Adapting Sustainable Design Assessment Tools for Local Development: Some Insights into Argentina's Textile and Clothing Industry

Carola Ruppel, Rocío Canetti, and Celina Monacchi

Abstract Clothing value chain is fundamental to Mar del Plata (Argentina) as it holds a high rate of industrial added-value, is rooted in local history, and has shaped relationships and institutions. This means sustainable clothing practices are interwoven with Mar del Plata's social and economic development. However, fashion entrepreneurs must overcome many difficulties when talking about sustainable design. To begin with, some aspects of international labels and certifications are unsuitable for textile industry in a developing country. Due to the absence of measure tools, companies lack information about their production and cannot afford improvements. Furthermore, there is a gap between academic knowledge production and industrial production. Therefore, the following questions arise: How to engage firms in assessment processes to work on a sustainable culture? How to enrich relationships between companies and research groups? The Sustainable Design Research Group (GIDSu) belonging to Universidad Nacional de Mar del Plata, Argentina, has been working for local industries for more than ten years. GIDSu has been able to design a tool to evaluate sustainable design and management in local fashion and textile firms, which finally took the name of CeDiS (Spanish acronym of *sustainable design certification*). CeDiS was developed in order to offer a tailored solution for small and medium companies. It works as an ecolabel, based on self-declared claims from the firms and audited by the research group (GIDSu). The aim of this tool was to acquire information about each enterprise, detect problems to display it to managers and suggest sustainable changes for continuous improvement. In addition, it worked as a way to close the gap between private companies and public science. To design the CeDiS, researchers based on present methods and standards (D4S, LIDs Wheel, ISO 14006, ISO 14021) as well as field tests and interviews. As a result, the tool includes an interview protocol, a process matrix; a result display (wheel matrix); and a diagnosis and suggestions sheet. Finally, during September 2019, GIDSu verified the CeDiS, employing it over 20 textile and fashion firms from Mar del Plata, supported by a national program for local clusters (called *Programa de Apoyo a la Competitividad* or *PAC* in Spanish). The aim of this paper is dual. First, it describes the process of adapting and designing sustainable assessment methods

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for industries in a developing country. Second, it shows the positive impact of this tools in local development. Through the CeDiS study, we share a possible blueprint for fashion and textile value chain (including businesspeople, scientists, politicians, consumers, and workers) to face sustainable development in complex—and often uncertain—settings.

Keywords Sustainable assessment · Design assessment · Assessment tool · Local development · Textile industry · Design

1 Introduction

In Argentina, the textile and clothing value chain covers fiber processing, the production of yarn and fabric, and the design and manufacturing of apparel and home textiles. Sub-sectors vary along with the country and show differences depending on geography. This paper focuses on the city of Mar del Plata.

Mar del Plata is a medium-sized city, located over the Atlantic sea 400 km south of Argentina's capital city—Buenos Aires (Fig. 1). It is a well-known destination for tourism; as a result, its population (regularly, around 1 million people) grows up to 300% in summer. Even though tourism is socially recognized as the main industry, fishing, textile, and building industries have been fundamental in Mar del Plata's economy and are rooted in its history.

In this way, two sub-sectors of the textile and clothing value chain have developed in Mar del Plata: the textile activity, oriented almost exclusively to knitwear produced with flat knitting machines, and clothing.

The knitting industry in the city has a long history. The first local experiences date from the mid-nineteenth century and engage migrating families, mostly Italian. Favero [10] analyzes the effect that those family and ethnic ties had on the activity. The consolidation of the local knitting industry took place between 1960 and 1975, coinciding with the establishment of Mar del Plata as a main holiday destination in the country. Knitwear thus became a "tourist souvenir" even though the industry failed to overcome the economic problems of the 80s and 90s [9]. Since then, the weaving activity for national or international companies has intensified due to the recognition of the local product and its quality [30].

Furthermore, clothing and garment production came up as a support activity for the knitting industry. However, by the end of the 70s, it became consolidated through the establishment of local companies. It continued to grow until the 90s upon the structure of small businesses. Between 1994 and 2005, the textile facilities decreased by 65% while the clothing ones raised 29% [27]. This growth could be related to the entrepreneurship fever that was prompted after the national currency devaluation process that also drove the establishment of small-sized enterprises focused on apparel design in Buenos Aires, which is commonly known as the "signature design" phenomenon [28]. Fashion entrepreneurship continues expanding nowadays, along with the design education offer.

Nowadays, the fashion and textile sector in Mar del Plata and its region consists of 55% knitting companies and 45% clothing [36]. These are mostly micro and small-sized enterprises.[1] There are also a few medium-sized enterprises, and all are mainly family businesses. Concerning entrepreneurship, records are showing that the highest percentage of local initiatives are related to the textile and clothing sector [5]. According to records, the companies in this sector add up to 13% of the local industry and 10% of the industrial activity of the regional SMEs [33]. The textile and clothing industry in Mar del Plata shows characteristics distinctive of industrial

Fig. 1 Mar del Plata is located in center-east Argentina, on the Atlantic seacoast. *Source* Google Maps. Photo from: Fermin Rodriguez Penelas, available at Unplash.com

[1] In Argentina, the SMEs segment is recognized as "PyMES". Through the resolution Nr. 220/2019, the Department of "PyMES" and Entrepreneurs, from the Production and Labor Bureau, classifies companies in the "PyMES" category. In the industrial sector, a micro-sized company has an estimated turnover of $21.990.000, a small-sized of up to $157.740.000; a medium-sized "tramo 1" up to $986.080.000 and a medium-sized "tramo 2" has a turnover of up to $1.441.090.000. Source: https://www.produccion.gob.ar/area/secretaria-de-emprendedores-y-pymes.

districts: a large proportion of SMEs with their own brands, high interaction with local sub-contracting workshops, production flexibility, high rooting on the region's history, a relevant flow of unencoded knowledge between the participants, and a growing presence of design professionals [14].

