PRODUCT-SERVICE SYSTEM FOR SUSTAINABILITY: REFLECTIONS FROM AN APPLICATION ON THE FASHION SECTOR

KARLA SCHERER, MSc Candidate | UFPR
MARCELLA LOMBA, PhD Candidate | UFPR
AGUINALDO DOS SANTOS, PhD | UFPR

ABSTRACT

The pandemic caused by COVID-19 deepened the economic and social discrepancies throughout the world, especially in developing countries that presented severe difficulties in controlling and combating the virus, such as Brazil. It resulted in an increasing number of people in situations of social vulnerability. The fashion industry has suffered harsh consequences due to the confrontation and combat of the coronavirus. This article describes how a sustainable fashion company guided by the Ecodesign strategy can offer more equity and social cohesion to women in vulnerable situations. Through this perspective, companies could collaborate to reintegrate these women into remote working activities, recovering their self-esteem and supporting local culture. This article aims to share the identified barriers and highlight recommendations for companies that seek to contribute socially with artisans in situations of social vulnerability. This research concludes by proposing design guidelines, resulting from the application of the Design Science method and oriented to services for sustainability to create or adapt services during and after the pandemic, aiming at a better balance between equity and social cohesion for local community groups.

KEY WORDS

Design for sustainability; Sustainable Product-Service System - PSS; Distributed economy; Social vulnerability; Sustainable fashion.

1. INTRODUCTION

This research results from a case study carried out with a sustainable fashion company that designs accessories for retail customers with strong influence in the Brazilian market. These accessories are produced by reusing waste from local industries, applying the concept of Ecodesign, which aims to extend the life of products and allows identifying environmental impacts generated at each stage of the lifecycle, making it easier to make strategic design interventions (CESCHIN & GAZIOULUZOY, 2020).

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Part of the collections produced involves the collaboration of women from the local community, who participate in workshops at CRAS (Social Assistance Reference Center), where they receive training, materials, and guidance regarding customer expectations. However, the pandemic scenario caused by COVID-19 drastically affected the economy and productive sectors such as Fashion, making it impracticable to carry out handicraft workshops in groups. Derived from this context and aiming to expand its collaborative network between communities, a question emerged: How to enable distributed work in the fashion sector for craftswomen in situations of social vulnerability?

Although Ecodesign strategies focus on the environmental dimension of sustainability, the other dimensions: social and economic, are being explored with less emphasis. However, the company seeks to increase its efforts towards a better balance between these dimensions. Guided by Design for Sustainability, the research aimed to increase the balance between the social, environmental, and economic dimensions by establishing the following objectives: Integrate the fashion accessories development model based on Ecodesign; Promote the local economy; Facilitate remote and distributed work due to the pandemic and favor the inclusion of women on social assistance in the local community. Guidelines oriented to the management of environmental impacts in which all environmental aspects of the organization are coordinated systematically and with integrated structures (SANTOS *et al*., 2018) were also object of this study to position the company in a more mature sustainable stage.

2. LITERATURE REVIEW

2.1. Design for Sustainability

The concept of sustainable development discusses, as Vezzoli *et al*. (2018) highlight, the systemic conditions in which socioeconomic development occurs, both in the global or local sphere, considering the limits of resilience, ensuring the natural capital to future generations and priming for the equitable distribution of resources that enables universal right to environmental space. Thus, the Design for Sustainability approach approaches the ability to develop by quickly adapting to changes in the economic and commercial environment in a sustainable way, meeting human needs, preserving natural resources and local communities in the long term for human society (CRUL & DIEHL, 2008).

As Crul & Diehl (2008) explain, design for sustainability includes strategies limited to product and product lifecycle such as Green Design and Ecodesign but is closely related to broader concepts that involve developing sustainable product-service systems and systems innovations. Ceschin & Ídil (2020) detail the levels of evolution of approaches in design for sustainability that began in the late 1980s and early 1990s with the initial responses oriented solely to the product, exemplified by Green Design to the level that contemplates socio-technical systems as occurs in the Design for sustainable transitions.

