

WHITE PAPER

Transparency 2.0

**TRANSPARENCY IN AN AGE OF UNPRECEDENTED
CLIMATE, FINANCIAL AND REPUTATIONAL RISKS**

 Techstyler

FibreTrace[®]

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About Techstyler



Techstyler is a sustainability and innovation consultancy providing intel to fashion and textile industry stakeholders. Techstyler's research, analysis and reporting delivers trusted and objective insights on materials and manufacturing, environmental and social regulation, and consumer disillusionment arising from greenwashing.

About FibreTrace®



FibreTrace®'s traceability solutions give textile brands and suppliers 20/20 vision of their supply chain at every step from raw fibre to store. Through the power of combined physical and digital traceability, the patented technology provides unparalleled intelligence, real-time auditing, trust, integrity and verification to the global textile supply chain.

FibreTrace® has a mission to ensure every member of the textile supply chain has the ability to take direct accountability to reduce the environmental impact of the global industry. In doing so, they provide the consumer with the opportunity to choose a transparent and sustainable supply chain to follow and purchase from.

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Overview

Welcome to Transparency 2.0. From this paper you will understand what Transparency is in practice, how it's achieved, why it's difficult and why it matters so much to measuring and proving sustainability. The information in this paper aims not to be theoretical; it draws from industry research and directly from supply chain stakeholders, giving you tangible examples of Transparency in action and the role Traceability plays. It also deals with some common misconceptions about the role of the consumer in driving brand Transparency and the reliability of certifications as a proxy for Traceability and data Transparency.

Upon reading this paper you will be briefed on the upcoming challenges the fashion industry faces in achieving Traceability and Transparency and how you or your organisation might interpret and overcome them. You will hear how a cotton farmer, two denim brands and a textile and garment manufacturer are doing this, and the challenges, risks and benefits they have encountered along the way.

The distinction of this paper as 'Transparency 2.0' stems from its industry-specific context (and avoidance of theories alone) at a time when climate change, regulatory and economic pressures are intensifying sharply. It is with this urgency that we present to you the next phase of tackling fashion's biggest challenges through Transparency 2.0.

Why Transparency and why now?

Context

Transparency has become a focal talking point within the broader fashion industry. Discussions span about how brands' products are made and the impact they have on living things and the environment. Being a topic so large, it can only be fully understood when in a 'real world' context. To achieve this, the paper includes insights drawn from the people and processes along the supply chain spanning raw materials to final products.

Furthermore, Transparency can only be achieved when all relevant information can be gathered about a product, so that the eventual customer can know what they are physically buying, and inadvertently *buying into*, and by extension, the environmental and social conditions upheld or reinforced - directly or indirectly - by that purchase.

More specifically, consumers are asking product questions such as: What chemicals were used to make it? Where did the raw materials come from? What are the environmental impacts of producing it? Were the workers who made it paid fairly? In summary, they are asking: What does owning this product mean in the world, beyond the obvious visual statement made by wearing it?

Transparency: more than simply sharing information

Transparency, therefore, amounts to more than simply shared information. The data accessed through transparent networks can be powerful and revelatory - damaging even - depending on the stakeholder sharing it and the context in which it is provided. Consider that Social Media is a tool for independent communication - a democratic and 'open' platform for sharing information to the public. However, its pitfalls are clear, with the easy spread of misinformation and the co-opting of 'free speech' to serve hidden agendas. So Transparency, in this example, does not equal accuracy of information, just availability of it.

Whilst fashion does have some standards and certifications that seek to verify the accuracy of information and data gathered from raw material to final product, the methods of ensuring accuracy are varied and often manual (leading to inherent subjectivity and human error). Furthermore, standards and certifications are numerous and varied. There are no universal methods of data collection, analysis and sharing, which leads to commonly maligned 'apples and oranges' comparisons and data gaps.

Asking a garment manufacturer, for example, to share their production impact data is more than just the benign sharing of numbers. It could open them up to out-of-context scrutiny and judgement, leading to repercussions that threaten their business due to inaccurate or out-of-context conclusions by external parties. Similarly, seasonal cotton crop data culminates from factors both within (e.g. pesticide use) and outside (e.g. drought) of a farmer's control. The inevitability of 'better' and 'worse' years is a farmer's reality, but that fluctuating data in the hands of another stakeholder may be interpreted as grounds for exiting a business partnership, or demanding lower fibre prices in the 'bad seasons', thereby compounding a farmer's challenges.

When taken at face value, the sharing of information across fashion's supply chains may seem like an overwhelmingly 'good' thing to do. What could be the downside? But consider that this shared information will be the basis of decision-making that determines livelihoods. For example, whether a brand chooses to source raw materials from a specific cotton farm, as illustrated

above. Also consider that the data may be flawed due to a human data entry error (analogous to a Tweet containing a statistic with a typo) and the consequence is not simply the need to delete the tweet, but rather the loss of income. This reality casts Transparency in the light in which many fashion supply chain stakeholders view it: why should I share information that could be used against me, especially when its use and interpretation are outside of my control?

System flaws

Probing data collection further, fashion industry professionals may wonder how such errors happen. Aren't audits catching inaccuracies and putting them right? And certifications verify data accuracy, don't they? The notion that stakeholder conditions and practices can be reliably monitored via intermittent 'snapshot' auditing and certifications is at odds with the dynamic reality of fashion supply chains. Using cotton again as an example, in practice, audits do not extend to farms, and begin only at the gin or during later fibre and fabric processes, potentially after key information has already been lost or obfuscated.

Despite this, many certifications are based on Chain of Custody (CoC) checks that rely on transaction certificates and self-reported checklists, rather than first-person observations or primary data collection. This was explained in the recent Transformers Foundation report on fashion's chemical certification processes.² The report conveys systematic flaws in how certifications are conducted, chemical or otherwise, refuting their suitability as a proxy for Transparency and reliable data.

