.

Figure 5 – Leather of black caiman (*Melanosuchus niger*) from Resex Cunhã management project

Source: Coutinho (2002).

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CHAPTER 13

DESIGN & HEALTH
A FIELD OF SYMPOIETIC PRACTICES

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Understanding that we live in a period marked by turbulence, in this chapter we seek to discuss the importance of thinking about health as a design problem. In this sense, in the first topic we deal with the critical thinking of design focused on social innovation and collaborative action; in the second, we bring the proposal of operating through a "sympoietic design", dialoguing with authors who think of design as a connection between various actors, resulting in a "do with"; in the third part, we discuss the approach between design and Brazilian health, presenting the field work carried out with patients at the Clínica da Família da Penha, in partnership with the Arranjo Local da Penha. In the fourth topic, we bring some considerations that emerged from the meeting between design and health, involving the theoretical framework and the practices developed.

SOCIAL INNOVATION AND COLLABORATIVE ACTION

In 1970, Victor Papanek wrote critically about design from a reflection more focused on sustainability, when he published the book *Design for the real world*. In the preface, the author problematized communication design that seeks to convince people to buy what they do not need, with a capital they do not have

and with the intention of impressing other people who, in reality, would not mind (PAPANEK, 1985).

Papanek (1985), understanding the 20th century as a period marked by mass production, where everything is planned and projected, saw design as a powerful tool through which man can give shape to his environments and instruments in the social and personal spheres. It is from this line of thought that the author understood that the designer must have social and moral responsibility in his performance. Papanek highlighted innovation in the designer's performance, but in a different way from what capitalism does, that is, with the "obligation to stop filling the Earth with badly designed objects and structures" (PAPANEK, 1985, p. X).

From a more contemporary perspective, Manzini (2008) brings the following reflection: what is the effective role of designers, taking into account current contexts and the nature of transformations, characterized by the author as catastrophic? Manzini understands that, as designers, we were and still are part of the problem, but that it is possible to transform ourselves into part of the solution (MANZINI, 2008).

In fact, Manzini defends the transition to sustainability through radical changes in production and consumption patterns. According to the author, these changes would be the basis for society's learning to reduce environmental and social problems (MANZINI, 2008).

The transition to sustainability, proposed by Manzini (2008), is driven by social innovation by being responsible for changes in the ways people and communities solve their problems or create new opportunities, being more related to behavior than technology. In this context, the term "design for social innovation" emerges, formulated from the definition of the interlocutor role assumed by the designer in the process of social innovation. The dialogue occurs through professional qualities as designers, through the indication of new directions focused on technical innovations and the projection of new artifacts. Manzini thus highlights the consequent development of the so-called "project networks", in which we, designers, using specific knowledge from our field, have the responsibility to actively participate (MANZINI, 2008).

Meroni (2008) complements Manzini by stating that the designer has been distancing himself from activities considered traditional in design, such as the creation of products and visual identities, becoming a "social designer", characterized by a collaborative performance. In this context, the designer, through his professional qualities, assists communities in making strategic decisions and

projections for the future. The author adds to the attributions of the social designer the function of "catalyst of project paths", for considering that experts like to imagine and influence behaviors. According to Meroni (2008), there is also a relationship between present and future in socially oriented design, based on the notion that the present, developed in the best way, would become a paradigm shift for the future.

The designer, according to the author, through the professional point of view and her experience, makes the articulation between several techniques, disciplines and strategies for the creation of artifacts whose purposes would be to facilitate mediation (MERONI, 2008). In this sense, we understand that the social designer does not work alone, because, besides the participation of communities, it is important the contribution of different disciplines, forming the project networks proposed by Manzini (2008).

In 2020, Manzini made a reflection in face of the unexpected and transforming context of our habits, caused by the coronavirus disease 2019 (COVID-19) pandemic, affirming the need to rethink everything that has been said and done so far. The author identifies that, in times of coronavirus, interesting paths have emerged, such as reterritorialization and microsociety, elements that we must consider in the reformulations of the project networks.

The issue of reterritorialization is related to the perception that we are immersed in a physical space. Thus, it is necessary that our proposals are focused on strategies whose objective is the reconstruction of the bonds between human beings and the places where we live in.

The microsociety, on the other hand, is the process of rediscovery of micro-sociability, which we can understand as the contact between those who live nearby: the neighborhood. Manzini (2020) understands that for social innovation, proximity, whether physical or not, has its function.

The author concludes by emphasizing that design for social innovation must be guided by the objective of supporting the construction of new forms of local community, including physical and digital spaces, human, living and nonliving entities that constitute the network of life.

DESIGN, CONNECTIONS AND THE SYMPOIETIC PRACTICES: THE "DO WITH"

According to Szaniecki et al. (2019), while in the industrial economy the focus was on products and communication, the transition to the post-industrial economy emphasizes in services and conversation, thus renewing design

thoughts and practices. In this context we can situate both the social designer's performance and the project networks.

Complementing the idea of networks, Cardoso (2013) states that we live in a scenario of complexity in which the best compositions would result from teamwork or networks. According to the author, adjusting previously disconnected connections would be a designer's assignment.

Considering our complex times, rethinking our attributions within these connections dialogues with Papanek's (1985) understanding about the designer's ability to transit through all environments and using different tools, making us assume a great moral and social responsibility.

To these reflections on the connections in design, we can add those of Thackara (2008) who, when dealing with the theme of sustainability, highlights that, currently, it is necessary to think about innovations by seeking inspiration in social fiction, that means, in social practices.

Apart from the project networks, Manzini (2017) presents us with another concept related to the term connection, the "design mode", which combines critical sense, creativity and practical sense (what is the viability of doing something). According to the author, integrating among these three "gifts" allows us to imagine things that are not yet available, but that would have chances to exist through appropriate actions (MANZINI, 2017).

Manzini (2017) states that the design mode has become predominant in other areas (not only in the design field), both at the various levels of activities considered human and for individual and collective subjects. In a world with high connectivity, organizations/associations, public agencies, companies and regions are operating through the design mode (MANZINI, 2017). Thus, considering that the design mode is an already widespread operation, the design field is capable of bringing contributions to those organizations that already operate it.

Articulating Manzini's (2017) mode of design and what Pazmino (2007) understands as the attribution of the social designer, we can reflect on the formation of alliances between designers, public agencies, nongovernmental organizations (NGOs) and communities, guiding us through the mode of design and production for real social needs.

We are living in a period marked by economic, environmental and social crises, further aggravated by the COVID-19 pandemic. To reflect on this context, more specifically from where we live, at the Escola Superior de Desenho Industrial da Universidade do Estado do Rio de Janeiro in partnership with

Arranjo Local Penha, we turned to Haraway (2016) who uses the term turbulence to define the current complexity resulting from the devastating processes of ambitious human action on planet Earth. The overcoming of the catastrophic results of these actions, according to the author, comprises the dynamics of the so-called Chthulucene Age, characterized by the formation of arrangements, or kinships, that include humans, nonhuman, more than humans. It is in this context that tentacular thinking emerges, which, according to Haraway (2016), is characterized by complex and problematic tentacles, entangled in temporalities and spatialities, in addition to the formation of new relationships.

The Arranjo Local Penha is a partner network working in the region of Serra da Misericórdia, North Zone of Rio de Janeiro, with the objective of promoting actions related to urban agriculture, debating topics such as healthy food and agro-ecology, from workshops, lectures, experiences and task forces, it is a network that involves not only humans and their institutions, but also the relationship with land, plants, food. It is in this sense that Haraway becomes an important ally to think about these networks. To understand the tentacular thinking, Haraway shows that, for the era she calls Chthulucene, it is important to "stay with the trouble", understanding that its composition is made by a tangle of temporality in which there is no elimination of the past, to consider the present and think about the future (HARAWAY, 2016). It is from tentacular thinking that the vision of a world configured by string figures, or rope figures as conceptualized by Haraway (2016), emerges. To understand this configuration, it is necessary that the practices be based on what the author calls sympoiesis, interesting and possibly effective ways to think about paths in our context.

The term sympoiesis, present in Haraway's (2016) text, is coined by Beth Dempster to give name to a collective production system, in which there is no definition of spatial and temporal limits, and in which information and control are distributed to all components. For Haraway (2016), these are evolutionary systems from which the rehabilitation and sustainability of living systems, so damaged in recent decades by human actions, can emerge.

Sympoietic actions are part of Chthulucene, since this era has no end, only continuations, and its contact zones are omnipresent. As it occurs in sympoiesis, it is not possible to identify any beginning and its paths are all associated through the interaction between the units (HARAWAY, 2016).

The approach between the sympoiesis and the design field can be identified in the text of Szaniecki et al. (2019), from the debate about the sympoietic practices and sustainable design. In the article, the authors cite different practices,

among them the Arranjo Local da Penha, and propose to think of them as a "do with" in which living and fighting with others are also added, resulting in the reflection on a "design with" (SZANIECKI et al., 2019).

In this sense, we can reflect on the proposal of a sympoietic design focused on "doing with" that involves several fields and actors in a creative way. In this way, we orient our thoughts to the creation of bonds and to the formation of arrangements through design, seeking collaborative and creative paths. The starting point is the designer's engagement in everyday life issues, assuming our role in a context like Chthulucene and understanding that collaborative practices would be more efficient in the current scenario, looking at the world as a rope figure.

Hence, the reflection on the sympoietic practice in design dialogues with the role of connecting the disconnected, treated by Cardoso (2013), directing this expertise to the connection of different fields and actors, with the aim of seeking and creating ways to reduce certain knots. We bring to the debate on sustainable design based on the tripod of society, economy and environment, the view of the sympoietic relationship. In it, the connections between these three elements include human and nonhuman. This view is essential for the relationships between design and the field of health.

Manzini (2020), reflecting on the moment of coronavirus expansion that has been demanding a whole reformulation of our experiences, dialogues with the sympoietic design by emphasizing that the social innovation design should aim to support the new forms of local community construction, in which they are considered human, living and nonliving entities, physical and digital spaces.

DESIGN AND HEALTH: AN EXPERIENCE BETWEEN THE ESCOLA SUPERIOR DE DESENHO INDUSTRIAL (ESDI) AND THE ARRANJO LOCAL DA PENHA

Health in Brazil is a social right provided in the 1988 Federal Constitution, along with education, work, leisure, housing, food, transportation, safety, etc. (BRAZIL, 1988). Social rights are fundamental to society's balance and the State should provide them through public policies.

It is possible to observe that there are relations between each social right, indicating that an eventual damage to one of them will have effects on the others. Thus, we can look at social rights as interconnected and essential elements for Brazilian health.

The consolidation of health as a right occurs through the Brazilian unified health system (Sistema Único de Saúde – SUS), whose operation is ruled by principles and guidelines, such as: universal access, preservation of people's autonomy to defend their physical and moral integrity and popular participation. The SUS was implemented through Law 8,080 of 1990, highlighting Article 2: "Health is a fundamental right of human beings, and the State should provide the indispensable conditions for its full exercise" (BRAZIL, 1990).

Design and health usually meet when the subjects are services or products. In the context of the COVID-19 pandemic, which started in 2020, we can identify this meeting in the joint work between designers and health professionals to produce personal protective equipment, a "do with" that involved two institutions: the Escola Superior de Desenho Industrial (Esdi) and the Pedro Ernesto University Hospital (HUPE).

Graphic design can also be very functional for the health field, since, according to Schrauwen et al. (2017), it acts through words and images, signs and symbols, colors and formats to communicate visually, resulting in messages, projecting ideas and contributing with experiences. In this sense, the authors identify that graphic design helps health to persuade, as in the images of campaigns aimed at reducing the use of tobacco; educating, informing about the functioning of the human body as well as healthy choices; spatial guidance in hospital environments (hospitalization), helping in the transit of patients and visitors in these hospital spaces, assisting in the reduction of stress and anxiety; to provoke, working as a tool that empowers or awakens awareness for actions and behavior changes, such as campaigns; inform about contagious diseases through the design and visualization of information.

However, services, products and visual communication are not the only possible approaches between design and health. The research we have been doing at Arranjo Local Penha is an example of these different possibilities and the opening of new investigations on how design and health meet.

As already mentioned, Arranjo Local da Penha is a network formed by different partners that operates in the region of Serra da Misericórdia, north zone of the city of Rio de Janeiro. Among the social actors are: the Centro de Integração Serra da Misericórdia (CEM), Esdi-UERJ, with the participation of undergraduate and doctoral students; Clínica da Família Doutor Felippe Cardoso; Escola Municipal Brant Horta; Parque Ary Barroso (Arena Dicró); Agricultura Familiar e Agroecologia (AS-PTA, a civil law institution focused on strengthening family agriculture); Espaço de Desenvolvimento Infantil Maria de Lourdes Ferreira,

among others. The arrangement, with its hybrid composition, counts on activities mediated by designers and presents itself as a very powerful space for sympoietic actions.

Our initial contact with this network was through Diego Costa, Ph.D. student at Esdi, member of the arrangement and one of the researchers who constitutes the network of relations between Esdi and Arranjo Local da Penha. Although the design has already participated in the arrangement through other action fronts, such as working together with a municipal school, we will focus here on health work from the Clínica da Família Doutor Felippe Cardoso, located in the Penha neighborhood and commonly called the Clínica da Família da Penha.

The promotion of health is involved in the entire project of the arrangement since it promotes a more sustainable life and values local knowledge. Activities are also worked on to promote environmental health, through practices focused on the environment, such as responsible use of soil, contributing to the reduction of problems caused by construction on hillsides, common in the communities of Rio de Janeiro, and also mental health, understanding that the actions of the network as a form of sociability and production of encounter contribute to the mental well-being of the population; however, our performance was in a space that is directly understood as a space of health.

The family clinics, and thus the Penha Family Clinic, function as a "entrance door" for Rio de Janeiro citizens to SUS, characterized by initial care, or "basic care", according to the SUS hierarchy, working through mechanisms of prevention, health promotion and early detection of diseases. Basic care has the function of avoiding the overload of hospital emergencies, since many cases could be treated in basic care, besides having a focus on prevention, reducing or delaying the appearance of diseases.

The clinic is an important partnership for the arrangement because, through the "food and health circles", formed by the nutritionist, a group of patients, women, and some network articulators, a bridge was built to promote health through agroecology. The circles were the spaces that allowed the development of mechanisms for prevention and control of food-related diseases involving not only food health, but also environmental and mental health.

Since 2017, we had contact and carried out some actions with the group "Food and Health Circles"; however, in October 2018, the news of the dismissal of teams in several family health clinics, extinguishing the nutrition sector of the Clínica da Penha, caused great commotion in the patients and in the arrangement. How not to let the knowledge worked in the food and health circle be lost

with the closing of the nutrition activities at the family clinic was what drove us to think how design could act in this space producing a memory and a future of and with the group.