2.1.1. Economic Dimension

Design for economic sustainability has the role of promoting changes in attitude regarding the decentralization of the economy, fair trade, respect for the individual and his community, as well as proposing new models of consumption and business guided by the dimensions of sustainability (SANTOS *et al*., 2019). The economic dimension of sustainability promotes economic evolution fairly and ethically, promoting economic development instead of the unrestrained growth of the economy, which does not consider the resilience of environmental resources. According to Santos *et al*. (2019), it presents a new economic paradigm guided by the following values and stances: solidarity; development; small scale; cooperation; distribution; well-being; intangibility; service-based; ethical and fair; sharing. The author also adds that a sustainable business model enables the creation, delivery, and capture of value that benefits all those involved, such as the company, customers, suppliers, the environment, and society. Among the innovative business models that have emerged from this sustainable approach are the sharing economy, blue economy, and social entrepreneurship.

2.1.2. Social Dimension

Santos *et al*. (2019) defines a sustainable society as being able to achieve individual happiness and harmony with other individuals and nature through the satisfaction of the individual's needs, the promotion of well-being, the appreciation of culture, and the reduction of social inequality, promoting improved quality of life. The social dimension considers human capital and seeks to promote a society with more social cohesion and equity, ensuring all rights (SANTOS *et al*., 2019). However, the utopian essence of this dimension reveals significant challenges to achieve a fairer and more egalitarian society, such as economic inequality that favors the inclusion of individuals in situations of social vulnerability.

- Social Vulnerability:

The social vulnerability term does not have a single meaning, as revealed in the discussion on Social Vulnerability in Brazil described by IPEA (Institute for Applied Economic Research) in 2018. Still, it derives from broader social processes against which individuals, on their own, do not have the means to act and depend on public policies from the State to change this condition. Prowse (2003) describes the implications of multiple meanings about the topic referred to as vulnerability, poverty susceptibility, poverty symptom, as well as social unwellness, suggesting that this last is not necessarily limited to poverty. Social well-being and quality of life are concepts that transcend financial status and consider the availability of public services, environmental quality, and the levels of individual and political freedom offered by society (Sen, 2001; Rocha, 2000; Barros, Carvalho, and Franco, 2006; Codes, 2008).

The Human Development Report (PNUD, 2016), cited by Santos *et al*. (2019), describes residents of vulnerable localities, predominantly composed of women who have low or no power of negotiation, interlocution, and participation that enables them to exercise their full citizenship.

In 2004, the Unified Social Assistance System was created in Brazil, which enabled the creation of the Social Assistance Reference Centre (CRAS), described by the Citizenship Ministry as the main public access to social assistance for people in vulnerable situations. The objective of the public institution is to offer Social Assistance services to strengthen the coexistence with the family and the community. Also, CRAS aims to promote community actions to face challenges such as lack of accessibility, violence, child labor, lack of transportation, reduced quality of services, absence of leisure and cultural spaces. Besides the services mentioned above, CRAS also offers courses and workshops through local partners to provide knowledge, such as handicraft workshops.

The agency serves families, severely unprotected individuals, people with disabilities, the elderly, children removed from child labor and beneficiaries of government programs such as *Bolsa Família* and the Continuous Cash Benefit.

- Cohesion and Social Equity:

Social cohesion and equity are the core concepts highlighted by Santos *et al*. (2019) for the social dimension of sustainability. The author characterizes social cohesion as an assumption that allows society to establish a minimum level of well-being and emphasizes that cohesion is revealed through the convergence of attitudes and opinions to pursue high values such as freedom, fraternity, and equality.