Another significant fact about the knitting sub-sector is its working method based on outsourcing for Argentinian clothing brands, called "fason" (toll processing). It is a method related to the putting-out system: the workshops and factories get commissions from other companies that outsource their production (usually called "comitentes"). In Mar del Plata's economy, toll processing signals both the outsourcing activity and the manufacturer suppliers. Furthermore, it is used to describe two types of service suppliers. Firstly, it is referred to small productive units, mostly domestic and individualized [41], where companies decentralize their activity and outsource their fixed costs. This paradigm makes invisible the crucial nodes, creating asymmetric relations where the workflow becomes irregular and there is no encouragement for job stability [40]. Secondly, toll processing is used to name knitting companies that allocate their resources to satisfy the demand of regional or international brands. "Fason" is clearly a complex concept. For the purposes of this paper, we call the working method "outsourcing", the small productive units as "domestic manufacturers", and knitting companies as "manufacturers". Similarly, those companies that outsource their production are being called "clients".

The local Textile Chamber estimates that 60% of the national knitting production is carried out in Mar del Plata. This indicates the city's acknowledgment associated with its economic activity, through the quality of its products and specific know-how. Oppositely, the clothing sub-sector consists of companies that produce under their own brands and occasionally outsource some processes to workshops in Buenos Aires. From the economic perspective, companies that work as manufacturers completely count on their clients and have reduced bargaining power, engaging so much as 70% of their production for the clients that sometimes even fix services' prices [7]. In this way, the manufacturers relegate their own brand production. This results in a lower investment in matters of branding, image, product communication, and trend analyses [31].

The local textile–clothing value chain relies also on supportive roles engaging in the traditional productive stages (Nutz and Sievers [32]. For instance, there are some educational organizations acknowledged, such as the National University of Mar del Plata and the National Technology University, along with political organizations such as the Textile Chamber of Mar del Plata and the Association of Clothing and Related Manufacturers (ACIA in Spanish). Additionally, since 2017 these organizations, along with the township of General Pueyrredón, through a support program for micro-, small- and medium-sized enterprises, constitute the Textile and Clothing Cluster of Mar del Plata. This organization outruns existing business institutions and involves new stakeholders in the sector. Its goal is to readjust this sector and promote cooperative relations between companies, the public, and academics. Its core matters are related to R&D, communication, and new niche markets. Accordingly, this unprecedented associativity fosters the local economic activity, although

there are recognized differing interests about this program among the different social groups [29].

Along with this context, the Sustainable Design Research Group (GIDSu in Spanish), located in the Center for Research and Actions in Industrial Design (CIPADI in Spanish) within the National University of Mar del Plata, has a long history of working with local companies and their relation to sustainability. Its interest has been to introduce in the local manufacturing context the sustainability concept, considering its intrinsic peculiarities. In 2017, the Textile and Clothing Cluster of Mar del Plata, along with the National University of Mar del Plata, created a favorable space for spreading these studies. Furthermore, companies became interested in new markets and in adding value to their products, as an opportunity to improve their competitiveness in the unstable Argentinian economic context.

2 Sustainability in the Local Textile–Clothing Industry

2.1 Opportunities and Limitations

Since 2016, the GIDSu has made its central goal to raise SMEs' interest in sustainability, as well as to redefine the theoretical framework of the locally adapted sustainable design [17, 18]. To this end, the group has been focusing on developing a certification system politically agreed with every social stakeholder and technically defined by the group, to encourage sustainability (social, environmental, and economic) and improve the information given to the consumer.

GIDSu has chosen to focus on the textile and clothing sectors on account of its tradition and its effect on regional employability [15]. The project is addressed in two stages: (1) textile–clothing diagnosis regarding sustainable methods and strategies; (2) instrumental approach and testing.

The diagnosis resulted in a SWOT analysis of the industry from a sustainable perspective. As previously indicated, some strengths of the local companies are their tradition in production, skilled workforce, high-quality standards, and existing capacity, among others. Regarding weaknesses and threats, it can be inferred that:

- company owners showed low interest in fully incorporating the sustainability concept or had a deficient understanding of the matter. This means that even on the greener companies, sustainability strategies were associated only with the use of natural or local materials. The approaches that implemented design strategies such as multi-functional or zero-waste clothing, modular garments, etc. [39] got a score next to zero;
- the deficiency of specific data, particularly quantitative, encumbers the statistical analysis of the SMEs' environmental impacts [37, 46];
- there are detectable difficulties to adapt international sustainability assessment tools (such as SIMA-PRO software) to the local context, because of the related

costs (economy, time, and need of professional assistance) (Retamozo, loc. cit.); and

- the industry is vulnerable to the political and economic context, in which the agro-export activity gets fostered, the imports freed, the domestic market falls, and the subsidies withdrawn.

Moreover, the diagnosis allowed to find some opportunities for the sector:

- The implementation of sustainable design management tools could act as an encouragement for organizing the production and improving the products concerning social, environmental, and economic responsibility. Accordingly, it becomes an added value for companies. Design for Sustainability or D4S is a competitive management system [46]. D4S "*…is a globally recognized way in which companies can work to improve efficiencies, product quality, and market opportunities (locally and internationally) and at the same time, increasing environmental performance.*" [34], p. 23.
- The growing social sensibility toward sustainable consumption draws attention to consumers [20]. A survey carried out in Mar del Plata revealed that 67% of the respondents are willing to embrace new developments in durable consumer goods [15]. However, consumers explained that despite their interest, they do not consume eco-friendly products given the difficulty in recognizing and acquiring them [38].