In the context of this paper, certifications are a subject of concern since they are routinely used in the absence of Transparency to provide guarantees of the source and credentials of fibres (for example, organic versus conventional cotton). By extension, certifications infer relative environmental or social impacts which brands use as part of 'more sustainable' sourcing strategies and to communicate sustainability efforts to their customers.

In the example of cotton, stakeholders usually pay a premium for certified organic fibres or fabrics to compensate for the unavailability of exact environmental and social impacts of the cotton they source (due to a lack of Traceability and hence Transparency). Such certifications offer assurance that a set of declared standards has been met where the stakeholder would otherwise have little or no information about the farming methods used or the environmental or social impacts of the fibres.

In extreme cases, such as where a lack of traceability could obscure human rights abuses (as evidenced in the Xinjiang Uyghur Autonomous Region, in the People's Republic of China³), some brands are enlisting DNA and

isotope testing to determine the exact region of origin of their cotton, thereby obtaining proof that it was not sourced from Xinjiang and therefore does not contribute economically to such regimes.

When the numbers don't add up

When examining global cotton production data there are notable discrepancies, particularly between the certified organic cotton volumes reported by certifying bodies when compared to cotton volumes reported at country-level by the International Cotton Advisory Committee (ICAC).⁴

Terry Townsend, former Executive Director of ICAC recently reported that "according to the Textile Exchange, world production of certified organic cotton rose 37% from 2019/20 to 2020/21".⁵ However, upon comparison with ICAC data, the top eight organic cotton-producing countries were reported as having yields for organic cotton that were equal to, or higher than, the overall yields in each country.⁶ This discrepancy indicates data collection errors for cotton volumes and false certification of conventional cotton as organic cotton. This demonstrates that certifications are not a reliable substitute for Transparency, and that the CoC methods they use do not accurately attribute environmental and social impacts to materials and processes.

Organic cotton certification fraud is well publicised,⁷ but stakeholders continue to rely on certifications in the absence of robust impact data collection systems that would rely on Traceability.

So, sharing available information through existing processes, such as certifications, is not a reliable Transparency solution due to proof of fraud and data inaccuracies.⁸ But how can this be overcome, practically speaking?

Traceability: the ability to track the history, application or location of a product or material by means of recorded identifications.

Transparency: where relevant information is made available in a standardised way to allow common understanding, accessibility, clarity and comparison.

Supply Chain Vs Value Chain

From a brand vantage point, the **supply chain** describes the downstream flow of goods and supplies from the source to the customer (ie. from the raw material to the final product purchased by the consumer). From a manufacturer's point of view, the supply chain is downstream from them - for a textile mill, for example, it will include the raw material producer and chemical suppliers.

The **value chain** instead focuses on the overlapping processes executed by a brand to generate a sense of value for the customer; for example, branding, marketing and merchandising to promote the features of a product. The 'value chain' represents customer demand for products and the flow of funds from the customer to the brand or retailer. Successful value chains are said to generate profits.

What might full Transparency look like?

An ideal approach to Transparency could be this: The supply chain for a given product is mapped geographically from 'seed to shelf', recording all the fibre, material and product steps as well as the stakeholders and their locations along the way. Accompanying this would be a definition of the essential data to be gathered (and the method) at each step, from each stakeholder. The data types and methods would be determined by what is stipulated by regulators and in legislation, plus stakeholder-specific environmental and social impact metrics such as greenhouse gas (GHG) emission represented in CO2 eq. Such a map would provide Traceability, defining a clear path for Transparency.

The mapping outlined above describes the essential supply chain steps, stakeholders and data collection points, but how could the job of collecting the data at each step be done, and how would agreement to share it be achieved?

Ideally, discussions between stakeholders along the supply chain would determine the data that is needed by each stakeholder, to what platform(s) it should be entered and shared, and how it should be interpreted and used; the aim being fair, accurate and effective data collection, system entry and sharing.

Regarding interoperability of data, a set of Transparency standards that include a methodology and units of

measure to ensure universal data collection, analysis and comparison would need to be established to avoid the 'apples and oranges' comparison stated earlier.

Having sketched out an ideal approach to supply chain tracing and transparent data sharing, it's clear that achieving this would be neither easy nor quick. The need for multi-stakeholder agreement and action, as well as universal standards to minimise or eliminate the risks of misinterpretation and errors sheds light on why certifications or deductions from globally averaged data, rather than the primary source, are the first port of call for many stakeholders. But there's another behavioural component to this complex Transparency hurdle, too.

Achieving Transparency would unlock the mysteries of the fashion supply chain and quantify the true impacts on people, wildlife and the planet. This means that Transparency is not only operational, but has political, economic, cultural and social facets too. Shifting to the previously outlined 'ideal approach' obliges organisations and stakeholders who may not directly benefit from Transparency to take part in enabling it. Understanding and accommodating operational differences from country to country, as well as the governing political, economic and cultural factors are realities that stakeholders and Transparency systems would need to accommodate in order to be effective and credible.

The what, why and how of Transparency

(and where Traceability comes in)

Transparency has been defined as: where relevant information is made available to value chain stakeholders in a standardised way, which allows common understanding, accessibility, clarity and comparison. **Traceability** is the ability to track the history, application or location of a product or material by means of recorded identifications.⁹ Tracing these processes and their locations creates a ‘map’ to which data may be attached, thereby providing Transparency of information within a specified context. If both Traceability and Transparency united to form a building, Traceability would be the underlying architecture and Transparency the visible details.

What is motivating Transparency?

Stakeholder groups are calling for Transparency in their supply chains as a means of mitigating business risks, which include climate change (that affects materials supply and demand and causes price fluctuations) and increasing environmental and social regulation and legislation. Despite agreement that it is essential, stakeholder groups have differing motivations and needs regarding Transparency, and understanding these is essential to overcoming supply chain opacity. Transparency is often examined from a brand perspective, however since it demands multi-stakeholder agreement and action, this paper examines brand, farmer and manufacturer viewpoints and challenges.

