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NEW/OLD PRODUCTION AND CONSUMPTION APPROACHES

Product & Textile Design Interventions on Circular Sustainable Systems

Enabling Coherent Projects that Preserve a Balance within their Context

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Product Design, Textile Design, Participatory Design, Circular Sustainable Systems.

Abstract
This paper aims to share methods used in design education, where new models of textile design have been developed by first recognizing "circular sustainable systems".
In the Huasteca region of México there are indigenous communities dedicated to textile production, they work in a circular sustainable system. The main characteristic of the system is that it shows a carefully developed balance of production using resources directly from its territory. This balance is usually reached, as in nature, with lots of years of molding needs and resources until it all comes together as a sustainable system. One of these communities was then used as a scenario for design students to develop new projects. The sustainable system allowed them to comprehend the cultural richness and the carefully balanced inputs and outputs of a community dedicated to silk: craftsmanship, knowledge, resources and their equilibrium established a different framework. The awareness of the circular sustainable system translated into interventions, co-design practices and participatory design, developing strategies for sustainability and circularity and coming up with textile products that supported and echoed the community's already culture-rich crafts and designs.
Starting in a circular sustainable system scenario, designers are encouraged to grasp the value of balance and sustainability, which leads to design only when the understating of the system fosters innovation from within.

1. Introduction

The objective of the following work is to communicate a methodology where the resolution of complex or wicked problems through products has a framework within a circular sustainable system. Where the ability of designers lies in recognizing the main elements that allow the equilibrium of the system so that they can participate in it and intervene without altering their balances, which is an ever more important skill in design students.

A general impulse that drives young people to study design is their desire to generate innovative, disruptive ideas, as part of their own search for identity. To make something in order to become someone (Anderson, 2014). But the grand majority of these ideas emerge from decontextualization, hence they are not linked to a concrete reality. Mainly with textile clothing and products. When the design ideas are developed without looking at the surrounding conditions and limits, it tends to become some sort of superficial solution or one that hardly contributes to the recognition of problems, which makes solving them much more arduous and difficult.

It would seem then that an essential aspect of design is that it is sustainable, however, our reality shows that much more often we overlook everything around us when we have to come up with projects intimately linked to their context. How can we bridge the extreme poles of desire and aspirations to create with the limits of what is necessary and possible to make? Thinking about the sustainability challenges resulting from our behaviors of creation, use and consumption of goods has been introduced to the curricula in design schools. But we have taken a theoretical approach rather than its practice and

repercussions, for that reason, we decided to incorporate a design practice, where we mixed the interest of design students in textile products but within a specific context, a community of silk workers who had a specific history and was in a continuous production, the craft of silk. This community had somehow managed to overcome many obstacles and had already take advantage of the whole production process in a complex circular system considered as a circle where the beginning and the end meet.

This paper aims to describe the importance of contextualization in design, as a first step to understand the value of sustainability in production processes. Then we will explain what we mean when we refer to a circular sustainable system, and the case study of the Santa Anita community where we were able to collaborate with design students in a project involving textile and product design, concluding with several considerations on what we can learn from this experience.

2. Designing according to the Context

Industrial design and product design have always been questioned by their sustainable approach or their lack of. The way in which a design object is created is to locate the solution inside a productive reality, that consequently leads the solution to become not only a single product but a series or a production run. Seems logic to solve that particular problem to several people, and eventually scale it up to an industrial level. Gloomily this does not necessarily is the start point from a sustainable vision. What happens to that product once it solves that problem? to what extent does the object really solves a problem if later will creates another (Walker, 2006).

In these cycles, products are called to consider whole processes not only one ended (from the cradle to the grave) but sustainable cycles capable of being renewed (from cradle to cradle) offering a method in which objects and products can be used whilst maintaining the balance of production and demand. This balance is rarely achieved on the realm of products but is a widely spread condition in our environment (McDonough & Braungart, 2002).

Designing according to a local context sets up a realistic scenario where we can find complex problems and where design intervention is not only relevant but necessary. But most contexts exceed in complexity since the factors that determine these balances are not easily spotted nor the changes or repercussions that are triggered when these factors are altered. In nature, all ecosystems are complex systems resulting from hundreds or thousands of years of iterative design and trial and error (Thackara, 2006). That is the main reason why many projects and products that at first glance seem to be good ideas end up having a damaging or even devastating impact in their environment when their scale and context are not taken into consideration and they are just industrialized and commercialized massively.