In this context, it seems logical for companies to implement a continuous improvement process, such as the ISO 14.001. In fact, in the local textile sector, management improvements affect 41% of the product innovation and/or production processes. On the contrary, only 14% of companies adopt some type of ISO certification [36]. **Therefore, there is a need for designing tools that are adaptable to companies of all sizes, as well as it is important to reduce the obstacles related to fees and bureaucracy and to ease their implementation**.

From the perspective of local development [1, 44] and industrial design [25, 26], there is a need to adapt global methodological tools to the regional context considering not only the environmental and economic attributes but also the production, social, and cultural ones. Therefore, it is relevant to enhance and organize those variables to turn them into innovative strategies with local added value.

Also, there is a possibility to enhance the regional development through joint efforts of the academics and the industry who can integrate their knowledge to organize, simplify, and advance the implementation and management of eco-design [35]. Accordingly, the Quality Assurance Standards (ISO 9001), the Environmental Management Standards (ISO 14001), and the Guidelines for incorporating eco-design from the Environmental Management Systems (UNE 150301/ISO 14006 Ecodesign) involve valuable sustainable design concepts and measurements (Fig. 2). Particularly, ISO 14006 defines eco-design as follows:

> "(…) a process integrated within the design and development that aims to reduce environmental impacts and continually improve the environmental performance of the products, throughout their life cycle from raw material extraction to end of life." (p. 8)

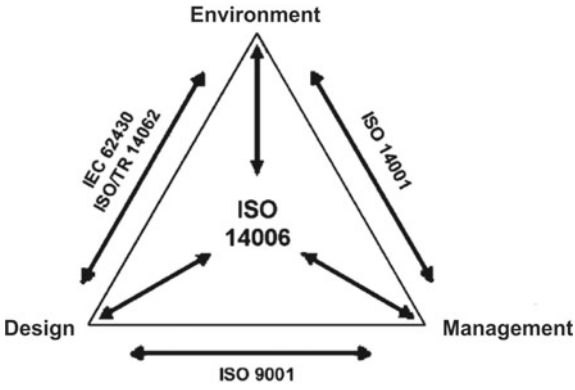

Fig. 2 Framework including ISO 14001, ISO 9001, ISO/TR 14062, IEC 62430 e ISO 14006. *Source* ISO 14006:2001 (es.) Sistemas de gestión ambiental—Directrices para la incorporación del ecodiseño

Finally, the relation university–industry–government was considered. To this extent, the instrument has to assess and analyze the sustainability within the company and over time, in terms of continuous improvement. Also, it must evaluate and compare the sustainability from a group of companies over time.

2.2 Existing Norms and Instruments

Nowadays, designers and companies rely on a variety of tools and methods to approach sustainability as a support to design processes and product development [8, 45]. Depending on the project's complexity and progress degree, the following tools can be recognized: checklists, Ashby charts, MET Matrix, D4S Strategy Wheel, and Life Cycle Assessment (LCA). They can be used along with other tools such as Eco-Indicators, Eco-Labeling (type 1, type 2, type 3), GRI Reports (Global Report Initiative), ISO 26000 (social responsibility), sustainable materials inventories, or "materialotecas" [21].

This project takes two of them as its main focus: D4S Strategy Wheel and Eco-Labeling.

- In the local context, Bernatene and Canale [3] focused on the Strategy Wheel [4] that stands out due to its ease of use and implementation. There are two ways to use it. The first one, more analytical, goes around in a clockwise direction leading to understanding the product life cycle—extraction of raw materials, production, use, and disposal. The second way goes counter-clockwise and allows us to get a project overview inviting us to think environmental strategies from three levels: product-system, product-structure, and product-component. However, this approach tends to have quite qualitative impact evaluations. To solve this, Canale [6] developed a method that blends the Strategy Wheel and the rating guidelines to measure the impact degrees.

- Also, regarding environmental labeling, many mechanisms are aiming at giving accessible information and identifying the goals needed to achieve sustainable production. Next, three labeling types can be recognized (Table 1).

GIDSu focused on the product self-declarations or Type II, which is based on the ISO 14021. They are developed by the manufacturer under their criteria, referring to specific stages of the product life cycle. The main responsibility of guaranteeing the data accuracy is of the person carrying out the self-declaration. They have to give all the information needed for verification.

This type of declaration is the most suitable for the stated requirements for local certification. Firstly, they would allow working with currently available resources at a lower cost than other labeling systems. Also, they involve public organisms and academics. They allow as well higher flexibility, as the company itself defines the criteria. Finally, self-declarations give simple and precise information to consumers. As a result, the GIDSu' project has been framed into environmental self-declarations.

Table 1 Environmental labeling systems comparison, Types I, II, and III

Environmental labeling		Type I	Type II	Type III
		Certified eco-labels	Product self-declaration	Environmental Product Declaration (EPD)
Charact eristics	Certification b y a third party	required	not required, but enhances credibility	not required, but enhances credibility
	Communicates	Better environmental performance	Improvement of one environmental aspect	LCA data
	ISO	ISO 14024	ISO 14021	ISO 14025, ISO 21930
Evaluation	Useful for	improved communication with the final consumer	improved communication with the final consumer	improved B2B communication and green procurement
	Standards	the company has to adapt to standardized criteria from certifiers	development of own criteria	requires LCA, so the company has to adapt to standardized criteria from certifiers
	Associated costs	high costs assigned to certifying body	could be lower when using own resources	high costs assigned to certifying body or experts
	Data availability	measurable and accurate data about the LC and production	verifiable data could be of only one production aspect	measurable and accurate data about the product

Source self-construct based on ISO 14024, ISO 14021, ISO 14025 and ISO 21930

2.3 CEDiS: Theoretical Aspects and Units of Analysis

The **instrument GIDSu developed was initially identified as Sustainable Design Certification, in Spanish: Certificación en Diseño Sustentable—CEDiS. However, finally, it was named after Self-declaration in Sustainable Design Management**. It is registered under the Argentinian Intellectual Property Law, with the reference number 17017885. Taking into consideration all the previously mentioned reasons, this instrument has been defined within the Environmental self-declarations, Type II which implements the ISO 14006 structure and the Strategy Wheel.