As an initial idea, we are thinking on the production of a campaign of defense and valorization of nutrition in the region of the Penha complex. However, considering that among the objectives of the Arranjo Local da Penha was the stimulus to the group's protagonism and autonomy, to come up with a ready strategy would be a vertical process, which would be in conflict with the principles and practices of the participative design (PD), path through which all the designers of the collective sought to work. According to Robertson and Simonsen (2013), PD has no rules and also is not defined by written formulas or definitions, so to verticalize the process would be to fall into contradiction. In this sense, we started the work in November 2018, trying to understand how the group was feeling in face of that turbulence.

To discuss in this article, we divided the activities into two phases, one of approach and the next of production. The total duration of the work with the group was seven months, occurring between November 2018 and July 2019.

As activities of the approaching phase, we carried out: collage using images and words, trying to understand how the patients were feeling after the departure of the nutrition team from the family clinic (November 2018); two meetings with proposals of fraternization, trying to stimulate the maintenance of the group (December 2018 and January 2019); mapping the neighborhood from the residents' point of view to understand a little of the region dynamics and women's habits (January 2019); conversation about what health is, aiming to identify how the participants relate it to their experiences (March, 2019); conversation about our steps during the following months we could produce together (March 2019); meeting to commemorate International Women's Day, in which the participants of the group brought recipes and images of women who inspire them (March 2019); mapping on the issue of garbage in the Penha complex, a demand that emerged from the conversation on health, relying on the leadership of another multiplier of the Arranjo Local da Penha (April 2019); picnic at Dicró Arena with the participation of the nutritionist who conducted the food and health circle, proposed by her, aiming to rescue the memories of the group (April 2019); cooking workshop conducted by one of the participants of the circle complemented the objective of the previous meeting (picnic), stimulating autonomy through getting their hands dirty and protagonism by passing on knowledge to their colleagues (April 2019).

Figure 1 – Approaching phase activities

Source: Authors' collection.

It is important to highlight that in the first meetings the activities were proposed by us, but throughout the process the participants became more active and coauthored the activities.

From the first phase, we noticed that two very important elements emerged: recipes as an instrument of remembrance and integration of the group, and a desire to value the Penha neighborhood. Therefore, we arrived at the production phase, proposing the collective construction of a recipe book, including those learned from the nutritionist, as well as those they already used to do in their daily lives, integrating the life stories of each participant in the food and health circle. To do so, we carried out the following activities: communication workshop mediated by professionals and students linked to the communication area

of UFRJ, with the purpose of stimulating oral communication and dialogue; "my story" workshop, in which each participant tells a little of his or her story in Penha and on the food and health circle; collective diagraming; co-creation in which we took the book in development so that other Penha inhabitants, who were not participants of the circle, could contribute; evaluation of the book "doll", when we evaluated the materialization of the concept, the colors, fonts and illustrations chosen; launch of the book in LivMundi; conversation about the book launch, in which we dealt with possible changes in the book content and other materials that they would like to develop; selection of recipes for the production of a zine of recipes to be distributed in Penha.

Figure 2 – Production phase activities

Source: Authors' collection.

From the second phase, it is important to highlight paths that have stimulated autonomy in the group: representativeness, through the book concept definition, and the understanding of design as a tool and the process of "doing with".

It is fundamental to highlight the concept, because the women asked that Dona Glória, the oldest participant of the group, was portrayed on the book cover, with the idea of conceptualizing the book as a recipe book of a fictional resident of the region: Dona Penha. The definition of the "character's" name was a way of thinking this resident as the personification of the Penha neighborhood, seeking reflection on its valorization. From the identification and representativeness, we have the neighborhood of Penha emerging as an entity as woman and as powerful as the participants of the circle.

The perception of design as a tool and the importance of "doing with" became evident in the dynamics of the pre-event LivMundi, through the group's decision to tell the other participants what we had been doing since 2018, as well as in the speech of one of the women of the circle, who said: "without you we would not have the tools for that!" The exchange of the pronoun "you" for the noun "design" allowed us to understand that the participatory process of design that we were trying to accomplish was giving results, indicating the democratic character of design as a tool capable of amplifying voices.

Other lines from the participants caught our attention. During the communication workshop, Sarah highlighted that the change from nutrition mediation to design was not a replacement, but a continuation, since the nutritionist represented the past, and the designer, the present. Already in the evaluation meeting of the work done by the arrangement during 2019, the participants stated that the "turbulence kept them stronger".

All these lines lead us to "stay with the problems" and the temporalities marked by the relations between past, present and future, approached by Haraway (2016). The past has always accompanied the meetings, whether in the memories, in the food theme, which was one of the most recurrent themes in the activities, and the reality of the nutritionist's absence, which also expresses the precariousness of the health that the neighborhood receives. The present represented the period in which design came into action and we sought together to be resilient after the dismissal of the nutrition sector of the family clinic, remaining with the problems that these women live and face. The future was evident in the plans that the participants of the circle began to propose, such as the development of other materials besides the book.

DESIGN AND HEALTH: THOUGHTS ON SYMPOIETIC PRACTICES

The experience of the Arranjo Local da Penha can be observed as a sympoietic construction. When we look at the practices of the collective from the perspective of health, we identify a sympoiesis relationship, translated by the actions focused on environmental issues related to housing, through the planting in their houses; food, through the fight for food sovereignty; and mental health, realizing that the meetings contribute to the leisure of the region residents. From this perspective, we see the sympoiesis also reflected in social rights, since health, housing, food and leisure are among them.

We can also see how the actions in the arrangement, even before the crisis caused by COVID-19, but being reinforced by it, are constituted from reterritorializations and microsociabilities placed as important by Manzini. Local actions with neighborhood partnerships and based on the land itself as a fertile and living space, as well as land of memory of other humans and nonhumans who lived there.

The design role in the relationship between the arrangement and the Family Clinic brings us an interesting reflection on the SUS reconnection with the popular movements, which were fundamental in the health system consolidation. Thus, we identified our role as designers both in the connection of what is not connected (CARDOSO, 2013) and in the "fight with" proposed by the sympoietic design (SZANIECKI et al., 2019) as a path for the reinforcement of SUS and the guarantee of health as a social right.

Regarding the more specific work with the clinic's patients, sympoiesis was also present in the relationship that ended up forming between food health and mental health. We make this statement based on what we collected during the activities, such as the feelings that arose before and after the dismissal problem. We highlighted an emblematic speech on one occasion, in which Sarah, one of the most frequent participants of the meetings, said that the nutritionist was teaching them how to eat and the designer was teaching them how to love themselves. Considering that, even after the departure from nutrition, we continued to guide our practices by eating, and self-love was perceived by the participant, we understood that there is a close relationship between mental health and nutritional health, reflecting the care of oneself as an expression of affection.

It is not a very simple task to find a vast literature on the subject of design and health, but it is possible to find articles dealing with design productions that serve the health field through the design of products or services. In this sense,

we have the ability to contribute to the construction of a reference based on sustainable design, through the reflection that health problems are social issues, which are also related to environmental ones, therefore, real needs for which the designer is able to present not necessarily solutions, but ways or possibilities. In this sense, when Schrauwen et al. (2017) highlight the important roles played by graphic design focused on health, we have the possibility of thinking the promotion of health as one of the most important social functions for the designer, even more so in a country where health is a social right registered in the Constitution but not always guaranteed in real life.

In this text, we have observed that it is possible to rely on several authors to guide our practices, highlighting the concepts of mode of design and sympoiesis, without forgetting that practices in the field are essential, especially when we want to talk about issues related to democracy.

In this manner, we realized that design should not fit into a linear production from the response of a designer to the client's briefing, whether it is a commercial company or a government command. In the field of health, it is particularly necessary to align the linear to think and act through Donna Haraway's "tentacularities", opting for a design that is a "do with" between a multiplicity of actors and the multiplicity of the very notion of health. This perception reflects what was experienced at the Arranjo Local da Penha, not only when we verify health relationships with environment, leisure, food, and housing, but also in the role of design as a democratic tool that, appropriated by Penha dwellers, builds new ways to "fight with" social movements and SUS, for the re-democratization of Brazilian health, bringing the State and community back together through affective and territorial actions. Design in health is necessarily sympoietic.

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CHAPTER 14

PARADIGMS TRANSITION IN DESIGN
WHAT IS ITS POTENTIAL TO SUSTAINABILITY AND INNOVATION RESIGNIFICATION?

Ione Maria Ghislene Bentz

Historically, what makes knowledge advance are the movements of critical reflection, point and counterpoint, which put on screen theories and methodologies that intend to guide the production of knowledge by man. These movements move through the community of knowledge in the form of art or science and present themselves in the form of different narratives that seek to mean the practices of life lived.

When asked about the potential of paradigms in transition to design, one is already stating that it exists for all fields of knowledge, but that it is particularly interesting to ask design how it is affected by the pragmatic and post-structuralist movements dominant in the twentieth century and systemic by the theory of complexity, gaining increasing relevance in this century. To talk about this set of doing, strategic design organizes this reflection on ecosystems, innovation and sustainability, taken as part of the argument that considers that the understanding of life by ecosystems extends to all human knowledge, that innovation in them finds inspiration to re-signify itself and that sustainability is the ethos capable of ensuring human life on the planet.

In this sense, the changes that design has undergone since its origins, systematized by industrial design to design that recognizes the influence of theories

from other areas of knowledge on propositions about design, extends the sphere of doing to those of thinking and feeling. In this sense, by presenting the six axes for the philosophy of design, Beccari et al. (2017) organized philosophical reflections on design, expressing the perception of design as a field of research and the consequent expansion of the theories that appear in it. Thus, design and language, design and sensitivities, design and values, design and knowledge, design and reality and design and culture are presented as reflective parameters for design.

One of the main incentives for changing comes from the systemic theories and complexity theories which, in thesis, intend to oppose the reductionist Cartesian thought. This kind of thinking comes under various names when dealing with natural, artificial or social systems. Social innovation, sustainability and collaboration can thus be resigned.

PARADIGM IN MOVEMENT: THEMES ON THE TABLE

Innovation has appeared more and more frequently on the design researchers' agendas and has received different approaches. Two points in particular deserve attention: the polysemy of the term which requires its meaning to be precise; and the widespread use of the term which weakens its relevance. It is insufficient to treat innovation only as a result of creativity or as changes capable of transforming one's vision of reality and generating or adding value, whether financial or symbolic.

Due to the society's appreciation of stability and value of permanence, it is not surprising that experimental or innovative projects find space in the laboratories or research institutes that test artifacts and evaluate them, especially in the preservation of systems, before offering them to the market, understood here as a space for the exchange of goods and services. In terms of strategic design, the indication of understanding reality as ecosystems gives scope and dynamics to this cut-out in which creative project processes operate in the production of devices capable of transforming the world (FRANZATO et al., 2015).

Considering the binomial problem/solution, always mentioned by the design as project parameters to meet the user's needs, these terms need to be critically retaken. To the needs, add desires; replace user by actor, or actor of the action/interaction processes; and understand the need to 'problematize' the problem, otherwise to recognize new problems resulting from sociotechnological changes either simply created by mankind, or imagined by it, which ask for concerning

solutions. Thus, to paraphrase Manzini (2008), there would be a shift from the idea of projecting to something broader and more enabling, which is to project to empower people to achieve the ideal of a society of well-being and sustainability. Within the framework of these changes produced naturally or culturally, there is a certain social inertia that is only impacted when major problems arise or worsen, in such a way that there is an imposition of more expressive or differentiated innovative solutions. In this sense, Manzini's formulations are directed towards behavioral changes in particular or changes in the market and technology, not necessarily outside the framework of social innovation. It is possible that migration between market and society is easy to occur, although it is preferable that, when appropriated by the market, a certain innovation does not lose its perspective of maintaining sustainability and promoting social welfare. Understanding this well-being from social, environmental and economic perspectives, the most relevant is that it is based on the ecologies of Guattari (2011) thus formulated: the environment, social relations and human subjectivity, all of them in permanent interaction. These ecologies broaden the perspectives of social welfare, since they require an ethical-political articulation without which the way of living on the planet is in danger.

Strategic design (ZURLO, 2010; CELASCHI; DESERTI, 2007; MERONI, 2008; VERGANTI, 2009), a design methodology always under construction, proposes an effective and collaborative organizational model, cooperative creation of a common knowledge base that includes the proposition of organizational strategies. It is the recognition of new forms of networking organization in which a large number of people come together to build a common vision. This understanding combined with the recognition that people, and not just designers, can favor design for innovation. Thus, the number of project actors is increased and, consequently, the possibility of differentiated creative propositions. Thus, the design of services cannot only consider some actors as relevant to the project, but all of them. There is a process of indissociability between who projects/produces and who consumes, in the same way that occurs with the distinction between sender and receiver (source and recipient) in communication processes, indissociability understood as a recurring and complementary movement. As a result, the chances of producing significant innovations for society are high.

Anyway, practicing processes in this direction imposes a series of qualities that would be behaved in learning by behavior change, based on reliability, responsibility and exchange, and that enable people to seek their own solutions. According to Manzini (2008), in the field of organizations, people participate in

collaborative processes not only through face-to-face forms, but also through internet applications used by everyone, which favors real world organization. All participate significantly in the formulation and support of collaborative actions, in the context of productive economy, by reducing time and erasing distances. Finally, a favorable context is created for the increase of project production by methodologies, techniques and tools compatible with these processes thus defined.

Zurlo (2010) highlights that the strategic design approach promotes innovation, based on continuous strategic thinking, signaling paths for possible futures, interpreting the signals that society issues, building meaning and giving identity to organizations, products and services. For such prognoses to be confirmed, it is important to emphasize that the organizations must incorporate the design culture, in such a way that it starts to guide the totality of their actions, which will favor the development of innovation. The incorporation of innovative design processes in organizations should be a regular activity, so that it would be incorporated into their DNA (CELASCHI; DESERTI, 2007), an action that would ensure the permanent updating of processes and strategies and not only sporadic or urgent to cope with difficulties or disasters.

What has been said so far corresponds to reflections arising from the paradigmatic basis of the dominant strategic design to a given point in its development. Inspired by the complex thinking proposed by Morin (2005), design can be resumed from the understanding of ecosystems as a vector to work on topics such as sustainability and social innovation. This shift is expressed in the 'moving paradigm metaphor'.

The knowledge production that contemplates the notion of system is not new in science. To bring it here, revised, is imperative the conviction that the term usage has entered the process of naturalization and that complex thinking reinvigorates it through studies derived from sciences, such as biology and physics. It is in the agenda of open systems that ecosystems find expression. In order to make them a subject of interest in design, it was necessary to recognize that design has been shifting its interest from products to processes and that the design processes recognized by the field (linear, coevolutive, etc.) are well described and refer to recognized practices and methodologies. However, the same does not happen with the autopoietic processes that present possibilities to respond, in an unusual way, to the challenges of the field in terms of creativity and foresight. They can, therefore, reinvigorate a set of established knowledge, including the notions of system-product-services for generating social innova-

tion. Marked the prominence for autopoietic processes, in the sequence, when talking about complex thinking, they will be resumed.

