A value-driven business ecosystem for industrial transformation: the case of the EU’s H2020 “Textile and Clothing Business Labs”

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ABSTRACT
This article reports on the experiences and results of the European Union-funded Horizon 2020 project TCBL which has been successful in creating a European network of Textile and Clothing Business Labs aimed at the sustainable transformation of one of the most problematic industries in both social and environmental terms. The approach followed by the project was based on the diffusion of value by and for all stakeholders, including consumers. This, in turn, implies a systemic transformation of business models, brought about by all players in the sector engaging in the experimentation of new processes and transaction patterns. In this way, all stakeholders were able to reap the benefits of innovation, and the lever of competitive advantage shifted from price to knowledge, collaboration, and shared values. In the meantime, the COVID-19 pandemic has had a devastating effect on the business models of the luxury and fast-fashion brands for which TCBL has aimed to offer an alternative path, also loosely in line with the provisions of the European Green Deal and the United Nations 2030 Agenda. Given the results attained, a two-pronged strategy for the constitution of a sustainable post-project TCBL ecosystem is now being implemented.

Introduction
Addressing the twin challenges of environmental and social sustainability requires significant changes in the way goods are produced and consumed, and one of the more evident examples of this challenge is in the textile and clothing (T&C) industry. The sector’s significant environmental and social impacts have been widely known for several years and visibility has grown as a result of specific episodes such as the discovery of child labor for Nike shoes in 1996 (Schanberg 1996). In addition, Greenpeace raised the environmental issue with its 2011 Detox program1 to reduce chemicals usage, followed by the 2015 documentary The True Cost2 which claimed that the fashion industry is the second-most polluting on Earth; more specifically, “the production of [the fabrics used in fast fashion] creates more toxic chemical pollution per item than any other industrial product” (Angelov 2016, x).

Public awareness of these impacts has expanded to include the use of chemicals in dyeing and finishing and the resulting water pollution (Kant 2012), the impact of pesticides used for growing cotton (Luz 2007), and the sheer quantity of clothing produced amounting to some 80 billion garments per year. It was not until 2017, however, that these claims gained widespread institutional acceptance with the publication of the report A New Textiles Economy: Redesigning Fashion’s Future by the Ellen MacArthur Foundation in collaboration with the multinational consulting firm McKinsey & Company. To quote from the report’s executive summary,

[...] total greenhouse gas emissions from textiles production, at 1.2 billion tonnes annually, are more than those of all international flights and maritime shipping combined. Hazardous substances affect the health of both textile workers and wearers of clothes, and they escape into the environment. When washed, some garments release plastic microfibres, of which around half a million tonnes every year contribute to ocean pollution – 16 times more than plastic microbeads from cosmetics. (EMF 2017, 3)
These astonishing figures highlight the scope and scale of the issue which clearly cannot be resolved by one company alone. A broad-reaching structural transformation is required, leading to the main (action) research question posed here: Is it possible to intervene holistically to transform an entire industry toward sustainability, and if so, where to start?

The last ten years have seen the launching of a range of large-scale initiatives worldwide following different approaches. One is to make consumers more aware of what they are buying. Following the collapse of the Rana Plaza garment-production factory in Bangladesh in April 2013, with its death toll of 1,134 mostly women (Reinecke and Donaghey 2015), the Fashion Revolution movement was born as an international awareness campaign. By asking the simple question: “Who made my clothes?” the organization highlights the dismal conditions of garment-factory workers making the products of the global fashion brands. Every year on the same date events around the world are held by local chapters in over 100 countries, with a Facebook page followed by more than 100,000 subscribers.4 Starting in 2015, Fashion Revolution began to publish a Transparency Index that now rates over 250 brands on different aspects of their supply chains.5

With such negative publicity mounting, most of the larger brands have in parallel initiated their own campaigns for creating supply-chain transparency, recycling used clothes, adopting sustainable practices, and so forth. Fashion for Good attempts to bring these efforts together, with an approach that sees the larger brands as the most effective impact path: indeed, the top 20% of sector companies had a 60% share of total profits in 2019 (McKinsey & Company 2021).6 In parallel with joint adoption of sustainability targets and similar commitments, Fashion for Good also promotes innovative startups as models for sustainability.

The public sector has also recognized the importance of the issues at hand, starting with the UK’s Sustainable Clothing Action Plan in 2009–10 (DEFRA 2010) through to the European Union’s (EU) listing of textiles as one of the priority sectors in the new Circular Economy Action Plan (European Commission 2020).

Despite these well-publicized programs, however, little has changed. The yearly report “Pulse of the Fashion Industry” by Global Fashion Agenda and the Boston Consulting Group stated in its launch edition of 2017 that if global population and gross domestic product (GDP) grow as expected, “the overall apparel consumption will rise by 63%, from 62 million tons today to 102 million tons in 2030 – an equivalent of more than 500 billion T-shirts” (Global Fashion Agenda 2017, 8). The most recent update states: “The fashion industry must overcome its roadblocks to achieve more substantial improvements that lead to a systemic change” (Global Fashion Agenda 2019, 15). In addition, a recent report by Business of Fashion, Measuring Fashion’s Sustainability Gap, has come out with a new Sustainability Index. Comparing concrete actions against environmental and social targets, the report states that “Pockets of innovation and progress mask significant outstanding challenges that must be resolved over the next decade…. The average score [on the Sustainability Index] was just 36 out of a possible 100, with significant disparities in engagement and progress” (Business of Fashion 2021, 8).

