Empowering citizens for garment longevity

Insights gathering

Credit: Ancuta Sarca

Acknowledgements

Executive summary

The role played by care, maintenance and repair has been under-explored in wider narratives on fashion and sustainability, and how they can combine to successfully reduce the impact of fashion once in the hands of the user. With the support of evolving technologies, brands and manufacturers can in time be jointly responsible as co-custodians of products' journey. Providing informed choices at point of purchase, and throughout the use phase about the care and maintenance of garments, can lead to extensive behaviour change; and subsequent reduction in textiles waste and wider environmental impact. The imperative for garment longevity is not just an environmental one but carries economic benefit to all parties through the implementation of circular and sharing business models.

The 'Empowering Citizens to Enable Garment Longevity' project sets out to examine how emerging hardware technologies can help industry accelerate garment care and maintenance. This report presents research findings through a three month period, to ascertain the key challenges and opportunities to empower citizens. It is part of 'Building the Roadmap for Change' which is Phase 2 of the British Fashion Council's flagship Circular Fashion Ecosystem (CFE) Project, of which Vanish was a founding partner. Vanish have kindly provided key data, research and insights into citizen behaviours around garment care, enabling analysis of potential solutions and target audiences.

Industry insights were gathered from different stakeholder groups, including SME designer businesses and larger scale brands, digital innovators and technology companies and industry discussions through the IPF Forum held in 2022. The recommendation is to develop industry-wide initiatives focused on garment care, with citizen behaviour change empowered through emerging technology for digital storytelling and citizen education. this would align with upcoming regulatory requirements including the EU Digital Passport and Extended Producer Responsibility scheme, combined with traceability demands by increasingly conscious citizens supporting a programme with wide-scale industry influence.

In order to drive towards circular fashion ecosystem target outcomes, plus stay relevant and future-proofed, brands should embrace digitalisation and emerging approaches to innovate on all fronts, including sustainability.

As regulation landscape changes, this will inevitably be a lever for the industry to move to technolody-based solutions for compliance. This presents an opportunity for enhancing sustainability actions across operations.

High quality data across the supply chain is imperative for sustainability goals, and driving greater connection between citizens and their product for enhanced longevity and durability. Leverage QR codes to improve transparency and traceability, educate citizens, increase garment longevity and facilitate responsible gathering of customer data.

However, the baseline activity must come from industry to design and manufacture higher quality garments using more durable materials which are recycled, recyclable and regenerative. Communicating this to their customer base will help citizens to better maintain garments for longevity.

Credit: RAEBURN

Introduction

Credit: E Stott

Background

In 2020 the British Fashion Council (BFC) launched the Institute of Positive Fashion (IPF) with an ambition to unite and accelerate the fashion industry in its goal for a sustainable and equitable future. Focused on creating actionable pathways in response to the climate change agenda, the IPF's ambition is to build the foundations of a circular fashion ecosystem in the UK by 2030 whilst contributing to the UK's commitments under the 2015 Paris Agreement on Climate Change. The Circular Fashion Ecosystem (CFE) is the IPF's flagship programme, underpinning the BFC's intent for industrial-scale change for the UK fashion industry. CFE Phase 1 was published in September 2021, which set a blueprint for the fashion industry to reach a circular fashion ecosystem. This included three Target Outcomes, 10 Priority Action Areas and 30 Recommendations to stakeholders.

CFE Phase 2 was launched in 2022, with the IPF Team publishing an interim Progress Report, which presented insights into stakeholder advances and challenges to reach a circular fashion ecosystem. Specifically, engagement within the framework of 10 Action Areas and 30 Recommendations from CFE Phase 1. By collating these advances and challenges, the complexity, ease, potential for collaboration and opportunity to leverage existing initiatives to transition to a circular fashion ecosystem were understood.

The IPF Project 'Empowering Citizens to Enable Garment Longevity' is one of the projects from Phase 2, where the IPF is specifically focused on the opportunities within CFE Action Area 2: Consumer Empowerment and CFE Action Area 5: Enhanced Identification and Tracking in order to reach a circular fashion ecosystem. This report focuses specifically on the UK fashion industry and its notably high consumption rates and excess waste streams[3].
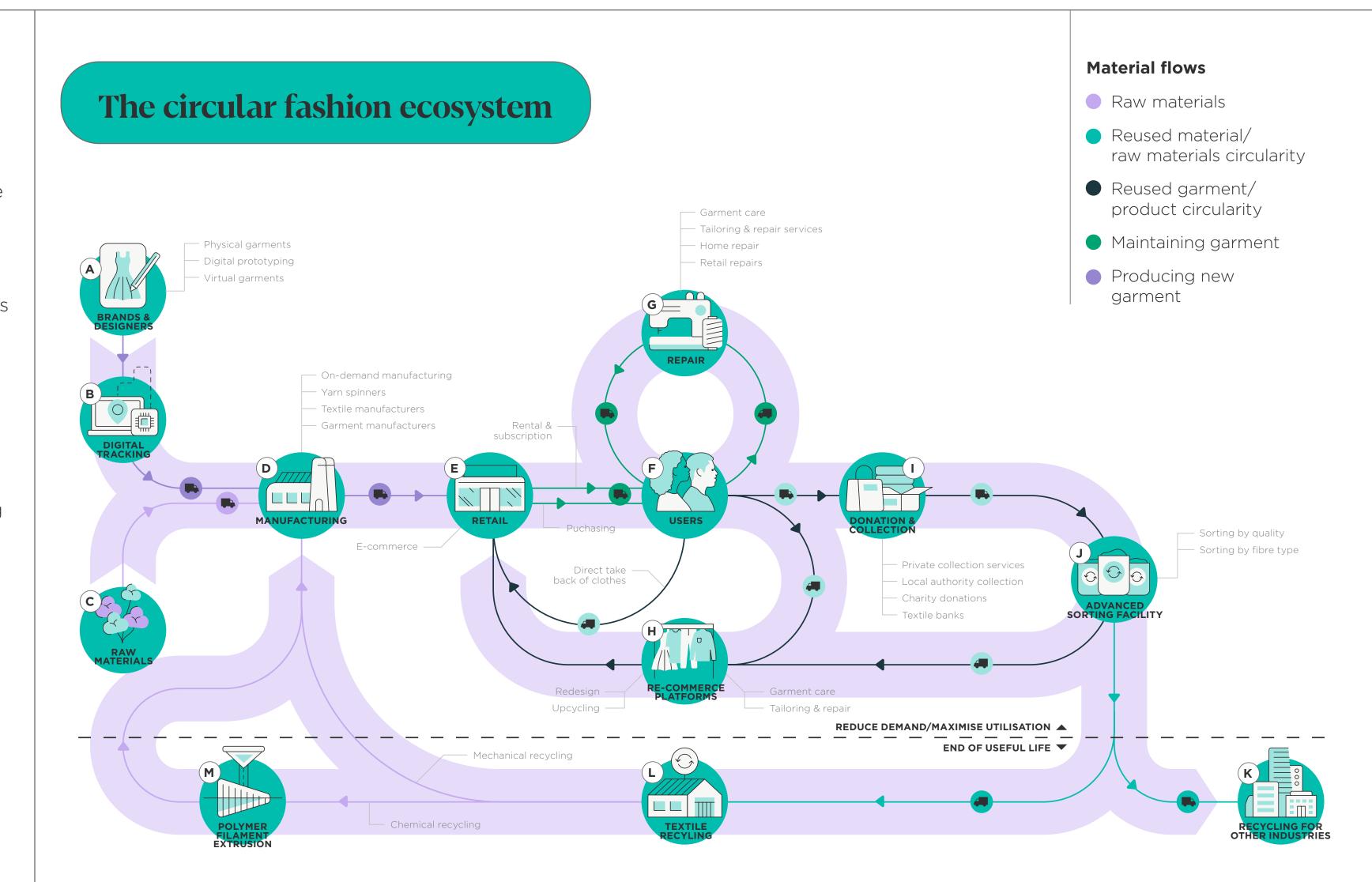

Figure 1: The Circular Fashion Ecosystem Target State
Source: Institute of Positive Fashion CFE Phase 1 Report, 2021

Project overview and approach

Globally, less than 1% of garments are recycled at the end of life. In the UK alone, around 300,000 tons of textiles are disposed of every year through household waste, ending up in landfill or incinerated[4]. Valuable, untapped materials for the fashion industry, that do not require depletion of natural resources and habitat, or extraction of fossil fuels, are not being utilised.
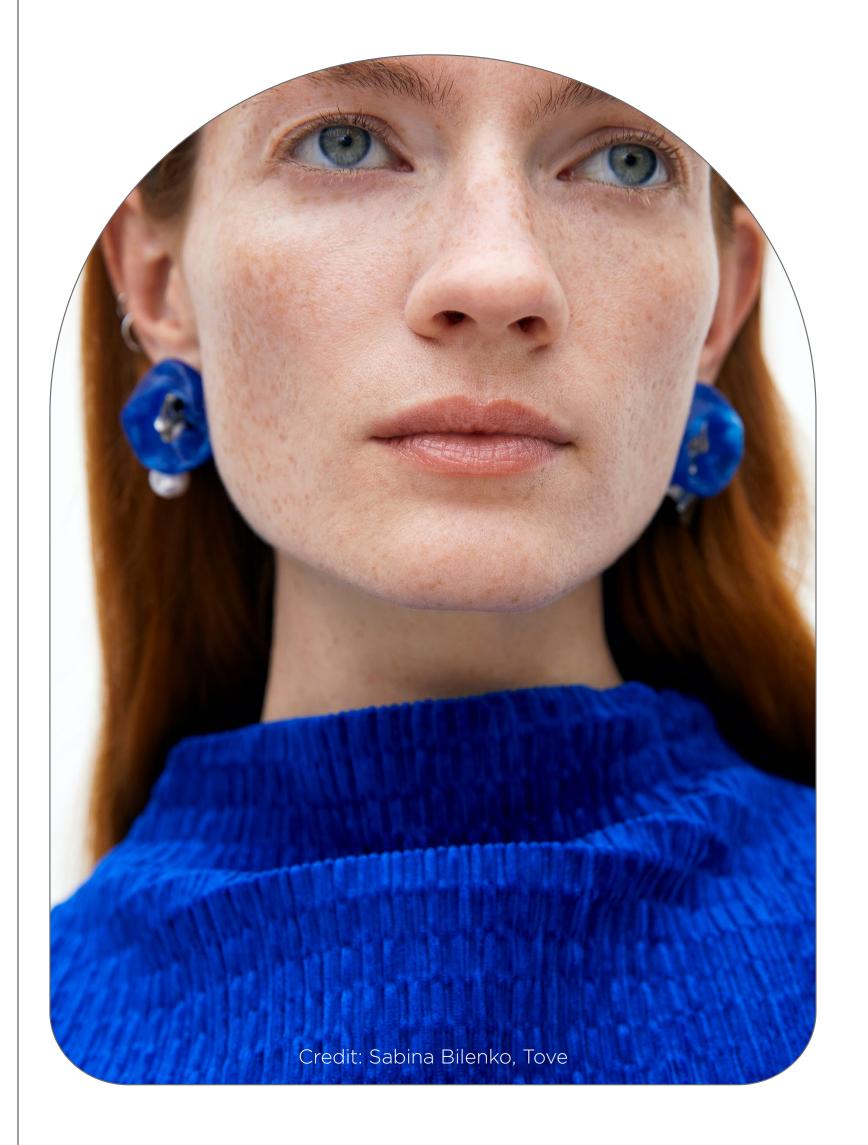
How can we tackle fashion's waste issue by empowering citizens to keep their clothes in use for longer? Clothing needs to be both physically and emotionally durable if it is to be long-lasting, and not prematurely disposed. In addition, many citizens claim that information on durability and reparability of products is difficult to find and there is a desire to receive better information. This report will explore the role that technology and innovation play in providing care, maintenance and repair information to citizens.