Ecosystems are understood as sets of material species, natural or social, whose organization patterns are complex and dynamic in nature, and whose elements are in constant interaction (connection). These relational systems have the capacity to adapt and assume an important role in building and maintaining natural and social sustainability. In a previous reference, it was considered relevant to add to ecosystems the adjective 'creative', to mean that innovation would be leveraged by creative processes whose flow would generate transformative actions, by creating devices that would lead to an inclusive, shared and articulating design practice.

However, considering the ecosystem principles, this adjectivization is redundant, since ecosystems would be creative by their own dynamics and by the surprise resulting from the relationships that ecosystem elements establish or will establish in open systems. Ecosystem processes would be autopoietic and therefore creative.

COMPLEX PARADIGM: STRATEGIC ADVANCE

This so-called 'strategic advance' points to the introduction in design studies of a type of thinking that can bring theoretical-methodological challenges that stimulate innovative design practices. A first reference is the replacement of disciplinary knowledge, dominant in scientific society, by transdisciplinary knowledge. This is what Morin (2001) calls the "reconnection of knowledge". This perspective seems to mimic nature in its intrinsically collaborative practice, in the sense that research problems can receive contributions from all sciences to the solution of the issues that guide man's necessities, desires and curiosities.

The theory of complexity represents a universe to be explored by design. Stimulated by what it can represent for innovation in the current paradigms, the notion of system is taken as a starting point. Capra (2005), Morin (2005) and Luhmann (2010) were revisited in what is proposed for systems and ecosystems in living organisms and social organisms. According to Capra, the new perception of the world is based on the awareness about a state of interrelation and interdependence inherent to physical, psychological, biological, social and cultural phenomena. It understands systems as totalities integrated with properties that cannot be reduced to smaller units, because once the system is fragmented into isolated elements, the systemic properties disappear. For Capra, most

living systems are organized in many and varied levels, carrying out journeys in different directions, without the dominion of any, "being that all levels interact in harmony, interdependent, to sustain the functioning of the whole" (CAPRA, 2005, p. 274).

Complex thinking (MORIN, 2005) indicates two principles that command complex thinking, therefore, that structure concepts and have repercussions on practices: that of the emergency, according to which the whole is superior to the sum of the parts. This capacity of generation makes it possible that isolated components are not summed up in themselves and that from this 'dialogue' new ideas or new properties may emerge; and that of imposition, also important, according to which the qualities or properties of the parts, when seen separately from the system, are dispersed, that is, become virtual. It is to say that there are systemic restrictions without which the totality is not evident. The hierarchy and the virtuality are conditions of guarantee of the relationship between parts and the whole, always in benefit of the latter. Still considering that complex thinking takes into account harmony and disharmony, conflict or adherence, regular and chance, but contrary to the duality that the terms suggest, it is both at the same time. These principles, among others, directly impact the understanding of project processes.

Considering these principles (MORIN, 2005), ecosystems are creative by their own dynamics in which order and disorder, multiplicity and transformation are constant and simultaneous. These systems contain in themselves the unforeseen and the uncertainty, that is, one cannot ignore the possibility that some unforeseen (friction in the ecosystem) requires the adhesion of systems so far external to the designed ecosystem. In the complex system, therefore, new states may emerge, which determine a different level of organization from the previous one due to the dynamics of systemic properties. Among the qualities of a system in the paradigm of complexity (MORIN, 2003), the principles of integrative, recursive, dialogic, polyscopic, autonomous processes and reintroduction of knowledge are highlighted. In terms of principles, the physical, biological, spiritual, cultural and historical dimensions of what is human communicate through polyocular or polyscopic processes that respond to the principle of interconnections (of networks). On the other hand, the adaptability that guarantees the maintenance and adjustment to changes in the same temporality corresponds to the principle of autonomy (of self-regulation, dependence, adaptation and evolution) in the dynamics of the system. The principle of reintroduction of knowledge recognizes that all knowledge is reconstruction/translation of the mind and suffers the interference of the subject (without the dissociation of subject/object) and the

principle of recursion corresponds to the perception that causes act on effects and vice-versa, resulting in a dynamic balance made of continuities and ruptures.

Once the ecosystem concept and the principles and processes proposed by the complexity theory to think about design are taken up, the autopoietic process stands out as more relevant in its essential condition of creating self-generated ecosystem relationships in the spectrum of fractals and disruptions. Recursiveness and network connections operate in the process. And the main reason to bring these fundamentals to discussion is to identify the potential of this type of episteme to the methodology of research and practice of design in relation to the totality of creative project processes. Thus, the problem-solution chain would be affected, that is, resignified in the light of the principles and propositions derived from complexity. From this perspective, these principles should be maintained when being technical proposals or design tools so that the theoretical-methodological design is harmonious, which constitutes a design challenge.

Sustainability, also a comprehensive and versatile concept in economic, social and environmental terms, is now attributable to ecosystems (such as balance/preservation) that guarantee their duration and mutations by the very principles that organize them and that, for all these conditions, remain sustainable. In more specific terms, sustainability presupposes the satisfaction of the population's essential necessities, without inequalities that exclude people and condemn them to complete deprivation, including access to cultural goods. It is, therefore, an ideal to be achieved by ethical-political actions of promotion or intervention, all the more necessary as they strengthen globalized capitalist practices. Although it is recognized that the utopia of social equality (FOUCAULT, 2011) is impossible to achieve, the commitment must be to build a dystopia marked by sustainability.

In this sense, Manzini (2008) recognizes that the transition to sustainability requires a change in society's way of life and production and points to the need to promote social learning. The necessary changes reach forms of knowledge and organizational capabilities to be developed in a participatory way, in open and flexible spaces of co-creation. For Murray et al. (2010), to achieve a more equitable and sustainable society, in progressive upward growth, a systemic change is needed. It is at this point that the ecosystem vision aligns itself to this concept, because, from the perspective of complexity theory (MATURANA; VARELA, 1984; MORIN, 2005; 2003), the systems are complex, guided by inseparable principles and in permanent interaction and, among other consequences, all the

movements that occur in the ecosystem reach the system as a whole. The reality is understood as ecosystem and there are inherent properties to each level of complexity. The increase of systemic complexity is the element that promotes differentiation and all differentiation implies reduction of complexity. In relation to reality there is a paradox, because man knows reality by being excluded from it and by being inserted in it.

CONCLUDING REMARKS

Taking back the concept of ecosystem and the principles and processes proposed by the theory of complexity for strategic design, it is possible to say that the most relevant among them is the autopoietic process in its essential condition, not only of self-regulation, but of creating self-generated ecosystem relationships in the spectrum of fractals and disruptions. Recursivity and network connections operate in the process. And the main reason to bring these fundamentals to discussion is to identify the potential of this episteme type to the research methodology and practice of design.

In this perspective, it is necessary to work so that these principles are maintained in the design of services by the strategic design approach. A first step for the practice of design research (as social practices research) is to choose or propose techniques and tools that respond to the principles of complexity, since it was the counterpoint chosen to think design in this text. This care stems from the ease with which the openness proposed by open paradigms, such as, for example, the one pointed out as strategic tactics can be neutralized by techniques or tools that respond to the organization, categorization and exhaustiveness in terms of closed systems and disciplinary practices.

The organization of an ecosystem without pre-defined systemic relationships favors the expression of relationships identified in the systems, but also the recognition of unpredictable and positively destabilizing ecosystem relationships. Perhaps more than favoring product design, this point of view favors service design, due to the characteristics of intangibility, indissociability, complexity and nonapprehensibility that are attributed to it. The experiences in services, "useful, desirable, usable, efficient and effective" (MORITZ, 2005) would be supported by a multidisciplinary platform of skills to respond to the design of this type of procedural experience, interactive and continuous. The multidisciplinary condition would correspond to the transdisciplinarity (reconnecting knowledge) proposed by Morin (2001) which could, in turn, transcend the design of services and achieve the production of any and all design artifacts.

It is considered essential for the continuity of this proposal to examine the relevance and ownership of the parameters of complex thought to resignify the proposals of strategic design in the certainty that not only are they under construction, but they need to be in tune with the design ideals advocated by contemporary design. This is how the challenges would be expressed: (a) art and technique, or inspiration and work; (b) space to create in ontological, aesthetic, cultural and ethical dimensions; and (c) research not as analysis or description, but as an abductive 'platform' capable of responding to what one wants to do and has not yet done, or to imagine what one has not even thought possible. If the relevance of the proposed approach is defined, it remains to develop the methodological apparatus with which it can operate.

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CHAPTER 15

DESIGN AND SOCIAL UTOPIAS
THE OPEN-ENDED DESIGN OF HETEROTOPIC MOVEMENTS

Chiara Del Gaudio

This chapter is meant to share some of my reflections on how designers' skills can be applied to produce the conditions necessary for enabling the social, economic and environmental changes necessary for transitioning our societies towards more democratic and plural possibilities. It presents some initial thoughts on the relationship between the concept of utopia and the design process and the role that, so far, the concept of utopia has been playing in the design process. It also brings to the reader's attention the concept of heterotopia and points out its relevance for design practice to be able to contribute to more democratic futures. Finally, it introduces my initial ideas on the need to design for "heterotopic movements towards transition".

DESIGNING SOCIAL UTOPIAS

A few years ago, at Design Thinkers, a design conference, when asked about the relationship between design and utopia, Paola Antonelli, renowned design curator of the Museum of Modern Art (MoMA), New York, stated: "designers at all scales imagine a place that does not exist (yet), populated by beings, tools, interfaces and experiences that represent our contemporary goals and aspirations"

(TERSIGNI, 2016). With these words, Antonelli clearly remarked on one of the main inherent features of the design process: utopian thinking. Designers envision situations that transcend (and/or aim at transcending) the existing ones and pursue them through their work. This happens both when in the design process there are *ad hoc* activities aimed at envisioning alternative social scenarios, and when there are not. As a matter of fact, every design artifact is a representation of a specific understanding of reality that also gives shape to its features. Design is a world-making and sense-making activity that constantly declares its role in the achievement of imagined, alternative social scenarios through design projects.

The general understanding of the design community about the role and potential of envisioning alternative scenarios in the design process is exemplified by Christopher Turner, director of the London Design Biennale of 2016: design can point out a relevant debate and catalyze change "by suggesting inspiring or cautionary futures. Together these visions formed a laboratory of ambitious ideas that might contribute to making the world a better place" (LONDON DESIGN BIENNALE, 2016). Envisioning in design is designing social utopias that will contribute to overcome current issues and to improve daily reality. Therefore, utopia and utopian thinking have a crucial role and relevance within a design process and practice aimed at more democratic futures.

Utopia, from the Greek *οὐ* «not» e *τόπος* «place», was introduced by Thomas More in 1516. It means "no place" and refers to the projection of a "place that does not exist". Among utopia main features are: being a nonexistent place, being described in detail and being located in a specific time and space (CLAEYS; SARGENT, 1999). The association to a specific location furthers the idea that it might exist and, along with the detailed description, makes it relatable to its audience (CLAEYS; SARGENT, 1999). This also means that even if, usually, it is understood as the projection of a positive nonexistent society, utopia is an imaginative projection of a society that is different from its author's, but does not have either a positive or negative connotation in itself. As a matter of fact, according to *The Utopia Reader* (CLAEYS; SARGENT, 1999), there are two variations of utopia: eutopia (positive utopia), as a projection of a society that the contemporary audience understands as better than the society in which they live; dystopia (negative utopia) as the description of a society with highly negative political, social, technological features — the bad place.

Design has always been engaged with the process of transforming and of imagining transformation of the present with the aim of either achieving a specific outcome or developing possibilities to achieve them. This is a broad

statement that embraces the points of convergency of different understandings of design: for instance, design understood as a process of making things how they ought to be in order to achieve a desired outcome (SIMON, 1969) or as a way of acting that allows to imagine something that is not there and ways to achieve it through crucial sense, creativity and practical sense (MANZINI, 2015) or even when design is a mean to speculate how thing could be (DUNNE; RABY, 2013), among others.

Thus, utopias are both outcomes of the creative process of design and a catalyst of subsequent design processes. Specifically, utopias are the result and focus of meta-design activities, while the design of artifacts for the realization of such utopias is the focus and outcome of subsequent design processes. As a matter of fact, utopian visions are what designers look towards when engaged in the design of new artifacts. We can understand the latter as the shape that utopian visions acquire within the boundaries of current reality. Hence, design refers to the process of temporary materialization of future possibilities.

WHY, THEN, SHOULD DESIGNERS RETHINK THE ROLE AND RELEVANCE OF UTOPIAN THINKING WHEN DESIGNING FOR FUTURE PLURAL AND DEMOCRATIC POSSIBILITIES?

Over the last decade we have witnessed a growing understanding among design scholars[1] about the need for the design discipline and its related practice to undergo fundamental changes in order to be able to contribute to more democratic social possibilities. This understanding has gained strength due to the increasing awareness about the crisis (as well as limitations and implications) of the model of scientific rationality that, till the mid of the 20th century, ruled in the production of knowledge in every branch of knowledge and, therefore, in people's mind and behaviors in all areas of human life and activities (MORIN; LE MOIGNE, 2000). This model was structured around the understanding that human beings should and could dominate and manipulate, in a foreseeable way, nature through scientific knowledge. According to this, reality, which is apparently complex, is characterized by order and made of separated elements that can be organized and reorganized through the laws of nature in line with human beings' interests. Functionalism and determinism are crucial principles of this

[1] See for instance the special issue of the Strategic Design Journal on Design and Autonomia (BOTERO et al., 2017), and the call for contributions and proceedings from the Participatory Design Conference 2020 (DEL GAUDIO et al, 2020), among others.

scientific paradigm. The limits of this paradigm, which is in crisis but still alive, have emerged since the second half of the previous century (for more on this, see SANTOS, 1987). Its crisis was caused by scientific discoveries that have converged into the theories of complexity, as well as by the understanding of the socio-environmental issues caused by that way of thinking and acting. All of this has brought up the need to explore new ways of thinking and interacting with the world we live in, as well as new principles through which to rethink disciplinary knowledge.