The “TCBL: Textile & Clothing Business Labs” project, started in 2015 and completed in 2019, formulated an alternative approach to address the problem, based not on remedial actions but rather a diffused creation of sustainable value by and for all stakeholders, including consumers. Its stated objective was to “create a transformational ecosystem capable of constantly innovating the business and process models of the European T&C industry” (TCBL 2015, Part B, 4). This, in turn, implies a systemic transformation of business models, brought about by all players in the sector engaging in the experimentation of new processes and transaction patterns. In this way, everyone can reap the benefits of innovation, and the lever of competitive advantage shifts from price to knowledge, collaboration, and shared values.

TCBL argues, in fact, that the economic and social problems of the T&C sector derive from the structural nature of the large brands’ top-down supply chains and business models, designed to reduce costs and increase output. This subsequently imposes specific behaviors on the mostly small companies – over 170,000 textile manufacturers, garment designers and producers, service companies, and so forth employing over 1.7 million workers (Euratex 2018) – who are forced to sacrifice what drive they may have for more sustainable ways to the need to constantly lower prices and reduce delivery times.8

Rather than focusing on the large brands, TCBL, therefore, addresses the industry as a whole system, with a specific eye on these smaller, pre-existing European companies. Together with them, TCBL envisions an environment within which production companies can experiment with new materials, processes, and methods together with other businesses sharing the same values and goals, thus reducing the risk of exploring new suppliers, new clients, and new markets. The underlying hypothesis – and this
can only be validated by practice – is that individual businesses, given the right conditions, are best equipped to make the most appropriate innovation choices rather than being asked to adhere to some abstract model of sustainability.

The remainder of this article is structured as follows. The next section overviews the antecedents of the project vision, namely open innovation, living labs/fab labs, and knowledge champions on the methodological side and industrial districts, smart specialization, and the rebuilding of local-global value chains on the policy side. The third section presents the TCBL methodological approach to building a sustainable, value-based innovation ecosystem. This is based on three main pillars: a combined outside-in and inside-out business model-innovation approach; an impact oriented (or focused) collaboration model between TCBL community members (labs and associates); and an emphasis on shared values as the unifying element for a community of like-minded ecosystem members. The fourth section describes the key implementation results of TCBL and the fifth section discusses them, in tight connection with the project’s evaluation strategy, which was inspired by three key concepts: Business Ecosystems, Complexity Theory, and Large-scale Change. The final section concludes with an outline of a two-pronged strategy for the post-project phase that is now being implemented by a soon-to-be-established nonprofit association and an already operating commercial small- and medium-sized enterprise (SME).

Background

A cornerstone of the TCBL vision is the application to the T&C sector of a lab concept, leading to structures that openly explore different kinds of innovation in areas ranging from new bio-based materials to social sewing collectives. TCBL Labs collaborate and network with other labs and engage with local T&C enterprises to understand the potentials for developing new business models. Labs are thus the active, physical context in which TCBL’s exploration of new sustainable models for the T&C industry take place. To make it easier for businesses to find the services they may be interested in, as well as promoting lab-to-lab collaboration in networked projects, an evolving TCBL Lab model aims to provide a structure that organizes this diversified network in terms of the types of activity carried out.

The initial classification distinguished three types of approach toward addressing a problem or opportunity. Design Labs apply a design approach, composing fragments and opportunities in new ways (Dorst 2015) in a “design thinking” (Brown 2008) mode. This, of course, includes fashion design but also entails, for example, service design for new retail models. Make Labs apply the maker-culture approach (Sennet 2009), exploring the potentials of new materials as well as process technologies such as laser cutting. This links to the Makerspaces concept (Dorst 2015) as well as to model factories for Industry 4.0 (Lasi 2014). Place Labs draw inspiration from the regional dimension (Barata et al. 2017) working with locally embedded knowledge and exploring new forms of social and territorial innovation (Marsh 2008) for work and production. Bringing together a network of different labs, each with its own mix of these three approaches, aimed to develop a multi-faceted TCBL lab model capable of overcoming the single-minded championing of specific methodologies and keeping the focus on the common goal of sustainability (Cohen 2017).

Antecedents to this vision are different strands of research relating to how companies can innovate together. The first is open innovation (Chesbrough 2003) whereby firms open up to external ideas, including collaboration in research with competitors, highlighting the value of knowledge flows within a sector. Open innovation is also at the heart of the living lab movement (Niitamo et al. 2006) including collaboration in research with competitors, highlighting the role of culture and creativity in promoting territorial innovation (Barata et al. 2017). Other open, participatory, co-creative models (Troxler 2011) include the FabLabs network, launched by the Massachusetts Institute of Technology in 2002 where digital fabrication technologies are made openly available to companies, nonprofits, designers, students, and others to develop their own projects.12 TCBL applied these concepts in engaging with businesses involved in textile and clothing value chains, from cotton farmers through to dress-sharing startups. So, in parallel with the development of the Labs network, it was essential to build a community of “Associates”: T&C businesses joining the TCBL movement to work together in shaping a new market structure for the industry. While Labs work with both technological and social innovations and explore their possible implications for the Associates, it is the latter that focus on finding ways to incorporate these innovations into their business models. The initial configuration of TCBL partners and labs allowed us to reach out to local business communities in eight regions of six EU member
states, including industrial districts specialized in cotton (northeastern Greece), textiles (Yorkshire, Prato, southern Germany), garment production (Slovenia, northeastern Romania) and fashion design (Paris, Tuscany), to build a first critical mass. The role of the Labs in this process is related to the notion of “knowledge champions”: organizations active both within and outside a certain territory who make a key contribution to a region’s capacity to grasp, to understand, and to process knowledge coming from the outside, in a way that neither entrepreneurship nor policy actions alone have proven capable of attaining (Molinari 2018).