However, the methodology to design congruent and sustainable products in complex systems goes much further than applying already established tools such as Life Cycle Design or Life Cycle Analysis in products or just their materials. The relationship between existing problems and possible solutions, no matter how sustainable and eco-friendly they may be, do not guarantee flawless success in the complex system

in which they will begin to operate, even more so in the long term, they can unleash much more counterproductive factors that are not so obvious at first.

When the environmental variable is introduced into the design process, design becomes a more complex activity (Vezzoli, 2016), and it not only happens with design but with most disciplines faced with the challenge of developing sustainable projects. These ever more complex challenges demand systemic technological, social and cultural changes that in turn will call for innovations.

And despite the overwhelming complexity, the responsibility to take into account these complex scenarios and, above all, contemplate their level of interference when proposing new products in partially known contexts is and will continue to be for the designers. There must be a paradigmatic change in sustainable design, not only with the development of methodological tools to guarantee the product's sustainability and impact, but with new design practices and concepts. Sustainable is often understood as just an attribute of the object and its materials, but truly sustainable considers the product within its context.

> So much of what travels under the various headings of 'design for sustainability' focuses on the design object itself -the materials form which it is made, the amount of energy embodied in it, its ability to be recycled, and so on. Now, these things are significant, but they do not ensure that a contribution to 'sustaining ability' is being made by the object. This can only happen if the object being designed is overdetermined by the design of the relations in which it is to be situated. (Fry, 2018, p. 187)

3. The Circular Sustainable System

The circular sustainable system is a complex system with specific attributes that theorists such as Carlo Vezzoli, John Thackara and Michiel Schwarz have studied in their writings and methodologies. The way to visualize the circular sustainable system is through a gradual approach to the system in order to understand its ramifications and its core factors. It is a shift from a research-to-do methodology, recurrently starting by making or designing, to a more cautious method of first recognizing and acknowledging the system within all its complexity and then to design for it, always as a process of improvement, but in a responsible way deeply interconnected with the context that is about to be intervened upon.

Some sustainable systems that surround us have characteristics that design is increasingly considering as qualities, such as localism as an attribute not only as a geographical location, the value of sharing among members inside a community, their level of connectivity and interdependence based on cultural values and shared visions and also dimensioning projects to a proportion or scale congruent with themselves (Schwarz & Krabbendam, 2013) (Fig. 1).

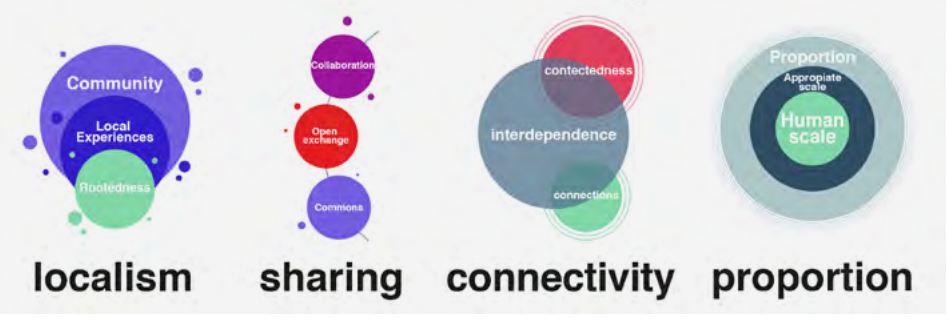

Figure 1. Circular Sustainable Systems diagram, author: gonzalezcabrero, 2020.

They then become circular sustainable systems when these attributes are manifested with variants linked to the longevity of the system. The more these variants have been acting upon a system, the better the system have had a developed balance. We can find clear examples linked to nature and the environment, like removing and then re-introducing species to a contained ecosystem, communities and environments where all its organisms have found the balance within the system to guarantee its sustainability, not as a productive demand but as an ecosystem in balance.