The European Green Deal proposal suggests that all regulated products will have digital passports by 2030, making it easier to repair or recycle products and facilitate tracking along the supply chain[5]**.** There is abundant technology in nascent or developed stage to solve many of the issues throughout product lifecycle and across the value chain. QR code technology is already providing information related to the product provenance, and there is the opportunity for it to be leveraged to provide digital garment care and maintenance instructions, supplying the user with expanded information at point of purchase and throughout the use phase.

Project scope

The project encompasses the IPF's CFE Action Area 2: Consumer Empowerment and CFE Action Area 5: Enhanced Identification and Tracking.

According to the IPF's CFE Phase 2 Progress Report[6], brands, designers and retailers are advancing one of the priority recommendations associated with Consumer Empowerment: Shifting Consumer Practices (figure 3). However, digital innovators are also instrumental stakeholders in reaching the aims of this recommendation and need to become more engaged. One of the priority recommendations associated with Enhanced Identification and Tracking is Developing a Digital Tracking System. Comparatively, digital innovators are advancing this recommendation. However, it was cited as a major challenge for brands, high-end designers and manufacturers largely due to a lack of resources and knowledge to integration. There was interest in integrating RFID or QR tags into clothing if it could help increase product transparency. The IPF has thus identified an opportunity to bring together stakeholders to address both recommendations – shifting consumer practices and developing a digital tracking system - to accelerate the implementation of a circular fashion ecosystem.

Credit: Sabina Bilenko, Tove

10 priority action areas for realising the target state

Figure 2: 10 Action Areas & 3 Target Outcomes for a future circular fashion ecosystem in the UK
Source: Institute of Positive Fashion CFE Phase 1 Report, 2021.

Maximised utilisation through product circularity

Reduced volume of new physical clothing

2 Consumer empowerment

o The UK needs to empower consumers to make less environmentally impactful purchasing choices, value clothes, and make circular behaviours mainstream

9 Policy and regulation

o The UK needs to drive support and dialogue for effective EPR consultation and development, exploration of preferential incentives, and development of standards for labels and feedstock.

6 Post-use ecosystem

o The UK needs to facilitate an integrated and cost effective ecosystem of operations post-use.

7 Sortation and recycling

o The UK needs to demonstrate the value of and drive investment in efficient textiles sorting facilities and phased scaling of open-loop, closed-loop, and regenerative recycling.

1 Circular design

o The UK needs designers and manufacturers to create items for circularity, using recycled, recyclable and renewable inputs and technology that minimises material use.

5 Enhanced identification and tracking

o The UK needs designers, product teams, technology and logistics providers, and resellers to co-develop and implement identification methods and tracking that facilitate sorting for resale and regenerative recycling.

8 Ecosystem modelling

o The UK needs dedicated research and collaborative initiatives aimed at mapping out the envisaged future flows of materials and involved actors and economic case for an ecosystem shift to regenerative recycling.

3 Circular and sharing business models

o The UK needs brands and retailers to shift to circular and sharing business models, allowing brands to profit from maximised use rather than consumption.

10 Innovation investment

o The UK needs to drive investment in circular business, enabling logistics and platform providers, the economy for maintenance, repair, and resale of clothes, efficient sorting facilities, and open-loop, closed-loop, and regenerative recycling.

4 Demand for recycled and renewable fibres

o The UK needs brands, retailers and consumers to drive demand for recycled and more renewable fibres.

Optimised sorting methods and materials recovery

Stakeholder actions and connections

Figure 3: CFE Stakeholder Actions & Connections diagram
Source: Institute of Positive Fashion CFE Phase 1 Report, 2021.

Stakeholders

- Academia
- Brands
- Collectors
- Consumers
- Designers
- Digital innovators
- Government
- Institutions, industry bodies, 3rd sector
- Investors
- Logistics providers
- Manufacturers
- Reprocessors
- Retailers

Lead | Enabler

Mainstreaming circular design
Matching designs and reprocessing
Designing for reprocessing
Adopting digital prototyping
Developing a digital tracking system
Digitising garments
Supporting manufacturing in the UK
Manufacturing and distributing clothes on demand
Utilising supply chain textile waste materials
Educating for circularity
Changing perceptions of recycled content
Shifting consumer practices
Formalising skills
Expanding brand repair and care services
Expanding rental and subscription
Expanding product take-back and service provision
Boosting recommerce
Developing systems for optimised recirculation
Standardising local authority collection systems
Investing in advanced sorting
Investing in upskilling for sortation and recycling
Financing emerging technologies
Scaling recycling
Introducing an EPR scheme
Developing feedstock and label standards
Modelling economic and material flows
Modelling industry and innovation hubs
Mainstreaming metrics for societal prosperity
Directing investment towards circular performance
Providing grants and incubation

Synergy | Priority

Action areas

1. Circular design
2. Consumer empowerment
3. Circular and sharing business models
4. Demand for recycled and renewable fibres
5. Enhanced identification and tracking
6. Post-use ecosystem
7. Sortation and recycling
8. Ecosystem modelling
9. Policy and regulation
10. Innovation investment

Methodology summary

Building on existing research carried out by the IPF, a mixed-methods approach was used to determine the vision to empower citizens to enable clothing longevity. This encompassed primary research through interviews, a workshop and consumer research, supported by secondary research through an extensive literature review. The research participants included those from the following stakeholder groups: Brands, consumers, designers, digital innovators, manufacturers, and retailers.

Literature review

A desk-based review of literature conducted at the beginning of the project established the following:

o   The role played by technology as a critical innovation tool in fashion and retail, namely software but also emerging micro-hardwares. This was examined at a global and domestic level.

o   Use of QR codes in wider fast-moving consumer goods (FMCG), consumer engagement, and insights from QR based campaigns across multiple sectors.

o   Consumption patterns and disposal of garments, both in the UK and globally.

o   Existing circularity initiatives in fashion, globally and domestic.

The findings of the literature review were used to shape the approach and focus of the stakeholder consultations and consumer research, and provided input for case studies of best practice.

Industry voice – workshops and interviews

Qualitative consultations with stakeholders from across the ecosystem were conducted in three formats: Interviews, a designer focus group, and an industry panel and hackathon. These were designed to understand the intersection between technology and circular systems, and barriers and opportunities for adopting QR codes or other digital passport technologies to communicate garment care & maintenance and repair information to users. The findings from these consultations were fundamental to understand industry perspective and adoption.

Consumer research

Observed consumer behaviour research by Codec, and a quantitative sample survey engaging with Gen Z audiences were carried out to yield insights into the behaviours and preferences of citizens. The insights from the consumer research were used to refine citizen behaviours towards garment longevity and relevant target markets for the longer-term project.

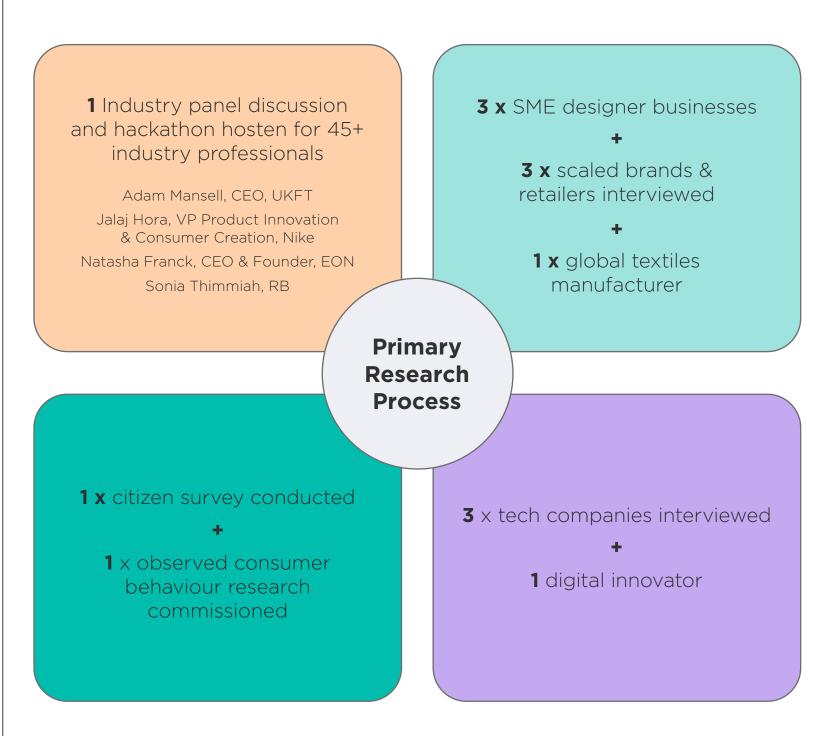**The stakeholder actions and consultation process**

1 Industry panel discussion and hackathon hosten for 45+ industry professionals

Adam Mansell, CEO, UKFT
Jalaj Hora, VP Product Innovation & Consumer Creation, Nike
Natasha Franck, CEO & Founder, EON
Sonia Thimmiah, RB

3 x SME designer businesses
+
3 x scaled brands & retailers interviewed
+
1 x global textiles manufacturer

Primary Research Process

1 x citizen survey conducted
+
1 x observed consumer behaviour research commissioned

3 x tech companies interviewed
+
1 digital innovator

Figure 4: Overview of the Primary Research process including Stakeholder Consultations
Source: Institute of Positive Fashion, 2023

Fashion industry

Credit: Joao Maraschin

Current state

Fashion is one of the largest revenue generators in the UK economy and part of a global market which generated $1.8 trillion in 2021 and is expected to reach approximately $2 trillion by 2026[7]. In 2019, the revenue of the UK apparel market was estimated to be just under £59 billion[8], contributing £35billion to GDP[9], with the market projected to reach more than £75 billion by 2026[10]. In 2019, the fashion industry employed over 890,000 people in the UK[11].