Brands

For brands, vulnerabilities span consumer questions regarding the social and environmental impacts of their products; regulations against unsubstantiated sustainability claims and inaccurate product labelling; and raw material and operational risks in their supply chains due to climate impacts. None of these challenges can be overcome while supply chains are untraced and product-specific impact data is unknown.

Reputational risks may be of particular concern to brands operating in a very competitive sector where sustainability claims are used as a competitive edge. As described in the supply chain explainer above, brands’ profits hinge upon the ability to provide added value to the customer. This is likely to become increasingly difficult if customers are posing questions about environmental impacts and pollution that brands cannot calculate, much less answer. The reason? They do not know where the fibres came from or where and how the materials were made. Is the material ‘sustainable’? How can I be sure there was no child labour in creating this product? And in the case of the current lawsuit brought by consumers against the period-proof underwear brand Thinx they ask: ‘Why does this product contain toxic chemicals when you assured me it didn’t?’¹⁰

Consumers face daily media coverage of extreme weather events from climate change, negative health impacts of toxic chemicals and rising environmental pollution from ‘throwaway’ fashion. Simultaneously, new and proposed legislation to address such damage (evidenced by the banning of single use plastics in some jurisdictions, for example) set the scene for the clamp down on fashion’s impacts.

Farmers/growers

The farmer/grower stakeholder group represents the raw material producers of plant and animal fibres and materials. This group ranges from small shareholder farmers supporting the livelihoods of their family, to large-scale industrial farms producing vast volumes of raw materials and employing large workforces.

Continuing with the earlier cotton example, there are many small shareholder farmers located in smaller countries across Asia and Africa that operate within local cooperatives, sharing knowledge and expertise to shape best practices. By contrast, large-scale industrial farms are located in larger landmass countries like China, the USA, Brazil and Australia and tend to operate somewhat more independently.

There are differences in the ability of small and large farm operations that do not reflect on willingness or trustworthiness, but rather climactic, infrastructural and other limitations. For a small shareholder farmer in India, for example, their processes are less likely to be digitalised or connected to an energy grid, meaning data collection and Transparency are difficult due to infrastructure limitations. In such a case, the inability to be transparent bears no indication of their level of trustworthiness or of the impacts associated with their farming methods. In fact, they may be disadvantaged in that regard compared to large industrial farms.

Large scale farms are more likely to be in countries with access to electricity grids that provide renewable energy usage data, allowing relative ease of emissions impact calculations. Furthermore, they may have the resources and remit to invest in digital solutions due to their size, with national energy infrastructure already in place to power it. Such farms are also more likely to have access to scientists that can quantify and digitally record crop data that demonstrates critical impact factors, like soil carbon sequestration levels. A small shareholder farmer is less likely to have the resources and infrastructure to measure, quantify and share this data.

These few examples demonstrate why farmers might not be able, or inclined, to be transparent, and the potential consequences of Transparency on livelihoods if data is interpreted out of context.

Manufacturers

The manufacturer stakeholder group encompasses raw material processing to the final product spanning tiers 1-3 of the supply chain. This stakeholder group oversees the highest proportion of environmental impacts across the supply chain. Within this, the majority of impact is in the energy and water-intensive spinning, dyeing and textile finishing phases.¹¹

The yarn spinning is often carried out by one facility, whilst dyeing and finishing is conducted by another. In each case, the facility's environmental credentials will depend heavily on the type of energy they can access and their water treatment plant. Using manufacturers in Portugal as an example, country-level renewable energy infrastructure already exists, so spinning and dyeing factories located there have the immediate advantage of a relatively low carbon footprint for these processes. If, however, the spinner is in Bangladesh, there is no centralised energy grid and there are economic and political barriers to investment in, and scaling of, such renewable energy infrastructure (through no fault of the factory owners). In Bangladesh, purchasing renewable energy certificates or credits from offsetting schemes may be the only option. Furthermore, factories without access to renewable energy supplies may be reluctant to invest in digital tools to capture data from their machinery, since it would be to their detriment if compared to more fortunate counterparts in countries with existing renewable infrastructure.

For manufacturers, who operate in a cut-throat competitive environment, data could be used to pit one facility against another in a (you guessed it) apples and oranges comparison. Since there is no level playing field regarding data collection and evaluation, and there are no data standards, the safest stance for some may be to withhold data while it is legal to do so.

Whilst withholding information is an option for stakeholders now, soon it may no longer be. When regulations demand disclosure of such data, Transparency will be a licence to do business. With this in mind, the next factor to consider is evolving legislation and regulations, and the influence they will have on Transparency solutions and implementation.

What role do evolving legislation and regulations play in Transparency?

Environmental impacts

Legislation and regulations that will impose changes to fashion and textile products and business conduct are evolving rapidly. The scope of review for this paper is Europe and the U.S. due to the global dominance of fashion and textile imports into this region and countries. This is stated with the acknowledgement that what is imposed on stakeholders in Europe and the U.S. will be exerted on stakeholders in manufacturing countries. Whilst current environmental and social legislation originates predominantly in Europe and the U.S., the largest environmental and social impacts in the fashion and textile industries occur in its manufacturing countries (mostly in Asia), so the implications of such legislation are far-reaching.