This approach of intervention is not something new in universities and design schools in Mexico. Due to the strong link between design practice and context some design teachers have developed these participatory design practices in circular sustainable systems collaborating with rural communities, starting from a scenario of theory and knowledge but always following up with an immersion experience in the context. A notable framework comes from Architect Oscar Hagerman, who in addition to being a professor at various design schools including the Universidad Autónoma de San Luis Potosí (UASLP), has surely strengthened the intervention and co-design approach.

Hagerman's work extends throughout the entire Mexican territory and one of the characteristics of his ventures is that they are born from collaboration with the communities where the buildings are located. Starting always from knowing the place, arranging work meetings where the resources of the territory are listed, both material resources as well as knowl-

edge of the community and even the cycles and availability of such resources. In this way at the end of all, the project is already intimately linked to the community, accepting it as part of them because they see it not as an idea implemented by someone but as a collective one. Schools, churches and rural hospitals tailor-made by the community, made with materials such as clay, wood and natural fibers coming directly from the territory and shaped by processes and techniques deeply engraved in the local culture is a new way of making architecture, an architecture made by everyone and for everyone (Hagerman & Vera, 2014).

This way of gradually recognizing the complexity of the system and only after identifying part of its complexity then propose design interventions, is what has inspired some of the methodology and design work carried out in the industrial design program at the UASLP, as an effort to educate design students on their important role while designing in complex systems. As part of their formation these industrial design students have a subject called Context Workshop in their sixth semester, where the main goal is to understand the relations between design and context, and its where we provide a circular sustainable system scenario for them to understand and design upon.

4. Textile and Product Design Interventions in Circular Sustainable Systems

The following case study started with an approach by professors and students of the Industrial Design program of the UASLP, who have contacted the community of Santa Anita in Aquismón, a municipality located in rural central México known as Huasteca.

This activity was conducted for academic purposes; however, it is backed up by design research carried out continuously by professors in the Huasteca region. Their research individuates material resources of a certain region and the local transformation processes from the perspective of the local inhabitants themselves. This is why, a key aspect that acquires relevance, is to recognize the very system that we call circular, which can be represented as follows (Fig. 2):

- First: the precise time in the right place, connecting with the context by collecting various stems, branches, leaves and recognition of the condition of the environment and its continuity.
- Second: the transformations that reveal materials, which means learn the processes to prepare and set up the materials to obtain their best qualities of flexibility and workability.
- Third: the dialogue with materials and processes, this dialogue consists of an application of different techniques in diverse materials as a permanent exploration of procedures culminating in utility elements or objects.
- Fourth: contemplation and use, meaning coexistence and consumption of textile products in the everyday life to evaluate their function and success.
- Fifth: prolonged time of use in a relocated place, reuse and/or readjustment of objects for the next stage, iteration and improvement design process.
- Sixth: when the end meets the beginning, development disuse scenarios of textile products and their reincorporation into the environment.