The industry is still in an adjustment phase from the impact of the Covid-19 pandemic, which exposed the fragility of globalised supply chains. Disruptions were legion alongside exponentially higher shipping costs, forcing brands to re-evaluate production strategies and consider more localised[9] and even on-shore approaches to design, production and distribution. This created the opportunity to build in less climate-intensive solutions at every stage of the garment lifecycle. However, the COVID-19 pandemic also left brands scrambling to maintain bottom lines. Priorities for many brands shifted from longer term strategies around sustainability to shorter term offloading of unsold inventory to keep afloat. This highlighted a flaw in current rapid trend cycles - how quickly styles became obsolete. Many brands in the mid to lower ends of the market came under fire for not paying for production orders with factories in developing countries, leaving factory bosses and workers deeply compromised.

Despite the toll taken on societies and economies, one positive side effect of the pandemic was reduced fashion consumption, driven by lockdowns and largely domestic based lives. Many citizens experienced reframed, simplified sartorial existences and wardrobes were purged. For example, 36.2 million of online secondhand store ThreadUP's 52.6 million users in 2020 were first time sellers[12]. Comfort and ease became dominant values for revised relationships with fashion, which was reflected in consumption patterns during this time. In 2020, retail sales for clothing fell 43.5%[13]. Since the start of the pandemic, UK demand for athleisure increased by 84%[14]. As well as prioritising e-commerce, brands who outperformed during the pandemic were those centred around comfort and outdoor activities[15]. Time will tell whether this trend will have a lasting or measurable legacy but there is an opportunity to remind citizens of how their reduced consumption from lockdown dressing can be carried into post-pandemic lives and wardrobes, and accordant positive impacts on the planet.

Credit: RAEBURN

Overall, fashion is not on track to align with wider global climate goals, neither to limit global warming in line with the 1.5 degree pathway set out at the Paris Accord nor to reach net zero or carbon neutrality in line with other sectors. At the current rate, the industry will fail to cut down greenhouse gas emissions in line with efforts to limit global warming at the raw materials stage without drastic changes towards sustainability in the next 8 years[16]. At COP26 in 2021, the Fashion Industry Charter made progress with over 130 global companies engaged, and an additional 41 committing to sourcing 100% of electricity from renewable sources by 2030, sourcing of environmentally friendly raw materials, and phasing out coal from the supply chain by 2030 among others[17]. However at COP27 in November 2022, the UN Economic Commission for Europe outlined how "science is telling us that the environmental footprint of the fashion industry has worsened since COP26. We need to be more proactive. Instead of only speaking about catastrophic scenarios, we should speak about solutions"[18].

Out of all industries, fashion is acknowledged to be one of the least sustainable. In 2021, the fashion and textiles industry and its supply chain was the third largest polluter. As recognised in the CFE Phase 1 Report, it emits 4% of annual global emissions, over 2.1 billion tonnes of CO_2-e emissions per year[19]. Annually 98 million tonnes of non-renewable resources and 93 billion cubic metres of water are used by the textiles industry. By 2030, global apparel consumption will rise by 63%, from 62 million tons in 2022 to 102 million tons, the equivalent to more than 500 billion additional T-shirts[20]. It is suggested that global fashion sales will reach 96 to 101% of 2019 levels in 2021 and 103 to 108% in 2022[21]. Research in 2021 recommended the industry address what was previously termed "the elephant in the board-room, the unchecked consumption of apparel"[22].
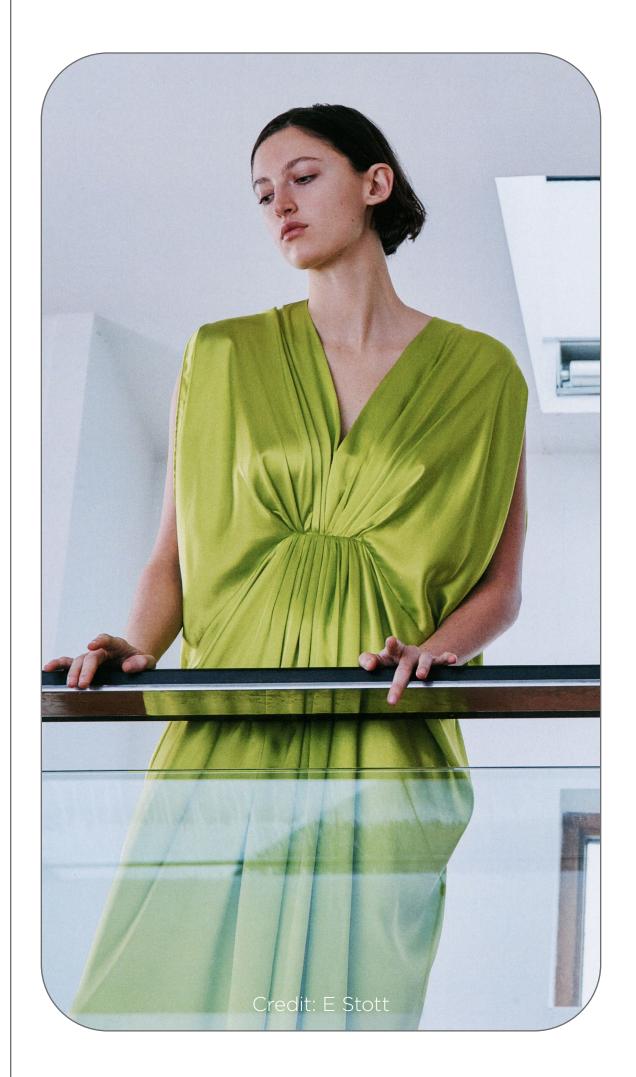
To counter these impacts in a timely manner, brands and manufacturers will need to accelerate action . Global fibre production reached an all-time high of 113 million tonnes in 2021 and is expected to keep growing by 2030 to 149 million tonnes[23], while the production of fossil fuel-based polyester, which accounts for 54% of all fibres, has increased from the year before[24]. This is most likely due to the lower price point. However, research published in October 2022 showed that in comparison to the demand for fossil fuel derived fibres, there is a stagnation in the shift to lower impact textile alternatives and regenerative fibres[25].

Accelerated action is also needed when it comes to brands being more responsible and transparent with their strategies and communications for promotion, marketing and point of sale. This would mean the need for increased garment longevity and durability can be tackled from both a supply and demand perspective. In 2022, the UK's Competition and Markets Authority (CMA) stated that 40% of green claims by fashion brands online could be misleading[26], with fashion brands making up 25% of greenwashing complaints[27]. It has since launched investigations into several volume players about eco-friendly and sustainability claims. If brands are to be found using misleading sustainable claims, CMA will take enforcement action through the courts if necessary[28]. Further research also found that nearly 60% of the environmental claims made by several fashion giants are "unsubstantiated" and "misleading"[29]. Without encouraging initiatives such as this, and further sanctions and accordant action, the risk run is that misinformed citizens are seduced by false green claims which leads them to continue with excess consumption, on the basis that they assume they are making better choices for the planet, when in fact their behaviour could unintentionally be adding to further negative impact.

This chapter has been informed by a variety of research and investigations. The IPF, together with other stakeholders within the BFC and Greenwith Studio, conducted primary research with decision makers across the UK fashion value chain. A targeted hackathon and documented breakout discussions were held at the BFC's IPF Forum in June 2022, comprising leading expertise from areas such as:

o   Fashion brands from all sectors and price points

o   Technology

o   Consumer behaviour

o   Management consultancy

o   Wider UK government entities

A series of targeted interviews have been conducted with brands, online and e-commerce retailers, brick and mortar multi-brand retailers, manufacturers, software suppliers working in fashion, and designer SMEs. In addition, extensive secondary and desktop research using fashion industry resources, academia, trusted news sources, and white papers and reports from NGOs and non-profits.
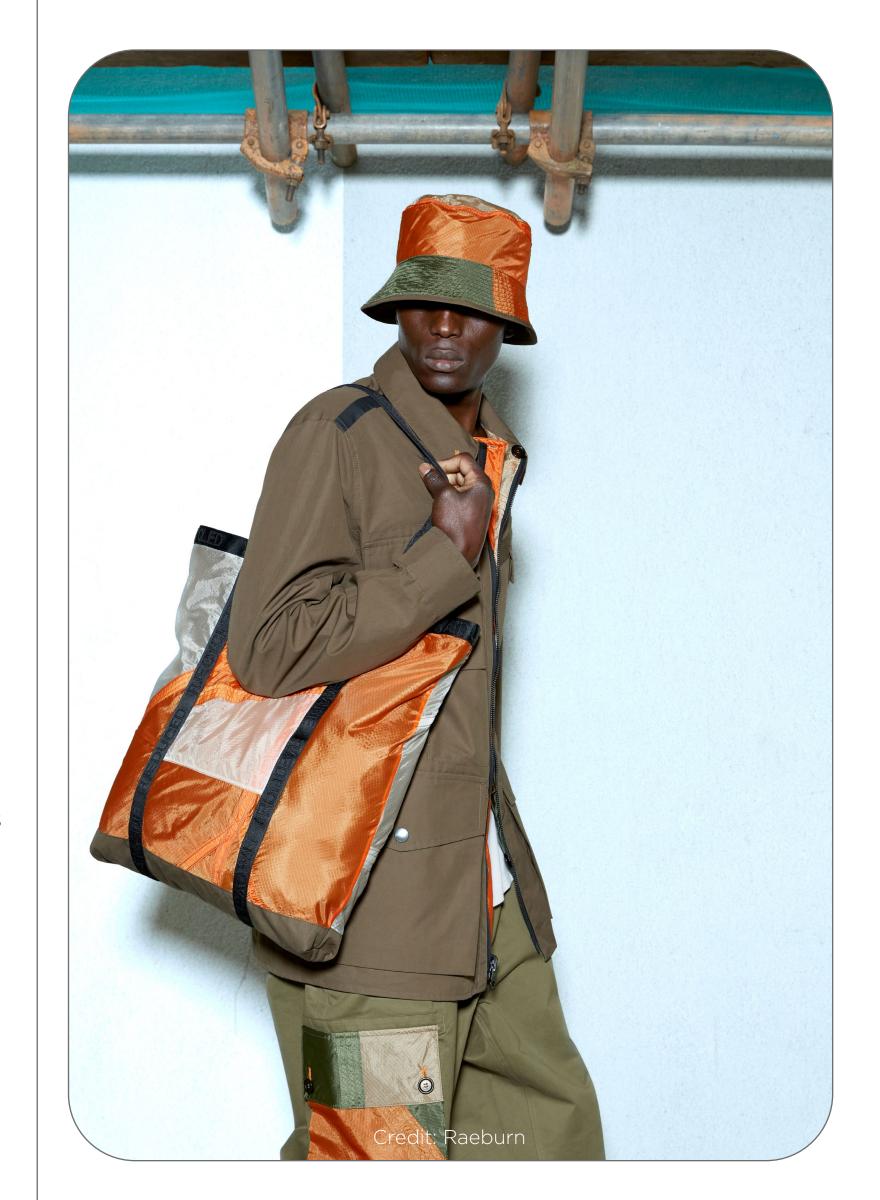

Credit: E Stott

The need to increase garment longevity and utilisation

It seems that sustainability has some way to go to becoming the necessary core pillar within brands to bring fashion in line with wider UN and other net zero targets. Only 12% of fashion executives surveyed in 2021 decided that sustainability is core opportunity in the year ahead[30]. This might contribute to why, in the short term, overproduction needs to be addressed, and excess waste, despite this being the era of data-driven manufacturing where demand can be monitored 24/7, so manufacturers and brands' supply can be ever more responsible and targeted as a result. Consumer demand for fashion is now back up post-pandemic[31]. It is estimated that by 2030 the fashion industry will have consumed the resources of two earths and the demand for clothing will increase by 63%[32]. Currently, an estimated 150 billion items of clothing are produced globally every year, with 60% being discarded within 12 months[33]. The industry needs to build systems to enable garments to be in use for longer, and meet the vision for a circular future.