In addition, the project vision drew on understandings of how industrial business systems work and how they innovate. The concept of an industrial district dates back over one hundred years (Marshall 1881) and in fact the T&C industry has historically been a case example of this kind of territorial organization. The question of the impact of industrial districts for regional economic development – the competitiveness of firms within them (Camagni and Capello 2002) – gained particular relevance as the globalization of the T&C sector over the last decades has broken regional value chains and transactional contiguity and drained Europe of important knowledge resources (Dunford 2009).

A related concept to territorial (spatial) development is the EU’s so-called Regional Innovation and Smart Specialization Strategy (RIS3) (Foray 2015), an effort to coordinate the planning exercises for innovation policies in Europe’s 236 regions for the European Regional Development Fund’s 2000–2014 programming period. In this context, the idea of “place-based innovation” was revitalized, with a case-study analysis (Rissola and Haberleithner 2020) published by the EU’s Joint Research Center (JRC) identifying as key elements of success: multi-stakeholder partnership, effective leadership and orchestration, talent attraction, presence of research infrastructures, and internationalization. The concept of related variety is also part of the RIS3 and further elaborates the advantages of knowledge spillovers from different sectors (Asheim, Oughton, and Smith 2011) and the recombination of knowledge, ideas, and practices among heterogeneous industries (Frenken, Van Oort, and Verburg 2007). In this context, TCBL placed specific importance on rebuilding local-global value chains not only to improve environmental and social performance but, above all, to restore the territorial dimension of value and knowledge flows (Huiling and Dan 2020). Ongoing engagement is shaped by another concept emerging from the smart specialization experience, namely entrepreneurial discovery. This idea refers to an inclusive and interactive bottom-up process in which participants from different environments (e.g., policy, business, academia) discover and produce information about potential new activities, identifying opportunities that emerge through this interaction (Smart Specialisation Platform 2017). This approach allowed us to identify areas of common interest in which to engage Labs and Associates in collaborative projects.

Methodology

Over the project lifespan, TCBL dealt with the theme of business-model innovation by means of two distinct, yet complementary, approaches: outside-in and inside-out. In the exploratory phase of the first two years, the outside-in approach carried out an analysis and classification of exemplary cases. We selected a set of innovative companies and related service offers on the basis of their innovative contribution toward one or more of three dimensions – sustainability, openness, and use of data – and from there a set of archetypal business models were defined to highlight the possibilities within each dimension. Not by chance, a number of business-model archetypes discovered in the outside-in phase triggered initiatives subsequently activated by the TCBL project. For instance, the Second-Life business model archetype inspired the TCBL journey into circular fashion, resulting in services meant to maximize the value of end-of-life garments (e.g., Second Life) as well as partnerships with TCBL Service Providers such as Circular Fashion and Reverse Resources. The Do It Yourself business model archetype spawned a wave of interest in digital fabrication, with the involvement of FabTextiles and activation of new services as well as proximity production, for example, the “Short Runs” project, combined with the enrollment of Sqtetch and SourceBook as TCBL Service Providers. As far as the data-driven archetypes are concerned, the Predictive Offering business model raised awareness of the potential in leveraging data intelligence to reframe the customer experience, leading to TCBL initiatives such as My Yorkshire Wardrobe, proposing a radically new online clothing-rental concept that offers customized clothing and accessories selections for men.

As the TCBL innovation projects took shape, outside-in thinking was gradually replaced by inside-out thinking, where project developments were modeled to identify new business models representing the TCBL vision. Along these lines, the six TCBL innovation projects launched in project year 2 – named Business Cases – were generalized as three Business Model Practices that are seen to form the key strategic intervention axes through which to promote
the systemic transformation we are looking for (Figure 1).

The three Business Model Practices are as follows:

- **Re-connecting value chains**: This involves innovation across value chains and is derived from the Natural Fibers (material flows) and Eco-Friendly Production (process flows) Business Cases.
- **Re-shaping production**: This involves innovation within production units and is derived from the Independents (scaling up) and Short Runs (scaling down) Business Cases.
- **Re-framing consumer markets**: This involves innovation in the shared understanding of what fashion is and is for and is derived from the Digital Heritage (reinterpreting tradition) and Bio-Shades (radical disruption) Business Cases.

Table 1 below further develops the Business Model Practices in the context of key insights gained in the course of project implementation as well as the desired impacts.

This strategic framework leads to a synthesis of the outside-in and inside-out approaches, bringing to the fore business-model destinations – for which we have coined the term Business Model Magnets – capable of attracting T&C companies into an alternative, value-based market space.