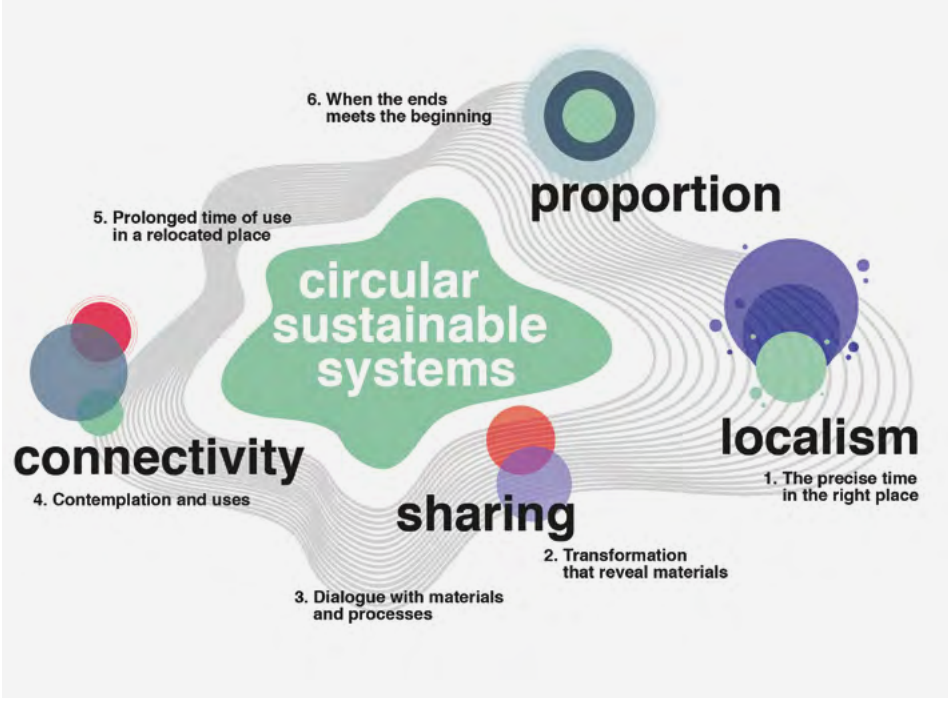

Figure 2. Circular Sustainable System methodology and implementation, author: gonzalezcabrero, 2020.

The path chosen was one where students could approach the knowledge of this circular way of living with the environment, it implied that is the community itself who adopts the role of instructor and the students are the ones who grasp experiences and knowledge. So, it was necessary for the students to live among the community in that environment. Thenceforth the resulting design of a textile product was a response to that dialogue between the possibilities of resources and the requests that arise from the activities where the designed object was used. The aspirations to accomplish this balance allowed students understand how their design proposal could be part of that circular sustainable system.

5. Santa Anita's Community, a Circular Sustainable System

This project starts from a paradoxical condition. In 1979, as part of a networking program between the governments of Japan and México, the cultivation of the silkworm *Bombyx Mori* was introduced to the Huasteca region in the east part or the state of San Luis Potosí, and various communities in this region were trained to produce silk.

The logic that led to this intervention was to provide silk as a raw material to another region of the state called Santa María del Rio, where since the 19th century there is a strong tradition of craftsmanship knitting the rebozo, a long flat garment, very similar to a shawl, made entirely from silk. The rebozo is a feminine garment that covers the upper body, head, back and arms of women (Salinas, 2011). The productions territories are linked in a vision of commercial exchange between two distant regions, where one is the one that cultivates the resources and the other, who can transform the material into a finished product.

The inhabitants of the Huasteca and in particular the municipality of Aquismón, where 64% of its population is Tenek,[1] are not only growers of materials, their system is circular, as they are also producers of a large number of textiles (Rocha Valverde, 2014) that have been constitutive of their native culture (Fig.3).

1 The Tenek are an indigenous community located in the Huasteca region of central Mexico. They are a branch of the Mayans and have established a particular culture strongly linked to their environment rich in water and biodiversity.

Figure 3. Tenek community of Santa Anita located on Aquismón, San Luis Potosí. A tropical weather located in central rural Mexico; region known as Huasteca.

Although the warm climate of the place favors the growth of the blackberry tree that feeds the *Bombyx Mori* silkworm species, obtaining the silk thread of a certain quality also requires special care and adequate tools.[2]
Thus, far from being able to cultivate, produce and self-consume their own silk as raw material to incorporate it into the textile products that they know how to make and have a strong tradition in making, they only became suppliers of silk cocoons.

The Santa Anita community still practices sericulture or silk farming, but only as a secondary activity, because a large part of its day is occupied by self-consumption agriculture. They raise and grow the silkworms to the stage where they become cocoons, which they sell to a third-party intermediary who boils the cocoons and spins the silk for sale (Fig.4).

2 The control of temperature, humidity, times and cleaning of the worms, the cocoons and the mulberry plant itself, guarantees the contribution of starch so that the strands are formed and reach up to 1500 meters in length in each cocoon.

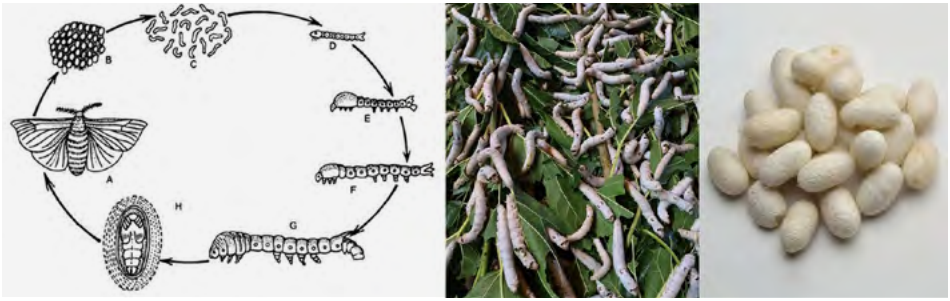

Figure 4. *Bombyx Mori* silkworm lifecycle, feeding from blackberry leaves, silk cocoons. Photos: gonzalezcabrero, 2017.