The European Union has implemented several policy initiatives to support its goal of achieving climate neutrality by 2050. The European Climate law, enacted in July 2021, sets out the commitments of the European Green Deal, where all 27 Member States pledged to reduce emissions by at least 55% by 2030 compared to 1990 levels. Further, the Green Deal states: “Companies making ‘green claims’ should substantiate these against a standard methodology to assess their impact on the environment”.¹²

For example, the new Circular Economy Action Plan (CEAP)¹³ adopted in March 2020 and the Sustainable and Circular Textiles strategy adopted in March 2022 include numerous key actions that will introduce legislative and non-legislative measures that cover the entire life cycle of products. This includes new design requirements for textiles under the proposed Ecodesign for Sustainable Products Regulation (ESPR) introduced in March 2022. The ESPR establishes a framework for specific product groups to improve their circularity, energy and resource efficiency, and carbon and environmental footprints. The strategy also calls for more precise labelling of textiles introducing a Digital Product Passport (DPP), tighter controls on greenwashing, and measures to address microplastics. Regarding DPPs, the piloting and deployment of a standards-based passport for textiles that is compatible with the ESPR is underway.¹⁴ Publication of the Transition Pathway for the Textiles Ecosystem is expected in March 2023.¹⁵

Ultimately, these measures will require brands to understand the impacts of their supply chain in order to quantify them and adopt material and design features that uphold longevity, recyclability and impact reduction targets (including GHG emissions). Without mapped supply chains for the products produced on their behalf, obtaining this data will be extremely difficult, and the accuracy of it questionable. The exact requirements for data collection and reliability are unclear, as standards have not been defined (however the EU Product Environmental Footprint (PEF)¹⁶ framework is seeking to address this). Despite this, the obligations set by the EU will require brands to know, and be able to access, impact data from their supply chain, from the raw materials to the final product.

For the reasons explained in previous sections of this paper, Transparency is not simply a matter of opening the doors all along the supply chain to allow the flow of data, but of understanding the gaps, and risks posed to stakeholders of sharing data that may not be accurate (for myriad reasons). For Transparency to be achieved, tracing every step of a product’s supply chain is necessary. This demands mapping to establish the Traceability architecture outlined earlier, then capturing and attaching the relevant data to each of these steps (Transparency).

Today’s data challenges will also apply to new ‘sustainable’ materials unless Traceability and Transparency solutions are robust. When the EU Textiles Strategy comes into effect (requiring the declaration of a minimum percentage of recycled or ‘sustainable’ content), the ability to determine the origin and environmental impacts of those fibres and textiles and their impacts will be essential; but how will that be achieved? What solutions are best placed to capture and share data and overcome the limitations of manual and non-universal practices, including auditing and certifications? This is a pivotal challenge for achieving meaningful Transparency which, when achieved, would reveal the magnitude of environmental and social impact problems and the extent of the changes needed to be compliant with regulations.

Social impacts

The industry's most focal legislative changes related to social impacts address forced labour. In February 2022, the EU proposed the Mandatory Environmental and Human Rights Due Diligence Directive¹⁷ requiring large companies operating in the EU to investigate and report on human rights and environmental impacts and risks. The Directive is in progress within the European Parliament. The EU Ban on Forced Labour Products proposal is comprehensive in its aim to eliminate goods made with forced labour; it has a broader scope than current US legislation,¹⁸ which only bans importing forced labour products (requiring a certificate of origin and a detailed product supplier list covering the entire supply chain). The EU proposal prohibits the manufacture of goods within the EU using forced labour, the importation and exportation of products made with forced labour to and from the EU, and requires any goods currently within the EU found to be made with forced labour to be withdrawn and disposed of. Enforcement is determined by each Member State and two member states (France and Germany) have already introduced domestic legislation. It is foreseeable that other EU Member States will do the same to manage various enforcement obligations and requirements.

Proving an absence of forced labour has historically been all but impossible in fashion and textile supply chains. This is well documented in the International Labour Organisation (ILO) Global Slavery Index¹⁹ and by Fair Wear and other organisations. Traceability plays a role in tackling forced, unsafe and child labour, but the industry's current business model demands flexible, fast production and price-competitive supply, often met by the use of sub-contracting and sometimes sub-sub-contracting.²⁰ It is important to note that this is true industry-wide and is not unique to 'fast' or 'cheap' fashion. Instead, it is symptomatic of the practice of outsourcing manufacturing and the labour arbitrage elicited by negotiations where as little as 1 cent per unit can be the margin between landing or losing an order.

As a result, it is difficult to deduce how product-level supply chain mapping could ensure an absence of forced labour or other labour breaches, since the supply chain and its stakeholders adapt dynamically in response to supply, demand and ever changing product requirements. This also flags a limitation of 'static' versus 'real-time' tracing within the dynamic operations of the industry at large because suppliers, processes and product specifications are subject to sudden changes.

Overarching regulatory context and Transparency

The regulatory and legislative landscape, therefore, sets the scene for motivating stakeholders to shift from weighing up Transparency's limitations and benefits (the carrot, if you like), to recognising the impending legal, financial and reputational consequences of not implementing it (the stick). Transparency is necessary to obtain data and properly quantify environmental and social impacts, but is only effective if the data is accurate and timely, in order to make Traceability and Transparency valuable risk mitigation tools.

For stakeholders within the jurisdictions of Europe and the U.S., the evidence presented suggests that both Traceability and Transparency will be essential for mitigating business risks, rather than a voluntary and sometimes burdensome task that some stakeholders believe it is today.

Industry Context

Are brands becoming more Transparent?

Beyond the climate, regulatory and legislative risks that are motivating Transparency efforts, advocacy groups including Fair Wear and Fashion Revolution have long called for fashion's social impacts to be laid bare. But despite the launch in 2016 of the Fashion Transparency Index,²¹ which asks brands to disclose where their clothes are made and by whom, brands have been slow to act.

Across the seven years of the index to 2022, the number of brands responding to the voluntary survey has increased from 40 (in 2016) to 121 (in 2022). 250 brands (a modest number in an industry of many thousands) are requested to submit the survey each year. In 2022, the response rate was 48%, with some of the world's largest brands represented.