Business Model Magnets aim to define key spaces within the landscape of roles, transaction patterns, and value chains of the kind of sustainable T&C ecosystem that is expressed in the TCBL vision. As exemplary models, they aim to have a lighthouse effect for existing businesses tracing their own transition path toward an alternative market space where their own practices of sustainability, inclusion, and transparency can contribute to the broader picture in a coherent way.26

The final phase of the TCBL project identified a first list of five non-exclusive Business Model Magnets, capable of engendering sustainable value chains in the T&C sector.

1. The first is Circular Materials.27 By considering the environment as an opportunity rather than a constraint, this business model keeps textile materials at their highest value at all times, through reverse logistics, restorative and regenerative practices (e.g., upcycling), and broader commitment to materials and processes whose life cycle has a lower environmental impact (e.g., bio and natural fibers, renewable energy)
and sustainable business practices (e.g., local production, traceability).

2. The second “magnet” refers to Design Coworkings. These provide independent designers with shared spaces within which to collaboratively develop a culture of sustainable design, where fashion designers can meet, share ideas, and exchange practices inspired by contemporary visions, daily cross-fertilization, and original (perhaps provocative) ideas.

3. On the supply side, an important role is played by Short-run Production. Short-run textile producers deliver and sell smaller quantities at a competitive price by combining sustainable nearshoring, small-batch production, and short lead times. The business model represents a diversification avenue for artisan fabric makers and processing houses (e.g., dying, printing) as well as a one-of-a-kind downsizing opportunity for large mills adopting flexible production technologies, delivering short-runs during intermittent or structural overcapacities, wishing to broaden their offer, and/or having leftover fabric to sell.

4. Complementary to this are Local Cut, Make & Trim (CMT) Hubs which bring short-run thinking from textile to garment production, spanning the gamut from home sewers to larger manufacturers needing to downscale. Following increasingly digital and distributed pre-production processes (e.g., product design, pattern making, pattern grading), Local CMT Hubs can form networks to supply established fashion brands in search of responsiveness, excellence in execution, local sourcing, and adaptability of production capacity.

5. Finally, we have new Retail Experiences. These place personalized, sustainable, and circular fashion at the core of the value proposition by tapping into a new breed of digital technologies and organizational models to reinvent the consumer journey.

While such Business Model Magnets aim to constitute emergent archetypes, their viability under certain conditions is proven by market-success stories coming from T&C value chains, including the identification of “champions” in the TCBL community that are implementing them.

Alongside the outside-in and inside-out thinking, a third pillar of the TCBL methodology was the emphasis on shared values as the unifying element for a community made up of like-minded ecosystem members laying the foundation for a novel way of working in line with the TCBL vision (Jonker, O’Riordan, and Marsh 2015). We invited Labs and Associates to join TCBL more as a movement than a business network, on the basis of their match with seven principles that the TCBL partnership identified as important for its mission, not as convention – on the basis of company profiles or specific project proposals. The TCBL values, further refined and developed over the course of the project, are as follows:

- **Curiosity**: creative exploration of new paths, roles, social constructs, and business models.
- **Viability**: equally increasing the prosperity of businesses and the well-being of communities.
- **Durability**: commitment to the environment, moving toward circular economy and zero kilometer, reducing waste, and designing for durable relationships.
- **Multiplicity**: highlighting the value of different cultures, traditions, and opinions, and designing for diversity of needs and tastes.
- **Openness**: sharing resources and information, and working toward interoperability through common processes, platforms, and standards as well as transparency in business practice.
- **Respect**: of privacy, authorship, and intellectual property as well as the dignity of individual workers and consumers, the power of social knowledge, and the value of place and territories.
- **Responsibility**: committing to reliable, trustworthy, and professional behavior as well as responsible design, production, selling, and consumption.

This value-based approach proved highly successful, with 41% of Associates responding to an evaluation-outcome survey (see the Discussion section below) reporting they were attracted to joining TCBL because of this upfront declaration of principles. To consolidate this result, different forms of peer-based accreditation or Participatory Guarantee Systems were studied in similar value-based networks. Two examples are the distributed approach adopted by IFOAM – Organic International (for organic agriculture) and the coordinated accreditation system developed by the World Fair Trade Organization (WFTO). Applying these models, the TCBL Protocol was defined to ensure adherence to the shared principles over time and thus the long-term brand value for the community.

**Implementation**

The TCBL Labs network was launched with an initial set of fifteen Labs, five of each type, and expanded through an open process of registration and accreditation that continues today, with the network currently counting some sixty Labs worldwide. Some examples of TCBL Labs include:
- **Centexbel (Belgium)**, a textiles and plastics research center offering research and innovation, testing, and consultancy; currently working with biofibers.
- **Performance Augmentation Lab (UK)**, a university-research lab experimenting with augmented reality for on-the-job learning at the sewing machine.
- **TextileLab Amsterdam (Netherlands)**, a FabLab exploring new textiles, new materials, and new techniques of digital fabrication.
- **Lanificio Paoletti (Italy)**, a woolen mill operating since 1795 offering experimental weaves, on-demand production, and experimentations with local Alpago wools.
- **Makesense (France)**, a co-working and incubation space identifying market opportunities through participatory signature Créathon events.
- **SOFFA – Social Fashion Factory (Greece)**, a cooperative of fashion professionals providing work opportunities for refugees, victims of human trafficking, and unemployed persons living at risk of survival.

During the TCBL project lifespan, Labs held over 200 workshops and seminars, mostly with local communities and businesses but also including several networked events involving different locations contemporaneously (Figure 2).