The CEDiS development took close to two years, in which GIDSu had to answer *what* and *how* to evaluate. This process was full of discussions and analysis. However, the present paper focuses on the *final form* that CEDiS adopted. Only two of the instrument's main focuses will be in-depth described: 4-Corporate Social Responsibility and 7-Innovation and expansion of useful life.

Presently, CEDiS uses eight units of analysis (henceforth UA) integrated into D4S strategies. The UAs significance was weighted upon a 100-point scale.

1. **Selection of low environmental impact materials, 10/100**. The materials used in products are analyzed by their environmental impact. Their use and selection criteria are verified (for instance, the origin of the materials). The raw materials selection is an essential process; however, the local industry shows difficulties regarding supply and demand. Therefore, this item was given a low weight compared to items where companies have higher bargaining power.
2. **Minimization of materials usage, 10/100**. Strategies for avoiding oversizing of clothing and accessories, while maintaining its functionality, are evaluated. This item also has a low weight because companies focus their actions on reducing the materials use in their whole production process (see UA 3).
3. **Optimization of the production system, 18/100**. This UA includes: (1) documentation of processes to find early problematics and make adequate decisions; (2) quality assurance, implementation criteria, and improvement strategies; (3) maintenance of own and third-party equipment, to avoid production delays and ensure quality; (4) optimization strategies to conceive alternative methods that allow lower environmental impact, efficient use of resources, and reduction of waste materials (digital pattern making) or use of efficient processes (integral garment knitting); (5) resources management (electricity, gas, and water); (6) waste and waste disposal management, taking into account the proper separation and final disposition (reinserting, recycling, among others); (7) health and safety standards and human resources management; (8) acknowledgment of the role that the design sector plays in creating added value and in strategic planning. This results in the highest weighted item, by cause of the variety of strategies included, and because most of the environmental improvement actions are focused on this approach.
4. **Social responsibility, 15/100**. In this item, the relation between the companies and the different local stakeholders is verified. This includes the companies'

employees, the outsourced workshops and suppliers, domestic workers, and other community sectors—in vulnerable situations or not. In the long term, the objective is that companies commit to environmental, social, and economic improvement, beyond the current legislation. Then, this item involves (1) labor conditions of outsourced workshops and domestic workers, taking into consideration legal aspects and communication between parties; (2) labor relations and human resources management (minority incorporation, skills training programs, motivation); (3) interaction with non-traditional production sectors by incorporating vulnerable social groups (through coaching, seminars, integration initiatives) and community engagement (responsible use of public spaces, working with NGOs).

5. **Optimization of the distribution system, 10/100**. Strategies are focused on lowering the environmental impacts of the distribution whether it is transportation inside the city (factory–stores–outsourced workshops) and transportation to wholesalers, franchises, and customers. These strategies could be focused on the packaging (reducing, reusing, or using biodegradable materials) and/or on the logistics (closed circuits, reverse logistics, among others). It represents an item with a high environmental impact; however, the local context and market conditions restrict the companies' taking of action. As a consequence, this item has a low weight compared to the rest.
6. **Reduction of the impact during use, 10/100**. Although the use phase has the highest impact on the clothing life cycle, it was complex to measure it during this project stage. Most of the difficulties were associated with the lack of quantitative and qualitative data about users' behavior during use. On CEDiS, the strategies are verified for reaching the minimization of the environmental impacts of products in their use and maintenance.
7. **Innovation and expansion of useful life, 17/100**. This takes into consideration strategies for improving product efficiency and expanding the product's lifetime. It focuses on reducing the planned obsolescence of textiles and clothing. It also considers developing disruptive innovations (such as making new yarns) or incremental innovations (blending yarns, combining fabrics, or changing garments to improve functionalities, changing machinery, among others). It results in a relevant item, because of its relation to the company's design management and the possibility of rearranging the available resources (materials and humans).
8. **Communication, 10/100**. It evaluates if the communication between the company and its stakeholders is clear, coherent, and appropriate to each profile. This item also evaluates how the company obtains information about its customer experience and preferences and how it conducts the research and implements the results. This UA is considered by taking into account that information, and communication can improve the product and the company's position, enhancing the value.

2.4 The CEDiS Aspects

GIDSu developed a **questionnaire** to collect information about the UAs, as well as an interview and data collection protocol. The collected data is then processed through an **evaluation matrix**. This matrix consists of a spreadsheet where a partial score, as well as an overall score, is calculated. As explained before, each UA has a different weight according to its relevance in the textile–clothing industry, the possibility to implement related strategies, and the different aspects involved (technological, economic, social, managerial, and environmental).

The UAs are divided into analysis variables that are individually classified according to the company's actions: zero/low, medium, or optimal/high. For each ranking and variable, there are criteria, examples, and cases established that allow the researchers to measure the company's action. For example, Table 2 illustrates a

Table 2 UA3 weighting criteria, Sect. 3.1. Use of follow-up tools

zero	medium	optimal
0	0,5	1
Not verified. / There is no standardized use of follow-up tools or process documentation.	There is an implementation of follow-up tools or process documentation for some products. / No control or improvement measures and actions are taken for documented processes.	There is an implementation of follow-up tools or process documentation for every product. This allows communication within different company' areas and the implementation of control and improvement measures.