Since the annual index began, the percentage of brands not revealing any data about their supply chain has actually increased, from 1.2% (in 2017)²² to 6.8% (in 2022).²³ Despite more brands responding to the survey, there is simultaneously a lower level of actual transparent disclosure.²⁴ Fewer brands are becoming transparent, and of those that are, almost a third provide only 0-10% of the information Fashion Revolution deems as necessary for adequate levels of Transparency.²⁵

These findings indicate that fashion brands are not becoming more transparent; and with more than half of the brands declining to submit Transparency surveys, prioritisation of public engagement on this subject seems questionable.

Consumer expectations

Alongside the indices, consumer expectations of Transparency have been gathered from surveys conducted by consultancy firms such as Deloitte and Futerra, along with Fashion Revolution. The researchers concluded that 73% of consumers wanted more information about where and how their clothes were made and about the suppliers of materials in the supply chain.²⁶ In addition, 42% said they choose clothing and footwear brands based on 'environmentally sustainable practices/values'.²⁷

Despite these consumers saying they want more Transparency, brands, on the whole, are not providing it.

Perhaps the consumer research is misleading in that those surveyed wish for Transparency, but most don't prioritise it when making purchases - one third said they had stopped purchasing certain brands or products due to ethical or sustainability related concerns.²⁸ Important to note here, too, is that the survey group (2000 adults in the UK) is not representative of the global consumer population or their purchasing choices. Ultimately, whilst 'untransparent' brands do not experience a loss of sales from dissenting customers they are unlikely to be financially motivated to be more Transparent.

Sentiment versus action

In summary, consumer pressure at-large has not yet reached a point where brands are experiencing a significant loss of sales, or damage to their reputation, to compel them to act transparently. This is evidenced by the recent Norwegian Consumer Authority ruling, which warned the H&M Group against using marketing language and data the Authority deemed misleading to consumers.²⁹ A lawsuit was filed in the US against H&M in July 2022 for greenwashing related to their Conscious collections. These collections, which the company claimed were more sustainable than other products, have since been withdrawn. In the same year³⁰ H&M Group net sales increased by 12 percent to around \$21BN USD (SEK 223,571M) compared with 2021.³¹

Further probing brand inertia on Transparency, other reasons could include: a lack of prioritisation compared to shorter-term business needs, difficulty gaining (and interpreting) data from supply chain stakeholders, high operational workloads within sourcing teams, tight pricing margins and audit fatigue. Other notable barriers are the overreliance on certifications and low levels of tech maturity combined with a resistance to digitalising manual processes. The resistance to digital transformation was examined in a research paper which concluded that a lack of both universally accessible blockchain applications and common data standards, along with a reluctance to share data with perceived competitors³² were significant hurdles. "Complex and tedious data collection and transfer"³³ were also noted as barriers to the adoption of software and hardware for supply chain Traceability and Transparency.

Supply Chain Tiers 0-4 from a brand's vantage point

TIER 0 — offices, distribution,
retail centres

TIER 1 — garment making factories that
supply goods to brands

TIER 2 — fabric making factories and facilities (used
by Tier 1 factories)

TIER 3 — raw material processing factories and facilities (where
fibres and materials are prepared for Tier 2)

TIER 4 — the raw material source (for example, the farm (for cotton or animal
fibres/leather), or the fossil fuel extraction site (for synthetic fibres))

Supply chain mapping and data collection

Practices, limitations and opportunities

Current Status

Traceability practices today are often actioned ‘top-down’ (i.e. from brands at tier 0 backwards to tier 4), and they are rarely digitally managed. In the absence of Traceability throughout tiers 0-4 of the supply chain, stakeholders typically request certifications like Global Organic Cotton Standard (GOTS) and facility audits as a proxy for identifying the raw material origin, the stakeholders across the supply chain and the environmental and social impacts of materials and processes.

A study in 2017 of fast fashion brands’ sustainable supply chain management (SSCM) strategies showed that implementing Traceability management systems was their main focus, along with training and capacity building and joint long-term planning programmes to improve supply chain performance. However, the study’s assessment of the effectiveness of these strategies was hampered by the lack of Transparency about the level of identification, compliance with Chain of Custody (CoC) and relationships developed in the tier 1 position and beyond.³⁴ The study’s source data was taken from the six annual sustainability reports (2011–2016) published by the four biggest fast fashion companies in the global market (Inditex, H&M, Fast Retailing and Gap). Fast fashion was chosen for the study because it is one of the most globalised, dynamic and competitive sectors and accounts for a significant portion of the industry’s environmental and social impacts. This sample scope does not mean that Traceability and Transparency challenges are unique to fast fashion, since in reality, luxury, premium and fast fashion brands draw from the same global resources and share overlapping supply chains.

A few conclusions could be drawn from the SSCM study. Either the Transparency and Traceability strategies in place are not achieving the mapping needed across tiers 0-4 of the supply chain, and that’s the reason for the lack of Transparency beyond tier 1 in the brands’ sustainability reports. Or, mapping and data collection has been

achieved but the brands decline to disclose it publicly due to fears over repercussions, or competitiveness. Alternatively, perhaps this is a work in progress, where Traceability and Transparency have been achieved for only selected materials or products, but the whole picture at company level remains incomplete, hence the lack of full disclosure.

Incumbent resources and tools

Brands, manufacturers and farmers along the supply chain may address opacity in several ways. They can draw from globally averaged data (for example from the Sustainable Apparel Coalition’s Higg Index modules) to estimate impacts, or they can conduct Life Cycle Assessments (LCAs) to calculate environmental and social impacts of specific materials, processes or products.