Social equity is associated with reducing social, cultural, economic, and political barriers that deepen social inequalities and exclusion of individuals (SANTOS *et al*., 2019). In characterizing the difference between equity and equality, Santos *et al*. (2019) conclude by pointing out the paradox that while seeking to achieve more equality, it is often necessary to treat those in social inequality unequally. This balance in the fair distribution of services and resources distinguishes social equity.

2.1.3. Environmental Dimension

The environmental dimension is probably the most explored by sustainability-oriented practices. The first design actions on sustainability were directed to the reduction of environmental impact. Santos *et al*. (2018) lists the following strategies that aim to reduce these impacts: choice of resources with low environmental impact; optimization of the lifespan of products and services; extension of the lifespan through the revaluation of materials and easy assembly and disassembly. According to the author, the design contributes to the environmental dimension of sustainability in the environmental improvement of production and consumption flows; environmental redesign of the product; design of new sustainable product; design and implementation of product-service systems; and new scenarios of sufficient consumption.

Contributions to impact reduction depend on the role of stakeholders and strategies adopted. Companies, governments, designers, communities, and individuals have a crucial position in promoting these strategies. Santos *et al*. (2018) highlights those strategies for sustainability applied by companies depend on their stage of maturity, characterized in 7 levels. The first stage, inactivity, consists of an absence of environmental practices and knowledge about the problems. The second stage, awareness, reveals an initial contact with the environmental implications. The third stage, reactive experimentation, may lead to greenwashing practices. Proactive experimentation, pertinent to the fourth stage, consists of isolated practices in the portfolio of products, services, or processes. The fifth stage involves expanding projects associated with the environment but not coordinated in an integrated way. The sixth stage defines integrated management in which the company seeks to organize all its environmental aspects in an organized and structured manner. Finally, the seventh stage enables proactive action involving the entire production chain and the client, influencing production and consumption standards, as well as enabling environmental regulations and legislation. Understanding the stage at which the company is inserted allows the designer to act to lead the company to a higher level towards sustainability.

Another essential agent in applying strategies for collective change is the government, which can act in programs and projects to encourage research, efficient consumption, clean production, circular economy, organic and biocompatible products, seals, labels, and certificates. Social innovation and its association with product-service systems make it possible to promote behavioral changes in communities capable of fostering economic, political, and social transformations focused on collective well-being. However, Santos *et al*. (2018) emphasize that the leading agent of sustainability is the individual because it is through him, the behavior change begins. The designer in this context can promote significant changes through production, consumption, experience, and usability oriented to the individual and the collective.

2.1.4. Design PSS for Sustainability

The Product-Service System Design for Sustainability is defined by Vezzoli *et al*. (2018) as being a set of products and services able to meet the demands and specific needs of the consumer, delivering a unit of satisfaction that interacts with the stakeholders and where the interests related to competitiveness and economy of suppliers seek new solutions, continuously, in order to bring benefits for both environmental and socio-ethical aspects. Innovation guided by PSS for sustainability involves strategic design aspects that aim to converge strategies of all stakeholders associated with satisfaction, which is defined as the end result that meets user expectations. Services are understood as intangible activities that offer benefits and experiences to users, also contemplated by the PSS. However, the complexity of this dimension in design project occurs both by the low understanding on the part of designers who have little contact with this area of services and by the simultaneous or sequential interactions demanded by services and make them more complex than projects dedicated only to products (VEZZOLI *et al*., 2018).

Product-Service Systems oriented towards eco-efficiency, equity, and social cohesion (S.PSS), offer designers the opportunity to improve people's quality of life, distribute resources fairly, promote local economies, value and respect cultures, and enable network organization.

There are three S.PSS approaches to system innovation for eco-efficiency as describes Vezzoli *et al*. (2021): Product-oriented S.PSS; Use-oriented S.PSS and Result-oriented S.PSS. Product-oriented S.PSS implies in services providing added value to the product life cycle. Use-oriented S.PSS involves services providing “enabling platforms” for customers and Result-oriented S.PSS covers services providing “final results” for customers.