Source CEDiS Evaluation Matrix (extract)

variable from UA3, optimization of the production system. In this particular case, the use of production documentation tools is evaluated (technical sheets, process follow-up sheets, among others). The standardized use of these tools allows the company to obtain reliable information about their situation in order to improve their system. The company not using this type of tool gets a 0-zero score. If the researchers cannot verify the use of production documents during the interview, the score is also 0-zero. The company that implements these tools but has an infrequent use, or does not take any improvement measure, gets a 0, 5-medium score. Lastly, if the company implements standardized follow-up tools and improvement measures, it gets a 1-optimal score.

The score calculation delivers two types of values: one for each UA and one overall result. The first type is displayed in a radial graph, which indicates the level of compliance for each UA, to the D4S strategies. Series 1 (in blue) shows the optimal results according to CEDiS. Series 2 (orange) shows the company's performance in each UA (Fig. 3).

The second type illustrates the overall result of the company's actions related to the D4S strategies, in a score from 0 to 100. CEDiS is thought of as a program with a progressive implementation for D4S compliance. There are three possible

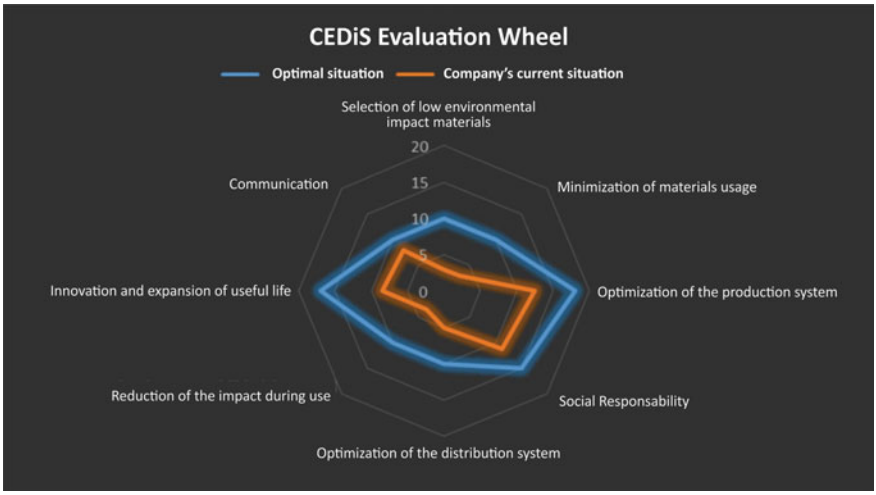

Fig. 3 Radial graph that compares the level of compliance: optimal situation (in blue) and the company's current situation (orange). *Source* CEDiS Evaluation Matrix (extract)

Table 3 Score rating for the different identification levels

Minimum score	rating	Maximum score
30,00	silver	45,00
45,00	gold	75,00
75,00	platinum	100,00

Source CEDiS Evaluation Matrix (extract)

levels of identification: silver, gold, and platinum that depend on the overall score (Table 3). The idea is to repeat the study in a period no longer than two years, to verify the improvement measures taken by the companies, many of which could be implemented in the medium term.

Finally, the analysis results and possible improvement measures are shown in the **Diagnosis Sheet**. This document is handed out to the companies with the results of the study carried out. It is presented as a table and summarizes the most relevant facts as follows:

- The first column describes the problem or the detected opportunities for improvement.
- The second column explains the actions to be taken to solve the problem or to capitalize on the detected strengths.
- The following columns evaluate the recommended actions for the company (Table 4). To easily communicate to the company the priority actions, it was chosen to use simple spreadsheets. For each firm and strategy, the following has

Table 4 Final rating and priority of the recommended action, considering its feasibility and benefits

Technical or economic		environmental, social, and managerial benefits		Priority of each recommended action
feasible	difficult /unknown	significant	limited	
X		X		1
X			X	2
	X	X		3
	X		X	4

Source CEDiS Diagnosis Sheet (extract)

to be considered: (1) the technical/economic feasibility; and (2) the environmental, social, and managerial benefits.

- The last column weights each recommended action.

2.5 Units of Analysis: Item 4—Social Responsibility

2.5.1 Background

The instruments studied in Sect. 2.2 are focused on the environmental impact. However, from a regional development perspective, it is also relevant to consider the social aspect to encourage corporate social responsibility (CSR) and Fair Trade.

The ISO 26000 defines CSR as the "responsibility of an organization for the impacts of its decisions and activities on society and the environment, through transparent and ethical behavior that contributes to sustainable development, including health and the welfare of society. The guideline and its implementation are voluntary and not a certifiable norm."[2] (ISO 26000, p. 2). The fair trade concept is incorporated due to its emphasis on the cooperation between stakeholders (state, consumers, and producers) and to focus on the ethical aspect of sustainability. The vision of the Fair Trade movement is "a world in which justice and sustainable development are at the heart of trade structures and practices so that everyone, through their work, can maintain a decent and dignified livelihood and develop their full human potential" (Manifiesto Comercio Justo [24], p. 1). Although it is not a concrete example describing specific actions, it is an encouraging movement that enhances values and ethical actions in search of labor and social equality.

Regarding specific certifications, the actions from *Fashion Revolution* an international NGO that works on creating conscience about the unsustainability of the

[2] ISO 26000 Guideline Social Responsibility Global STD, pp. 1–2. From http://www.globalstd.com/networks/blog/guia-iso-26000-responsabilidad-social.

current textile and fashion production systems can be noticed. They also created a campaign called *Who made my clothes?* to make visible the textile value chain creating conscience and connecting the consumer with the manufacturer in a way of respecting the environmental and ethical aspects of the production.[3]

Eco-labels are another example that contemplates the relation between consumer and manufacturer through product traceability. In the national context, the cases of "Sello Verde" in Rosario (green seal) and the "Ecosello de gestión salteña" (Salta's management ecolabel) can be recognized. They involve social aspects but do not develop them in depth. Another relevant case is B-System. According to B-Lab, the certifying organization, the B companies: "*measure their social and environmental impact and commit (…) to make decisions considering the consequences of their actions in the long term.*"[4] The B-System strictly evaluates the social and environmental impact of companies and proves that a business is meeting the highest standards of verified performance and transparency. However, none of these certifications have a comprehensive design foundation.