The industry and its consumers still have progress to make in reducing fashion's waste streams, which are driven by excess consumption and under-utilisation. Worldwide, an estimated 92 million tonnes of textile waste is created each year, and the equivalent to a rubbish truck full of clothes ends up in landfill sites every second[34]. 60% of waste associated with clothing lifecycles comes from garment disposal[35]. Three hundred thousand tonnes of clothing still ends up in UK household bins every year, with around 20% going to landfill and 80% being incinerated[36]. Clothing that enters the municipal waste stream often becomes contaminated or damaged, losing its reuse or recycling value[37].

Durability and longevity are not adequately factored into the design phase, and the relentless promotion of new items leads to a higher volume of units sold in a cycle of increasingly rapid turnover. There is an urgent need to shift to circular and sharing economy models. In addition, this translates to less emotional connection and clothing carrying less of a perceived value to the consumer[38].

Governmental regulation, both at a domestic and international level, is still in process of reacting to this. Despite recent moves such as the EU Carbon Border tax[39], today little stands in the way of any company extracting raw materials, manufacturing, importing, purchasing and disposing of fashion through traditional linear systems, which do not take into account impacts to human rights or the environment.

Credit: Raeburn

It is estimated that approximately 30% of a garment's environmental impact occurs post-purchase[40]. This may vary depending on how and where it was produced and how it is cared for, maintained and disposed of. This is the balance after approximately 60-80% of a garment's environmental impact has been accounted across the entire upstream (manufacturing) stage. This comprises of raw materials extraction, harvesting, cultivating, processing, weaving, dyeing, printing, cut and sew, distribution, logistics, to the point of sale or warehousing for e-commerce[41].

For most brands their relationship with the garment and the customer ends at the point of sale. This brings multiple challenges to reducing fashion's footprint and impact. First, citizens are left with the problem of what to do with product they will no longer use, whether due to perceived obsolescence or damage. The vast majority of the responsibility to ensure longevity and responsible disposal falls on the citizens shoulders, with little centralised, established or available guidance from either brands or other authorities.

This perpetuates the idea of fashion being disposable: if the manufacturer or seller is seemingly not invested in the product's longevity through to the end of its lifecycle, why would the consumer value it much differently?

Credit: Huishan Zhang

The bigger corporate brands are based on growth, so to offer a service that takes away growth is of no benefit to them. Getting people to realise something could be repaired is a challenge, however QR codes could be a good solution as they sit right there in the garment. A brand could offer consumers the option to bring back their garments, which they then redesign or repair: it would generate good publicity. Doing things such as this in retail spaces makes sense.

Amy Trinh, Co-founder, WED Studio

Brands are continuing to manufacture without Extended Producer Responsibility (EPR), since regulation in the UK is not yet in place. The UK can be inspired by Sweden's Extended Producer Responsibility adopted by law in 1993 and made mandatory for textiles in 2020[42]. While this has been addressed with the UK's 2021 Right To Repair law for domestic white goods, it is currently under review for being implemented for fashion and textiles.

Disposable clothing with built in obsolescence appears to have become, however unintentionally, a convenient revenue generator across the global fashion value chain, especially at the affordable end of the market. The quicker products fall apart or are beyond wear, the more successful the rapid sales cycle. Research shows that only 20% of brands offer repair options[43]. It is not dissimilar to highly affordable electronics; as it is often more expensive in both sectors to repair items than it is to replace them. Overall, it seems there is little motivation nor incentive for citizens to take care of their wardrobes within the current linear and affordable system.

For brands it is operationally costly to receive back garments from unwanted purchases, or to take back and repair[44]. Localised centres are required to improve post-purchase longevity and durability, which could be at considerable cost relative to the upstream costs of manufacturing in developing countries.

Against this backdrop, the fashion industry still has simplistic labelling systems, which do not educate the consumer in garment care or use, nor do they provide traceability. There is little support and information provided compared with other fast-moving consumer goods, such as beauty and food. This is partially driven by the lack of mandate from authorities. Ginetex, the International Association for Textile Care Labelling, has completed significant research into how consumer behaviour is changing: consumers who would not buy a garment unless it had information about how to look after the garment numbered 74% in the EU, 83% in the UK.[45] The hope is that as data and technology systems innovate, and it becomes increasingly normal to use mobile devices and modern technology to learn about products' attributes across all FMCG and other sectors, transparency and granular detail in labelling will innovate in tandem. This could empower consumers to know more about who made their fashion items, and how. This will lead to increased emotional investment and empower better attitudes towards care, maintenance and repair.

What is needed is a more coordinated approach to enable fashion waste streams go back into industry while recycling and sortation for clothing and textiles is centralised. This will enable a textile-textile system. Fashion produces 100 billion garments per year globally, with only 1% of discarded garments being recycled into the fashion value chain[46]. Disconnected stakeholders still have progress to make to put together a system that connects brands with disposal facilities[47], enabling a well functioning eco-system of closed loop manufacturing, ideally along with collaboration from recycling and circular innovators with business models not dissimilar to Sweden's Renewcell, Italy's Reverso, France's Carbios and the USA's Evrnu who are leading by example. Worn Again Technologies, along with significant UKRI government backed funding for initiatives such as this, has set about bringing about a UK based solution to this issue. Given that the UK is such a high consumer of fashion and has historically been synonymous and recognised globally for radical innovation and creativity in our industry, brands need entities such as Worn Again to be scaled and connected as strongly as possible to better support solving this problem[48].

Despite the positive impact of uptake of the secondary market, consumers are beginning to treat secondhand like fast fashion without significant regard for maximising wears, repairs, utilisation and maintenance. Trends and newness appear to be the primary drivers enhancing secondhand purchases, which defeats the object of buying secondary market for more responsible consumption. Research shows that 5.3 million consumers joined the secondhand market last year, but their overall purchasing did not decrease[49]. This suggests that consumers are addicted to novelty, regardless of whether or not the clothes have been worn before. The global secondhand apparel market will grow 127% by 2026, but may become less affordable as both demand for this market increases and also as primary market prices likely rise due to the cost of living crisis[50].

Post Brexit, the UK is falling behind the EU's efforts to reduce environmental impact in fashion. In this way it is not aligned currently with empowering citizens to be more sustainable in their consumption habits, of which enabling garment longevity is a key factor. Recent directives under the wider European Green Deal and its 2020 Circular Economy Action Plan alongside the 2021 update of the EU Industrial Strategy, have included 'Making Sustainable Products the Norm', and the 'Strategy for Sustainable and Circular Textiles'. Given that many UK brands export to the EU, they risk becoming non-compliant with EU regulation and compliance. In time, UK brands may see a drop in investment from the financial sector which is also increasingly concerned with ESG (environmental, social and governance) and a drop in consumer demand for their products if a similar item can be purchased with better environmental credentials from a brand that has followed, and has been compliant with the EU directives.

Credit: Tove

Opportunities for reduced impact and enhanced circularity

In the same way that the pandemic gave us insights into scaled back wardrobes, the current cost of living crisis will give both consumers and brands a reason to pause and reflect on how to move forward more responsibly. It is currently a challenging time for all sectors and fashion is not exempt: when living costs go up, demand for discretionary purchases inevitably starts to reduce , so there is an opportunity to be seized for consumers to embrace a modern version of the post-war 'make do and mend' frugality. High costs from continued supply chain disruption and a spike in energy costs, plus a desire to switch to renewable energy suppliers and respond to sustainability-conscious consumers, point to an opportunity to prioritise transition to localised manufacturing and promoting responsible custodianship rather than casual ownership of wardrobes. Anticipating more cautious consumers that seek investment pieces with durability, longevity and timeless design as key design attributes and brand values.

Brands to take ownership of this zeitgeist and its challenges, creating a narrative around it as the basis for change in their brand's broader direction and strategy. This could be communicated to their audiences as part of a move to being more responsible and eco-friendly, ideally moving away from overproduction and mark downs. Brands have an opportunity to create greater emotional connection to fashion purchases.

> **Once the customer scans our swing tickets that have QR codes, they are taken to our sustainability page. We have the opportunity to include repair information, but first it is about citizens using the correct wash cycles. It would be good to target staple pieces from the collection that last year after year. We would be keen to explore something through social channels to increase citizen incentivisation.**
>
> Cat Lee, Head of Ethics and Sustainability and Yasmine Winter, Sustainability Specialist, Ted Baker

Brands could be leveraging this current challenging global and domestic situation for ongoing storytelling. This could encourage consumers to take better care of garments or consume the secondary market more and to start to see acquisitions of garments as investments rather than throwaway rewards. This could include suggestions of multiple ways of wearing an item, including how to renovate, recycle or customise it if there is apathy or perceived obsolescence by the consumer.

Fashion is a cultural force that has a ripple effect on consumer behaviour and spreads across other sectors. The industry has the ability to change and shape lives[51]. We all have to wear clothes and every piece of clothing we buy represents a personal choice, one of the things fashion can do is spread an idea very powerfully, coherently and with the all-important 'cool' factor[52]. Many other sectors use fashion terminology to sell products.

Technology innovations mean we are finally ready to treat 'product as a system' with brands remaining connected to garments across their entire life cycle. There is interest to digitise products at every market level, providing a way for the customer to be engaged. The data on post-use can be fed back to the brand in this new ecosystem of ongoing connection, leading to greater audience insights which can inform design for more longevity and durability.

Greater durability in design will be valued by consumers as wardrobes become their own asset class, in fashion's version of the sharing economy. With resale or rental of apparel as a surefire option to the user, there is more justification for investment in the pieces upfront and for taking better care of the items[53+54].

Re-commerce (or the resale/secondary market) is forecast to overtake the primary market. Secondhand will grow 185%, nearly ten times as much as fast fashion[55]. The 'Depop Generation' have been a core driver in this, hence Depop's sale last year for approximately $1bn to Etsy, Vestiaire Collective's US expansion and Selfridges' announcement they intend half their sales to be secondary market by the end of the decade[56].