According to Santos (1987), some of these crucial discoveries and related principles are: the understanding of the impossibility of separating subject and object, that is, the structural interference of them with one another; uncertainty and unpredictability, and the dialogical relationship between order and disorder as key principles of the reality in which we live in and of its possibilities to exist and evolve; the relevance of the interaction and relationships between the elements, in addition to the relevance given to the elements themselves; the limits of reason and, above all, the understanding that scientific knowledge is not the result of discovery but of an act of creation in which the subject and object are in continuity; among others. In the new scientific paradigm, which emerges from these understandings, but is still under construction, there are some concepts that are particularly relevant for the reflections presented in this chapter. First, there is the feminist standpoint theory and the related concept of situated knowledge (HARAWAY, 1988). Knowledge is socially situated and there are some perspectives that are better than others in each specific situation as a starting point for knowledge building. Furthermore, knowledge production happens within and is shaped by a local power force (HARDING, 2003). Second, we need to rethink the instrumental use that we make of our reality, whose harmful implications became undeniable with the current environmental crisis and the other main global issues we are currently facing. Lastly, at least for the purpose of this chapter, we have the understanding of reality as constituted by complex systems that form a whole that is in constant transformation due to emerging dynamic relationships. In other words, the world in which we live in is not characterized by the principles of stability and permanence, but rather by evolutionary processes and by situations of constant instability (PRIGOGINE apud VASCONCELLOS et al., 2015). According to the theory of dynamic systems, new unimagined and unforeseen possibilities and life arise in systems that are unstable, nonlinear and open (VASCONCELLOS et al., 2015).

When it is understood that a different rationality is necessary when thinking, understanding and acting in our everyday life, it becomes clear that advancements in knowledge in design and more traditional fields are not enough to contribute to the necessary changes. This is because design is a profession and discipline that has emerged and evolved within the paradigm that has contributed to current environmental, social and economic crises. The foundations of design practice — therefore its concepts, methods, techniques and tools — were generated by the key principles of the previous scientific paradigm and the economic-capitalist system: functionalism, rationalism and determinism, among others. The design discipline needs to move away from this and rethink its very nature, its main concepts, principles and features if it wants to contribute to addressing current global issues. As a matter of fact, these roots do not allow design to contribute because they lead to the same conditions that have caused current issues. It needs to rethink them in light of its contradictions and limits. Design needs to be able to relate differently to reality, to produce and contribute to the existence of different realities, and to act according to the principles of the new paradigm. Thus, design needs to redefine itself and its practice from different epistemological perspectives (ESCOBAR, 2016). Researchers in design need to enable design processes to embrace complexity and the discipline to overcome the understanding of itself as an instrument to operate nature's machine. In this way, design will be able to promote broader changes in societies, social learning processes and the transition towards more sustainable and plural ways of living.

Therefore, we are looking for a design practice that is plural, not functionalist and determinist. In the context of this chapter, this means that design should move far from being a practice that aims to create order according to one specific vision through the manipulation of existing resources. In critically reflecting on design approaches, tools, techniques and practices, design scholars should also rethink the function of utopia and its relevance within the design process.

As a matter of fact, utopian projections within a design process are often unique visions aligned to a specific discourse. The issue, here, lies in being single-minded and not plural, both when they are desired and when they are feared. Even though, in some cases, these visions might be the result of a collective process of envisioning, whose potential issue of indirectly forced consensus I discussed in some of my previous works (DEL GAUDIO et al., 2018), they catalyze a design trajectory in which a series of artifacts emerging from the same principles are designed. Even though these artifacts can have different configurations, they are the embodiment, replication and dissemination of the same

principles and dynamics of the same discourse. When they enter real life, they become the means for the constant representation of an idea and the possibilities that this idea entails. They become deterministic. Furthermore, even though the initial vision can change due to adaptation to each design process, this vision is always aligned to a specific existing discourse that is strengthened by each design activity. The initial vision perpetuates one idea of society and promotes the organization in a new configuration that will change current order into the one suggested by the discourse. Even if by envisioning utopias in the design process designers develop a new possibility (or, when more than one, new possibilities), the process of envisioning contributes neither to the never-ending creation of new ones, nor to a situated vision — which would require the discourse to be redefined constantly.

Furthermore, an interesting example of the limits of utopian thinking in design is the one pointed out by Andrews (2009) upon analyzing the discourse of early industrial design. At the time, designers believed that design could lead to a better future society based on economic and material well-being through constantly stimulating and increasing consumption. In other words, their "compelling vision of a utopian future" was achievable through designing and selling new products, the stimulation of people's desire to own new and better products and the constant and indiscriminate use of natural resources (ANDREWS, 2009, p. 72). Designers such as Bel Geddes understood that the advancements made in the design of new products would allow for the establishment of a new order and would achieve a better future (ANDREWS, 2009). By acting at a micro level, designers would promote transformation at a macro level — in the social, economic and environmental systems. The dominating values of that period embodied in utopian design projections and artifacts contributed to the unsustainable society in which we live. However, designers were only trying to contribute with their visions and artifacts to a widespread utopia presented and embodied in the modern discourse.

HOW CAN DESIGN THEN PROMOTE PLURIVERSAL AND NOT UNIVERSAL FUTURES?

The relevance of rethinking the current role of utopia within design emerges stronger upon engaging with the political theory of agonism, which also enables the identification of a new path for the discussed relationship. According to this theory, a democratic society is characterized by a process of constant and nev-

er-ending confrontation between actors with different and contrasting positions, as well as by a subsequent process of tolerant and constructive organization of these different perspectives. This is why, in a pluralistic society, consensus is not to be expected due to the variety of opinions, perspectives and possibilities. At the same time, consensus and rational deliberation can be means used by hegemonic voices to support or implement hegemonic power structures. Consensus around a shared idea can be a strategy implemented to deprive social actors of their possibilities of expression, and so of different ideas to be heard and considered. The possibility for the expression of differences and productive conflict is what allows a society to be democratic and pluralistic (MOUFFE, 2000). According to Mouffe (2000), spaces of confrontation should be created where the different actors may discuss different points of view. The constant discussion happening in these spaces will challenge current order and hegemonic power configurations, open the space up for new possibilities of being, as well as push the current situation to evolve. These spaces foster the resilient dimension of society by challenging and changing the present system. Based on the theory of agonistic democracy, conflict and confrontation are crucial conditions for democracy: they are catalysts of more democratic scenarios.

When reflecting on the promotion of new more democratic scenarios through design, that is, on the process of transforming the present reality into different and multiple realities through processes in line with the theory of agonism, the design process should involve a process of destruction of the same reality. To build new, more democratic social settings, the current, undemocratic ones need to be undone. To do this, according to how new possibilities are generated (VASCONCELLOS et al., 2015), the designer must, first, act so that the current systems move away from their current state of equilibrium until reaching the state of new possibilities. Conflict and confrontation are crucial catalysts of this process.

Thus, the relevance lies less in design visions or outcomes and more on what can, during a design process, challenge current discourse and visions, move the current situation away from a state of equilibrium and shift it towards a new position constantly. As designers, we should give less relevance to utopias (and utopian thinking) in design and direct our focus towards heterotopias and towards the interplay that can happen with them in a design process.

WHAT IS A HETEROTOPIA?

> *There are also, probably in every culture, in every civilization, real places — places that do exist and that are formed in the very founding of society — which are something like counter-sites, a kind of effectively enacted utopia in which the real sites, all the other real sites that can be found within the culture, are simultaneously represented, contested and inverted. Places of this kind are outside of all places, even though it may be possible to indicate their location in reality. Because these places are absolutely different from all the sites that they reflect and speak about, I shall call them, by way of contrast to utopias, heterotopias. (FOUCAULT, 1984, p. 3–4).*

According to Foucault (1984), heterotopias are utopias that exist: they are real and can be identified in current space and time. Among their features, two of them are particularly relevant for our discussion: being a counter space and their opening-closing mechanism.

With regards to being counter spaces, while utopias are no-places and often understood as ideal places to be achieved, heterotopias are different since they concomitantly exist and at the same time they do not fit within the present situation — due to embodying alternative possibilities of being. They can be understood as "other spaces", since they are totally different from the context in which they are localized and that they counterpose. They can be understood as the expression of different voices that are different from mainstream ones. They are multiple and they bring and support a plurality of possibilities without being or striving for being hegemonic, since they do not represent a specific vision but counterpose specific contextual situations at the local level — their variety and number being potentially infinite. Heterotopias have the function of either exposing real life or compensating for it:

> *Either their role is to create a space of illusion that exposes every real space, all the sites inside of which human life is partitioned, as still more illusory (perhaps that is the role that was played by those famous brothels of which we are now deprived). Or else, on the contrary, their role is to create a space that is other, another real space, as perfect, as meticulous, as well arranged as ours is messy, ill constructed, and jumbled. This latter type would be heterotopia, not of illusion, but of compensation. (FOUCAULT, 1984, p. 8).*

Furthermore, Foucault (1984) explains that heterotopic space has the capacity to allow a mixed experience where the audience is neither in one place nor in another, but rather experiencing both places at the same time within the same space. Due to their subversive nature, tension forces are generated by and around heterotopias. These forces can be intensified when someone gets in contact with

them and experiences them, since they expose reality and allow discrepancies to emerge. The latter is a situation that has the potential to unfold into conflict and even change. Due to being opposing, multiple and plural, heterotopias sustain and have the potential to sustain a particular agonistic battle, one that can articulate plural and democratic expressions. Furthermore, since they exist within the limits of real situations, they adapt to them and to their constant changes, thereby avoiding being prescriptive. There is no rejection of other possibilities, but rather coexistence of different ones.

Regarding their opening-closing mechanism, they are islands ruled by different dynamics and they are opened and closed at the same time. Even though they can be found within reality, due to their opening and closing mechanisms, accessing them is not easy (FOUCAULT, 1984). A certain permission or certain qualities are necessary (i.e., shared gestures, features, values, etc.). The possibility of accessing them is not based on someone's choice. Heterotopias do not ask you to enter them, to access them or to get in contact with them. In order to enter them, you need to share something with them, or your access should be facilitated.

While the first quality is relevant to explain why heterotopia has a greater potential than utopia for more democratic and plural future possibilities, the second one is relevant for understanding the idea of heterotopic movements.

WHAT HAPPENS WHEN SUCH SPACES MEET REALITY?

It is from the concept of heterotopia that I derive the concept of "heterotopic movements towards transition" as the way to rethink design practice. This expression comes from understanding the points of concurrency between the new understanding of reality and its evolution, and the concepts of heterotopia and utopia. "Heterotopic movements towards transition" happen when heterotopias meet present situations.

When heterotopias meet reality, that is, when someone meets and experiences them, a conflict is generated. Whoever meets a heterotopia lives the mixed experience of being in two different worlds at the same time and experiences the discrepancies between them. The misfit between the two situations, governed by different rules and values, provokes a critical reflection on what has been experienced so far, on what could have been or on what could lead to — heterotopia can be both existing utopias and dystopias — and this generates a situation of conflict. This comprehension is not new. The very feature of a heterotopia im-

plicates such conflictual disposition. What I suggest here is that this conflictual atmosphere is something that designers should recognize as being what their practice should focus on and as the key for future plural and democratic possibilities instead of utopian projection.

As a matter of fact, when this conflict happens, some turbulence and instability are created in the existing system, which allow it to gradually move from its current state to a new one. Therefore, when someone comes across a heterotopia, a conflict emerges that can lead to a new idea and desire, thereby shifting the present situation towards (and into) a new one. This encounter and conflict are productive since they reveal and create other possibilities.

The internal conflict for whoever encounters a heterotopia causes and is followed by a reaction. All this can be understood as a movement since the reaction shifts the current situation into a new one, a new place. Furthermore, this movement happens in the space and time span between the encounter-conflict and the implementation of a new action. In this space-time, a reaction is organized and informed by certain values in which whoever is involved believes and wants to pursue. The latter can belong to a utopian projection. However, what is relevant here is the emergence of these values and ability of putting them into action during the movement phase — when the reaction is organized. These values and desires are adapted accordingly to the encounter, the situation and the people involved and potentially evolving with them. Utopias exist, but only in the background: they are lived, experienced and discussed at every encounter. In this overall situation, heterotopias exist in two different moments and locations: in the encounter and in the movement — that is, in the coming together of these principles and qualities. The qualities of the desired situation exist more in the movement than in the reaction, in which they are distorted due to the need to be adapted to reality. In the movement, they are in their purest form.

I defined this movement as a heterotopic movement because it is totally different from the context in which it happens. It counterposes the situation that originated it and, at the same time, it moves forward to another situation by embodying its desired principles. This movement can be understood not only as a space in itself too, but as a counter-space in which new possibilities are generated. Furthermore, this space can be the design process, in which the encounter and consequent movement can take place.

WHAT IS THE ROLE OF THE DESIGNER WHEN FOCUSING ON HETEROTOPIC MOVEMENTS TOWARDS TRANSITION?

A design process that aims to deal with current social, economic and environmental challenges and to promote more sustainable contexts does not have to act in the perspective of future utopias, but rather look at the present situated heterotopias-dystopias and heterotopias-utopias and use them to foster a shift from the current situation to a new one.

Designers should provoke the encounter with heterotopias-dystopias and heterotopias-utopias, as well as feed the ability to recognize differences, choose and react. Following this, designers should be able to support the organization of a reaction. Lastly, designers have to support new reactions subsequent to the implementation of the previous cycle of reaction, contributing to a never-ending process.

Design becomes relevant for the potentiality of designing encounters (heterotopia-reality) that can create a perturbation, thereby generating a transition movement that shifts the current situation towards a different one.

Designers' focus should not be on a specific design process and/or on its result but rather on designing for these encounters and the subsequent movement. Design process becomes an on-going and never-ending process that aims to provoke movements that can foster changes in the present situation, not according to a specific vision, but by supporting autonomy for change according to specific local visions and situations. This will also contribute to avoiding hegemonic situations: the trajectory is always redesigned based on previous and simultaneous movements. This can support the constitution of a society with plural ways of dealing with current issues and possibilities of being.

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PART III

CHAPTER 16

REPORT
DESIGN AND HANDICRAFT

Virgínia Pereira Cavalcanti

I write this account in an especially dubious condition, on one hand as a mediator of the round table Design and Handicraft, which took place in August 2017, and on the other as a participant and observer of the transformations that have occurred in the field of design since then. The distance in time allows another perspective, expanded, which allows to see and describe the construction of a trajectory that began in 2015, when the Simpósio Brasileiro de Design Sustentável + International Symposium on Sustainable Design (SBDS + ISSD) welcomed for the first time the theme of Design and Handicraft under the tripod of sustainability.

It must be said that SBDS + ISSD had its first edition in 2007, in Curitiba (PR), organized by the Universidade Federal do Paraná (UFPR) and encouraged other partner universities to host the event in the following years. In 2009, it was the turn of Universidade Anhembi Morumbi in São Paulo and, in 2013, the Universidade Federal do Rio Grande do Sul (UFRGS), Universidade Vale do Rio dos Sinos (Unisinos) and Centro Universitário Ritter dos Reis (UniRitter) in Porto Alegre.