2.5.2 Adaptation to the Local Context

From the design perspective, the regional development and social sustainability aspects, the following threats and weaknesses of the local industry can be identified:

- There is a high level of informality in the outsourcing labor relation.
- Production units turn out as disjointed and invisible. There are not only workshops but also factories that do not belong to any chamber, which minimizes lobby opportunities.
- There is an unbalanced production system (higher production volumes for the winter season). This seasonal production system leads to inactivity periods and labor instability.
- There is a need for valuing craftsmanship and employee training and development. This relates to the need of keeping a stable and skilled workforce.
- There is a growth in business competition and diminished demand.
- There is a need to advertise the city as a high-quality production center, in the local and regional context, as a distinctive value.

Thus, GIDSu decided to focus on two areas of the CSR concept. On one side, previous local researches regarding CSR [46] were taken into account, related to the community (community engagement, minority incorporation), health, safety, and employee training (training programs, family support programs, volunteer programs, etc.). On the other side, outsourcing and sub-contracting systems, and the toll processing modality were considered. This last aspect proved to be the most relevant since it is a conflictive topic in the local context.

[3] From: https://www.fashionrevolution.org, last revised on 04.21.2020.

[4] From: https://www.sistemab.org.

To evaluate outsourcing in the local context, the concepts of outsourcing [2] and labor informality [42] were strictly defined. Law 12713 was also examined, which defines the conditions for textile home-based work taking into account the aspects of corporate responsibility. The configuration and employment conditions of the home-based workshops [41] were also analyzed. The resulting evaluation of these aspects is of interest since these types of workshops play a central role in the local textile value chain. They are also contingent on the relations built related to the "ways of doing" due to the local production tradition and craftsmanship.

With this analytical basis, the development of variables and measures was addressed. In the first CEDiS draft, outsourcing was not included due to its implementation complexity. Firstly, there was a debate around the assessment of the concept. From the social sustainability perspective, outsourcing arises as a positive aspect since the manufacturing activities allow the creation of jobs outside of the company's facilities enhancing local development. However, also in the local context, outsourcing has a negative aspect related to labor instability. This can be observed in the working relations that appear asymmetric regarding development and salaries when comparing home-based workshops and factories [41]. Consequently, it is a sensitive topic for companies, and even under the self-declaration nature of CEDiS, they were not able to disclose in-depth and verifiable information. GIDSu took into consideration the goodwill of the interviewees and the observations of the interviewers considering the certification protocols.

However, once the pilot cases were gathered, it was clear the difference between companies that centralized their production and those that outsourced most of their processes. The first ones incurred high personnel investment, while the second ones did not know the situation in the workshops. In this first approach, both types of companies got a similar score on the CSR unit of analysis. This showed the researchers the need for including the topic of outsourcing and sub-contracting into the certification. Firstly, as a sensitizing method and to open the "pandora box" of the local production; secondly, to put under the spotlight the sub-contracting modalities and to implement, in the future, improvement strategies.

In a second CEDiS round, companies were questioned about their engagement in outsourcing activities. The aim was to examine the company's responsibilities and their knowledge about the operational and production aspects of the workshops they worked with. Furthermore, GIDSu resolved that those companies not outsourcing any of their processes were going to be identified as *optimal*. Outsourcing is not considered here as negative per se. However, the idea is to reward those companies that make an extra effort to keep all processes inside their facilities. Considering the local context, it takes a significant investment to keep a stable workforce in the long term (salaries, facilities maintenance, employee training, among others). This can be interpreted, as an achievement from the private sector, in an unstable economic context and a seasonal production industry.

For the final CEDiS version, some other aspects were incorporated. Firstly, it was evaluated which reasons lead companies to outsource (if they do), such as the business model selection, bottlenecks, unusual processes, among others. Secondly, the employment situation in the workshops was evaluated. Therefore, three levels

were defined: *zero* for those companies who do not know and do not adopt the legal framework for home-based workers; *medium* for the companies opting for the "Monotributo Social" (individual taxpayer category that allows entering the formal economy); and *optimal* for those who adopt the right legal framework (Law 12713).

Lastly, communication and exchange conditions are evaluated. For example, the companies that understand the external processes, and define those together with the workshops, get a positive score. To evaluate this situation, the adoption of standardized communication tools (technical sheets and production documents), delivery systems (of raw materials and end-products), quality standards agreed between parties, and product systematization is considered.

Some aspects of the relationship between the company and the internal employees are measured in the UA "Optimization of the production system".

2.5.3 CEDiS Diagnosis

The implementation of the instrument during 2019 allowed the researchers to test it and to obtain general information about the local industry. The most significant findings related to the UA 4—Social Responsibility, in particular those related to outsourcing, are the following:

- **Difficulties to define the production traceability**. Outsourcing shows different levels of sub-contracting. This means that there are different levels of intermediaries, which makes it hard to identify the responsible party in charge of manufacturing.
- **Persistency of labor irregularities**. The most common outsourcing modalities found are: (1) workshops enter the formal economy as "monotributo" (individual taxpayer category), and (2) there are operational workshops with no legal framework (small places or home-based productions, consisting of mostly women). The first case implies that the relation between the home-based worker and the company-owner is about business, when in fact they have a work and production relationship [40]. A dependence on the home-based workers can be observed, in terms of prices, product conditions, and lead time.
- **Lack of information about the work processes in the outsourced workshops**. This directly affects the quality of the end-product and its traceability.