What strongly propositioned the scenario as a circular sustainable system is how Santa Rita's community reincorporated this production cycle to their own cyclical conception of transformation, since a principle of sustainability is to recognize that everything that surrounds them is a limited resource. The community grows its own silkworms, and the way in which they retrieve new cocoons is what led to the reconstitution of the system.

Every year at the end of the incubation season they keep a certain number of cocoons in order to become butterflies, but when they hatch and leave the cocoons, they break the silk filaments in order to become butterflies. Those cocoons can no longer be unrolled and used as silk; however, they have found a way to use parts of the silk cocoons by designing earrings and jewelry, which they eventually commercialize. By not seeing these cocoons as garbage or byproducts, they recognized in them their potential as a new resource to create. And this scenario also allowed interventions at this stage of the creative process, a dialogue connecting their craft, their work and design (Fig.5).

Figure 5. Obispo family, part of Santa Anita's community and their jewelry and earrings made from silk cocoon shells dyed with artisanal pigments. Photos: Gabriela Trejo, 2010.

It was then a matter of recognizing that cycle together, they explore different processes to transfer the preform of the cocoons, which is a volumetric oval, to concave planes, to curved lines, which would open the imagination to textile products for other complementary accessories to clothing or jewelry, but above all to identify the best way to express the perception of their environment. In this way the designed textile products would be more profitable, fairly recognizing the community's work and craft in an equitable way.

Students then were also able to recognize the circular sustainable system of that group, because they realized to what extent they could design brand new objects, since they shouldn't radically change the market where the community was already commercializing their products and couldn't use more cocoons that the ones assigned, mainly because the community would

not release more butterflies than necessary, by spoiling more cocoons, they wanted to maintain the annual production cycle. This is how the students finally grasp the idea that the design of sustainable products has to do with keeping in balance the values of the system: locality, sharing, connectivity and the scale of production. In addition to considering that with the passage of time and the system's own evolution other ways of balance may appear.

Some of the results are shown below, all of them included a parallel work by design students and silk farming artisans documenting the natural fiber dyeing techniques (to be able to reproduce them), combining them with color palettes that, although they responded to new trends and coloring, were also tones extracted from the locality (Fig. 6).

There was also an extensive user research detailing which kind of consumer was buying the Santa Anita's products previously and what other products could match its lifestyle, for that reason accessories such as handbags were proposed that complemented the existing products of the community like jewelry and wallets.

Figure 6. Dying artisanal process and experimentation on silk cocoons for color trends in handbag collection. Design: Alejandra Terán, 2018.

Figure 7. Sketches, 1:1 mockups and final product of a clutch cotton hand bag decorated with custom colored silk cocoons. Design: María José Vergara, 2018.

Teams of craftsmen and students developed new complementary products, such as bag collections with a clear objective: that possible new customers could appreciate the diversity and expressive unity of these textile products made only with a certain amount of hand-dyed cocoons (Fig. 7).
In this way, the scenario that at first was contradictory because silk as a raw material had been introduced externally to the Tenek ecosystem of the Santa Rita community, became a circular sustainable system when the sericulturists and silk farmers themselves found in the residue of the cocoons a new resource to recreate their imaginative skills and materialize it in textile products. Meanwhile design students were able to participate, while they understood the main factors that allowed the balance of this productive condition. The relentless search of new ideas in a frame of participatory design for the benefit of all actors involved was the main axis of the collaboration, meanwhile maintaining the coherence of the project: to create using only the right amount of resources, being aware of the context and without altering the circular sustainable system.

