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Circular Economy, Systemic Design and Social Development in Emerging Economies

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## **ABSTRACT**

Circular Economy-CE is a systemic change that builds resilience in the long term, creates business opportunities and innovative solutions for the economy, providing environmental and social improvements. However, CE guidelines do not include how to deal with the systemic design of 'circular relations', that should involve the low-income population, as promoters and actors of sustainable development, imperative in emerging economies such as Brazil. This article investigates the lack of theoretical and practical structures, in the convergence between CE and design, which may guide the design of circular, systemic relations for socio-ethical development, proposing a bibliographic review of the CE concepts and guidelines, along with a brief evolutionary description of the approaches of Design for sustainability. Finally, present Brazilian case studies to discuss the power of organized vernacular actions for the inclusion and social development of the marginalized members of society, favoring socioeconomic development in an ethical and equitable way of needy communities within CE systems.

Key Words: Circular Economy, Systemic Design, Social Development, Emerging Economies

## 1. CIRCULAR ECONOMY: SUSTAINABLE ALTERNATIVE FOR LINEAR ECONOMY MODELS

The Japanese concept of *Mottainai* expresses that it is a shame for something to go to waste without having made use of its potential in full — something that happens with regularity in a linear economy (UNIDO, 2018, p1).

The consequences of the anthropocentric vision of man in the world today subvert the status quo by imposing a new paradigm: sustainability. Reversing the post framework involves collective consciousness, systemic and network action, and profound changes of values, which must necessarily migrate from 'having' to 'being' (Manzini, 2003). The Circular Economy, aiming at the overall health of the system, represents a systemic change that builds resilience in the long term, creating business opportunities and innovative solutions for the economy, providing environmental and social improvements. (Ellen Macarthur Foundation, 2013).

The Circular Economy (CE) model was born as an alternative to the Linear Economy (LE) model, which, in general terms, is based on the logic of 'Take, Make and Dispose', without considering the limits of natural resources and resilience from nature. The LE emerges simultaneously to capitalism mass production and consumption, and has been strengthened by globalization (Blomsma & Brennan, 2013). The linear structure represents the basis of the problems that underlie the paradigm of sustainable development, as it promotes the rapid degradation of the environment and its natural systems, stimulating the inconsequential waste. According to Rifkin (1980), these results are equivalent to the entropy of the planet and its systemic effects have disastrous and irreversible consequences in the short, medium and long term, both in nature, economy and society (Lewis & Gertsakis, 2001).

As a viable option for LE, the Circular Economy model has its theoretical matrix in systemic thinking, which considers the complex network of retroactive interactions between choices and results, offering guidelines to make them more effective and efficient in all dimensions of sustainability, being therefore, being more fit with the present and future needs of the use of the resources of the planet.

The more careful observation of living natural systems results in increased efficiency and effectiveness in the use of their resources. The CE is inspired by biological processes, which are structured and organized in continuous and circular transformations, without significant losses of matter or energy. In the Biosphere there is no hierarchy, but a network of relationships in which there are no degrees of importance, only functional and homeostatic diversity. There are also no linear certainties, since their cyclical functioning depends on the **feedbacks** that guide self-referencing and self-organization.

As a systemic science, where all structure is seen as the manifestation of underlying processes and whose thinking is always procedural (Capra, 1997, p.40), Circular Economy has core processes and its connections. It is inspired by the efficiency of the natural cyclical functioning of life and considering the interventions of human activities in these. The EC proposes as principles: a) To eliminate waste and pollution by (in) principle; b) Maintain products and materials in cycles of use; c) Regenerate natural systems.

These principles lead to the dematerialization of production and, in cases where this is not possible, lead to the permanent use of raw materials and full use of the energy in product transformations [within the maximum allowed value], diluting it by the greater possibility and amount of use [work] of the final product. These strategies, aiming at maximum effectiveness and efficiency of the life cycles of raw materials and products, should be conceived simultaneously with any human activities that demand (energetic or material) natural resources, (Arthur Foundation, 2013, 2018). In general terms, the CE focuses, in particular, on avoiding waste by migrating the thoughts from 'waste as a problem' to 'waste as an opportunity', avoiding or reducing the global entropy caused by technological cycles,

by means of system feedback. In Circular Economy projects and to meet the first Principle of Systemic Design, the Ellen Mac-Arthur Foundation suggests as guidelines:

Guideline	Orientation
Design without residue	Biological materials composted. Technical materials such as polymers, alloys and other synthetic materials are designed to be reused with minimal energy and higher quality retention.
Create resilience through diversity	Modularity, versatility and adaptability are characteristics to be prioritized.
Use renewable energy sources	Prioritize renewable energy and avoid energy from non-renewable resources.
Thinking in Systems	Understand how the parties influence each other within a whole, and the relationships of the whole with the parts. Systemic thinking refers to: non-linearity, feedback, interdependence.
Waterfall thinking	Processes feed other processes, in a circular way.