The opportunities and improvement measures detected are:

- **Finding the correct legal framework for each case**. There are some gray zones between the company-owners and the home-based and outsourced workshops. However, the revision of the Law 12713 is suggested, which explains the acknowledgment of the dependence relation between an employer (company-owner) and the worker [42]. This law considers items such as social security and pension fund of the textile home-based workers. Although this legislation fell into disuse, the idea is to make an interdisciplinary revision meeting (state organisms, businesses, and labor unions) to evaluate the best way to enforce it. This would also

benefit other areas such as traceability, making visible the production processes, eco-labeling, and an increase in product added value.

- **Appraisal of skilled workers in terms of trade**, by taking into account the craftsmanship behind textile and clothing manufacture. The fares proposed by the union of home-based seamstresses as a basic price criterion are recommended for use. It is also recommended to use communication strategies to sensitize and make visible the existence of these types of production units (through campaigns such as Who made my clothes?). These strategies could foster in the medium and long term, the regional development, and restructuring of the textile sector. Moreover, these could create a context of enhanced quality, added value, and industry access for vulnerable social groups.

2.6 Units of Analysis: Item 7—Innovation and Expansion of the Useful Life

2.6.1 Background and Adaptation to the Local Context

The structure of this item is based on two dimensions of the D4S Strategy Wheel [34]: optimization of the initial lifetime and development of a new product. In terms of D4S, the optimization of a useful life involves those expected product features that allow the extension of the product life cycle. The conditions to analyze are related to reliability and durability, ease of maintenance and repair, modular product structure, classic design, a strong relation between user and product, and involvement of local systems. Additionally, new product development involves those eco-design variables related to conceiving a new object. Some of its proposals are dematerialization possibilities, shared use of a product, function integration, and functional optimization of components. The D4S wheel also includes a third dimension: optimization of the product's end-of-life, which refers to reuse, remanufacturing/refurbishing, recycling of materials, in connection to local systems.

From the beginning of CEDiS design, GIDSu decided to address the dimensions of optimization of the initial lifetime and new product development together in one UA: Innovation and expansion of the useful life. At first, the item "optimization of the product's end-of-life" was evaluated separately from that UA. However, in consecutive iterations, the researchers decided to approach the item tangentially due to the difficulty to analyze it with the information provided by companies. For example, recyclability and compostability are extremely specific and rely on given physical and chemical conditions [43]. Moreover, the local waste disposal system, particularly the textile one, is diffuse. Then, many companies define their products as recyclable or compostable, only by their material composition without knowing, and so not being able to inform, about the right guidelines for the end-of-life processes. In the future, this variable is expected to be gradually incorporated into CEDiS.

As a result, UA-7 incorporates a systemic perspective, without downplaying its two composing dimensions. This proposal aims for a comprehensive vision of the

design process, related to sustainability and the possibility of innovation to extend the product lifetime from its projection. It is in line with the idea of Fletcher and Grose [11] that in the clothing and textile sector, sustainable transformations should be made in the system more than in the products. Also, Gwilt [19] proposes to explore new strategies when designing and producing: to think about innovating systems that could, for example, include renting and returning, shared use, product combinations. This holistic view aims to change the perspective of product-only sustainability. When observing the local value chains, characterized by small- and medium-sized productive organizations, innovation appears widely and is fostered by the interaction between different local stakeholders.

In CEDiS, UA-7 is one of the most relevant variables assigned with a high weight. This decision refers to the importance of innovation in small- and medium-sized companies that allow them increased competitiveness in new markets. The focus is given to innovative strategy design to guarantee the maximal expansion of the product lifetime. This approach takes into account that company owners still consider sustainability as an obstacle and an expense. When talking about expanding the product lifetime, it sounds contradictory to the main goal of selling that companies have. Accordingly, the same global debate between capitalism and sustainability is reflected in the local value chains.

Following the D4S variables, this dimension is focused on evaluating:

- product durability strategies;
- design for maintenance and easy repair from local systems;
- modular product structure, transformable or disassemble;
- classic design;
- a strong relationship between the user and the product; and
- disruptive product development cooperating with scientific and technical institutions.

This dimension enables a wide range of possible answers, aligned with the company's possibilities and its context. To avoid mistaken associations between innovation and technology—mainly related to hardware and software—there are open-ended questions with some explanatory examples. Those strategies that help to reduce textile and clothing obsolescence are considered here, such as durability, ease of maintenance and repair, customer after-sale services or quality assurance systems, multi-functional or modular structures, classic design, or the relation with the user (signature design, capsule collections, inclusive design, among others). There is also a question about disruptive design (such as developing new yarns), or incremental design (blending yarns, combining fabrics or changing garments to improve functionalities, changing machinery, among others). This dimension measures the interactions between organizations, under the framework of the National Innovation System (Sistema Nacional de Innovaciones in Spanish), and the involvement in other institutions to develop new products, enhance the quality, or optimize processes. For this dimension, it is highly valued the demonstration of intention or future projection, even when it is not implemented at the time of evaluation.

2.6.2 Found Problem Areas and Recommendations for Continuous Improvement

The findings related to the UA 7—Innovation and expansion of useful life define certain problem areas and potentialities for the clothing and textile sector. Among them:

- **Difficulties to engage with scientific and technical institutions, R&D, universities**. Although some companies demonstrated their link with this type of organization, when looking to achieve product or process improvements, it is mostly about a one-time relation. The possible access barriers to these institutions are the lack of dialogue and knowledge/research dissemination and the lack of articulation between science and technic with the industry.
- **Deficiency of product maintenance and repair strategies**. Most of the companies mentioned that they have an after-sale service for their customers, in cases of damaged goods. Although, beyond this option, there are no other strategies implemented to innovate in the user's care and repairment of the product.
- **Limited relation between the user and the product**. Some strategies to strengthen this relation were detected, although quite incipient. While some durability strategies are implemented, the idea is to focus on a comprehensive user experience related to a symbolic aspect.