Most importantly, the Labs identified a series of over fifteen innovation projects\(^{39}\) to explore together with the TCBL business community which have been and continue to be carried out by several Labs (often of different types) collaborating from their different perspectives. Examples of such projects include: Bioshades, researching bacterial dyes as an alternative through creative experimentation and the exploration of scalability and impact; Workplace of the Future, experimenting with team-production approaches in garment manufacturing, including island redesign of sewing-workstation layouts; and the already mentioned My Yorkshire Wardrobe.

Midway through the project lifetime, service-modeling exercises\(^{40}\) consolidated and structured these activities, further developing the original model of Design, Make and Place Labs to provide a multidimensional representation of each Lab according to a common set of criteria,\(^{41}\) some of which are shown in Figure 3.

The community of TCBL Associates\(^{42}\) also represents a wide mix of company types and sizes, covering the entire T&C value chain.\(^{43}\) Some examples include:

- **Thrakika Ekkokistiria**, cotton-ginning mills in northeastern Greece.
- **AW Hainsworths**, a centuries old woolen mill in Yorkshire (UK).
- **Beste**, fabrics dyeing and finishing in the Prato (Italy) district.
- **Feltros Portugueses**, a felt factory in northern Portugal.

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**Figure 2.** BioShades distributed TCBL workshop @Waag held on March 15, 2018.

**Figure 3.** A typical TCBL lab service profile.
Gorfoo, promoting and using hemp fabrics in western France.
Doljesi Modni Gumbi, a button producer in Slovenia.
Hall Couture, a haute couture prototype co-working facility in Paris.
Bivolino, an online made-to-measure men’s shirt maker in Belgium.
Ioanna Kourbela, fashion design and clothing production in central Athens.
Coco&Rico, a sustainable, small-lot fashion atelier in Paris.
Riô, apparel producer using recycled denim and cashmere in Prato (Italy).
Katty Fashion, a large-scale garment producer in the Iași (Romania) district (Figure 4).

Bringing this business ecosystem alive involved igniting collaboration between Associates and Labs. To this end, Labs engaged with Associates to identify the themes of reciprocal interest for the joint experimental actions built around the six Business Cases upon which the Business Practices discussed previously are based. The first of these addressed Natural Fibers and was launched with the reconnection of different companies along the natural cotton-value chain – from ginning through to design and manufacturing – in Greece, Europe’s main remaining cotton producer. This case now covers a range of natural fibers such as silk, wool, and hemp, extending throughout the European TCBL network. The Eco-friendly production case was launched in the Prato (Italy) textile district, where chemical usage in textile production and finishing is an important concern. The driving idea is to track and certify chemicals across the value chain rather than to focus on individual companies. Short Runs looks at the issues and barriers involved in both scaling down – the shift from mass production to smaller lots – as well as scaling up – supporting business development for small-scale producers. In parallel, the Independents Business Case addresses the needs and potentials of independent designer-producers, supporting networking, technology adoption, and zero-waste production. Another, BioShades, originated from research in the Amsterdam Bio-FabLab, experimenting with growing bacteria to dye textiles. The “open to citizens” approach and the disruptive sustainability potential – near-total elimination of the use of water and chemicals for a near-zero environmental impact – help spread awareness and learning across the TCBL network of Labs. Finally, Digital Heritage was inspired by the Design Lab at the Textile Museum in Prato; this initiative explores the brand value of digitized textile archives together with their potential as a source for the creation of new designs.

As these Business Cases developed and the community of Associates grew – 78 in 2016, 136 in 2017, 227 in 2018 and 249 at project end – a series of yearly two-day conferences provided important moments of information exchange and identity building.44 Each edition was hosted by a TCBL Lab at the heart of one of the textile districts – Huddersfield in Yorkshire (UK), Athens (Greece), Prato (Italy), and Iași (Romania). These events provided the opportunity to mix local businesses, schools, and innovators with members of the European network through different interaction formats: keynote talks, TEDx style sessions, a PechaKucha series, factory visits, workshops, textile-art exhibits, and evening receptions (Figure 5).

The different types of engagement of Associates with the collaborative Business Case projects and yearly events supported by a wide-reaching communication strategy ranging from the production of guidebooks (over 80) and videos (over 175) to active social media campaigns, led to growing recognition of TCBL as a brand signifying active membership of a value-based innovation community.

Discussion

The unifying element of collaboration within the TCBL community has been the collective goal of making progress toward four ambitious objectives as set forth in the Horizon 2020 call topic to which the project responded, “Business models with new supply chains for sustainable customer-driven small series production,”45 in terms of the expected impacts to be attained within five years after the end of the project. These are:

- A return of previously off-shored manufacturing to Europe, on the order of at least 5% of the total manufacturing capacity.
- A reduction in the environmental footprint compared to products produced in the traditional

Figure 4. The group production island layout tested at Coco&Rico production facilities.
value chains by 20% through less stock, less waste, and less transportation.

- The creation of a novel supply network involving at least 1,000 organizations and individuals.
- The creation of new embedded services supporting the customer-driven supply chain.

To assess the degree to which progress was made toward the project’s ambitious objectives, a multifaceted evaluation strategy identified specific tools capable of assessing impact in such a complex intervention as TCBL. The evaluation methodology was shaped by three key concepts: Business Ecosystems, Complexity Theory, and Large-scale Change.