Finally, S.PSS can be used as an approach to foster social innovation, however, such innovation in S.PSS can be complex to implement due to barriers: cultural, corporate and regulatory (VEZZOLI *et al*., 2021).

3. METHOD

Considering the exploratory character of the research problem and the objective of proposing a design meta-scenario to support distributed work for women in social assistance conditions, the Design Science Research (DSR) method was selected (DRESCH *et al*., 2015; SANTOS, 2018). Design Science Research is a research method that combines theory with practice, indicated when the study’s objective is to design and develop artifacts and prescriptive solutions to generate knowledge that supports the solution of problems (DRESCH *et al*., 2015; SANTOS, 2018). The application of the method was organized in three phases based on Dresch *et al*. (2015), contemplating the procedures adopted and their respective results.

The first phase of the research deals with the understanding of the problem. The study adopted a systematic and non-systematic review of the literature on the topic to identify the main requirements of the theory. To collect empirical data, an immersion in the context of the fashion sector was carried out in this phase through a partnership with a company. Semi-structured interviews were conducted with the company’s co-founders to map the current scenario and understand the challenges and requirements for an S.PSS project. Interviews were also conducted to complement the understanding of the problem, with specialists in social assistance from CRAS (Reference Center for Social Assistance). From the results of the initial phase, the partner company’s current system map and the project requirements were formalized.

The second phase of the research involved generating alternatives and the proposition of the meta-scenario for the S.PSS. Sessions of co-creation and selection of ideas were carried out, considering the needs oriented to the dimensions of sustainability (social, environmental and economic). The co-creation sessions helped generate alternatives and identify recurring characteristics that the solution should adopt in meeting the preliminarily mapped requirements. The specifications of the S.PSS meta-scenario that best met the project requirements were designed from the generated ideas. The activities carried out aimed at making ideas and concepts tangible through the use of the System Map, Specification of the Value Proposition, and the Business Model, in addition to Moodboards illustrating the system’s main elements.

The third and last phase of the research dealt with validating the proposed meta-scenario with the partner company. The results were presented in a workshop format and discussed in weekly meetings with graduate students in the Design for Sustainability discipline. The results of this phase enabled the identification of project guidelines oriented to the approach of S.PSS in the fashion sector in the context of women in situations of social assistance and distributed economy.

4. RESULTS

4.1. Current business situation

To support the study in understanding the problem from a real situation perspective, a company from the fashion sector was selected to identify practical propositions and reflections on the theme. The company, from Santa Catarina-Brazil, has more than five years of experience working with the creation and manufacture of fashion accessories based on Ecodesign. The Ecodesign is a Design for Sustainability approach characterized by lowering the environmental impact of products by focusing on the whole lifecycle, from the extraction of raw materials to final disposal (CESCHIN; GAZIOULOSOY, 2019). The company is also involved in corporate gifts and promotional products with the waste generated by local industries and creative economy initiatives, producing and executing cultural projects, strengthening the local market.

Although the company was already involved in local social initiatives, the COVID-19 pandemic accelerated the company's motivation to explore new business opportunities and ways to contribute with groups of women in a social assistance condition.

The selected company acts mainly as a product provider for fashion brands (accessories based on Ecodesign such as earrings, necklaces, bracelets, bags, etc. Figure 1 shows the System Map of the company's current business model.