Design acts as a creator of innovative ideas, comprehensive projects that enable the implementation of sustainability across the company. The difficulties to implement such innovations are attributable to the economic adversities or the lack of investment, according to companies. Respectively, there are some suggested improvement measures, which require low investment and would work as relieving actions for the periods of declined production:

- **Articulation with differential propositions**. Innovation is fostered in varied scenes, such as in participation in the "Good Design Seal" (Sello de Buen Diseño in Spanish), association with business chambers, the involvement in technological actions as the hackathon, among others.
- **Involvement with scientific and technical institutions, and R&D organizations**. Multiple university research centers work on a wide range of topics that could assist the development and improvement of troubled areas. Also, companies could present their inquiries and research topics to research institutions. The strengthening of the link between the private and public sectors and academics acts as a central driving force for innovation.
- **Design creative strategies for process and product innovation**. Each company has specific features and implemented systems that could be efficiently improved. This is where the designer's creativity plays the role of a unique strategies' developer. Examples of these could be art or brand collaborations, renovation or adaptation of machinery for new products, yarn blending, among others.
- **Design linking strategies, between the user and the product, in terms of symbolism and functionality**. However, the project aims to the local value

chain, consumers' choice answers to global social and cultural trends. The strategies comprehend the functional and symbolic dimensions. The first ones refer to propositions that relate the consumer with product use and care. For instance, the DIY concept by giving assembling or customization instructions, garment care instructions, or even online tutorials about these aspects could be implemented. Regarding the symbolic strategies, it could be implemented as a genderless capsule collection or inclusive collections also with a wider size curve, among others. All of the mentioned examples are intended for achieving consumer empathy with the product and thus, creating brand loyalty.

3 Final Considerations

CEDiS is the result of a series of researches over many years and the engagement of a diversified team involved with sustainable design in Argentina, particularly in the city of Mar del Plata. This project has been nurtured by different sustainability areas and the academic journey of the involved researchers and scholars. Industrial design has been entangled in new ways of innovation. Social innovation, particularly, depends on specific design actions: experimentation, replication, and connection, both in expert design and diffuse design, are fundamental to global development, initiatives, and goals (loc cit). According to Manzini, "*is it possible to outline a design scenario built on a culture that joins the local with the global (cosmopolitan localism), and a resilient infrastructure capable of requalifying work and bringing production closer to consumption (distributed systems)*" (loc. cit, p. 2). That is why, designers' hardcore differentials should include a refexión-action capacity which allows people to develop in a symbolic environment, diverse and complex (Galán 2018, p 71).

In this way, the article first focuses on the strength to develop a specific method for the local context. Previous studies lead to identifying the local difficulties for the implementation of eco-labeling and other sustainable certifications, into the clothing and textile value chain. These difficulties are related to economic aspects, disregard for the topic, and bureaucratic management challenges. After all, local sustainability is a relegated topic for clothing and textile SMEs. Therefore, the CEDiS project focuses on a self-declaration model introduced by a simple audit that is conducted by the researchers and experts, who contrast the information through prior knowledge and observation during the interview. Its structure was designed to analyze those sustainable design aspects quickly and systemically, evaluating the results, identifying problem areas, and proposing improvement measures. This structure enables local companies to reach sustainability processes and gives them the chance to gradually incorporate green actions into their processes and products.

Furthermore, CEDiS helps to prevent the blind spots that a firm could incur when performing green actions. Such blind spots could be innovative strategies not correctly informed to the customers, sensitizing about their product traceability, or outsourcing in poor conditions. It is also acknowledged the interest of micro-, small- and medium-sized enterprises, in the sustainability issue as a way of capitalizing the specific know-how in the region. The structure of micro and SMEs develop an enhanced human connection and particular knowledge about the local value chain, where territorial processes are easier to control, and where quality is valued over quantity ([13]; Thackara, *op.cit*).

It is also worth emphasizing that GIDSu's aim has always been to replicate CEDiS for other industries and has been making progress around it. The group has already analyzed sustainability and design among metal-mechanic and plastic local firms; however, this is not enough to scale the assessment method. On the one hand, each industry has its own impacts: differences translate into specific impacts and strategies. This would mean a careful redesign of the CEDiS, to adapt the tool and maintain its simplicity and usability. On the other hand, CEDiS's development did not only rely on theoretical work. On the contrary, CEDiS success is entangled with the development of the Textile and Clothing Cluster of Mar del Plata. CEDiS work was based on a common comprehension about what sustainable clothing meant, common goals and values, shared along with firms and institutions.

At this point, relationships between state, university, and private sector regarding sustainability become more relevant. Clearly, a joint action to transition toward sustainable projects in the city is fundamental for projects like CEDiS to thrive.

This experience shows the need for the implementation of academic projects involving community transference. For social innovation, design action is fundamentally based on social work along with the territory. These research-action scenarios [12] are highly valuable for the discipline and allow designers to identify new intervention roles, for both the professionals and their context. This strategic perspective is larger than product design and leads it to new management areas, coordination, and action in the territory and its actors. In the case of CEDiS, its implementation led to active linking the sector considering the empiric experience, iterating about inconsistencies that could complicate the tool implementation. Also, it turned the researchers into managers with the need to make CEDiS attractive for companies and make them participants, linking public and private institutions, managing resources [29].

Finally, this certification method was developed to be a flexible solution that encourages constant feedback between stakeholders and the creation of new improvement and cooperation scenarios. At GIDSu, this pilot experience lead to think about consumers' awareness, how to further implement CEDiS in Mar del Plata, and how to make this certification attractive for companies by its autonomy and advantages.

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