It was only in 2015, however, motivated by the need to understand the relationship between design [4] and handicrafts [5], observing the market pros-

pects, cultural issues and sustainability, that the theme, in roundtable format, was incorporated into the discussions held at the SBDS + ISSD. The event, on an intimate scale organized by the Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio) incorporated the relationship between design and handicrafts into the sustainability debate.

The structure of the meeting was organized in order to make SBDS a place of idea exchange defined under the tripod of sustainability, triple bottom line — people, planet, profit: 1. social pillar (people) — design, territory and culture, social innovation and collaborative models; 2. environmental pillar (planet) — ecomaterials, environmental labelling; 3. economic pillar (profit) — design and handicraft, circular economy.

On the occasion, I received the invitation from SBDS, in person of Prof. Alfredo Jefferson, to lead the first-round table Design and Handicraft, and I immediately felt the immense responsibility I had ahead of me, especially when considering the important actors who have pioneered this path in Brazil. In trying to bring together the various perspectives and experiences that guided the relationship between design and craftsmanship, the priority was to reconstruct, in part, the paths travelled for the composition of this Brazilian history, especially for the sustainability agenda.

He understood that, in order to master the theme, it was necessary to assume its singularities, outlined, above all, in the duality of a relationship that was theoretically structured at the same time as it was exercised in practice and field action. Immense was the challenge of designers and managers who were faced with the craft environment, with a social, cultural and economic environment far from that for which they were prepared academically and professionally. I needed to understand that without much training and far from the industrial environment, the design professional found new ways to produce, conceive, relate. In its majority, the methodological approaches of design that considered the perspectives of the industrial production and, although renewed with more comprehensive concepts, systemic and strategic, did not realize when of the artisanal environment.

To this was added, dealing with sustainability issues not only environmental, but essentially social and economic ones, which made the challenge even greater. It was through the experiences in the field, therefore, that much of the history involving designers and craftsmen was being built in Brazilian territory. And it was in the face of the challenge that pioneering actors, designers and artisans were forged, opening the way to new possibilities of interaction between

knowledge and doing. In this scenario, liberal professionals, governmental and nongovernmental organizations, universities and entities of the most diverse types experimenting with models and forms of action emerged. Boundaries were tested, models built along the process and forged references.

With the intention of rescuing this trajectory, the framework for the composition of the round table Design and Handicraft was defined, modelled for reflection from reports and experiences of actors who contributed to the construction of the history of the relationship between design and handicraft in Brazil. The guests brought the paths taken, stories that tell visions and experiences, diverse, rich, singular in their narratives and that made possible the interlocution of different perspectives, professional backgrounds and instances of performance.

Figure 1 – Round table Design and Handicraft SBDS 2015 (from right to left) Lia Mônica Rossi (*in memoriam*), Raquel Noronha, Helena Sampaio, Ana Maria Andrade, Virginia Cavalcanti and Rita Engler

Source: Author's collection.

I did not realize that I was also contributing, in some way, to model a history of the designer's commitment as a persuaded supporting social agent for the preservation and enhancement of the craft. The memory of the words spoken by Lia Mônica Rossi today seems to me more limpid and valuable, "the creative verbs and sustainability" that showed in no less than ten cases her process of intervention in 14 communities in the Northeast of the country.

So bold in her trajectory of more than twenty years of performance, that it is worth repeating here.

> *ADAPT a good "original design"; ADAPT traditional components to new products; FRAGMENT elements and COMBINE with traditional product; ELIMINATE waste; ELIMINATE lethal stamping process, ADAPT a good original and ELIMINATE a painful finishing process; REPLACE perishable raw material; REDUCE to optimize; ELIMINATE finishing process; DIVERSIFY to stand out; PRESERVE, PROMOTE, VALUE, REVITALIZE [...] (OLIVEIRA et al. 2017)*[1]

Active and thriving, Lia Rossi spoke with energy and brilliance, generously sharing wisdom and experiences gained in the most different corners of the Brazilian Northeast. Soon after, Lia Rossi passed away and left us missing her immensely. Here are my sincere thanks to her participation, but especially to her pioneering and enthusiastic spirit, her fiber and altruism in dealing with the Brazilian craftsman. Our respect and appreciation.

The table also brought other valuable contributions. How can we not mention here the contribution of Helena Sampaio, who added to the debate the important role of ArteSol as a national public policy to stimulate Brazilian craftsmanship. Helena Sampaio, who served as national coordinator of solidarity craftsmanship from 1995 to 2002, incorporated into the discussion a vision of public policy management within the framework of the Solidarity Community Council, already emphasizing the importance of partnerships between civil society and the state.

By establishing the advantage of networking relationships with the negotiated production of knowledge between academic and traditional knowledge, we have incorporated the anthropological vision, under the gaze of Raquel Noronha. With a conceptual approach on the "organic designer", it reinforced the inevitability of building collaborative design methodologies with the inclusion of all those involved in the project process.

As the lectures followed, it became more evident the evolution and the path already taken by designers and artisans. The signs of the maturation of this relationship became explicit with the *Laboratório O Imaginário* (Universidade Federal de Pernambuco – UFPE) experience report, by partner and friend Ana Maria Andrade. I explain: since 2001, we have shared the management of the laboratory, the challenges and pitfalls of adopting a transdisciplinary methodological approach developed and experienced by a group of teachers, technicians and students from various areas of knowledge. The collective, once again reinforced, brought in this narrative a baggage of performance in artisan communities of the State of Pernambuco and the approach of the university with the local reality.

[1] OLIVEIRA, A. F; FRANZATO, C; DEL GAUDIO, C. Ecovisões projetuais: pesquisas em design e sustentabilidade no Brasil [e-book]. São Paulo: Blucher, 2017.

The closing of that emblematic table also anticipated a perspective of social innovation on the relationship between design and craftsmanship. The understanding of handicrafts as a creative enterprise was brought by Rita Engler and it brought important reflections to the discussion of studies for local solutions and paths to sustainability.

Despite the reflections resulting from that debate, some provocations brought conceptual convergence:

- Respect for local social interaction networks and appreciation of the communities aesthetic heritage;
- The importance of understanding social policies through emancipatory principles, which must be contributed to combat situations of poverty and not to feed the condition of dependency;
- The construction of collaborative design methodologies associated with the need to admit that all those involved in the design process can be "organic designers";
- The challenge of bringing university and society closer together and confronting academic knowledge with practice, sensitizing and committing students and professors to the need for social transformation.

The compilation of this conference can be better understood in the title *Projective Ecovisions,* published in 2017, the same year in which the 6th edition of SBDS + ISSD was held, celebrating its 10 years of existence. The event would take place in Belo Horizonte, organized by the postgraduate program in Built Environment and Sustainable Heritage of the Universidade Federal de Minas Gerais (UFMG). Again, I was invited to coordinate the Design and Handicraft table, this time by Professor Andrea Franco. Armed with another look, living new experiences by the *Laboratório O Imaginário*, I accepted the invitation right away.

The challenge of composing a new table capable of promoting the production of knowledge and contributions to the field, motivated me to look for the names of the speakers. We intended to move forward in the reflections produced in 2015, guided by the reconstruction of processes and actors in the history of the relationship between design and craftsmanship in Brazil, and bring new experiences, contemporary, of interlocution of this relationship, focusing mainly on sustainability. The access to the market, still a very controversial issue, was also a focus especially recommended by the organization of the event.

To guide the framework of the Design and Handicraft table 2017, we pondered about:

- The advancement of the interlocution of design with the immense complexity of the reality of Brazilian handicraft and the self-questioning of designers about their own models and design practices;
- The diversity of interventionist approaches identified in the vast Brazilian territory and experienced by NGOs, universities, liberal professionals, government agencies;
- The limits of the relationship between design and handicraft, still apparently very imprecise and sensitive for most of the actors involved, as a result of the profound contradictions derived from technological, economic, social, cultural and environmental contexts;
- The urgency of the search for alternatives that preserve the artisanal activity while expanding the income generation of artisanal communities, in favor of more socially inclusive and sustainable development models;
- The transversal intersections that directly affect the artisanal production, such as market, management, public policies, especially regarding social and economic issues.
- This understanding came from the conviction that:
- It is essential to value cultural goods and their territories by establishing a dialogue between consumption and production, tradition and innovation, and the creation of conditions capable of boosting local resources in favor of benefits for the communities;
- The designer can and must move from the role of creator to that of mediator in the processes of intervention;
- This shift is supported by the recognition of the creative and technical potential of craftsmen and artisans, essentially in the value of the unequivocal and inherently invisible human dimension behind materiality.

Yet, under the economic pillar, the table Design and Handicraft was composed by Christian Ullmann (founder of iT projects) with provocations about the role of the designer and his social and environmental responsibility in design, innovation and management for the creation and development of products, projects, systems and services; Paula Dib (founder of Transforma Design) who presented experiences in training, rescue of techniques and adaptation of craft production in urban and rural communities in Brazil and abroad; Mary Figueiredo (proprietary partner of the brand Mary Design, from Belo Horizonte)

describing the workshops and lectures given throughout the country by Serviço Brasileiro de Apoio às Micro e Pequenas Empresas (Sebrae), Serviço Nacional de Aprendizagem Industrial (Senai), Serviço Nacional de Aprendizagem Comercial (Senac); Tibério Tabosa (researcher, consultant and process facilitator in the fields of creative economy and market access/*Laboratório O Imaginário* (UFPE) in an approach about the expanded product and the production chain of handicrafts.

Figure 2 – Round table Design and Handicraft SBDS + ISSD 2017 (from right to left) Virginia Cavalcanti, Christian Ullmann, Tibério Tabosa, Mary Figueiredo, Paula Dib

Source: Author's collection.

Christian Ullmann began his lecture by instigating a discussion about the controversy involved with market access and the role of design as a mediator of this approach. With more than twenty years of professional experience between Brazil and South America, he brought provocations that questioned the formats of the intervention processes experienced in Brazil. With detachment, he shared the challenges he faced over the years, exemplifying his own successes and mistakes.

With a degree in Industrial Design from the Facultad de Arquitectura, Diseño y Urbanismo, Universidad de Buenos Aires, Argentina, Christian Ullmann chose Brazil to reside since 1996. Having worked as a consultant in design, innovation and management for the creation and development of products, projects, systems and services, he coordinated projects for companies,

governments and institutions in Brazil and Latin America, with awards in Italy, Spain, Brazil and Argentina. Professor and lecturer of Design for Sustainability in different national and international educational institutions, he is the creator, along with Tania de Paula, of iT Projetos — an office for product development and projects with social and environmental responsibility.

Nomad was the name chosen for the workshop project, with the objective of valuing the environmental, cultural and characteristic issues specific to each location, but especially resulting from its concern in dealing with the "ready market variables". Christian Ullmann mentions the difficulty to reach, with the intervention, the layers of problems and complexity inherent to the diverse realities, in the social, economic, cultural and political sphere of each group. Christian Ullmann's report, described in this volume, truly traces a timeline that parallels the history of the relationship between design and craftsmanship in Brazil and his professional trajectory. This narrative, Christian Ullmann himself will do.

In the sequence, we were presented with the sensibility and delicacy of Paula Dib's lecture that, when invited to compose the table, brought an excerpt by Octávio Paz as inspiration:

> *The craftsman is not defined in terms of nationality or religion. He is not faithful to an idea, not even an image, but to a practical discipline: his work. His workshop is a social microcosm governed by his own special laws. His work day is not dictated rigidly by a clock, but by a rhythm that has more to do with the body and its sensitivity than with abstract production needs. While he works, he can talk to other people and even start singing...*

By raising the idea of reflecting on the relationship that we (designers) "establish with artisans and various social organizations", he pointed out:

- "The look at the context,
- For the rhythm.
- The look at me: from where I look, what do I see?
- Intervention × interaction.
- And the subtle and concrete aspects that involve this practice that I like to call 'delicate activism'".

It is not for nothing that Paula touched everyone with a light and intense talk, describing her "practice as creative, social and reflective", revealing the involvement and paths travelled in her trajectory. Founder of Trans.forma Design, Paula graduated in Industrial Design by Fundação Armando Álvares Penteado (2000) and works, since 2003, in the qualification, rescue of techniques and adequacy

of the artisan production in urban and rural communities in the Brazilian territory and abroad. Her career attests to her performance, winner in London of the International Award Young Entrepreneur Designer 2006 promoted by the British Council and Market Design Award TOP XXI, and first place by the popular jury in the category New Talents promoted by Federação das Indústrias do Estado de São Paulo (FIESP) in 2007. Participated in the exhibitions Design Possível, in Milan; Bienal Brasileira de Design in São Paulo; New World in London and 100% Design in London.

His sensitive and humanistic look brought invaluable contributions to the debate. Identifying potentialities, provoking the rethinking of the designer's social role, his performance is always turned to people. Always questioning about consumerism, the environmental impact of industrial production and social inequality, Paula has adopted Brazilian handicraft as a cause. With a trajectory of more than 30 projects with urban and rural communities in several regions of the country, she is today a reference in the humanist approach of this relationship.

In the sequence, each speaker would become more evident the indissociability between individual life stories and the format of each designer's professional performance. The speaker Mary Figueiredo reinforced this understanding by mentioning having been forged in Vale do Jequitinhonha. With few resources, she attributed her inventiveness to the ambience, characters, culture of the place where she was born. A tireless defender of the craftwork and of the potentialities of Brazilian artisans, Mary proposes to "elevate the concept of national handicraft, adding design to already known and explored techniques and others almost in extinction".

Mary Figueiredo was partner and owner of the brand Mary Design, from Belo Horizonte, for 34 years, closed in 2017, the same year that this round table took place. The writer, born in Minas Gerais, teaches in workshops and lectures throughout the country, through Sebrae, Senai, Senac and was part of the Projeto Talentos do Brasil, coordinated by the Ministério do Desenvolvimento Agrário. She was the curator of the Minas Trend Preview event and director of the Sindicato das Bijuterias de Minas Gerais. Among the awards received are the commendation Industrial Merit by Federação das Indústrias do Estado de Minas Gerais (FIEMG), José Costa Award / Fundação Dom Cabral and Diário do Comércio, for a company that makes the difference in the market and Maria Elvira Salles Ferreira trophy as a remarkable woman by the Associação Comercial de Belo Horizonte.

With a fluency and intimacy of her own, she has given us an account of years of experience with fashion creation, the various interactions with artisans and their premises. She assumes that "made the necessity the mother of her inventiveness", as well as thousands of Brazilians who, not having the resources to buy materials, recycle, reuse, reinvent. Her professional career, initiated in adolescence, personifies the creative power of Brazil and the capacity to transform objects and apparently disposable materials into artifacts with a certain materialized poetry, linked to theoretical basis and biographical texts.