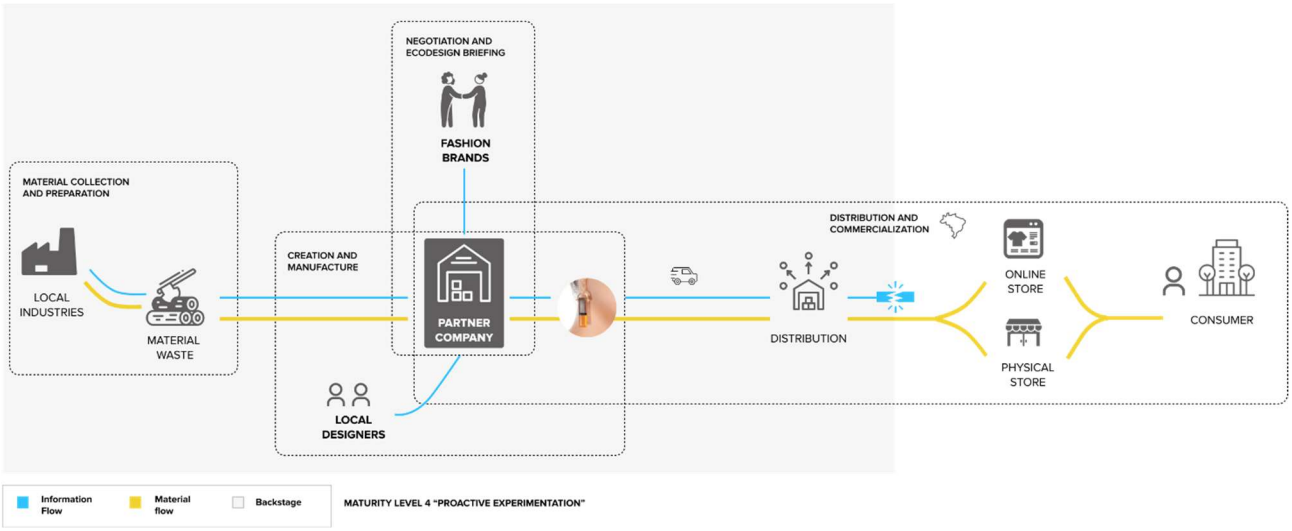

Figure 1: *Example of the System Map of the current situation. SOURCE: The authors.*

From immersion interviews with the company partners, was possible to macro map the main information and material flows between the main process and stakeholders. The analysis of the current situation and identification of opportunities was conducted based on the design principles for the sustainability dimensions identified from the literature review, environmental (Santos *et al.*, 2018), social (Santos *et al.*, 2019) and economic (Santos *et al.*, 2019). During the analysis was possible to identify that the company current propositions were more focused on the environmental dimension of sustainability by the design and manufacturing process based on Ecodesign.

However, to address the new challenges regarding distributed work by women in social assistance condition, is required a better understanding and balance of the social and economic dimensions by the company and the other stakeholders involved in those process, going beyond the creation and manufacture of accessories as a provider. Also, although the high competence of the company in handling the sustainability aspects around the products, was identified a lack of

transparency for the end consumers of fashion brands for whom the products were provided. The communication of the differentiations and value proposition regarding the Ecodesign aspects were lost and or even poorly addressed.

Based on the environmental maturity stages proposed by on Santos *et al.* (2018), the company was classified within stage four 'proactive experimentation', due to isolated environmental practices in isolated stages of the business process. The development of a project in the thematic of this study is an opportunity to the company to pursue a maturity upgrade to stage six 'integrated management', embracing more systematically all environmental aspects of From immersion interviews with the company partners, it was possible to macro map the main information and material flows between the main process and stakeholders. The analysis of the current situation and identification of opportunities was conducted based on the design principles for the sustainability dimensions identified from the literature review, environmental (Santos *et al.*, 2018), social (Santos *et al.*, 2019), and economic (Santos *et al.*, 2019). During the analysis was possible to identify that the company's current propositions were more focused on the environmental dimension of sustainability by the design and manufacturing process based on Ecodesign.

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4.2. S.PSS approach: key requirements and propositions

By understanding the context and expectations of the partner company and key stakeholders, was important to strategically guide the selection of a Design for Sustainability approach (CESCHIN; GAZIOULOSOY, 2019) that best supported a proposition for the company to envision a solution based on distributed work of women in social assistance condition, but also, that facilitates its implementation by the company, considering business operational limitations and COVID-19 pandemic barriers.