First, the literature on Business Ecosystems explores the relationship between business entities and business models and how these interrelate to form business networks. In this context, a business, or service, ecosystem is defined as “a value-coproduction configuration of people, technology, other internal and external service systems, and shared information” (Spohrer Maglio and Gruhl 2007, 7). TCBL, in fact, seeks to promote new kinds of networks, and hence new kinds of value chains within the textile and clothing sector by stimulating the production, diffusion, and replication of business innovations in its Labs and Associates.

Second, understanding how these ecosystems work is supported by Complexity Theory which focuses on understanding and better describing dynamics and processes of change in interventions such as TCBL that are not predictable, involving emergent and responsive interventions and causal processes that cannot be completely controlled or predicted in advance (Ramalingam et al. 2008).

Finally, this endeavor requires (1) an adaptive development mode that supports reflective practice and organizational learning (Ling 2012), inclusion, and sense-making with multiple competing explanations of why and how change happens and (2) an understanding of the project’s Theory of Change (Sullivan and Stewart 2006) to identify the key dependencies upon systems and subsystems which lie outside the formal structures of the intervention.

On a broader level, the TCBL’s systemic vision raises questions of governance and transferability of the experience. What features of the methodology were instrumental in reaching these results, and what relevance might they have for the continuation of these efforts or for their application to other industrial sectors? The evaluation-planning activity addressed these issues, looking at processes and outcomes as they unfolded so as to constantly feed into shaping the system’s configuration.

Considering TCBL as a complex intervention (Rogers 2008), the evaluation team identified a number of key characteristics that are embedded in the project design and that have been critical for its success.

- **Emergence:** The project was designed to be implemented in phases, with transition periods allowing for the shaping/designing of each phase and the taking on board of learning from the preceding phase. This allowed the TCBL ecosystem to shape itself as a function of the kind of organizations joining and the innovative transition paths they brought.

- **Open system:** TCBL was from the outset designed as a “living and breathing” organism in which the different components grow and interact, both with each other and the wider social and ecological environment, to change the textiles and clothing industry. TCBL was thus an innovative, if not experimental, initiative, aggregating shared knowledge, innovation, creativity, and business innovations to attain a systemic impact on the T&C sector; technology is used as a tool for this change, rather than imposing itself as a driver of change.

- **Diversity of experience and expertise:** TCBL could draw on significant diversity of experience and expertise including partners from within and without the textiles sector. This diversity contributes to produce innovation itself, as well as to offer a valuable backdrop to the implementation of the project.

In this context, Large-scale Change can be defined as

> [T]he emergent process of mobilising a large collection of individuals, groups and organisations towards a vision of a fundamentally new future state, by means of: high leverage of key themes; a shift in power and a more distributed leadership; massive and active engagement of stakeholders; and mutually reinforcing changes in multiple systems and processes. Done properly, this leads to such
deep changes in attitudes, beliefs and behaviours that sustainability becomes largely inherent. (NHSIII 2018, 12)

The main lessons learned from the TCBL experience are in terms of the mechanisms identified to be successful. In the Theory of Change, the journey from activities to impacts is assumed to be determined by these mechanisms, defined as “underlying entities, processes, or structures which operate in particular contexts to generate outcomes of interest” (Astbury and Leeuw 2010, 368). They explain the combinations of “resources” (for example access to TCBL Labs) and “reasoning” (changes in knowledge, skills, and behavior associated with the use of these resources) that lead to outcomes. For TCBL, seven such mechanisms were initially developed in a co-creation workshop with TCBL partners and subsequently refined to eliminate duplication between individual mechanisms and to remove unclarities. The wording of the mechanisms was finalized on the basis of the evaluation evidence.

1. Alternative vision mechanism: TCBL offers an alternative scenario that includes and liberates and leads to innovation. This includes opening up opportunities for international working to transcend local competitive attitudes and behaviors. The alternative vision has been central to making TCBL a “movement” in the context of Large-scale Change.

2. Mobilizing untapped resources mechanism: By participating in TCBL, Associates recognize untapped abilities and resources in themselves and their businesses and the broader potential of what they are doing. This has been an essential element of the value added, allowing participants to “discover” their own worth.

3. Engagement, relationship, and human relations/networks mechanism: Change/collaboration in TCBL happens by promoting interpersonal relationships directly, at workshops and conferences, and digitally. This element is an essential ingredient for enabling knowledge flows and lowering the risk of innovation.

4. The Lab as an ecological bridge: TCBL Labs serve as bridges that connect systems and practices with the external environment and thus play a pivotal role in changing ecological systems and practices. TCBL Labs thus directly have an impact on reducing the T&C sector’s carbon footprint and indirectly lead to more widespread eco-friendly consumer behaviors downstream.

5. Value and mentality change mechanism: TCBL provides the stories that are in line with TCBL values. Change of attitudes leads to a change in behavior which in turn fosters the creation of services and products with higher ethical values.

6. Networking mechanism: Successful networking between TCBL stakeholders through matching for business outcomes provides concrete examples of best practices and evidence of added value of services.

7. Knowledge generation mechanism: Through Labs and the experimentations within them, knowledge is generated in terms of processes and practices, technologies, and materials that TCBL Associates can then turn into products and services.

The specific methodological tools used for the evaluation of project impacts can be summarized as follows.