There is an opportunity is for brands to match this trend: a gradual swing towards prioritisation of eco-friendly alternatives is gaining momentum, especially in the Gen Y and Z cohorts of fashion consumers. It is reported that in 2022, 58% of Gen Z and 47% of Gen Y want brands to create more eco-friendly products[57]. As their spending power increases, brands risk losing audiences and customers if they do not innovate and evolve to meet market demands and therefore create a self-inflicted threat to their own future profitability or existence.

If the secondary market's recent and forecast exponential growth poses a threat to brands' bottom lines, they can take ownership of this internally by white labelling additional services or partner with 3rd party provider. Reflaunt are one such entity, with an aggregate 50 million shoppers in their global network: this allows brands to access new audiences through branded re-commerce due to lower retail value; with 85% of re-commerce customers being new to the brand[58].

Secondary market businesses partnering with volume players are showing appetite for innovation and more sustainable habits across the affordable end of the consumer market. This increases accessibility to audiences and consumers by being relevant to their budgets and raises awareness around renting.

Insights from IPF Forum June 2022

The convening power was harnessed to gather key industry decision makers from brands, as well as technology innovators and other stakeholders, for a focus group with breakout round tables. The summary takeaways are below.

o   The group spoke about the need to address the inherent philosophical, conceptual contradiction of de-growth and the need to increase sales. They felt there was a need to change the culture of fashion. A change of revenue streams, such as creating circular and sharing business models that don't depend on traditional sales, is required.

o   It was identified that Extended Producer Responsibility (EPR) could create added value by making the customer an ongoing stakeholder in the post-use ecosystem. By doing this the customer feels seen, heard and valued by brands and will be continually invested in the product.

o   In order to facilitate re-use and re-wear, the design of garments needs to be emotionally and physically durable enough to last for more wears and wash cycles. Better storytelling and education about the provenance of products will also increase emotional investment for citizens.

o   The group discussed the value of blockchain and other digital tools that communicate provenance and how the garments have been engineered, reinforcing knowledge around durability.

There're so many ways to do it [renovate or up-cycle clothing], there could be a printing screen in store for your old garment - it takes 10 minutes and costs next to nothing. Or in Selfridges the Chanel boutique could have an artisan on-site, to remake garments. It's not limited to market level. Repair can be charged for as well, it doesn't need to be free.

Patrick McDowell,
Creative Director & Founder of Patrick McDowell

Case studies

Barbour

The brand offers a repair service where customers are encouraged to send their Barbour coats in to the factory to be rewaxed, cleaned, repaired, or altered, recommended once per year. They also provide resources for consumers to carry out DIY repairs and maintenance such as rewaxing jackets themselves with video tutorials for guidance.

Ganni x SOJO

Via embedding into e-commerce an online first repairs, tailoring and alterations service, Ganni customers can book complimentary alteration services through the Ganni website, and have them picked up and delivered for free. The shared philosophy of this partnership is that returns in fashion carry a heavy environmental impact, and are more often than not down to poor fit. This leads to reduced emotional investment by the user and less wears, ultimately driving up products' wider climate footprint. By adding in this user experience, the goal is that with improved fit will come increased emotional durability and therefore longer wears for Ganni products.

Marks and Spencer

Their Shwopping initiative, based on an open loop recycling model and in partnership with Oxfam, resells, reuses, or recycles used clothes from any brand, as well as soft furnishings. The user places product in a dedicated in-store location. QR code technology is deployed to reward this behaviour with vouchers which are downloaded onto the customers loyalty card with the retailer. Since 2008 the partnership has collected over 35 million items, contributing an estimated £23 million to Oxfam's revenue stream.

Mulberry

The brands 'Made to Last' commitment is to achieve net zero Greenhouse Gas (GHG) emissions by 2035, delivering repair services from cleaning and leather protection to comprehensive restoration services. Their UK factories, which produce more than 50% of the products, are carbon neutral, working with Zero Waste to Landfill providers, recovering energy from waste which cannot be reused. They work with Scrap Stores to supply waste materials to local schools, universities and craft groups and are aiming to achieve "hyper-local, hyper-transparent" supply chains.

Nudie Jeans

The company offer a take back and repair scheme. The Repair and Recycling programme allows customers to trade in old pair of Nudie jeans and get 20% off their next pair. Recycled jeans are washed and repaired as needed to be sold in Nudie's Reuse Range, selling 2238 pairs of Reuse jeans in stores and online in 2020.

PANGAIA

Digital passports are printed directly onto PANGAIA care labels via QR codes. This provides a bespoke digital experience when scanned by a customer's phone, simulating the user-experience of social media platforms to take the customer on a journey from the product's origin through to its purchase, transportation and aftercare. Provenance information and mapping of the dyeing, production and distribution facilities is also included.

Ralph Lauren

Ralph Lauren's upcoming cashmere recycling programme 'Live On' will allow for the first of its kind, Cradle to Cradle Certified, luxury cashmere jumper. This customer-led programme is part of the company commitment for all past and future products to 'live on responsibly' by 2030. They pledge to expand this across five of their iconic products by 2025. They also offer a QR code on Polo by Ralph Lauren products which provides authenticity and information and styling advice.

Sheep Inc

Sheep Inc provide a purpose driven yet engaging QR code example using a serial number on a garment swing tag. This provides a complete digital record through a scannable QR code, delivering transparency along the supply chain. Granular detail of where their garments come from and who made them is paramount to their operations. In addition, Sheep Inc provide a full breakdown of their CO2 impact and issue community-driven farm updates.

Recommendations: externalities & policy

Adapt business models to triple bottom line or stakeholder models and crucially, circularity based models. Companies should build their business model around sustainable profits. Performance metrics and targets, along with true price accounting, R&D expenditure and budgeting should be reflected in the sustainable business model[59]. The government has an important role to play in helping business leaders to drive responsible business behaviours through incentives, tax breaks + VAT and other support.

Make ESG mandatory at board level for larger fashion brands, manufacturers and retailers. Enhancing responsibility at C-suite can be a driver for change, Sustainability is highly specialised, comprising knowledge areas such as biology, chemistry, agriculture, materiality, engineering, policy, technology, climate change, supply chain, auditing, innovation and law. It is not likely to lead to success if sidelined[60]. Instead the position should be appointed to internal C-suite level or for SME's, outsource to a reputable sustainability consultancy or independent officer whose methodology is aligned with established frameworks such as B-Corp[61], the UN SDGs[62], and Science Based Targets Initiative[63], amongst others.

A move to 'Extended Producer Responsibility' (EPR) could be a commercial imperative as it enhances circular economy principles. In other industries, various forms of EPR are now the norm in the UK. The 2021 Right To Repair regulation on white goods (such as domestic appliances) demands the availability of spare parts for consumers for repairs for a mandatory time frame[64]. In the automotive industry, it is increasingly common to lease or part-own your car, meaning the customer and seller are integrated for longer and the manufacturer takes responsibility for subsequent services relating to maintenance and care and the customer does not carry the load of the full depreciation[65].

EPR in fashion could therefore take a similar format: involving take back, repairs, up-cycling or down-cycling and recycling or disposal services, as well as education on garment care and maintenance. Research into the luxury sector 2022 showed that approximately 80% of respondents surveyed believe that luxury companies need to take responsibility beyond production and sales by offering repairs, up-cycling, and secondhand services[66]. In the future, brands that join forces with their consumer in post-transaction services could monetise the myriad transactions through to resale. Additionally, brands that show a willingness to take ownership of unwanted items, in whatever capacity, could gain competitive advantage by drawing in the increasingly growing segment of customers who shop sustainably. Sneaker brand Thousand Fell created an initiative called 'Supercircle', where customers can return worn out product for recycling via a prepaid shipping label, and earn a monetary credit for doing so[67].

Introduce legislation and regulatory frameworks to transition to a more circular based fashion industry, especially where utilisation, durability and longevity are concerned. Mass-produced clothes without sustainable upstream processes and inputs do not lend themselves to emotional investment by consumers, so in future could be subject to additional levies or taxes. Tighter regulation could further empower the secondary market, concentrating valuable garments into the secondhand stream, ideally seeing VAT and import duties on used clothes being waived[68]. Brands could be asked to disclose how much they produce, mark down below cost, and dispose of. And ultimately all brands should be encouraged to disclose care, repair, maintenance information at a granular product level.

Credit: Huishan Zhang

Case study: SOJO

SOJO is a digital platform that aims to reduce fashion's footprint by empowering better fit and repairs with affordable tailoring. This is achieved via an application which allows users to book alterations or repairs on garments, or via brands that have digitally integrated their service, such as Ganni.

Our call to action is to be conscious and slow in your approach to clothing and make sure all your clothes fit you well and last for decades to come. This service and approach doesn't rely on consumption or consumerism which is different to other aspects of circularity within fashion.

Josephine Philips, SOJO Founder and CEO

Their philosophy

People's behaviour can be altered by slowing down fashion and reducing throw-away culture. Clothes that fit well and can be easily repaired extend the post-purchase life and place greater value on the garment. The reason for the disposal of many garments is that they don't fit or because they are worn out or damaged, thus if garments can be fitted well upfront, or repaired, then users are likely to keep them for longer.

Since a large proportion of fashion return rates are due to poor fit, and shipments produce a lot of CO_2, as does packaging and re-packaging, a tailoring service attached to point of sale helps reduce return rates and wider negative environmental impact .

How it works

After selecting the garment, sizing details are put into the app or webpage. The customer sends an item that fits correctly for tailors to match it to, or users can pin the item themselves, following a video tutorial. The garment is picked up and altered by SOJO's in-house tailors. This service is available in London Zones 1-3.

Credit: Di Petsa

Section 3

Citizen behaviour

Credit: Huishan Zhang

Overview

Reducing consumption rates in tandem with improved garment longevity is critical, however it is a complex, multifaceted issue. Currently the blame is by and large attributed to citizens. However, as is seen with many other citizen consumption areas, such as aviation, food or beauty, the blame needs to be shifted away from citizens as the core problem, instead seeing all stakeholders uniting to create change via education, tools and wider solutions.

Approximately one-third of the total environmental impact of the average garment happens post-purchase, during consumer use[70]. Those factors include how it is i) laundered, ii) repaired or not and iii) where the garment goes once the consumer no longer retains it or does not submit it for resale or charity. Citizen disposal of fashion mainly centres around textile waste bins, or household or domestic waste bins which can often divert to landfill or incineration.

Over the last twenty years, citizen access to rapid cycle fashion has exponentially increased: clothes prices have halved, while prices for most other goods have doubled[71]**.** This does not reflect the full societal and environmental cost of these items; and it is assumed that 'sustainable' alternatives often come with a higher price tag. The downstream effect is that emotional investment is significantly lower than before the advent of globalisation and the late 20th century's explosion of fast fashion.

However, as we enter a new era of climate consciousness, we can begin to solve this problem by bringing to bear the dual twenty-first century pillars of technology and Generation Y and Generation Z's environmentally minded values. To create a modern, sustainable and positive feedback loop in fashion[72], the goal should be high quality, sustainably sourced, reasonably priced garments which are well cared for. And then instead of traditional disposal methods, either recycled in circular systems or handed down to future generations and an empowered, motivated generation of consumers who have learnt to reevaluate their relationship with and consumption of clothing.