LCA is a useful tool that typically combines primary and/or secondary data, giving a snapshot of impacts in a highly specific and defined scenario. A limitation of LCA as a proxy for Traceability and Transparency is that it reflects static scenarios with fixed variables that do not reflect dynamic supply chains. Furthermore, the data LCAs use to calculate impacts is often from secondary sources and based on global averages. Additionally, LCA scope is usually cradle-to-gate, representing only a segment of the full life-cycle. Some brands are leveraging AI-driven SaaS solutions like GreenStory to address LCA data gaps and inaccuracies and credibly measure their product level impacts. Traceability plays a role in achieving this too, and existing software in use by some fashion companies and manufacturers include TrusTrace, TextileGenesis and Sourcemap.

At an industry level, Traceability and data collection remain limited. Current tools (supply chain management tools, impact assessment databases, certifications,

manual excel spreadsheets) offer some assistance in obtaining fibre, material and product information to assess environmental impacts and risks; but their reliance on averaged and outdated information, or on intermittent CoC audits leaves stakeholders ill-equipped to make sound sourcing and production decisions. Ultimately, the consequence of this is the inability to assess and control risks (whether environmental, social, economic or regulatory).

Digital Traceability to enable Transparency

Tracing the flow of goods and services in simpler supply chains might only depend on supplier relationships built on trust, with Transparency being a natural facet of open and ongoing communication. But for fashion's globalised and convoluted supply chains, digital Traceability systems can offer accurate, scalable, real-time supply chain mapping and data collection, leading to Transparency. Such systems can circumvent flaws in current ad-hoc processes and fill data gaps, or on the flip-side they may incorporate existing globally averaged data of questionable relevance.

This distinction between circumventing unreliable data and incorporating it is particularly relevant now. This is because stakeholders are preparing for new environmental and social impact regulation, legislation and reporting requirements in Europe and the U.S.



Transparency in Action

PVH Denim Centre insights

The limitations of certifications and globally averaged data were highlighted recently by Nicolas Prophte of PVH Corp. During a panel discussion at KingPins trade show in October 2022, the VP of PVH's Denim Center said he was "interested in what suppliers are doing [at a vendor level]" and "not interested in averages" regarding impact data.³⁵ Prophte is leading a team that is mapping PVH's denim supply chain and collaborating with FibreTrace to inform its fibre strategy, which he said will likely start at the farm level regarding data collection and tracing.

PVH's mapping and data collection uses two systems: FibreTrace MAPPED (a blockchain solution for logging all supply chain stakeholders and recording impact data from them) and FibreTrace VERIFIED (a permanent, invisible and traceable pigment added to fibres that, when scanned, connects them to MAPPED).

Prophte explained that PVH are implementing these solutions "to help [achieve] granularity and transparency in the supply chain" through mapping and assessing their impacts. It's also conceivable that such data might enable smarter and more responsive design and production of denim products since real-time data can be captured. Once the mapping is done and the data methodology is finalised Prophte predicts that PVH will be able to make decisions from the connected data across the supply chain, thereby informing a more responsible sourcing strategy. In turn, this suggests an advantage of better oversight of, and preparedness for, supply chain disruptions and risks.

Tracing and Transparency in practice at Nobody Denim

To contextualise Transparency in practice, it is useful to look at a product that has been fully mapped. Using the example of jeans by Nobody Denim, all the product steps and the stakeholders are traced using FibreTrace VERIFIED:

1. Growing the cotton
2. Ginning
3. Spinning
4. Dyeing and weaving
5. Cutting and sewing
6. Whiskering and brushing (finished effects)
7. Washing, drying, distressing; washing and dyeing again, pressing, attaching hardware, buttons and swing tags

Source: [Our product journey](#)

In this example, Transparency is achieved by using a connected system of physical and digital tools. These tools trace all the steps along the supply chain and the processes conducted at each step. Tracing starts at the farm and continues to the final product, which is permanently traceable.

The connected system of tools are:

- a luminescent pigment ‘tracker’ that is added to the cotton fibres at the gin
- a hand-held scanner that verifies the presence of the pigment
- blockchain software that the scanner connects to, which logs when and where the pigment is scanned

Combined, the luminescent pigment, scanner and blockchain software are the FibreTrace VERIFIED system.

The luminescent pigment is from a rare earth mineral that is indestructible and invisible to the eye. It is as fine as dust and does not change the characteristics of the fibre it is attached to. It can be added to any fibre type and allows permanent tracing, since it is bonded for life. When the pigments are attached, a unique ‘digital signature’ is created so that each batch of fibres can be traced independently.

Scanners are calibrated to each batch’s unique digital signature. The scanner works by spectrometry, measuring how light interacts with the fibres.

This interaction detects the presence (or absence) of the specific luminescent pigment, and how much of the pigment is present.

Using the example of cotton, the bales from each harvest have a different pigment signature that is unique to each stakeholder who purchases cotton from the harvest. This means that each batch of Nobody Denim’s cotton from each harvest has a different digital signature. This allows environmental impact data for the specific cotton crop to be connected to the digital signature and eventually the jeans made from it.

The unique pigment ‘signature’ makes Traceability and Transparency possible not only at the grower level, but according to each individual cotton harvest. For brands wishing to make credible sustainability claims and avoid greenwashing, being able to declare the actual water usage and carbon sequestration of the cotton in the pair of jeans to climate-conscious consumers is a powerful marketing and sales opportunity.

In the case of blended fabrics stated to contain, for example, 50% VERIFIED cotton blended with 50% virgin polyester, the scanner can detect the concentration of pigment to audit and verify those percentages. This allows real-time physical verification of the presence and amount of verified fibres in the material, permanently.

When scanned, the date, time and location data are recorded in a blockchain digital ledger. This ledger is connected to a user interface that allows brands and suppliers to upload certifications and other metadata to flesh out their supply chain partners and product specifications. This software solution, which unifies data from VERIFIED’s blockchain ledger, as well as from supply chain stakeholders, is called FibreTrace MAPPED. MAPPED can also be used as a stand alone mapping tool, independent of VERIFIED.