It was recommended to widen the design scope to a Sustainable Product + Service (S.PSS) (CESCHIN; GAZIOULOSOY, 2019). From an S.PSS perspective, the company could have a more strategic role within design for sustainability, beyond product level, entering into a more systemic level of intervention as a facilitator to fashion businesses that are starting to or already adopts sustainability-oriented projects. From the characteristics of the challenge, it was clear that a new economic paradigm was necessary to explore solutions for the generation of work and income and value inclusion and creative expression of the social groups involved with the project. According to Vezzoli, Garcia and Kohtala (2021), distributed economies can promote locally based sustainability, sharing or jointly using various forms of local resources, including skills, knowledge and manufacturing/service capabilities.

The findings from the activities of mapping and understanding the current situation of the company was combined with findings from the interviews with social assistance experts and the literature review on the theme, reveling social, economic and environmental requirements and priorities to be addressed by a solution envisioning to support

distributed work of women in social assistance condition. The requirements categories identified were (SANTOS *et al.*, 2018; 2019; DUARTE; SANTOS, 2019):

Groups of women in situation of social assistance:

- Social: to offer mechanisms for training, sharing and access to equipment and materials, in addition to integrated supervision with social assistance, in the working conditions of women.
- Social: to favor future conditions for generating income and / or employment of the women.
- Social: to encourage women's self-expression and creativity in the process of creating fashion accessories, in addition to manufacturing.
- Economic: to generate income for participating women.

Local communities:

- Economic: to promote the reintegration of locally generated waste.
- Economic: to contribute to the local economy through income generation.
- Social: to promote mechanisms that enable women's access to systems of social assistance in your region.

Business model:

- Social: to instrumentalize the transparency of the project to support the decision-making and actions of the partner fashion brands.
- Social: to instrumentalize the transparency of the project for the final consumer, stimulating responsible consumption and education in sustainability.
- Economic: to integrate business model to the *Balseiro* project and SALIC system for public incentive notices.
- Economic: to promote cooperation groups between people who carry out similar activities.
- Environmental: to integrate the Green Proposal fashion accessories development model based on Ecodesign.
- Environmental: to offer mechanisms to prolong the use and useful life of fashion accessories.
- Environmental: to systematically monitor the main indicators of environmental impacts throughout the life cycle of products and services, in order to support strategies for increasing transparency.

Companies from the fashion sector:

- Economic: to integrate the business model with strategic and operational partners in initiatives to offer products and services focused on sustainability.

These requirements were used to guide the second phase of the research regarding idea generation activities and design a meta-scenario proposition for the solution. Desktop research on the fashion sector were conducted to gather insights on real practices and better support the representation and validation of the ideas.

The concept selected for the S.PSS meta-scenario proposition was called '*Raízes* Program' an enabling platform for sustainability-oriented projects. It is a complementary offer in the portfolio of the partner company for fashion or accessories companies that are looking for a strategic and operational partner to invest in projects and don't have the know-how or the infrastructure. Through this program, the companies will have the opportunity to run projects based on a business model which shifts the focus from selling products to offering a combination of products and services developed in conjunction with a distributed network of woman artisans from local communities distributed along different Brazilian regions and with the final user's/customers. Also, the program aims to promote projects that help strengthen woman's self-esteem and creative expression and rescue the stories and culture of local communities.

The product offer was based on Ecodesign and Circular Economy principles (ELLEN MACARTHUR FOUNDATION, 2017; VEZZOLI; GARCIA; KOHTALA, 2021) so that the company can evolve their current practices to influence how a fashion accessory should be designed to extend the product longevity through maintenance, prolonging reuse/redistribution and recycle, of bio jewels developed with wood residues, fibers, bark and seeds that have already ended their cycle or from local industrial waste.

The service offer is aimed for the consumers, based on circular economy-based services for extending the useful life of products and intensifying use such as maintenance, reuse, exchange, repair, recycling, disposal, etc.), changing the value perceived by the consumers of fashion accessories / styling as a service.