[Figure 2]: Circular Economy Guidelines. (Source: based on Ellen Mac-Arthur Foundation, 2018)

The concept of Circular Economy, proposed by the Ellen Mac-Arthur Foundation (2018) and accepted by other institutions, describes it as restorative and regenerative precisely by design involved, through the contemplation of two types of material cycles: biological - capable of being reintegrated in the biosphere and technical - destined to be revalued without entering the biosphere (Bompan, 2017, p. 18). Aware that the word 'design' has many meanings and yet, considering Design's scope of action for sustainability in the last decades, it can be said that it is right in this context to use the word Design as a 'strategic discipline' in promotion of Circular Economy.

## 2. DESIGN FOR CIRCULAR ECONOMY

In order to design in a circular way, Design must use systemic thinking and ability to manage sets of elements that may at first appear disconnected or even irrelevant. Systemic skills and thinking are being explored at varying levels of breadth and depth through design approaches that address sustainable development issues. Since the 90s of the 19th century, XX, Design has expanded its scope of action, first addressed to environmental and economic issues, now evolved in complexity, encompassing in its attention spectrum, the social dimension, nurturing multidisciplinary knowledge that has culminated in its systemic performance.

Without seeking to extend the discussions about the epistemological evolution of sustainability in the discipline of Design, it is worth giving a rather reduced view of the main methodologies that integrated these areas and the evolution of the systemic approach in Design, as proposed by Ceschin and Gaziulusoy (2016):

- *Environmental Approachs* - ecodesign, green design, emotionally durable design, design for sustainable behavior, cradle to cradle design, biomimicry design.
- *Systemic Approachs*: product-service system design, design for social innovation; systemic design; design for system innovations and transitions.

Ceschin and Gaziulusoy (2016) points out that the design methodologies for sustainability were primarily focused on the environmental requirements of the products, developing methodologies, tools and instruments for the design of intrinsically sustainable artifacts. This position had its turning point facing the insufficiency of these actions in overcoming the sustainable paradigm and the need for an extremely radical change - the dematerialization of production and consumption.

As a possible solution, within the current social reality and when it is impossible to offer pure services, the design proposes the union of product with services for the satisfaction of

human needs and extends its performance to the development of multi-actor satisfaction systems, known as Product Service System, or PSS (Manzini & Vezzoli & Clark, 2001). At this moment, society shifts from the situation of the spectator, with power of choice, to that of a fundamental actor in the paradigm changes, when he is called to abdicate ways of life and consumption with individualistic and centered tendencies for those collective and centered in human being (Manzini, 2003). Although the proposal of a human-centered view may seem merely anthropocentric, it is worth remembering that this methodology also advocates the consciousness of the limits in the relations of human beings with the surrounding environment.

This approach radically subverts the historical role of design, which shifts from being a product designer to a developer of systemic solutions, paving the way for the emergence of approaches such as Design for Social Innovation, Systems Design and Systems Design for Transition and Innovation.

### 3. DESIGNING INCLUSIVE CIRCULAR ECONOMY: AN APPROACH FOR EMERGING ECONOMIES

Nowadays it is understood that all the choices drawn by design with objectives to promote sustainable development are only possible with the active participation of all social actors, without exception and in a systemic way. To illustrate this statement, the example of the mineral water bottling company, Santa Joana, is based in Pernambuco State, Brazil. Aiming at reducing the environmental impact of its bestselling product - disposable bottle of mineral water, 500ml - it promoted its redesign that reduced by 70% the amount of raw material used in its manufacture. As a result, the packaging has become much lighter and more compact, improving its environmental performance in the pre-production, production and distribution phases. Despite this, a specific strategy has not yet been developed to direct the post-consumer waste.

The material used in this package, Polyethylene Terephthalate - PET, despite being derived from petroleum, nonrenewable source, has a high degree of recyclability and if it returns to industry, can be used as a material of consecutive life cycle for new products. It is at this point that social actors should act as agents for sustainable development, participating in the system that redirects PET back to productive processes. However, this does not actually occur!



[Figure 2]: Sustainable redesign of the 500ml mineral water bottle - Santa Joana and uncontrolled disposal in the subway of Recife - PE. (Source: [www.thepicta.com](http://www.thepicta.com); <https://www.viabilizze.com.br/project/naojogomeulixonarua/>; author).

This example points to limitations in design approaches that focus only on the economic and environmental dimensions, while showing the need to involve the social dimension in design-oriented systems for sustainability. It is observed that even actions considered basic on the road to sustainable development, such as material recycling, are only effectively possible if there is not a systemic planning that counts on the participation of social actors in the various levels of action.

Thus, it is understood that, while recyclability is a property of matter and reuse is a product quality, circularity is an attribute of the system. This means that when it comes to a physical product, all its characteristics and properties are sustainable and especially those related to the end of the life cycle, they remain dormant until activated by the system, which in many cases, requires the adhesion of society.