MAPPED handles the input of environmental and social impact data from the product processes outlined above. FibreTrace VERIFIED and MAPPED are further explored with FibreTrace users, Impetus Group and with Good Earth Cotton (GEC).

In Conversation with Impetus Group and Good Earth Cotton

Impetus Group (Impetus) is a Portugal-based brand and knit manufacturer with operations spanning knitting and weaving, dyeing and finishing and garment-making. The Group explained during an interview why Traceability and Transparency are critical to their business, and why existing solutions left them with data gaps and inaccuracies, affecting sustainability decision-making.

As a brand and manufacturer, Impetus is uniquely positioned to view Transparency challenges from multiple perspectives. On the one hand, they produce and sell their own products to retailers and direct consumers; on the other, they supply knitted fabrics and finished garments to other manufacturers and brands.

The interview with Impetus Board Member Tercio Pinto and Manager of Sustainability and Textile Certification, Carlos Soares probes the barriers to Traceability and Transparency and the benefits and limitations of implementing them.

Tercio Pinto explained that Impetus began sourcing FibreTrace VERIFIED Good Earth Cotton (GEC) direct from the farm in Australia a year ago. GEC is owned by Sundown Pastoral Company, whose founders also developed FibreTrace. GEC, by default, contains the VERIFIED pigment tracker for Traceability from farm to final product. Having relied previously on Chain of Custody certifications, Pinto explained that the lack of access to primary impact data and an inability to guarantee the source of origin or fibre type (e.g. conventional or organic) were major roadblocks to assessing and managing their company and product-level environmental impacts. Why is this origin and impact data at the fibre-level so critical?

Cotton is the main fibre used by Impetus and in a recent study they used SimaPro LCA software to input primary data from their traced supply chain to model the environmental impact of a cotton/elastane boxer short, from cradle to gate. They calculated that 39% of the product's impact was in the raw material phase. 45% was in the dyeing and finishing and 16% during textile and garment construction.

With raw materials accounting for 39% of overall impact, Traceability and Transparency to the farm level are essential for effective mitigation. Pinto revealed that a key reason why Impetus is investing in the switch from commodity cotton from multiple countries to GEC from Australia is the inbuilt Traceability and access to scientifically sound data. As a result of the GEC regenerative farming

methodology and testing, along with the pigment tracker, the impact data is reliable, timely and transparent.

In a separate interview with GEC and FibreTrace founder Danielle Statham, she explained why GEC willingly shares farm and crop level information: "We have no concerns about sharing data from the cotton farm. Our biggest concern is aggregated [country or regional] farm data creating mediocrity". "What's scientifically measurable should be used to manage the farm and shared [with stakeholders]" she added.

Statham is referring to recording energy, water, fuel and chemistry usage, and says that across the industry "there needs to be a measurement within the supply chain that's third party verified", hinting at the need for standardisation. Further outlining the pitfalls of aggregated and averaged data, the founder explained that "in Australia, the biggest challenge is reducing synthetic fertiliser (i.e. Nitrogen) use, but in other countries [like India] it is reducing energy usage; for example by installing solar power on pumps to avoid using diesel". Farm-specific data avoids the trap of "talking about the industry as a broad monolith" and provides the granularity to understand and tackle environmental and social impacts, she explained.

On the subject of data misinterpretation Statham revealed that GEC has a team dedicated to education to ensure that brands, in particular, understand regenerative farming practices, the data collected and the complexity of growing natural fibres. The cornerstone, she says, is farming according to robust scientific methodologies that are measurable and improvable, particularly in terms of optimising soil health.

Acknowledging the breadth of global cotton farming, Statham explained that it involves "different seed varieties, traditions, cultures and religions, and [understanding] these differences requires knowledge and education". Traditionally, commodity markets have added a hierarchy to the way cotton is sold which separates farm-level knowledge from the users of the fibre. "This is why I founded FibreTrace," she concluded.

GEC's scientific approach met the granular data requirements of Impetus. Sustainability manager Carlos Soares explained that achieving cotton Traceability across their supply chain using VERIFIED had taken a year to implement. The main limitation Soares has encountered is the lack of third party verification of the scanning step. He described the possible chink in the armour as follows:

when fibres are scanned and the location and quantity is locked into the blockchain, that is proof of the scan, but in theory the fibres could then be blended or swapped with others. This is where technology cannot account for physical actions that are ‘unseen’ in between scanning.

Impetus has addressed this so far by using mass balance checks (checking the transactions and delivery volume of VERIFIED cotton coming in, to ensure it equals the volume of VERIFIED cotton out) of each facility. As touched upon in the Nobody Denim case study, the scanning process also assesses the concentration of luminescent pigment, detecting whether any ‘dilution’ of the fibres has occurred. Soares’ recommendation is that third party verification of the scanning and fibre handling stages is conducted at stakeholder sites. With VERIFIED fully implemented, Soares is now preparing to implement FibreTrace MAPPED.

MAPPED is software that can be layered on top of VERIFIED, or used independently of it, to map supply chain stakeholders and processes. When used without VERIFIED, MAPPED can collate and assess supply chain impact data at a SKU level without the use of the physical pigment tracker. A key advantage of using the VERIFIED pigment tracker is that it provides data from the hardest-to-access facets of the supply chain (the source of the raw materials/farm, as well as fibre and material processing data).