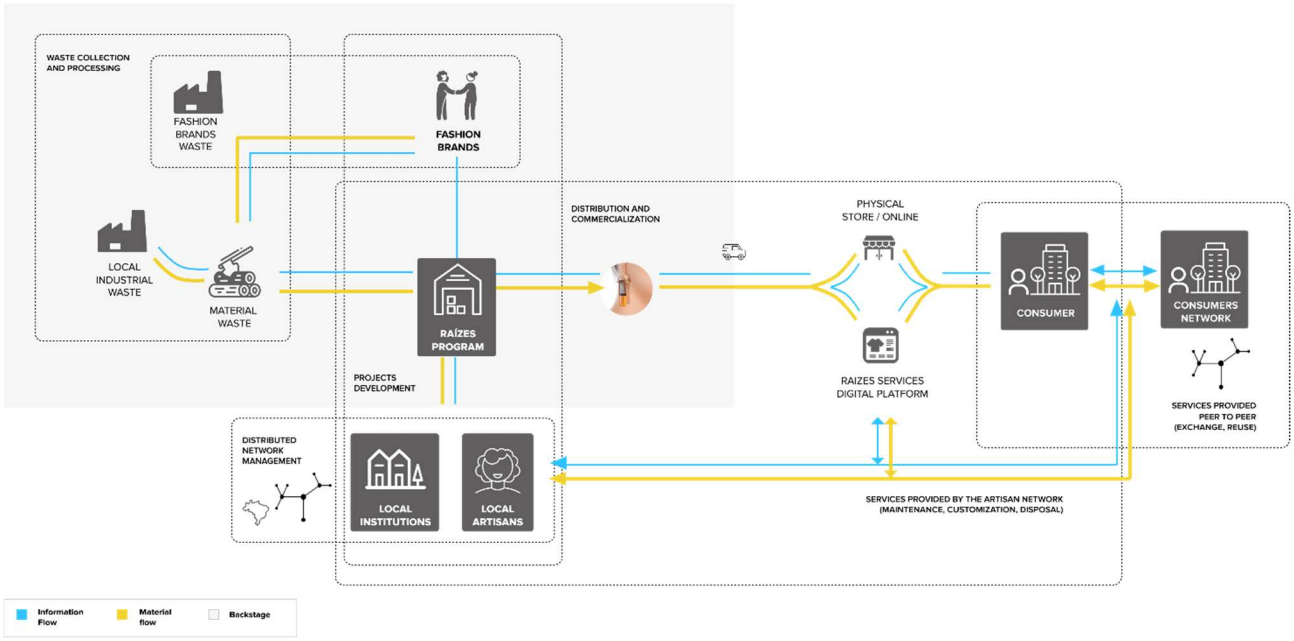

Figure 2: *Example of the System Map of the meta-scenario proposed. SOURCE: The authors.*

The program acts as a connector or a hub for various processes and stakeholders involved in the system. Besides the local industrial material waste collection and processing already practices by the partner company of this study, on this proposal was also considered the possibility to include the waste materials from the fashion brands/companies which joined the program, so that at least one part of their own waste could be recovered.

Manage the distributed network of local institutions (private and public) and artisans becomes part of the '*Raízes* Program' activities. Building, managing and sustain this network becomes so important as the production of the products was before. During the interviews and literature review, it becomes clear the need to go beyond hard-working labor and onboard partnership with institutions and professional experts in Social Assistance, Pedagogy and Psychology to support the groups of women participating in the program with training and follow-up. Also, to promote awareness for those interested in participating or in a situation of vulnerability and could be welcome. The management of the local artisans could also work as a career incubator for the women, with period cycles in which they are exposed to a plan of training, operational and creative jobs to gain experience, with psychological and social follow-ups. The program provides the necessary equipment to enable remote work from home or a local safe hub.