The biography and life history were also determinant for Tibério Tabosa's immersion in the world of handicraft. Passionate and a collector of popular art and crafts, he has always dedicated time and effort to get to know Brazilian artisans and their crafts. Moved by this passion, he accumulated a lot of knowledge about the handicraft practices in the Brazilian territory and in the countries where he worked for 25 years as a multinational producer of mass products executive.

Tabosa, who holds a Master's degree in Production Engineering from the Pontifícia Universidade Católica do Rio de Janeiro, defines himself as a researcher, consultant and process facilitator in the fields of Creative Economy and Market Access at the UFPE research and design laboratory *O Imaginário*. Besides being a cultural producer with focus on research and studies on productive chains. Specialist in areas such as marketing, trade marketing and brand experience, he presented important contributions in an approach on the concepts of extended product and productive chain of handicraft.

With a professional profile different from the other speakers, his contribution was fundamental to instrumentalize the debate on issues related to the market perspective. Sources of financing, public policies, price formation and the various layers of the expanded product were addressed during his explanation. Mediated by both technical knowledge and enthusiasm in doing craftsmanship, he clearly and didactically traced the application of marketing concepts to the crafts universe.

The debate that followed, valuable, allowed the interlocution between different but complementary visions, experiences, training and approaches. I must humbly add my own contribution here. Acting in the coordination of the laboratory *O Imaginário* of UFPE, I have been militating, living and researching the relationship between design and craftsmanship in Brazil since 2001. I have collaborated in the formatting and implementation of the design intervention model for artisan environments and have shared the challenges faced by the Laboratory with the most diverse artisan groups in the Northeast of Brazil.

I am a designer by training, in fact, graduated in Industrial Design with qualification in product design, nomenclature in 1990. Master and Ph.D. in environmental and urban structures from Faculdade de Arquitetura e Urbanismo (FAU/USP), professor at the design department of UFPE and currently coordinator of Postgraduate Program in Design of UFPE (PPGDesign). Researcher and advisor of the intersection between design and material culture, I have always been adept at project practice. Here too, just like the speakers, my life story made the difference, I was born inside the industry, more specifically the furniture industry founded by my father. My familiarity with the manual craft comes from there. Chisels and planers were part of my repertoire from a very early age. From there to design education, the study of material culture and the relationship between design and handicraft, it was a matter of time.

At the Design and Handicraft table in 2017, I had the privilege of associating the findings of the previous table, SBDS 2015, and consolidating networks of collaboration aimed at recognizing the value of craftsmanship and its relationship with design. Armed with theoretical arguments, field experiences and reflections on the role of the designer, we moved forward in the debate and hope to have contributed to it:

- Awareness and mobilization of the scientific community for the value of handicraft and its research potential with the potentiation of the discussion of the relationship between design and handicraft;
- Awareness and mobilization of the public opinion about the value of handicraft and its potentialities for the socioeconomic development of its creators;
- Discussions and reflections that will allow deepening on the definition of the limits of action of design interventions in handicrafts;
- Search for alternatives that add value to handicrafts, fundamental to preserve the activity and, at the same time, expand the income generation of craft communities, especially in places where there are few or no opportunities for income generation;
- Reflection of the designer who intends to act in the artisan environment, fundamental to position himself in a responsible way and be prepared to deal with the complexity and contradictions inherent to the artisan craft and its artisans.

In the end, a feeling of duty fulfilled and an immense gratitude to Professors Alfredo Jefferson and Andrea Franco for the invitation and confidence.

In 2019, the third-round table on Design and Crafts was held at the 7th edition of the symposium, now named Simpósio de Design Sustentável / Sustainable

Design Symposium (SDS), held in Recife (PE). This table continued the reflections made in the 2015 and 2017 editions, discussing the valorization of cultural goods and their territories; the dialogue between consumption and production, tradition and innovation; the potentiation of local resources in favor of benefits for the communities; the displacement of the designer's role as mediator and, above all, the recognition of the creative and technical potential of artisans, essentially in the value of the unequivocal and inherently invisible human dimension behind materiality; but this is another story...

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CHAPTER 17

REPORT
NOMAD WORKSHOP, LOOK FOR WHAT, FIND OUT WHAT? LOOK FOR AND FIND WHAT THE COLLECTIVE KNOWS

Christian Ullmann

For more than 20 years I have had the opportunity to travel across Brazil and South America meeting and working with artisan production groups. The activities developed are very dynamic and most of the time involving an intermediary, a development institution that invites or hires the design consulting service to be applied in a craft production group.

The objective has always been clear, to help the group to improve some situation related to production, product/service and/or relationship between the group or with the market.

Surely Brazil, and in particular the Brazilian Amazon, is a very important reference for my work, because that is where I saw, understood and had time to think about it: making design, because the action of designing is greater than what we knew as industrial design until the 90s.

In 1995, I had the opportunity to work on an exploratory project of the Italian company Alessi — the Centro Studi Alessi, selected 7 young Argentine designers to participate in the "Progetto Biológico del Centro Studi Alessi".

And there it was, in the mecca of design in Alessi's show room in Milan, thinking possible products for a line of objects for the bathroom. But exactly one

year later I was getting involved in another project to work with native Amazon wood for the manufacture of furniture.

Only now I can understand, reflect on how things happened and why they happened:

Alessi introduced me to the daily industrial design that I had studied in Buenos Aires — all the university theory in practice, to finally achieve: impose our "project authority" and everything would work out.

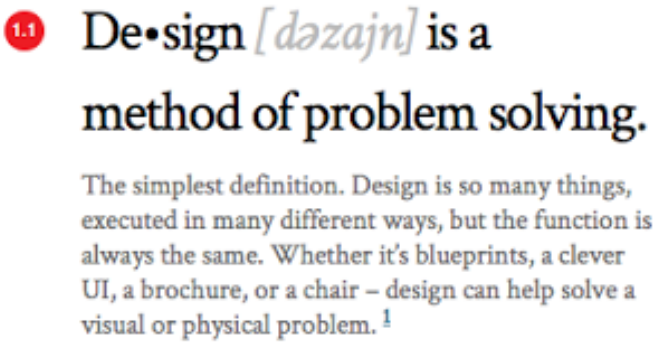
However, a year later, I began to discover the multiple Amazonian realities; another view of design, thinking the action in a broad way: to project — to project from the cultural, social references, limitations, contradictions and especially with the valorization of the natural and human.

This was a big mess in my head in many exchanges of ideas and discussions, because what I was starting to live was what the design universe would take almost 10 years to assimilate.

This "new" cut-out of the design universe, design focused on handcrafted production, gained strength, scale and recognition at the beginning of this century, in which designers, NGOs, companies, governments and, finally, the academic universe believed they had a lot to collaborate — surely this can happen thanks to the separation of the words "industrial design" and finally we were able to see and understand that "design" has more strength than industrial — that designing is more important than how we do it; handcrafted, semi-artisanal, industrial or robotized.

And when everything seemed to be getting clearer, another update arrives to the universe of Brazilian design, focused on the cut of the more commercial, corporate design, where design is seen as a tool for "problems solving" definition of — design is a method of problem solving — Wells Riley, an idea reinforced in the last decade thanks to the dissemination and popularization of the concept and methodology of design thinking.

Figure 1 – Method of problem solving by Riley



Source: Riley (2012a, b).

TO PROJECT

As we can see, the lines of thought are not few: past, present and future meet and contradictions appear — here everyone can see the lines of thought they can see and understand. But it has already been seen that we, designers, are not good at solving problems, because if this is really what we do, and we have been doing this for at least 50 years (that there is a recognized design with a university degree), today we have more problems than 50 years ago.

In punctual and very well-defined situations, I can even agree, but in general it is not easy to believe this truth as unique, broad and infallible.

If we cannot solve problems within known contexts and even "invented" as urban markets of industrialized products in an endless sequence of endless fashions.

What can we talk about the meeting between globalized contemporary urban designers with artisans and or craft production groups from the interior of Brazil or simply from the periphery of the city where we live?

We designers are in the middle, between this dubious truth and the artisans or artisan production groups waiting for answers, help or tips to improve their work.

To better understand my point of view I will quickly comment on the experience accumulated in the development of products and projects with artisan production groups:

In 1996, I had the opportunity to participate in the pilot experience of a project that proposed to combine design and handicraft of Serviço Brasileiro de

Apoio às Micro e Pequenas Empresas (Sebrae-DF), the "Tradition & Renewal" project of the Global Program for Assistance and Valuing Craft Production. After that and also in Brasilia, I had the opportunity to get involved in the project of Laboratório de Produtos Florestais of the Ministério do Meio Ambiente (LPF-IBAMA) of the Amazon for the manufacture of furniture. The involvement was of three years and many trips to the Brazilian Amazon, knowing the diversity of possible realities in the Amazon linked to the universe of manufacturing of furniture and wood objects. From areas of illegal timber extraction, areas of sustainable management, certified extraction areas, degraded areas, reforestation areas and artisans who work in the forest itself, to companies that exported the wood to be sold in Europe.

In 2000, already living in Sao Paulo, we created with Tania de Paula our design office and as we were not known and believed in the differential of the Brazilian sociobiodiversity we bet our VARIG miles and fairs in a project of development of new products from Amazonian native wood residues certified Forest Stewardship Council (FSC) seal.

Today, we understand that in the year 2000, we did everything wrong, responding to the interests and wishes of the market: we developed a product in Boa Vista do Ramos in the countryside of Amazonas to be commercialized in a store in Vila Madalena in São Paulo, and little by little we understood that this logic made no sense. We wanted to do different, to help the artisans to have more chances of selling their products. But this did not happen, or at least not in a lasting way.

We were able to see only the first layer of problems and were involved in the market demand and had a small success.

For instance, it was difficult to explain to a craftsman in a city in the interior of the state of Amazonas that the customized paper bag used in the Projeto Terra store in the city of São Paulo was more expensive than the cost of the product that was inside.

Contemporary urban market logic, where sometimes appearance and "social demand" have more weight, cost and value than the product itself to be commercialized.

Here we can understand that the logic of making design and solving problems, is only a variable of a bigger equation when we talk about making design together with artisan production groups in the interior of Brazil.

I confess that since I was a design student at Facultad de Arquitectura, Diseño y Urbanismo de la Universidad de Buenos Aires (FADU/UBA), I have difficulty responding to ready-made variables of the market and I still question what could be done differently.

Surely for this reason that together with Tânia de Paula we created the Oficina Nômade Project, valuing the environmental issues, cultures and characteristics of each place in the year 2000.

After the project in the city of Boa Vista do Ramos in the Amazon, we started our consultancy for the state handcraft programs of SEBRAEs, NGOs, companies and it was always difficult to leave the established market logic.

Little by little we understood that our "clients" were the artisans and we had to develop the projects for them and not necessarily for those who "hired and paid us", it was fun to do something in the field and in the reports of the contractor (as the contracts we signed spoke) we described what was necessary to be able to continue doing the consulting.

TWENTY-FIRST CENTURY

Between 2000 and 2010 we developed many projects together with artisan production groups, being able to expand our field of action to the five regions of Brazil and neighboring countries. And, in the different projects, we were able to see similar situations where the designer was expected as a professional full of answers and opportunities, and yes, we carried out our work in the best possible way, but always with a clear objective, from a single point of view, or at least opening little the range of alternatives to see different situations and build new possibilities that could become new opportunities.

We always manage to reach some layer of problems, but never all or a great majority. The social, economic, cultural and political reality of each group is very complex and our intervention had a very small cut-off to be able to involve us.

Between 2000 and 2010, it was interesting to compare us with other designers and or projects that also worked for this sector of design, first with designers such as: Renato Imbroisi, Fabiola Bergamo, Lars Diederichsen, Porfírio Valadares, Luiz Galvão or the Italianized Colombians Giulio and Valerio Vinaccia and/or projects that emerged from institutions and or universities such as: Cultural Capital, Tropical Design, Laboratório Piracema, Imaginário Pernambucano and Design Possível.

This decade was also important because there was a lot of discussion and a change in the definition of industrial design to design in universities and gradually the work with artisans was accepted and incorporated into classroom activities. Before that, the work with artisans was not well seen by the academy.

The consequence of this is that many projects of course completion had the subject of artisan production as a focus and then masters and doctorates. Finally, the design had a broad vision without the limitation by quantity of pieces produced or processes used.

The young people who studied design during this period created and are creating a new generation of designers with a broader vision, where the reality of handcrafted production of almost 50% of Brazil was considered, studied and even promoted by teachers and universities.

Finally, we were able to leave page 81 to enter a new universe, that of page 82 of the book *Diseñar para el Mundo Real* by Victor Papaneck (1977), where he presents the possible ways to act and develop projects with underdeveloped countries.

This way of acting described by Victor Papaneck for countries in underdevelopment has always inspired us and we were able to understand and adapt it to projects with artisans or artisan production groups. Where the first step is to develop products as he presents "for tourists or decorative".

Where we can only enchain our economy with theirs, the only thing we are doing here is to speed up the process of artisans to reach the situation we are living in. And we must agree that bringing them into our world and reality is not a big deal, from this point of view the more distant from the design the artisans can stay, the better for them.

A second moment, which he presents as "slightly more effective" is the designer living the reality of the craftsman during a period perfecting his products and projects.

And finally, we enter page 82 where the proposed evolution suggests a change of proposal and performance, where we, designers, collaborate with the formation of these artisans from the local reality, committed to their daily lives and the local context.

This suggestion is very interesting and so yes, we will really be able to think differently and, the most important, to live differently and understand which things are important and which are worth the investment in long-term projects.

The last step or "ideal solution" proposed is the formation of a body of designers from the local population involving one, two or three generations.

All this was necessary to tell you exactly what happened to us and the evolution of our work in the Projeto Oficina Nômade together with the artisans, almost 20 years have passed and we have grown together, making mistakes, adjusting and creating alternatives.

Even so, we never managed to identify ourselves in a region or with a group and change our lifestyle. But we know some designers, architects, artists and or projects that made this change: Domingo Totora, Mauricio Azeredo, Imaginário Pernambucano and Design Possível.

What we got right was the choice of the project name and what we still propose to do today and what we felt and finally we can confirm is that looking at the collective, valuing the individualities that build the group is the great differential of every group and that is what we must be attentive to identify the great ideas and opportunities.

Doing different is that, not only in theory, but in practice: doing different is really proposing changes. Because the problems are more complicated than we can understand, there are different levels of problems and most of the time our vision allows us to see the first and second layers of problems, but under them there are so many layers with bigger and bigger problems.

Developing open alternatives, multiple and dynamic, can be a first response directly connected with the context and the specific time of each situation.

Theoretical and practical of the design universe, we coined definitions of our performance and, soon after, we always discovered that something has escaped and we need to expand our own limits of understanding. It is not being different today.

Once again, thinkers, doers, teachers and students' question: what is design? What is design for? What can design achieve? Design for what? Design for who? Design why?