To do this, brands, manufacturers and all entities across the fashion value chain, with collaboration and support from software and technology providers, could create implementable sustainability roadmaps. These should adhere with or accurately reflect i) the UN's 17 Sustainable Development Goals[73], ii) be in line with the Paris Accord[74] of restricting global warming to 1.5 degrees and escalating all practices across both their upstream and downstream towards circular economy principles. To do all of the above will require buy-in from legislators and the financial sector who have the ability to cut off the fuel supply when their assets do not meet the correct ESG targets. The risk of not doing this is that brands could alienate both employees and consumers from Gen Y, Gen Z and in time Gen Alpha, all of who are well informed digital natives who have grown up in the shadow of climate change.

The other risk is that citizens continue to be sent the signal that fashion is disposable and that they are free to continue acquiring it and disposing of it at unsustainable rates, and not giving wardrobes the due care and attention that would bring down the collective post-purchase impact. This is perpetuated by the allure of lower-end volume apparel brands promoting fashion with persistent marketing and artificially deflated pricing and not factoring longevity into their designs[75]. When the consumer often acquires items in the context of convenience via commerce's instant gratification culture, this model leaves someone somewhere else to pay the true price of the environmental impact. It should not be surprising therefore that emotional investment, subsequent care and enhanced longevity are not yet priority factors in a garment's life cycle.

Credit: Huishan Zhang

This chapter has been informed by various insights. In addition to desktop and other secondary research, primary research via several specific studies have been commissioned for purposes of this report.

o   Greenwith Studio surveyed a cohort of 150 Gen Y & Z climate conscious individuals who were either students or recent graduates, living in shared accommodation. This specific audience was targeted following the exploratory research that found beliefs that: 'Climate change will affect us and our children most' 'It's our futures that will be damaged' 'We will be making the changes as we will be the next generation with the power to.', 'Change happens through education so talking to and instilling these sustainable practices at an age where you are still learning and developing, in education and life, is very important.[76]' The outcome of the survey was a series of insights into how these participants care for, repair, launder, maintain or resell their wardrobes.

o   Vanish commissioned an independent targeted body of research from leading players such as YouGov and Ipsos, to investigate laundering and garment care behaviours of UK consumers. The outcome of that research can be summarised as: i) In a post Covid world, people are re-evaluating how they live. ii) The industry is recognising the need to disrupt the way people are thinking about their clothes. iii) Education is part of what needs to happen but we need to meet ordinary people on their terms and iv) Unless we get proper engagement we may find, despite low environmental barriers, people may not participate to desired levels.

o   Codec, a digital-first analytics organisation who work with proprietary artificial intelligence technology capabilities. Their focus is on the values, or capital, held by global digital communities with local focuses. Their process is comprised of multiple verticals including tracking billions of daily content interactions, with live data streams showing audience updates in real time.

Observed research by Codec

Codec analyses and classifies billions of social media interactions, using AI and cultural databases to identify and qualify communities. They identified 27 different fashion communities in the UK that include 'streetwear connoisseurs' to 'digital expressionists' and 'sneakerheads' at a total sample range of <200,000 participants. Cultural changes are tracked in real time.

Using this approach, Codec identified some of the citizen behaviours related to the lifespan of clothing. These included:

Interest in Sustainability

o   75% of fashion communities are curious in sustainability, indicating their desire to learn if the information is available to them.

o   Many communities are interested in women's rights and climate change. This shows that they already care about both the human and environmental impact of clothing production. In particular, these groups are likely to respond to emotive storytelling.

Lack of Awareness

o   There is a lack of understanding when it comes to the lifespan of clothing and lack of awareness that extending the lifespan is a behaviour they can easily embrace.

o   There is a lack of understanding about the relationship fashion has to sustainability and the impact that it has on the environment. Especially, recognising the impact of clothing longevity.

o   29% of fashion communities are unclear about the benefits / value of choosing eco-friendly brands.

Unconscious Engagement with Clothing Longevity

o   Some communities are eager to reduce their footprint and seek brands that promote how to style the same item differently or owning wardrobe staples.

o   There is an interest in learning quick and easy sustainability hacks.

Credit: E Stott

Trends and challenges

Consumption, Impact and Garment Care

Citizens are wearing each garment 40% less than they were a decade ago, with the average garment worn 10 times before disposal[77]. Despite increasing domestic infrastructure to tackle recycling and secondhand, the UK fashion industry is a major polluter, with British citizens buying clothing at a higher rate than other comparable economies. 4 billion pieces of apparel were purchased in the UK in 2019, or 16kg on average per person, which equates to more items per capita than any other high income country such as France, Italy, or Sweden[78].

The British government estimated in 2019 that British citizens throw away a million tonnes of textiles every year. Of that, 300,000 tonnes end up in household bins, with around a fifth going to landfill and the rest incinerated. Clothing that enters municipal waste streams generally becomes contaminated or damaged, meaning reuse or recycling is then not an option[79].

Consumer interest and demand in fashion is galvanised by media into excess consumption, especially online. Up until the advancement of online publishing and social media becoming shoppable verticals, publishers had a 'church and state' approach, or a clear line between editorial and advertising. Today, fashion media is intrinsically connected with fashion brands, and a pro-shopping agenda, promoting continual consumption, has become a dominant driver in the business model[80]. Indeed, no publication survives without affiliate sales, making publications partially front ends for digital retail catalogues[81].

While social media helps citizens to express themselves through fashion, its exponential growth, along with unprecedented influencer marketing, can perpetuate high levels of consumption[82]. How this issue intersects with excess consumption and decreased garment longevity, and the perceived disposability of clothing, is attributable to two factors. First, the influencer business model requires them to constantly showcase new looks and encourage their followers to buy them. Plus, many followers aspire to be influencers themselves and buy large quantities of clothes so they can give the impression they also have access to the same desirable brands. Second, brands' own feeds are a constant mix of drops, ads and influencers; a never-ending daily stream of advertising and newness designed to encourage constant acquisition.

During the IPF Forum hackathon related to this project, many industry stakeholders agreed with the EU Strategy for Sustainable and Circular Textiles guidance:[83] That citizens feel that information on durability and reparability of products is difficult to find and there is a desire to receive better information. Material being worn out, followed by stubborn stains, are the two main reasons for clothes to be discarded in the UK, according to research disclosed by Vanish during the IPF Forum 2022[84].

Excess emissions are produced and avoidable fabric damage occurs when citizens unknowingly launder garments at higher than needed temperatures. The washing temperature indicated on most garment labels is usually the highest that a garment can withstand and often higher than is needed. However, many citizens understandably adhere to these temperatures, therefore requiring a higher amount of energy. This also sets them back financially: it is reported that citizens could save up to £100 per year by ensuring a full load, maintaining the machine, and washing at the coolest temperature[85].

Users opting for high intensity laundry cycles, combined with a deficit of longevity and durability in garment manufacturing and design, leads to excessive garment damage and disposal. Citizens still appear unaware of the connection between the garment degradation and their washing habits. Insights by Vanish indicated 49% of consumers surveyed had increased their washing temperatures, while 43% of the cohort believe clothing quality has declined[86]. Greenwith Studio's exploratory research into Gen Y and Gen Z laundry behaviour showed that approximately half of respondents stated they were unaware of how to improve garment longevity. The overall solution to this is to educate citizens on how to launder more responsibly - such as bring down washing temperatures and cycle lengths to save energy, which has an economic as well as environmental imperative. It will also empower them to make their clothing last longer.

There is no established, well-publicised and default consumer-facing resource for guidance where laundering and garment care aligns uniting with the fashion industry, washing machine manufacturers and detergent producers. That which is supplied by brands, via in-garment labelling and on e-commerce listings, on how to care for, maintain, repair and launder their garments can be perceived as vague. The challenge it points to is the lack of an industry-wide consensus, uniting laundering methodologies and consumer-facing communications. The following elements are unaligned:

o   Washing machine manufacturers

o   Laundry product manufacturers

o   The labelling industry and its standards, domestically and internationally

o   Consumer post-purchase behaviour

o   Brands education of their consumer and recommendations on a product level, not just a brand level

> **Some people have a natural tendency to wash too much and too hot. We encourage customers to wash less and at lower temperatures. We could be more explicit about washing less, but we don't want to be too specific, because of material blends. As if something is returned because of a direct piece of advice, you could be liable - so we have to be careful.**
>
> Cristina Gilkes, Director of Buying, Product Development and Sourcing, and Helen Webb-Carter, Fabric Sourcing and Development Manager, BODEN

Credit: Tove

Opportunities and recommendations

Empowering Behavioural Change & Reduced Impact in Garment Care.

Due to the cost of living and energy crisis, in the near term consumers may be incentivised to make their wardrobes last longer. Current economic challenges, from wider inflation to a potential global recession, would suggest household resources and assets will have to go further. This builds on lasting behavioural change from COVID-19, when our wardrobes became more casual and simplified. Both factors inevitably bear down on consumer attitudes towards fashion consumption. Research by Google in 2021 showed 82% of consumers are prioritising sustainability when making purchase decisions[87]. This means that they are not buying so many new garments, but instead repairing their clothes and buying second hand or up-cycled/repaired clothes. Consumers are choosing brands based on their sustainability and ethical practices[88]. Other research found that 25% of consumers surveyed say that they will consider buying more secondhand clothing if prices keep rising[89]. A recent survey revealed that Gen X is willing to spend the most on sustainability, with 10% saying that they would pay double, or more, for sustainable products[90].

The changing attitudes and consumer savvy of Gen Y and Z can be harnessed to drive wider change. They are the largest demographic in the UK combined, making up over 40% of the total population[91]. They know that every pound they spend is a vote for the world they want to live in: Over a third of the millennial and Gen Z cohort stated they have decided against a purchase because the brand or retailer did not reflect their values[92]. They are also familiar with the power of social media as a digital activist platform, deploying call outs and cancel culture against brands and organisations that do not match their values. Additional research showed nearly one fifth of millennials said that they learned how to do their laundry from social media tips and tutorials[93]. This shows a shift in attitudes that potentially represents the green shoots of genuine change. To truly affect and amend behaviours, Gen Y&Z have to be targeted, educated and mobilised alongside the more traditional 'garment care' audiences.

> It's interesting to think of the psychology of what the customer wants to do and how they act. Do they repair other non-fashion items they own? What are their domestic habits? How could that be tapped into?
>
> Marie Lueder, Founder, Lueder.

In terms of core audiences for bringing about wholesale change, research by Vanish suggests families represent the largest opportunity since they undertake the most laundry[94]. This is given their scale and headcount per household being higher than other population sectors, and the fact that garment care is predominantly handled within homes by women, weighted to those with children. This comprises both established families (children are into their teens) and young families (children are infant through to pre-school age). The largest group of 'heavy users' for household cleaning are women with children, at 46%, followed by women at 34% and men at 20%[95]. Research conducted by Vanish shows that although audiences have 'careful and practised routines', the opportunity for change is supported by the fact that 84% of respondents in 2022 stated that 'It makes sense to take care of clothes, so they last, rather than buying new ones'. The same study goes on to conclude that in there, lies the opportunity for changing behaviour[96].