- Contribution analysis (Mayne 2012) essentially involves constructing a plausible explanation of the contribution of different causal factors to a project’s identified outcomes and impacts. “It assesses causal chains from beginning to end, reports on whether the intended changes occurred or not, and identifies the main contributions to such changes, including the intervention under evaluation” (Delahais and Toulemonde 2012, 281). In parallel, the counterfactual describes the situation that would have arisen had the intervention not taken place (Ferraro 2009). While in complex interventions it is often much harder to identify the counterfactual, nevertheless it is crucial to pose the core question in an evaluation which is “did it make a difference?” as well as “compared with what?”

- The social return on investment (SROI) methodology is a framework for measuring and accounting for the value of an intervention by measuring change from the perspective of the people and organizations involved: “SROI tells the story of how change is being created by measuring social, environmental and economic outcomes and uses monetary values to represent them” (Nichols et al. 2012, 8).

- And finally, cost-consequence analysis is “a form of cost-effectiveness analysis comparing alternative interventions or programs in which the components of incremental costs are computed and listed, without aggregating these results (e.g., into a cost-effectiveness ratio).” Like SROI, this method considers a broader range of outcomes and measurements beyond financial ones, including “humanistic” measures such as value attributed by stakeholders to collaborative business partnerships, provision of more sustainable choices for consumers, contribution to promoting social inclusion, and so forth. These tools were implemented through a series of questionnaires, surveys, case studies, and
workshops involving project partners and Labs and Associates involved in the innovation activities.

Combining and synthesizing evaluation results, it is possible to assess the contribution the project made toward its key impacts.49

- As concerns increased manufacturing capacity, 24% of survey responses said that TCBL helped them to create new business lines, with an average value of €258,000. A total of 37% of TCBL businesses experimented with new sustainable business models, contributing €62,500 average value to business as a result. The economic analysis suggests that organizations in the TCBL ecosystem gained an aggregate of €2,331,000 in benefits from business-model experiments.

- For reduction of environmental footprint, the economic analysis suggests that organizations in the TCBL ecosystem saved €319,000 from implementing TCBL waste-reduction strategies, €100,000 through TCBL energy-saving strategies, and €120,000 by reducing raw material consumption. Twenty TCBL Associates witnessed increased orders based on waste-reduction measures, with an estimated €60,000 average value from compliance with the waste-reduction protocol.

- In the creation of novel supply networks, 71% of survey respondents extended their network of business contacts, while the majority of Business Cases involved new supply-chain relationships in real business transactions.

- And, finally, for embedded services, we have the TCBL Open Platform that aggregates third party online Business Services with 1,055 registered users.

- Overall, the cost-contribution analysis estimates a total value generated for TCBL Associates of over €16 million in the life of the project, with an SROI of 0.716 (significant for a research project).50

Despite the positive evidence attained through these evaluation exercises and the sophistication of the methods employed, some important limitations emerge that can set the stage for further research. The main issue is related to the known gap between the time frame of implementation and that of impacts. The desired impacts listed in the Commission’s call text were already situated five years after the project’s end, while the broader TCBL vision is perhaps realizable over a still longer period. This makes it difficult to measure progress toward results and feed those insights into the process as it is developing. Evaluation in TCBL experimented with the concept of mechanisms to address this issue, but it would be useful to follow up over time on the hypotheses discussed above to refine the method.

Related to this matter is the specific issue of measuring environmental benefits, particularly within the systemic approach adopted by TCBL. Work in the project began to attempt assessment of the impacts of chemical-use reduction, material-waste reduction, and so forth beyond the confines of a single company or product – looking for instance across value chains or within an industrial district, but further work is needed to address this level of complexity. A dedicated effort in this sense – including building forecasts of systemic environmental impacts into design and production systems – will be a priority for further research, including within the TCBL network itself.

Conclusion

Given the results attained, the TCBL business ecosystem represents a shared outcome that the participants – TCBL project partners as well as Labs and Associates – wish to keep alive. To fulfill this aim, a two-pronged strategy for the constitution of a sustainable post-project TCBL ecosystem is now being implemented. The commitment of a group of TCBL participants is leading to the creation of the TCBL Association, a nonprofit entity whose main purpose is to maintain the value-based community through the TCBL Protocol, to coordinate the search for funding of future activities with Association members, and to organize communication and knowledge-sharing, including the annual events (post-COVID-19). In parallel, an existing company with a track record of innovation services to the T&C sector was transformed into CEDECS-TCLB Sas,51 which among other possible business lines holds the license for commercial exploitation of the TCBL brand and services developed during the project and afterwards, on condition of supplying essential services to the TCBL Association and its members.

In the meantime, the COVID-19 crisis has had a devastating effect on the business models of the luxury and fast-fashion brands for which TCBL aims to offer an alternative path. Debenhams and Topshop’s Arcadia Group collapsed (Nelson and Paton 2020), Zara announced the closure of up to 1,200 stores in June 2020 (Jolly 2020), and H&M reported a 21% drop in sales in the three months to February 2021 resulting in the closure of “as many as 1800 stores” (Barnes 2021). In response to the impact on demand, large brands abruptly canceled over $16.2 billion of orders (Dean 2020), including garments already produced and ready to ship, resulting in over one million garment workers laid off or
furloughed in Bangladesh alone (McNamara 2020). Online retailers fared better, although with little regard to working conditions in fulfillment warehouses (Butler 2020).