The current moment brings new issues related to social relations, environmental crises, inclusive projects, collaborative platforms, behavior changes, new production processes, dematerialization and, finally, the disclosure and acceptance of design thinking for all human activities.

We talk about thinking differently, we talk to groups to think differently, but we can only think for them and not with them to build a bigger reality than a market response. Let's provoke, create time and space to discover what the col-

lective knows — it is time to embrace the mystery and not leave for the solution of a problem.

The challenge is the same as that of every designer of any age: to seek new paths that change our old perspectives and certainties to enhance our projects to a new level where discussion is what really matters and quality of life is what is essential.

Constantly, I repeat that to have reached this point and to have the necessary evaluations to act in this craft design sector, it took 30 years of studies, consulting and opportunities.

And it is not in a visit, 40-hour workshop, 6-month consultancy or 2-year project that concepts, learning and results can be passed on.

We would all need 30 years of activities to be able to be at the same time, intensity to build new alternatives together and, as we already know, this is not common to happen.

To cocreate and connect ideas only makes sense when it happens in all directions and not from the designer to the group or from the institution to the group.

It is time to stop creating more problems and shortcuts to solve them, it is time for collaborative processes, to work with the diversity and complexity of the group, the local handicraft of your product and service or context.

The great challenge is to provoke and realize the collective intelligence and differential that this artisan or group has and this is not defined by the market or what the market wants, but what the artisan or group knows and wants to do.

How is this recognized? It is necessary to listen attentively for hours, days and even months, perceiving, understanding, believing and materializing the interests of the group, connecting and pollinating ideas, making visible the intelligence and wisdom of the collective.

History

1995: Participant of "Progetto Biologico" Centro Studi Alessi – Milan, IT;

1995/6: Participation with a designer in the Programa de Valorização do Artesanato do Distrito Federal. Tradition and Renewal – Giulio e Valerio Vinaccia – SEBRAE-DF, Brasília;

1997/8/9: Participant of the Projeto Madeiras em Design – LPF-IBAMA, Brasília coordination of the Prêmio Madeira da Amazônia, Móveis e Design –

LPF-IBAMA, Brasília coordination of the Projeto de Divulgação de Madeiras Amazônicas – LPF-IBAMA, Brasília;

1999/2009: Creator and curator of the exposition Design & Natureza, Shopping D&D, São Paulo;

2000: Line of table objects for the Projeto Terra Store – Boa Vista do Ramos, AM Coca-Cola toast – Itacoatiara, AM;

2002/8: Consultancy Louceiras de Maruanum – SEBRAE-AP – Balneário de Maruanum, AP consulting Oficina Escola de Marcenaria Carlo Castiglioni – EMEC – Xapuri, AC co-coordinator of the Núcleo de Inovação e Design para Artesanato – Via Design SEBRAE-SP, São Paulo. Guest researcher of the sustainable design center UFPR, Curitiba;

2006: Curator of the design for social and environmental improvement sector of the Contemporâneo of the 1st Bienal Brasileira de Design, São Paulo;

2008: Founding member of the Red Latinoamericana de Diseño Sostenible, Red Alebrije – Mexico;

2011: Project Oficina Nômade Ribeirão Preto e Região;

2013: Design coordinator of the Como Penso Como project, SESC Pompeia, São Paulo;

2014/2015: Coca-Cola Arts Collective Project – Brazilian Groups, Cooperac, Criar & Criar, Charlotte and Visart – ASTA Network, São Paulo;

2015: Oficina Nômade Novo Horizonte project, São Paulo;

2015/6/7: Coordinator of the Núcleo Exploratório de Design of Istituto Europeu de Design, São Paulo;

2017: Carpentry of Good | Instituto Leo Madeira, São Paulo.

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CHAPTER 18

RETHINKING DESIGN FROM OTHER LENSES
PEER-TO-PEER OPEN DESIGN

Samara Tanaka

For some years now I have been reflecting on design processes, especially in project contexts that seek to provoke social innovations. Researching and getting to know several initiatives, both governmental and private, and from civil society, coming from several countries, I became aware that the design processes frequently used bring intrinsic limitations. These are related to certain principles imbued in practice and to ontological understandings widely spread in the field of design, which often contribute to the creation of projects that are not in the best interest of the communities for which they are intended.

Understanding the necessity to explore this field, we started in 2013 netweaving to experiment alternative forms of collective creation in communities, consciously using some principles, perspectives and intentionalities referred to in this text as lenses. This approach was called Peer-to-Peer (P2P) Open Design and comprises several network-based initiatives that are distributed, open, with horizontal co-creations, made and incorporated by common people (formal designers or not).

Peer-to-Peer Open Design initiatives do not have features often present in a design project, such as stages, managers, specialized team, schedules. Due to the absence of these characteristics, we differentiate “project” from “netweav-

ing" — the former has definitions and limitations (such as beginning and end) and the latter is more fluid, being able to be continuous or intermittent, without time restrictions or pre-established planning, and is not restricted to fulfill a project objective. Moreover, a fundamental point in this differentiation is that, in netweaving, the relationships between the people involved are of great importance, and generally transcend the initiatives that are being undertaken.

Because it is an open and networked approach, there is no single vision about P2P Open Design, but multiple understandings constantly dialogued, which change over time. Among the common understandings that permeate the network from my point of view are that any individual has relevant contributions and the capacity to develop new proposals and solutions; that creative activity is part of human practice; that there are several intuitive design practices being applied daily by "non designers"; and that there are alternative ways to give life to sustainable and nonhegemonic solutions if we use other lenses, such as the open-source sharing and opening mentality, the new economies, the concept of commons, netweaving, to name a few.

There is also the understanding that design practices brought by "formal designers" carry with them thoughts, methodologies and project structures that may, even if not consciously, reproduce and stimulate hierarchical and colonizing relationships, both in the design process and in the form (solution) created, if there is not a reflection of the designers on the subject.

This text seeks to discuss and outline an analysis — from the perspective of a formally trained designer, author of this text — about some experimentations on ways of designing, the learning obtained, the difficulties of designing this way and what this means for the understanding of the role of the designer when acting to stimulate, promote, or create favorable conditions for sustainable social innovation in communities.

THE LENSES USED

The P2P Open Design started as one of the open social technologies of Mecca Rede (Microeconomia Cocriativa Conectiva Glocal), a network which converged people who were working with several of these technologies, such as creation of community broadband (provision and maintenance of Internet access by communities), crowdfunding, zero waste, among others. All these initiatives bring in some way elements of open source and open knowledge thinking, such as collaboration, knowledge sharing and creation of nonproprietary solutions.

Open-source thinking has been used by design communities with different degrees of openness, such as in the sharing of files and solutions (solution libraries), the means of production (in the case of Fab Labs), the creation process (as in cases of codesign where the aim is to reduce barriers between users and designers [STAPPERS, 2011]). In P2P Open Design both the solutions and the dynamics of creation are open and when there are means of production involved, they are also usually open.

Another important aspect of thinking that permeates individuals connected to this network is the concept of commons: everything for common enjoyment, which should not be alienated to private entities (BOLLIER, s.d.). Through Mecca Rede and P2P Open Design, we seek to create environments and solutions for common enjoyment or create a common good.

The new economies (shared, collaborative, creative, multi-currency) (DEHEINZELIN, 2016) are also lenses that encourage us to think about new ways to structure initiatives and to perceive resources and financial flows. Fluxonomy 4D organizes these new economy concepts into a four-dimensional flow: the first is cultural (equivalent to creative economy), the second, environmental (shared economy), the third, social (collaborative economy) and the fourth, financial (multi-currency economy) (DEHEINZELIN, 2016). The flow between the dimensions would generate sustainable solutions.

Another lens that is no less important, but perhaps less disseminated and deepened among the nodes of the network, is the one of systemic and complex thinking and concepts linked to biological systems (such as autopoiesis, described by Maturana and Varela [1995]). These point to the systemic interconnection between all that exists — a paradigm that brings deep implications for the understanding of how to act in a network, inspired by nature and life.

From a design perspective, another inspiration is the concept of design humanism described by Bonsiepe as the "exercise of design activities in order to interpret the needs of social groups and to develop viable emancipatory proposals in the form of material and semiotic artifacts" (BONSIEPE, 2011, p. 21). Although it does not broadly reflect the intentionality of P2P Open Design, the concept of an emancipatory design, which reduces heteronomy and is more democratic, as well as the idea of exploring alternative spaces of creation from a critical consciousness is one of the references for the experiments described here.

In other words, the set of these lenses brings thoughts and principles, such as: collaboration and netweaving; free sharing of resources and knowledge, along with new ways of thinking about the concept of property and assets; the

multi-currency perspective, i.e., the nondependence on a single currency — such as fiduciary — and the perception that there are other resources and forms of value being generated; the nonconcentration, which translates in a practical way in the possibility of disseminating not only resources but also triggering the embodiment of knowledge and ways of doing; the concept of emancipatory design, generated horizontally.

WHY THESE LENSES?

Behind the choice of using these lenses, there is a continuous search to understand alternative ways of living, creating and relating, which reflect values identified from critical observations and thoughts about the way we currently live, relate to each other and produce. Besides inspirations for initiatives and projects, these lenses are ways of seeing and thinking that we seek to apply in our lives and that consequently influence the way we act. It is not only a change in how to design, but also a personal change.

The necessity to rethink under which lenses the project activity was shaped came up, in my case, from analyses and observations of various initiatives of social impact and citizen participation in recent years (TANAKA, 2011), which brought reflections and criticisms about how these design activities were thought, structured and from which principles and purposes they were carried out. One of the questions that frequently occurred was the short duration of projects, which mostly ended up with lack of participation of affected communities, lack of financial resources, government changes or end of investment by companies. In these cases, the power of decision about the continuity of the project is usually outside the benefiting community.

Another obvious issue is the lack of involvement of the communities to which the solution is directed during the project conception (TANAKA, 2011). Or even the opening to participation only for appearances, in order to position oneself in an open way but not effectively opening the process. Corroborating this observation, Miessen (2010) points out the concept of pseudo-participation, a politically motivated model of openness to decision processes, which in their origin have no intention of democratization but rather a political agenda. Examples of this are referendums often used to transfer decision-making responsibility on controversial issues to society, thus avoiding further criticism.

One of the conclusions I have come to is that when the project is not thought out together, the possibility of effective interaction and incorporation is not

opened up and there is inevitably a maintenance of a position of power. When the designer sees the people who will use and benefit from a solution only as users, a relationship is created that, besides keeping the benefited communities in a situation of dependence, does not generate exchange of knowledge and networks so that these solutions are maintained by them.

Another reading about the term "user" is the type of relationship it evokes. Using more traditional design methods I realized that, when we design for users, we are referring to a passive relationship and, most of the time, a consumer relationship. While netweaving P2P Open Design, we try not to frame people as users, but to consider them as cocreators, codesigners, netweavers, or prosumers — people with agency, with an active attitude and position.

Centralized and hierarchical structures do not have characteristics of sustainability and resilience, and everything that is sustainable has a network pattern (FRANCO, 2008). Projects that purposefully build and maintain a relationship of dependency (either of financing or of access to knowledge) hardly bring with them a genuine thought and intentionality of sustainability.

With all this in mind, experiments on how to generate solutions in alternative ways, taking these lenses into consideration, began in 2013 at the Complexo do Alemão in Rio de Janeiro and continue to take place in several locations.

EXPERIENCES IN P2P OPEN DESIGN

In this section, three initiatives are described: JogaCria, Casa Livre do Altinho and Mini Bibliotecas Livres, chosen to exemplify some characteristics of both the P2P Open Design approach and the lenses identified in the previous section of the text.

Figure 1 – JogaCria at Complexo do Alemão, 2015

Source: Author's collection.

JogaCria is an open initiative of learning through the creation of games aimed at young people. From the personal interests of each one, with stimulation to the creation of games and with the creation of networks, young people seek to learn, by their own initiative and along with their peers, about diverse subjects such as mathematics, history, science and programming, with the objective of making their own games.

The initiative arose from interactions with young people at Complexo do Lins with little interest in what the school has to offer but great interest and dedication to games. From this observation and before starting to design what this initiative would be, conversations and provocations with young people led to the discovery that there was a latent desire to create their own games.

Together, we decided to hold a workshop, which at that moment was simply a way to gather interested young people and generate interactions on the subject, so that the initiative could take shape. This is a characteristic of P2P Open Design initiatives: not to start with a ready-made proposal, but with stimuli for interactions, conversations and meetings so that the whole project is thought and carried out together and everyone perceives it as a common initiative.

All the dynamics of designing this first workshop (naming, structuring, producing, communicating) was done together with two teenagers so that they could incorporate this project knowledge. The first workshop lasted three days, with high community engagement, several games created and many discoveries about

youth interests. There wasn't anybody in the role of a teacher — the exchange of knowledge between the youth themselves and other people we invited to share their knowledge in the area was encouraged. This experience worked as a first step, from it we were able to have a common understanding of what this initiative could be, and start to evolve. Many relationships gained flow and netweaving followed so that the youth themselves took the initiative to continue it.

Since then, JogaCria gatherings have been held several times at both Complexo do Lins and Complexo do Alemão locations, in different formats, depending on who was involved. At Complexo do Alemão young people took ownership of the initiative and netweaved it independently, even receiving public funding for it. Other youths in the Complexo do Lins are intermittently incorporating the dynamic, each in their own time and with their own barriers, but so far there has been no broad incorporation of the initiative in this location. It is still necessary to encourage young people to meet and continue to overcome various barriers linked to fear and the new without giving up.

Like the other P2P Open Design initiatives, JogaCria is an open initiative, it is stimulated that any interacting person becomes the initiator of a cluster and there is the desire to dedicate efforts to creating materials and sharing experiences that stimulate young people from other localities to form other clusters. Generating materials that at the same time stimulate people to have an entrepreneurial attitude, without this being a recipe ready to be reproduced (and therefore leave room for changes that are consistent with the context in which it will be applied) has been a challenge not only of JogaCria but also of other P2P Open Design initiatives.

The Casa Livre do Altinho is a convivialist space located in the community of Cachoeira Grande, one of the favelas inside Complexo do Lins, in Rio de Janeiro. It is a house open to residents of the region and other people in the network, where I live since 2016 and opened for common use. Several people, mainly teenagers and children who live in the surroundings, attend the house daily by their own will, without a call. There is no program — the visitors themselves are encouraged to suggest and carry out ideas and activities. Most of the time, the motivation is the desire to be together and to coexist, in a space that is perceived as a place of freedom. These fluid interactions in the house make possible the emergence of new ideas and actions, which occurs daily. The visitors have already organized movie sessions, workshops, plays, all on their own, simply by stimulating the creation and use of existing resources. Initially, I realized that there was an expectation on the part of the visitors that someone

would lead the activities, but over time they began to take over the space and start netweaving activities that they wanted or at least suggesting ideas that could be carried out together.