Research shows that audiences want a 'quick presentation of the facts', so there is an opportunity to use short form digital storytelling to empower behavioural change. The aforementioned Codec survey, tracking the interests and behaviours of over 2000 digital communities, saw recurring sentiments such as "I love learning quick and easy hacks I can incorporate into my life to be more sustainable". These tended to feature high profile influencers articulating the problems with garment care, in a tone their audience relates to, understands and is inspired by[97]. The same survey showed that audiences want to 'hear a voice and see a face' to humanise the advice and foster a relationship with the creator. One such example is Ann Russell, affectionately nicknamed TikTok's 'auntie', for the video hacks on garment care. The core takeaway is to bring down the emissions surrounding garment care[98] and maintenance by employing engaging, simple narratives; and that digital first, social media structured storytelling is a reliable and successful solution to engage audiences.

Younger generations are increasingly buying second hand. 50% of Gen Y/Z UK and German consumers surveyed in 2020 expected to purchase more items second hand in the future[99]. 59% of those who bought second hand for the first time in 2021 say it gives them 'bragging rights', showing the cultural shift toward second hand and vintage becoming mainstream[100]. Indeed, the secondary market is forecast to overtake the primary market by 2030[101]. Gen Z take this high regard for the secondary market seriously when it comes to non-disposal of garments: recent research shows that approximately four fifths of the cohort would either hand down to friends and family or donate, compared to 30% who would discard[102].

> We want to focus on customer awareness, care and maintenance, repair and end of life. Yes it's about emotional connectivity, the blue sky thinking is being able to see who wore the garment to which event, and the story, there's an opportunity there.
>
> Catherine Loader, Sustainability Specialist, John Lewis and Partners

In this secondary market, consumers become 'custodians' and their wardrobes become an asset class in their own right, where enhanced care maximises value - both proprietary value and onward - for resale or rental. The opportunities generated by enhanced education around garment care, maintenance, and repairs expand when we consider how much the millennial and younger cohort are driving the change from primary to secondary market[103]. A 2020 report showed 65% of respondents were planning to purchase more durable fashion items in the future, 71% are planning to keep the items they have for longer, and 57% of respondents were willing to repair items to prolong usage[104].

In the near term, virtual try on can contribute to longevity and also help eliminate excess purchasing leading to rising returns issue, which is of particular benefit in the lower end of the market, where it can be more costly for a manufacturer to process and restock returns than to dispose of them. Since virtual try on technology exists and will likely reach mass adoption in the coming years, in future, brands will be able to empower users into adoption as the technology becomes more widespread, affordable, accessible and user-friendly. This advance of technology will enable greater connection in the consumer's immediate pre-transaction experience to the product. As we increase our consumption via e-commerce versus brick and mortar, if greater consideration and emotional investment happens pre-purchase, product is likely to be cherished further, cared for and repaired better.

Circularity will increasingly become synonymous with luxury, and viewing "waste" as an acceptable, preferable raw material input. As consumers become ever more familiar with, and aspire, to circularity across many areas of their lives, garments designed and made with circular economy innovation as a central element will be desirable. This would indicate the aforementioned textile-to-textile recycling innovators (Worn Again Technologies, Reverso, Renewcell), could become B2B2C recognised trademarks on garments in time, similar to GoreTex or Lycra in the past. While natural fibres are known for being biodegradable, sometimes compostable and deemed more ethical choices, we are still in possession of huge reserves of post-consumer synthetic and blended textiles that can be re-purposed. Since synthetics are also relatively durable, as long as they stay away from landfill and remain within closed-loop systems, the durability and longevity needed in fashion can be partially addressed in this way.

Recommendations for change

Brands should deploy advancing technology and software tools to educate and inform citizens with clearer, more detailed, and standardised garment information. Perhaps, what you put on your body should be as comprehensively communicated and transparent as what you put in your body. We have noted how food product labels contain all ingredients and nutrition information and sometimes product user guidance. Beauty also has its ingredients and detailed instructions. Fashion brands could provide better care instructions via QR codes linking to more detailed information and potentially video tutorials. Labels could include as much of the garment's life cycle as possible, including inputs and processes (material content, supply chain information), instructions on how to recycle, dispose of or make use of a take back/repair scheme and guidance on sustainable laundry habits. Ideally in time, once industry wide consensus along with policy makers and regulators is achieved, this would become standard.

An industry-wide initiative around garment care, with consumer education front and centre.. A coalition of industry leaders, government and other key stakeholders could unite and create a communications framework to educate citizens to enable garments to perform for longer, and help them bring down their energy bills. This could build on existing recommendations made by CleverCare: lower temperature, shorter cycles, using relevant laundry products, and hand washing where possible[105]. Air-drying would be recommended. Dry cleaning would be indicated only when strictly justified, with eco-friendly options preferred.

Multi-sector coordination deploying technological advances would enable connections between manufacturers of garments, washing machines, and laundry-care products. The digital software and hardware to support this exists, and will likely in time scale to critical mass, and become increasingly effective. Using enhanced technology, perhaps with next generation versions of RFID and/or NFCs, users might be able to scan their garment either using a smartphone or reader on the washing machine. From there, a series of instructions with simple guidance can emerge that pairs data from the washing machine manufacturer, with data on the materiality and inputs of the garment, enabling the ultimate environmentally friendly and responsible care and maintenance. Additionally, detergent brands could be included in the ultimate version of this customer journey. Essentially the users would enter garment data on either their phone or the machine, and receive back guidance based on a formula of:

$$X \text{ (Garment)} + Y \text{ (Laundered in washing machine)} + Z \text{ (Using detergent)} = XXX \text{ (Wash and / or dry cycle)}$$

Detergent manufacturers guidance to be aligned with washing machine manufacturers. Guidance is needed via an industry wide protocol, targeted at making consumers' lives easier. To "join the dots" and be the gold standard on consumer facing garment care, and rolled out via multiple media channels as a government backed campaign to help the UK's fashion consumers to contribute to net zero targets.

Credit: Huishan Zhang

Redefine what 'quality' means, as a value attributed to garments, which currently is vague, subjective and potentially misleading to consumers. Its definition would benefit from an industry wide standardisation, defined by opinion formers, taste makers and experts, for authentic guidance. While attributes such as ISO 9000 exist for B2B purposes, there is no simple, standardised consumer facing shorthand guidance for garments.

o   Contains a majority of a certain type of recognised grade or certified materials

o   Shorter stitch length

o   Reinforced or French seams instead of basic overlocking

o   Has a lining, if relevant to garment type, such as outerwear

o   The garment(s) is tested for durability and general wear and tear/ X amount of wash cycles at a specific benchmark for textiles testing and quality assurance

o   The dye is colourfast for X amount of washes.

With this guidance citizens would thus be empowered to make better choices. Perceived quality could also generate a higher emotional investment in items. In time the idea of quality, and luxury, should also comprise a core pillar of transparent sustainability or circular credentials - ideally they would be synonymous. This will mean products are perceived as less disposable, cared for better, worn for longer, therefore reducing their environmental impact and footprint.

> **Brands see care labels as a bit of a joke, citizens often ignore them, so brands have to really adapt designs so clothes can't be damaged as easily**
>
> Lewis Shuler, Head of Innovation, Alpine Group

On top of better factual information and guidance, brands and retailers should use creativity and simple entertainment methods to generate storytelling about the properties of a product. The content should be informative, uplifting, engaging content delivered across multi media touch-points. To do this, they could work with their suppliers and manufacturers to aggregate in-depth information, creating visual and/or written, short-form narratives at point of sale, whether brick and mortar or e-commerce. This would significantly contribute to citizen engagement with products that are made responsibly.

> **We have found that storytelling for consumers is successful. For example, we manufacture some fabrics in India with artisans, and whenever we do stories about that on social media they are very successful.**
>
> Cristina Gilkes, Senior Director of Product and Sourcing, and Helen Webb-Carter, Fabric Sourcing and Development Manager, Boden

Credit: E Stott

Brands should employ the use of QR codes as they are a successful mechanic for directing audiences towards further content and successful QR code driven campaigns employ a multimedia approach to drive adoption and usage. The QR code itself needs to be featured and promoted across all channels - both physical and digital and blended into the storytelling and narrative. Given that garment care is not traditionally seen as an exciting topic, the delivery and as such, ability to engage the audiences - is everything.

Work with prominent media titles and high level talent who can deliver garment care information: as accessible, positive, bite size, short form content that works best on social platforms such as TikTok, Instagram and You Tube. Additionally engaging the more traditional media channels (newspapers, radio and TV) to build broader awareness of the problem and need for change, combined this will create a wrap around, full funnel campaign that builds awareness through to a strong 'call to action' by harnessing the power of social media.

There is an opportunity in storytelling: more and more customers are asking for it, for example people want to know who made their clothes - it brings a product to life. Physical and emotional durability is important. It's about making sure we have all the evidence and documentation to be confident to communicate stories to customers.

Catherine Loader, Sustainability Specialist, John Lewis and Partners

Showing the process of how the garment was made was really important to us, and people are interested. Visualisation is really important, people don't engage with pure data, it needs to be interesting and visually engaging.

Amy Trinh. Founder of WED Studio

Credit:Huishan Zhang

Technology and data:

Enabling a transition to circularity in the post-consumer landscape

Credit: Sabina Bilenko

Current landscape

The first wave of transformation in the digitisation of fashion was dominated by e-commerce. Today, technology and software development, plus the proliferation of digital data, continue to transform the fashion industry. At a B2B level, key innovations include improved data driven manufacturing, ever more sophisticated and faster supply chains, visible real-time demand and supply, and inventory management[106]. Technology has paved the way for brands to pivot and evolve new business models, such as direct-to-consumer (DTC)[107]. Furthermore, shoppable social media has opened up methods of integrated entertainment and retail channels.

As data capabilities increase, the hope is that manufacturers and other suppliers in tiers 2 and 3 in supply chains will be able to integrate transparency about the upstream : raw materials, finishing, dyeing and all other processes and inputs. This will automatically indicate greater responsible processes and materials as transparent disclosure capabilities will drive less harmful behaviours. With this verified and more reliable information to hand, brands can drive greater garment longevity and durability by setting measurable KPIs for wider suppliers, and communicate back enhanced sustainable, responsible and ethical processes and inputs back to consumers. These combined efforts will all drive more responsible behaviour in the post-use phase and enable circular ecosystems ultimately.

In fashion's downstream and post-purchase, brands not only utilise data to gain deep insights about their customer base or new target audience, but data flows back in a constant cycle of information between all parties[108]. This empowers retailers and brands to have direct conversations with their current and potential customers, enabling increasingly streamlined decisions around design, manufacturing and retail. This bodes well for sustainability: as granular information becomes visible around the growing demand for eco-friendly fashion, all stakeholders will be able to harvest and respond to complex, revealing consumer driven data sets, to meet greener demand rather than over-produce and mark down.