Some of the larger brands have experienced recovery following the initial impact of the COVID-19 pandemic: already in Spring 2020, as China was the first to emerge from lockdown, LMVH claimed that “Chinese shoppers have flocked back to its boutiques in mainland China” (Dalton 2020) while Inditex, owner of Zara and other brands, saw revenue hit record levels a year later (Q2 2021), 7% above pre-pandemic figures (Bottomly 2021).

Nonetheless, recovery is “uneven” in the words of the Business of Fashion/McKinsey report for 2022, as supply chain issues – “logistical bottlenecks, manufacturing delays, high shipping costs and materials shortages” – plague the large brands’ clockwork organizations (McKinsey & Company 2022, 11). Most interestingly, consumer trends toward more ethical and sustainable purchases have continued to grow throughout the pandemic, such that, “following supply chain disruptions, the second most prominent challenge on executives’ minds is the sustainability gap” (McKinsey & Company 2022, 16). It remains unclear, however, whether this renewed concern will lead to any better performance in meeting the highly touted sustainability goals discussed at the outset.

In the meantime, the EU is aiming to give a clear direction to recovery of the bloc’s economy through the European Green Deal, described on the Commission website as “a new growth strategy that will transform the Union into a modern, resource-efficient and competitive economy, where there are no net emissions of greenhouse gases by 2050, economic growth is decoupled from resource use and no person and no place is left behind.” This policy will certainly have an impact on the T&C as well as other industries, but the ultimate prospects for a sustainable transformation of the sector will also depend on other, broader forces already at play even before the onset of the COVID-19 pandemic. Rapidly increasing awareness of the climate crisis is accelerating a change of mindset that was having a concrete effect on both policy (new legislation under the Registration, Evaluation, Authorisation, and Restriction of Chemicals (REACH) regulation, Circular Economy funding) and consumer behaviors even before the European Green Deal. While not initially the focus of attention, the T&C sector is now fully in the spotlight both in European policy (e.g., the European initiative on Textile Innovation) and in consumer perceptions (e.g., “fast-fashion shaming”) (Hoikkala 2019). This trend strongly reinforces the mission of the TCBL ecosystem and could lead to a greater than expected increase of its role in accompanying industrial transformation toward sustainability.

In parallel, there is the trend toward digital society and, more specifically, Industry 4.0. These technologies can bring important benefits to supporting business models coherent with TCBL’s goals, digitizing supply chains and making sustainable fashion economically viable, but will also have to address serious concerns about privacy, job losses, and the tendency to only further contribute to overproduction. The TCBL project showed that innovative technologies are alone not sufficient to bring about structural change, but once mindsets have shifted, they can play an important role in making change viable. This approach is fully in line with the EU’s new approach branded “Industry 5.0”: “a vison of industry that aims beyond efficiency and productivity as the sole goals, and reinforces the role and the contribution of industry to society… putting research and innovation at the service of the transition to a sustainable, human-centric and resilient European industry.”

Here the opportunities for the TCBL ecosystem are to demonstrate how technology can support knowledge and interaction rather than replacing them, in a model of “human digital fashion.”

All these trends will be influenced by the strategic choices of the big brands in both the fast-fashion and luxury markets. While many continue to claim headline actions toward sustainability, their business models are likely to face difficulty in escaping from their current ways as they emerge from the COVID-19 crisis: fast fashion trapped into overproduction and luxury into exploitation, with overconsumption as the main driver of profit in both cases. Those willing to undergo a real transformation, shifting their significant organizational and infrastructural assets to support alternative business models, could potentially be powerful allies for TCBL, although this is not seen as a necessary condition for the ecosystem’s continuing development.

The real key to keeping the momentum built up to date is to maintain support for the innovative business ecosystem post-COVID-19, in line with the methodologies, principles, tools, and initiatives developed during the TCBL project’s four years. With the significant challenges being faced by the existing brands’ business models, ever-increasing public awareness, and opportunities offered by the EU’s new policy directions, the time is ripe to tip the balance in favor of a finally sustainable fashion system.

Notes

1. https://www.greenpeace.org/international/act/detox/
2. https://truecostmovie.com/
The second-life business model is predicated on establishment of an online or offline marketplace enabling the exchange of T&C goods that are not new, either transferred hand-me-down, or sold for a fraction of their original value.

For more information on this and other projects in TCBL, see https://tcbl.eu/projects.

The do-it-yourself business model consists of the publication of digital clothing that is made available performed directly by customers using 3D printers, either at home or in next-door digital fabrication workshops ("fab labs").

The predictive offering business model combines art (i.e., on-trend clothes) and science (i.e., algorithm deciphering personal styles and tastes) in order to surprise and delight customers through a recommendation engine while saving time.

The final sample size for the survey analysis was 66. This sample size includes cases that did not complete the outcome questions.

Social return on investment (SROI) was used to calculate a financial return for TCBL. This process used data drawn from a survey of TCBL businesses and combined their estimates of the tangible financial gains from being involved in TCBL – for example increase in turnover – with the financial gains on “intangibles” – for example, business benefits from experimentation. The SROI ratio of 0.716 measures the social impact value set against the initial investment amount. For a research project, this ratio would normally be expected to be negative. The figure of €16 million in total value generated extrapolates the estimated total value to all members of the TCBL ecosystem on the basis of the data derived from the survey.

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