Objects present in the house, as well as provocations from the netweavers (usually house dwellers or other netweavers in the network), instigate visitors both to learn and to generate ideas. Conversations about zero waste, for example, are stimulated by the strangeness provoked by a compost bin, the separation of recyclables and organic waste — elements that provoke questioning and bring familiarity with the concepts of zero waste to the frequenters. Some local children have already built, by their own initiative, compost bins in their homes, started to separate organic waste and to grow food, which indicates a change in behavior. This learning is also perceived by the frequenters, even the youngest ones — a 15-year-old teenager reported that he attends the space because he learns more there than at school.

The site hosts temporary residents, who contribute to the flows of the house, both financial and interactive, and bring with them different world views and ways of thinking. Coexistence makes it possible to create deeper relationships, exposes conflicts, catalyzes exchanges and generates learning about new ways to coexist. The existence of this physical space allows actions to be created and becomes a point of reference and encounter that enhances ideas and joint actions.

The Mini Bibliotecas Livres initiative begun by a netweaver at the Complexo do Alemão and consists of thematic minilibraries distributed in different locations. The initial idea was simple: placing boxes with books in accessible locations, allowing anyone to read, take home and include books. What differentiates this initiative from similar ones is that it is not centered on books, but on the people who are caretakers of the libraries. We started the initiative by talking to the owner of a small store in Complexo do Alemão, with whom we already had a relationship, and, from her personal reading interests, the initial books were selected and placed in a crate. All the dynamic was done with the owner of the store (caregiver) and netweavers and together we discussed several aspects of the initiative and implemented this first library point.

The differential of the minilibraries is not only to make books more accessible, but to stimulate conversations about reading and therefore themes of interest to the local caretaker are chosen. In this first library created, the caregivers demonstrated incorporation of the initiative dynamic through the modifications they made in the crate: painting and making a sign indicating what it was and how the dynamics worked. They also started reading sessions for children who

frequented the place, that is, in fact, the caregivers started to netweave the Mini Biblioteca Livre and stimulate its dissemination. One of the wishes that emerged at that time was to generate a network among these minilibraries, generating a distributed library, so that these interactions were not only local, but this has not materialized until now. The thought of networks is present both in the way books are collected, and in the care and use of libraries, in the activities carried out locally, and in the connection that can be made between the various localities. We notice that when there is no netweaving, that is, when there is no close contact with the caretakers, the tendency is for them to give up. Even with cocreation, netweaving is essential to keep the initiatives alive.

This is a very simple and concrete example that demonstrates how the thinking of the lenses and the dynamics of P2P Open Design becomes tangible in projects in communities.

Figure 2 – Gathering at the Associação de Moradores da Cachoeira Grande, in Complexo do Lins, 2015, for the cocreation of a room for community use. Several residents created workshops to share their knowledge with the community

Source: Author's collection.

P2P OPEN DESIGN APPROACH CHARACTERISTICS

As there is no centralization of the dynamics, the characteristics identified here refer to the author's point of view. I emphasize that they do not represent or seek to generate any type of methodology. It can be said that they are perspectives, open enough for them to be incorporated and modified by whoever wishes to do so.

The basis of P2P Open Design thinking is the relational peer-to-peer (P2P) dynamics. The P2P Foundation (2006) in its wiki defines P2P as a dynamic in which there is equipotency of participants, free cooperation for the performance of a common task, creation of common good and distributed forms of decision making and autonomy. The P2P dynamic is related to ways of producing (peer production), governance (peer governance) and universal common ownership as a mode of distribution and access (P2P FOUNDATION, 2012).

One aspect that differentiates the dynamics described here and the processes adopted by a traditional design vision (STAPPERS, 2011) is the principle of equipotency of participants (or interagents). Peer-to-Peer Open Design is based on the understanding that everyone has value to add to the network, any individual is a potential designer, and there is no control of the dynamics by an authority — everything is talked about and defined horizontally (at least it is sought to do so).

In traditional design processes, even in participatory design, the designer usually has a position as the conductor of the process, defining when and in what terms participation will be open. In P2P design this fixed driving role is eliminated, since all are considered designers and noncentrality is sought.

For this to be possible, in my case, it was necessary a certain "demethodologization" of the previously incorporated design practices, by the understanding that inserting a design methodology that must be followed by everyone puts the formal designer in a command position. In order to respect the fact that the participants are equipotent, for the initiative to be distributed and horizontal, and to create together cooperative ways of doing, it is necessary to have openness to absorb distinct ways of designing (and sometimes not designing). This means that the formal designer is not the owner of the process and of the project methodologies, but only one of the participants that has specific experiences and knowledge to add.

Another characteristic is the openness of both the dynamics and the solutions created, which can be replicated and incorporated by others and become a common good. This feeds back the network, distributes the learning generated, and enables the continuity, collaboration and evolution of the solutions created. The total openness of the design dynamics also means giving up control, since the pace, design time, way of doing, quality and definitions do not depend only on a group in command.

When starting conversations about an initiative, a very relevant aspect to be considered is how to enable and stimulate the incorporation of ideas, process and knowledge by all involved, which characterizes an open learning process. It is

from these constant interactions that there is exchange of knowledge to generate solutions — all dynamics are shared and thought out together, not developed by one group and delivered to another for use.

During the development there is a joint construction, so that all participants take ownership of what has been created. In thesis, completely opening the dynamics and enabling the exchange of design knowledge is a form of emancipatory design, because it allows the participants to acquire this knowledge to apply in future modifications in the project and in any other initiatives they want to accomplish. This is an example of creating a relationship of nondependence.

During these constant conversations and interactions, it is not intended to teach design methods, but to create conditions for learning interests to arise. The learning arises from doing together, from the conversations, in a fluid way and without previous and rigid structuring of content. This fluidity is a characteristic that allows the various paces and ways of thinking to be appreciated.

The interactive dynamic of creation depends a lot on the interests of the network nodes that are interacting and netweaving an idea, so it is not a linear process, nor does it obey artificially established schedules. If there is no interest, desire, flow, convergence, there is no cocreation. In several cases, an idea hibernates for months until the flow emerges, which can occur by convergence of wills or by an effort of individuals to netweave this idea so that it comes to life.

For all these described dynamics to occur, it is necessary to netweave, which is what makes everything come alive. As there is no command-and-control relationship, netweaving is what generates connections, connects resources, keeps conversations active. It is a constant exchange that allows an initial idea or will to begin to take shape, and the participants to start to generate knowledge, language and common narratives. Netweaving is what connects networks, people with different knowledge.

The motivations for interaction or making something together are the most varied and are not primarily a financial reward. They are usually linked to interest in learning and personal concerns (e.g., intrinsic need to create or solve some identified problem). The ideas and the initiative to accomplish something together arise from the relationship and interactions, which provide opportunities for conversation, stimulation for reflection, exchange of contents and references, connections between thoughts and people, and thus spontaneously sparks and connections appear.

There are also characteristics that are part of the implemented solutions, so that they reflect values discussed by the participants, as well as sustainability

thinking. With new economies as one of the lenses used, one always tries to have a broad look at the concept of resources (mainly identifying the idle) and not to focus narrowly on monetary resources. Opening our eyes to these possibilities is a way to reduce our dependence on monetary resources. Examples of idle resources are spaces, tools, assets, knowledge. A house can be considered an idle resource that can be transformed into a common good for dozens of people, as is the case of the Casa Livre do Altinho described above.

Another important aspect is the balance between the tangible solution (spaces, things, tangible objects — "hardware") and the intangible, that is, the netweaving that gives life to these solutions ("software"). There are very well-equipped spaces that are not used by people because the netweaving was not taken into account as part of the project activity. Examples of this are the several Fab Labs that often show low incorporation of the dynamics by visitors.

The other values previously discussed, such as sharing what is possible for common use, prioritizing forms of financial sustainability that do not generate dependence and concentration, using language that facilitates absorption and incorporation of the dynamics on the part of those involved, are examples of aspects that we try to bring to the solutions.

The design and creative dynamics in itself do not have a methodology to be followed, but what frequently occurs is the stimulation of critical thinking and an active attitude towards problem solving. This arises through conversations and questioning that encourage people to reflect and perceive a problem or situation from other angles. An example of this was an interaction with a teenager who mentioned a problem of lack of dumps in the Complexo do Alemão. She reported problems with garbage collection and the impact this had during heavy rains. Through a conversation with questions that urged her to think about ways to solve the problem and to have another attitude towards it, she came to the conclusion that there were materials, people and knowledge available to build garbage cans and that this would be an alternative way to solve a problem that the public authorities do not solve. She then built a small-scale model of the dump and other people came together to build a second life-size version. This kind of thinking is in part nothing more than what is already done daily by various people, especially in economically disadvantaged communities — they are the quick fixes, or *gambiarras*, and ways of solving problems from the resources available.

This is an example of the wealth of local knowledge, which together with other thoughts (such as those of new economies, networks, virtual distribution) and design knowledge may gain other dimensions and pollinate. This kind of in-

sight that has just been reported is often generated in P2P Open Design interactions, but it usually depends on many interactions, conversations and meetings. This interactive dynamic is also important for the incorporation of the dynamics by the ones who are interacting and for common narratives to be formed. As they are fluid interactions, with no start and end date, the information must always be circulating because new people can insert themselves or withdraw from the dynamics at any time.

Peer-to-Peer Open Design is not only related to the activity of cocreating solutions themselves, but also to the creation of adequate conditions for this activity of cocreation to take place, that is, for solutions to emerge among people. Concepts that have some similarities to this, such as infrastructuring (HILLGREN, 2011) and seeding (MICHELIN, 2016) were addressed by other authors.

As already mentioned, this initiative is not only a way of designing, but also of living and coexisting that reflects certain values. P2P Open Design is based on empathy, affectivity and relationships and these have a relevance that should not be minimized in the face of a cocreation activity. Thus, coexisting is essential both for the emergence of solutions and for establishing and maintaining the flows of relationships. From being together, from constant exchanges, connections are made in a fluid way and thus new projects and netweavings are initiated.

For this reason, many meetings — face-to-face or virtual — are encouraged so that these exchanges and sparks occur. Having a flow of people who bring new thoughts and perspectives, who live in different places, enhances these meetings and the formation of connections.

Figure 3 – First P2P Open Design meeting at Complexo do Alemão, 2013

Source: Author's collection.

HOW THE EXPERIMENTATIONS HAVE TRANSFORMED THEMSELVES?

Along the P2P Open Design netweavings many transformations took place. The first meetings used as basis some traditional design formats for cocreation: materials for prototyping, mural for identification of problems and solutions, date and time scheduled for the interactions to take place in a given space. Over the weeks we realized that this configuration was alien to the location, it was not a natural form of interaction, and people started to go less and less to the meetings in this fixed place. So, we started to walk around the surroundings and talk to people in the places where they were: bars, streets, squares. In the following months, getting to know more people and creating relationships, we started visiting their homes and the meetings started to be more and more distributed and fluid. The cocreation started to happen during the conversations, wherever we were, and only if there was the will to do it. The intention with the visits was not to generate projects, but to nourish affective relationships. Thus, the networks were formed and maintained both in the Complexo do Alemão, the Complexo do Lins and other places, such as the Parque da Cidade in Niterói.

We realized with this the importance of conviviality for relationships and the importance of presence to generate mutual trust. This perception has generated several changes in our actions, including leading to the beginning of E2GLATS (Estação Experimental Glocal para Ciências Abertas e Tecnologias Sociais P2P), which values the various localities and conviviality in its surroundings.

CHALLENGES AND DIFFICULTIES

There are difficulties common to several of the network initiatives. And there are others that are related to each regionality. One of the main difficulties is that the initiatives and netweaving are indeed incorporated in a distributed way. There is still a behavioral expectation that someone will take over the role of leader or manager and for a distributed horizontal initiative to sustain itself, a significant change in perception and behavior is necessary. In the case of JogaCria, for example, several young people have the conditions and knowledge to be netweavers, but they lack the confidence to do so. This self-perception of capability, along with an entrepreneurial attitude, in many cases take time to develop and do not develop in everyone.

Over time, we come to understand that from a sustainability and networks perspective, there is a flow of initiatives that emerge and die and that they do not necessarily need to be maintained for a long term. Through relationships, new initiatives emerge, others are transformed. Even with this understanding, I consider that one of the difficulties is to be able to maintain the initiatives (or the interactions for them to materialize), especially when the initiatives involve people who live in places of great instability (for example, due to violence, the case of the favelas of Rio de Janeiro) or when changes occur that make their lives unstable (loss of income source, for example). In the communities in which we live, these situations are common and contribute to frequent interruptions, reducing the energy employed in these initiatives.

For some time, we have been cocreating environments for the generation of diverse multicurrency flows, but not yet generating sufficient financial flows through them for the maintenance of the netweavers' needs, which eventually causes intermittences or temporary asynchronies.

Because initiatives need netweaving to come to life, they can take longer to be incorporated and materialized than a traditional process and make people discouraged. For something to be created together, convergence is needed.

Maintaining the weaving of networks to enable convergence to occur is one of the challenges.

There are other difficulties that are common to other dynamics, such as how to deal with the freedom of an open learning process. We perceive a tendency to give up when the dynamics is very open, probably due to the habit acquired in schools, where we are often trained to receive stimuli in the form of command. Although it is a more generic difficulty of learning, it is essential for P2P Open Design because all the time we stimulate the learning and incorporation of what is being cocreated.

A differential of the dynamics are the ways of sharing and documenting learning and solutions so that they can be incorporated by other people. Currently, the sharing (pollination) is done through personal interactions and the documentation is done individually, by whoever wants to do it, which restricts its dissemination. Being able to document and narrate experiences in an intelligible way, for people who are not interacting, demands a great effort and there is not always a perception of value on the part of the netweavers to employ efforts to do so.

In conclusion, there are many difficulties and challenges when it comes to such a broad change of perception, which involves various aspects of our lives, our way of relating to other people and our way of producing. Unlike a traditional design process, where it is desired and practically certain that following a methodology a solution will be reached, in P2P Open Design there is not necessarily this expectation — the dynamics seek to bring changes in perception that go far beyond the creation of solutions.

Although there is an intrinsic personal desire to see various solutions materialized and implemented, I realize that the generation of these relationship networks is the change itself (FRANCO, 2008), that the very act of seeking to talk and generate interactions on alternative ways of creating and shaping our environment stimulates and creates conditions for these changes to occur spontaneously and in a distributed way.

Observation by the author: the thoughts and initiatives developed had influence and emerged from conversations with several people, including Vinicius Braz Rocha (initiator of Mecca Rede and E2GLATS), Letícia Santos (netweaver and initiator of Mini Bibliotecas Livres), Jonas Bezerra Alves (netweaver JogaCria), Vânia Trindade (netweaver), among others.

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