This career incubation is essential to sustain the services delivered between local artisans and consumers. Through the digital platform, consumers can reach local artisans for services that typically the brand or the local community doesn't offer, such as maintenance, reuse, exchange, repair, recycling or disposal of the fashion accessories.

4.3. Discussion

Below is described the reflections on how the application of the theoretical principles and concepts regarding design for sustainability played a role on the current project:

Design for Sustainability principles:

- Helps to understand the current scenario to identify opportunities and limitations of the company in address the sustainability dimensions. In this study, it was clear that the company is comfortable with the environmental dimensions but embracing social and economic aspects would bring new challenges, despite the adopted DfS approach.
- The need for greater transparency both for the partner companies and for the end consumers as an important requirement towards more systemic interventions. Regarding transparency for business purposes with partner companies, as those brands are entering or looking for a trustful partner on sustainability, demonstrating competence in measuring and managing environmental impacts can be a key business differentiation and help with prospection and new business formalization. Greater transparency for the consumer is also an important aspect to address in this type of project, so that value creation along the system is visible, understood, and influences satisfaction. To avoid poor communication or even green washing practices, the S.PSS strategies should include transparency for awareness about the different aspects of the system and education on its sustainability through courses, lectures, workshops, content and real cases of the projects already carried out, to help build a culture of a new way of doing business and generate value and impact (LOMBA; SANTOS, 2021).

Product-Service System for Sustainability applied to Distributed Economies:

This is a complex approach with lots of barriers for implementation. This required the creation of a variety of projects which could be developed with the fashion brands to accommodate different complexities and operationalization investments. As an example, the evolution of projects:

- Network Manufacturing: brand briefing is adjusted with Ecodesign + circular economy principles and the volume is manufactured using the network and local waste.
- Co-design and Crowdfunding: Creation is co-created between the Brand + Green Proposal + Community, considering an Ecodesign briefing + circular economy + socio-cultural creative expression. The project can also be supported by open contribution models for end customers to take part.
- DIY digital workshops (customers): Content sharing (videos, tutorials, etc.) that teach customers how to prolong the use of parts (maintenance, repair, exchange, donation, etc.). For example, earrings can become decorative elements or another type of accessory. Moving the user's role from consumer to a prosumer, with more protagonist and responsibility.

Covid-19 Pandemic and Brazilian scenario for small companies:

- Given the current context due to pandemic with high levels of unemployment, people in situations of vulnerability, etc., companies may have an articulating role to support new forms of business that promote more significant equity and social and economic cohesion at such a critical time. For small companies such as the partner of this research, good motivation and strategies may not be enough without the opportunity to incrementally evolve and test the implementation of the new business model. On the other hand, large companies can play an essential role in supporting this type of innovation experimentations through financing or even carrying out pilot cases in the early stages. An S.PSS approach for small businesses may be impossible to carry out without proper investments.
- In this sense, an alternative that the authors recommend further studies to explore in this topic is bottom-up approaches such as Design for Social Innovation and Design for the Base of the Pyramid.

5. CONCLUSION

The experience in applying design for sustainability, particularly a PSS approach to envisioning solutions for a real case problem, has shown that the proposed theoretical framework on the topic can be a helpful driver for innovative thinking. Although the proposed solution '*Raízes* Program' is a more conceptual meta-scenario, it represents the convergence of the main ideas to address the social, economic, and environmental challenges the partner company faces with the project.

Since the scope of design intervention in this study was more systemic, the System Map tool showed up essential to understand the current situation, identify opportunities, and represent new macro interactions between stakeholders. Due to project limitations, the study focused on analyzing the system's primary information and material flows. Further studies could explore a breakdown of these flows and include others to explicit economic, social, and environmental to better support the project viability implementation. Also, the System Map helped to delineate the types of service resulting from the PSS. Since this study tackled a conceptual level of representation, we understand that a further step should be prototyping the prioritized services from the system through a Service Blueprint, for example.

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