However, based on the heuristics and guidelines of the Circular Economy, there is no allusion to the role (s) exercised by society in the systemic organization required by sustainable scenarios and this is one of the weak points of the Circular Economy, according to the UN. Aware of its strategic importance for Sustainable Development to UNIDO (2016), it encourages the adoption of the CE to break with the linear model, but in its introductory document on the subject, it brings to us the following alert:

We find this vision of the future compelling, but we also see reason for concern. While the circular economy takes into account two pillars of sustainability—environmental and economic performance—it risks leaving out an essential third pillar: inclusiveness. Simply put, the circular economy could cut poorer countries out of the global supply chains they’ve worked so hard to enter (UNIDO, 2018, p. 6)

In Brazil there are many examples of Circular Economy in the field of solid waste recycling, mainly in the industrial sphere. The National Council of Industries-CNI, for example, maintains the Integrated Waste Exchange System, which allows the negotiation of these as raw materials within the industrial circuit itself, as proposed by the first EC Guideline (CNI, 2018). According to CNI, Waste Bags are information services created to identify markets for waste from productive activities. Therefore, they are important waste management instruments whose main function is to serve as a guide to promote business opportunities in order to avoid waste and allow better quality, lower costs and lower environmental impact. However, in peripheral countries like Brazil, recycling transcends the intra-industrial perimeter and moves social systems from the bottom of the pyramid. Circumstances of 'inclusive' economy sometimes multiply spontaneously, especially among the marginalized population and with less economic and social development, which finds in pre and post-consumer waste, their main source of their income while avoiding problems arising from its premature and indiscriminate disposal (Figure 3) (Carmo, 2009).



[Figure 3]: Garbage Collectors - part of the social cycle of the Circular Economy in Brazil. (Source: <http://www.cmc.pr.gov.br/> & [www.mobilizadores.org.br](http://www.mobilizadores.org.br))

In addition to spontaneous actions to collect and sell recyclable products after consumption, there are some Circular Economy projects in which industries join communities, exercising their social responsibility and assisting in their development. This is the example of several car manufacturers in the metropolitan region of Curitiba - Brazil. Many parts used in their final products are imported, packaged on treated solid wood pallets and whose responsible destination must be included in their Solid Waste Management Programs. In the circular composition, this wood is sold at a symbolic price to Mecos Madeiras Remanufacturers, a cooperative located at Fazenda Rio Grande, which associates about 100 workers, responsible for transforming the pallets into new products, commercialized, among others, for the food and for energy recovery. Pieces of wood not used by Mecos, in turn, are donated to a craftsman from Curitiba, who manufactures small solid wood products for 'Bendito Banho', a family-owned artisan company that operates in the personal care and perfumery sector (Figure 4). Bendito Banho, valuing the life cycle of packaging, created a product-service systems that include recharges of aromas for environments, avoiding premature discarding, thus contemplating the principles of Circular Economy.



[Figure 4]: Solid wood remanufactured – Curitiba, Brazil. (Source: Author)

Another significant example of inclusive EC is the work developed by Gabriela Mazepa, born in Curitiba but who has worked in different parts of the world such as France, England and Sri Lanka. In Brazil she lived in Rio de Janeiro for a long time and currently manages her *Re-roupa* project at her atelier in the city of São Paulo. During her years in Rio de Janeiro, one of her many projects was the development of a fashion collection from textile waste inspired by the stories and traditions coming from the residents of *Cidade de Deus*, a community where people with very low purchasing power live. The collection garments were produced with the participation of seamstresses from the OSAMI cooperative (Social Work of Support to the child and the Elderly). Mazepa not only gave the small local producers an opportunity, but also presented their collection paraded by young people from the community, valuing their beauty and paying justly (fair trade) strengthening their self-esteem (MAZEPA, 2017).



[Figure 5]: The work of Gabriela Mazepa using upcycling with disadvantaged communities. (Source: Mazepa)

These examples illustrate the transformative capacity for integrating low-income population in the process of Circular Economy and its positive effects on sustainability, especially in peripheral countries and regions of socio-economic vulnerability. However, although UNIDO (2018) points to this as a virtuous direction and emphasizes the possibility of inclusive circular processes in assisting socio-ethical sustainable development and reducing social inequality in emerging economies, this is still not detailed in the Circular Economy guidelines.

#### 4. CONCLUSION

The non-observance of social impacts, when adopting the circular economy initiatives, affects its efficiency. To achieve Sustainable Development, it is more important to integrate man in this process than looking at the relationship between the environment and the economy, since it is this man that will structure and strength these relationships, using as platform, their habits, their beliefs, their culture and their values.

Sustainability is based on the balance between the three basic pillars and, above all, social equity (UN, 1987, 1995). This assertion is constantly reinforced in the base documents for Sustainable Development. Therefore, in order to EC to be really an alternative to Linear Economics, it is imperative to also pay attention to the human being, and this obviously results in an increase in the complexity of the system with the involvement of subjective issues inherent to the human species, requiring thoughts and complex systemic actions.

The examples presented in this paper confirm the validity and importance of the inclusion of the social pillar in circular economy systems, especially in emerging economies such as Brazil, where the population has long seen in the residues of industry or consumption waste as raw material for survival. Thus, considering this question as fundamental and observing its absence in the heuristics of CE, it is necessary to adopt measures that bring the social dimension as a fundamental pillar from systemic and circular design.

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