6. Conclusions

For designers, but especially for design schools, creation must be and usually is important. But from a sustainable starting point, the recognition of a proposed scenario and its limits helps to understand the design process situated in a given context. Methodologies such as transitional design, participatory design, and even speculative design, whether creating dystopian or utopian scenarios (Porritt, 2013), help to understand design as an act of reflection, then creation.
In this case, when design participates within a circular sustainable system, it helps the students to recognize and cherish the balance that has been established and to tackle it in a gradual approach, trying to understand this complexity and, above all, recognize their responsibility as designers, when designing new projects and products.

Frequently, circular sustainable systems can be found in small communities whose main way of living is self-consumption agriculture. The complexity given in the relationships among all elements that constitute a territory can be widely affected by the work of the population that is also part of the territorial identity, however, the link is so close that reciprocity becomes an indispensable practice to live in harmony.

The design of textile products that each of these communities make are filled with identity traits from their locality, of a culture that values time, cycles, balance and even limits on its resources. They take advantage of this scenario and materialize it in elements of high aesthetic expression such as clothing, accessories or jewelry.

Sharing these creative experiences between the communities in the Huasteca region and design students has generated empathy and mutual acknowledgement, resulting in open feedback on what is proposed, what can be done, and what can be marketed and become part of the clothing or textile goods, even for other community that could acquire and use the textile products, incorporating them into their own circular sustainable system through new reflections and new searches.

A final conclusion would be that, just as there is a great interest of a maker generation to do and build for the simple fact of being able to do it, there is also a growing desire embedded in the new generations to do things in a more effective and better way. Countless publications, contests, projects and initiatives are based precisely on the desire to design increasingly sustainable products, fashion, textiles, not only in their configuration but in the entire extension of the projects.

Designers are agents of change and are asking themselves more frequently and incisively what it is that design can do in the face of these challenges (Lier, 2018). New generations of designers are seeking to be that agent of change and these interventions can help them understand the full potential and responsibility of design as a discipline.

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V

BIOGRAPHIES

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In addition to her studies, she supports Professors at DIDA in managing educational and training activities, communicating with students and tutors.
Outside of the academic environment, she is a designer enjoying philosophy and politics readings from all over the world, with a strong attention to their related languages, be they carved in stone or posted on social media.
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Gina Nadal Fernandez is a final year PhD student in the Design Department at Manchester School of Art, Manchester Metropolitan University. Her doctoral research is by practice, and investigates how emotional experience can be designed into digital jacquard woven textiles during a co-design process by using digital coding.
She takes a multidisciplinary approach that embraces design theory, textiles, digital coding, consumer behaviour and mass customisation in her weaving practice using a TC-1 loom and natural yarns.
Gina has presented her research at the PhD by Design workshop at the Design Research Society Conference 2018, at the Global Fashion Conference 2018 and 2020. She is also a member of the Textile Society and Design Research Society.
She holds a master's degree in Fashion Graphics from Manchester School of Art, Manchester Metropolitan University that looked at the relationship between digital jacquard textile practice and emotional value using digital coding.
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PhD, Architect, she is a Design Researcher at the Dipartimento di Architettura DIDA of the University of Florence. Since 1991 she works on Sustainable Local Development and the social implications of the project starting from the Cultural Heritage. For over 20 years she worked in projects in Ethiopia, Algeria, Tunisia, Morocco, Yemen, Jordan, Haiti, with the most important national and international donors as WHC - UNESCO, UNCCD, European Commission.
Since 2011 she has been collaborating with the DIDA UNIFI especially in projects around Maghreb countries and in the social field promoting Social Design projects and workshops using co-design methodologies. She is professor of Service Design at DIDA UNIFI, professor of Design for Cultural Heritage in the License Course in DesignS at Ecole Euro-Méditerranéen d'Architecture Design et Urbanisme de l'Université Euro-Méditerranéene de Fès EMADU – UEMF in Morocco and visiting professor in some universities in Mediterranean countries.
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She holds a Master of Technology in Design. Her Master's thesis, titled 'Beadwork and its impact on contemporary fashion in South Africa,' investigates the cultural wealth contribution to decolonizing fashion. She believes that modern arts and trends do not imply the demise of indigenous culture. Her latest endeavour is to investigate the possibility of sustainability in the current fashion industry in Namibia, which led me to PhD research at the Cape Peninsula University of Technology.
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