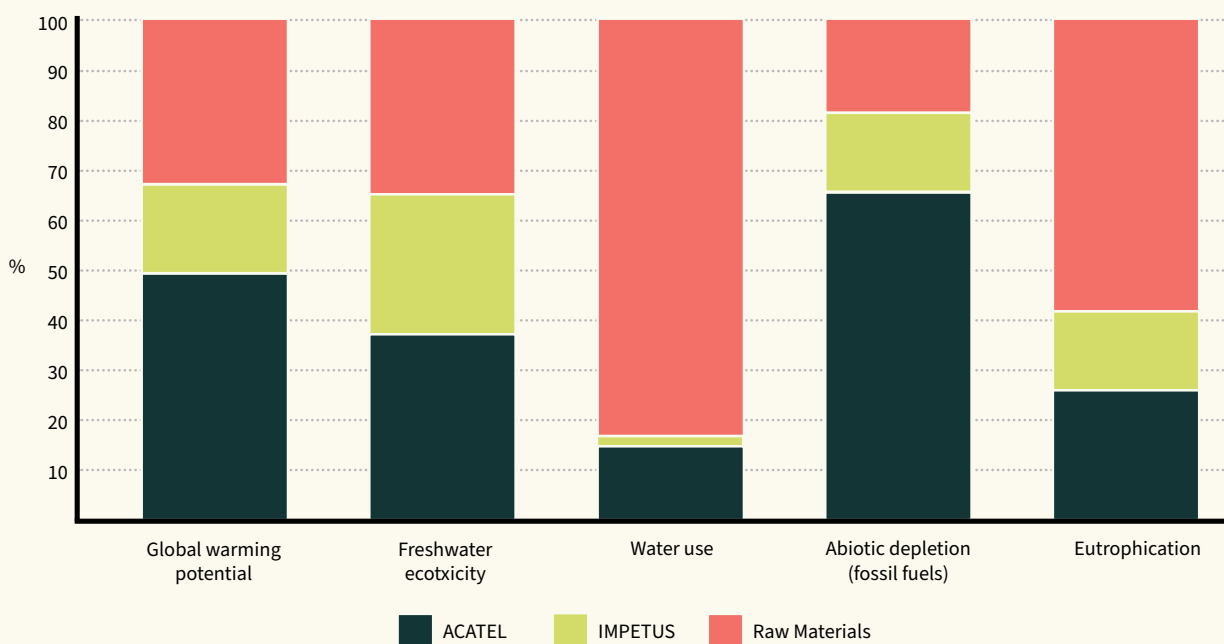
Within the past year, Impetus has upgraded its data capture capabilities on its machinery and processing equipment, which will send primary data to MAPPED. This, coupled with the primary farm-level data cotton, means their only other external data points are in the yarn spinning phase, which is conducted by a local partner company. Soares explained that the spinner has installed digital infrastructure to capture data that will feed into MAPPED. In all, this provides data from farm to final product, helped by the vertical integration at the cotton growing and processing stages with GEC, the local intermediary spinner and the vertically integrated Impetus and Acatel³⁶ facilities that handle the yarn to the final product phases.

The benefits of sourcing GEC and implementing VERIFIED have included the ability to compare their primary impact data with the secondary data ordinarily obtained from global databases. This has helped Impetus to fill data gaps and correct impact assessment errors arising from globally averaged impact data.

Pinto added that the environmental impact data for GEC is a powerful selling point, particularly for their brand clients who want to source products with reliable sustainability data that avoids greenwashing.

“Brands can source 1000 GEC t-shirts from Impetus with full data available via a QR code on the swing tag. This is very appealing if they are telling a sustainability story.”

Product Impact Assessment



Source: Impetus

(Acatel is the dyeing and finishing facility. Impetus the knitting and garment construction facility. Raw material is cotton 95% and elastane (5%).)

Conclusions

Transparency Overview

Transparency is more than simply the sharing of information. For the fashion industry, effective Transparency (meaning the sharing of reliable and accurate data) relies firstly on fully tracing the supply chains. Today's fashion supply chains are global, opaque and dependent on commodity markets that prevent Traceability to the raw material level, which is where a significant portion of overall negative impacts occur.

If Transparency is impossible without Traceability, understanding the barriers to the latter is crucial. These include a lack of digital readiness to implement tracing solutions and a lack of universal data standards, along with an overreliance on certifications and audits as a proxy for Traceability and, by extension, Transparency.

Traceability inertia is not a new problem. However, its consequences are becoming more severe as new regulations and legislations seek to clamp down on the environmental and social impacts of fashion products imported into, and sold within, Europe and the U.S.. Such regulations will effectively 'tax' textiles and products that don't meet sustainability standards and will seize and destroy those made using forced labour. For brands and their suppliers compliance will require Traceability and Transparency at a product level to calculate and report impacts and to demonstrate adherence to these regulations and laws. Furthermore, climate change poses supply chain risks as evidenced by low raw scarcity following droughts and floods, leading to rising costs. Such disruptions pose material financial risks to fashion businesses reliant on these materials.

Transparency is therefore shifting from being an administrative tool for approximating origin of materials and product impacts to a necessary risk mitigation one across environmental, social and economic factors. Today's solutions for Transparency fall short, relying on manual Chain of Custody audits and fraud-riddled certifications, rather than primary data that demonstrates actual source of materials and processes. The likely cost of this limitation includes the inability to mitigate increased risks and costs, as well as falling foul of the law once new regulations are enforced.

This paper puts forth physical and digital Traceability and Transparency solutions with the recognition that there are still limitations related to third party verification of data collection and entry, and a lack of universal data and transparency standards. It demonstrates, without doubt, the value of having access to primary data regarding impacts in order to operate with real-time data and be equipped to demonstrate this to governing organisations. It also exposes the risks to supply chain stakeholders when sharing data in the event that it may be taken out of context or misinterpreted - again pointing to the need for data standards.

This paper and in particular its case studies, indicate that effective Transparency relies on supply chain coordination (and tracing) from the raw material to the final product - in a 'bottom-up' approach. Whether the starting point is a crude oil mine (in the case of synthetic fibres) or a wool or cotton farm, access to impact data from that point and at every step along the traced supply chain is the foundation of Transparency.

Achieving Transparency would unlock the mysteries of the fashion supply chain and quantify the true impacts on people, wildlife and the planet.

This means that Transparency is not only operational, but has political, economic, cultural and social facets too.

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