At a B2C level, the digital revolution has radically changed the customer journey and user experience[109]**.** As well as the seamlessness and ease of shopping social media accounts they admire, customers at retailers in London can now see in-store activations based on hyper-efficiency and visibility of merchandise[110]. Two thirds of luxury purchases are now influenced by digital[111]. New troves of data have created an ongoing feedback loop of customer tastes and preferences to brands and retailers, meaning shopping online becomes hyper relevant, targeted and individualised for the user[112]. This can benefit wider sustainability in the medium and long term as data from the consumer's online searches for cleaner, greener products informs manufacturers, brands and retailers.

Digital technology and data can combine to drive a more responsible fashion industry. Data collection, harvesting, aggregation and communication and dissemination are driving pre and post purchase traceability, due to evolving and more sophisticated technology[113]. Traceability traditionally has been summarised as showing the full spectrum of a product's inputs or upstream process. Not just on where it was made, and by who, but also where all its component parts were made, and by who. This includes hardware such as zips and buttons, as well as embellishments and linings, and the primary textiles or material. However in the era of an ever growing resale market, and more software tools to give visibility on an item's full lifecycle, it is critical that traceability now also comprises all post-purchase activity. This will not just power authentication but also power product as a system and fashion as a sharing economy based service rather than a take, make, dispose linear model. This application of digital technology has the potential to unlocking circularity in fashion.

QR codes, as shorthand information centres, have been a key beneficiary post the Covid 19 pandemic, growing 96%[114]. The inclusion of QR code identification and reading in smartphone camera applications has led to their frequent replacement of traditional web links[115]. Their use in the hospitality sector during and post pandemic has accelerated the ubiquity of the technology. Nowadays they seem to be widely accepted tools for mainstream consumers to engage with[116]. In fashion, we now find QR codes attached to swing tags and accessory packaging[117], and in some cases, woven into clothing labels or printed on the garment[118]. In the future, fashion has the potential to be like food, where all stakeholders will come to expect and engage with much more granular detail about the materials and processes involved in bringing the product to the consumer.

There also are newer, evolving tools in micro physical form that contain digital information, surpassing software and the merely virtual. RFID (radio frequency identification) and NFC's (Near Field Communications) - the same modality that allows us to use our mobile devices to pay - are already in play and part of the near future'[119 + 120]. These come in the forms of almost invisible tags in garments, even now embedded at a fibre level.

> **We have considered QR codes, but we are not in a position to launch them. They may be part of the business in the future. We are well informed about where our products and fabrics are sourced, which enable us to ensure better quality standards.**
>
> Cristina Gilkes, Senior Director of Product and Sourcing, and Helen Webb-Carter, Fabric Sourcing and Development Manager, Boden

This chapter has also been informed by a wide variety of primary and secondary and desktop research, as well as in person interviews with industry experts and further explorations with Codec.

Greenwith Studio enlisted the support of a consulting CTO for this project, whose background has comprised building innovative, complex technology systems for fashion retailers, brick and mortar as well as e-commerce, as well as other sectors such as insurance. A comprehensive benchmarking study with data sets was conducted jointly between Greenwith Studio and wider external expertise to assess and analyse the 14 leading software suppliers within the global fashion value chain, looking in granular detail into how their functionalities and tools are driving change and innovation. Conversations were also had with existing or former technology and customer experience executives at fashion brands and retailers.

The IPF's convening power was exercised during the IPF Forum in June 2022 to investigate during a hackathon and subsequent breakout session how decision makers in the UK fashion industry currently regard the capability of existing technology; with additional support and involvement of Natasha Franck, CEO and Founder of EON.

Multiple interviews were also conducted with three shortlisted software providers that Greenwith Studio and the IPF jointly decided would best paint a wider picture of where these sectors intersect well currently. Further conversations were also had with both standalone brands and multi-brand retailers.

> **People seem to be really aware of QR codes, especially since the pandemic. One of the great things about QR codes is that we can see who has used it and we have measurable data. We have standard care label advice, and now we want to take the step further with QR codes. We want to focus on customer awareness, care and maintenance, repair and end of life. We have kicked off a trial already and we are working with a service provider with key product categories.**
>
> Catherine Loader, Sustainability Specialist, John Lewis and Partners

Findings by Codec on the intersection of sustainable fashion and technology

o   Communities are engaging with NFTs, digital influencers and fashion that exists solely in the virtual space.

o   There is both a curiosity and a skepticism around the use of technology in fashion, in part due to brands' use of their online data and privacy.

o   There is a particular interest in innovative tech to reduce garment waste and promote longevity.

o   77% of fashion communities are comfortable using new technology.

The role played by technology, software and data across typical product lifecycles

There are countless ways to apply the power of technology and software (plus nascent hardware) to transform the sustainability of the fashion industry. From either the point of view of what problem they solve, what opportunity they create, or their base functionality. The simplest way we have established, for the purposes of this report, is to follow the chronology of the garment life cycle.

Pre-purchase

Traceability and supply chain

The advancement of data and consumer demand to know more about the origins of their product across various sectors means supply chain information, once primarily buried deep in the B2B domain, is now more important than ever, even sometimes used as an additional B2C facing marketing tool'[121+122]. In future, raw materials themselves could carry information at a fibre level, as is currently made possible by innovators such as Textile Genesis[123] or FibreTrace[124]. The data is stored in the fibre itself and is scannable using specific compatible machinery.

Credit: Huishan Zhang.

Transparency

In addition to documenting raw materials and other inputs, transparency enabling software and technology allows both B2B and B2C visibility on all actions related to a product's lifecycle. It is increasingly normal to be able to get more in depth information about who made your clothes, and precisely where and when all its component parts came together to culminate in the garment[125]. The key to success is not just the documenting of the data but using it to tell a story that educates citizens[126].

Point of Sale & Purchase

It is likely that virtual try-on solutions will deploy augmented reality. This will both limit the amount of time spent trying items on in-store and allow customers to try on items online[127]. It will also empower a reduction in the excessive amounts of returns from customers who shop online, contributing to reduced emissions, packaging and more. Various brands, now fuse the real and the digital for enhanced, futuristic retail solutions. QR codes are themselves shoppable. This new strain of creativity gives brands new ways to communicate their sustainable efforts in productive and inventive ways, enabling consumers to make more educated purchases. The key is finding creative methodologies and storytelling to layer over the technology, which further engages and educates the consumer, meaning that garment care and clothing longevity information can be conveyed.

Provenance x Ganni

Provenance is a B2B2C software enterprise solutions platform, helping verify a product's environmental impact by connecting claims to supply chain data and third-party proof. In the same aforementioned 'show don't tell' approach, they create a series of material cards and proof points. These are plugged into e-commerce where consumers can then scroll past the essential product information to learn more about the sustainability credentials. Each one is interactive, allowing deeper learning and education depending on the viewer's preference, and enables garments to be filtered by sustainable material type.

It mitigates green-washing where brands make unjustified or misleading claims (whether accidental or on purpose) to the sustainability and environmental impact of their manufacture. Their technology also allows a QR code to be generated and added to a swing tag, woven label or other placement where, upon scanning, the user can see shorthand visual information via smart storytelling and lead visuals on the product's journey, and that of its raw materials and processes.

For Ganni, the value-add is summarised by them as 'no brand should mark their own homework'. Provenance supplied these material cards and data sets to Ganni, who then wrapped their own branding and house codes over the functionality[128].

Credit: Raeburn

Post-purchase

Authentication

Blockchain is a distributed ledger system in which a record of transactions and assets is kept. It is used as a way to keep track of valuable information, without the need for a centralised authority[129]. Using garment data on the blockchain could be through/could be in the form of an interactive application detailing supply chain, authentication and lifecycle of the garment and subsequent future actions. We have established that blockchain technology is non-editable and decentralised: meaning that in the ongoing future the provenance and lifecycle of a product pre and post purchase, especially in luxury, can be assured[130]. Authentication also equals attributed value in the eye of the consumer. In an ideal future, consumers would abide by the adage of 'buy less, buy better'. Meaning higher investments in quality items that have durability (physical and emotional), and longevity at their core. This tends to be higher priced fashion. The more luxury a product is, the more the need for authentication, which in turn tends to make the consumer want to take greater care.

Resale and re-commerce

Digital-first players, are transforming the secondhand market. Neither peer to peer direct sales, nor larger secondhand marketplaces, would be as scaleable or global as they are today without the use of myriad software, data and other technology tools to drive this huge new growth. As long as secondhand is shopped responsibly; and as long as platforms use renewable energy and other methodologies or frameworks operationally to move towards eventual carbon negativity, these platforms contribute wholeheartedly to a circular future. This should be a key target outcome for all brands. Not only does it keep more secondary market revenue in-house, give greater confidence to consumers if they are buying from the same source that created something, but the data feedback on who is selling what, when, how and why will drive greater efforts towards designing for longevity and durability.

As micro-hardware scales, it will be likely that all and every product can have its own digital ID or provenance tag, removing the cost for human authentication in the secondary market[131]**.** By enabling both technology providers, resale platforms and brands to authenticate garment viability through blockchain, the need for expensive and prone to error human input is mitigated.

Credit: Sabina Bilenko

Credit: Tove

Post-purchase

Recycling

Currently several key players, are powering new recycled textile technology for innovative materiality. In the future, granular fibre level data will empower ever more efficient textile-to-textile recycling, whether mechanical or chemical recycling is chosen[132]. A recent investigation revealed that out of 10,000 garments tested, 41% of the garments had a composition that did not match the composition stated on the garment care labels.[133] It will also enhance efficiency with down-cycling or up-cycling[134]. RFID and NFCs might in time allow aggregate items to be scanned, instead of one item at a time. Knowing how many times a garment or textile has been recycled indicates its re-use potential.

Garment care and repair

In the 21st century, the power of data gathering and communicating enables interactive, in-depth and user-friendly garment care information, that can be well communicated via QR code. This can also include guidance for recycling, up-cycling, reselling, responsible donation and disposal.

Clevercare by Ginetex, a formal framework and guidance embedded on brand websites, is to date the closest the industry has come to using enterprise software and data sharing to suggest precise solutions for garment and textile care[135]. Brands used Clevercare labels to encourage consumers to extend the life of their clothing while saving energy and water. This framework could be deployed by brands and combined with interactive storytelling to empower and engage citizens to play their role in bringing down fashion's post-transaction footprint.

Smart labelling technology could allow a more streamlined user experience with maintenance, care and repair information readily available via both the product itself and through integrated apps. Digital first repairs services have emerged in recent years. Using technology, users can upload photos of the repair needed, book in the services and more. Looking to the future, RFID and NFC technology will likely enable washing machines to detect what type of material the garment is made of and suggest relevant wash and dry cycles with correct detergent usage.

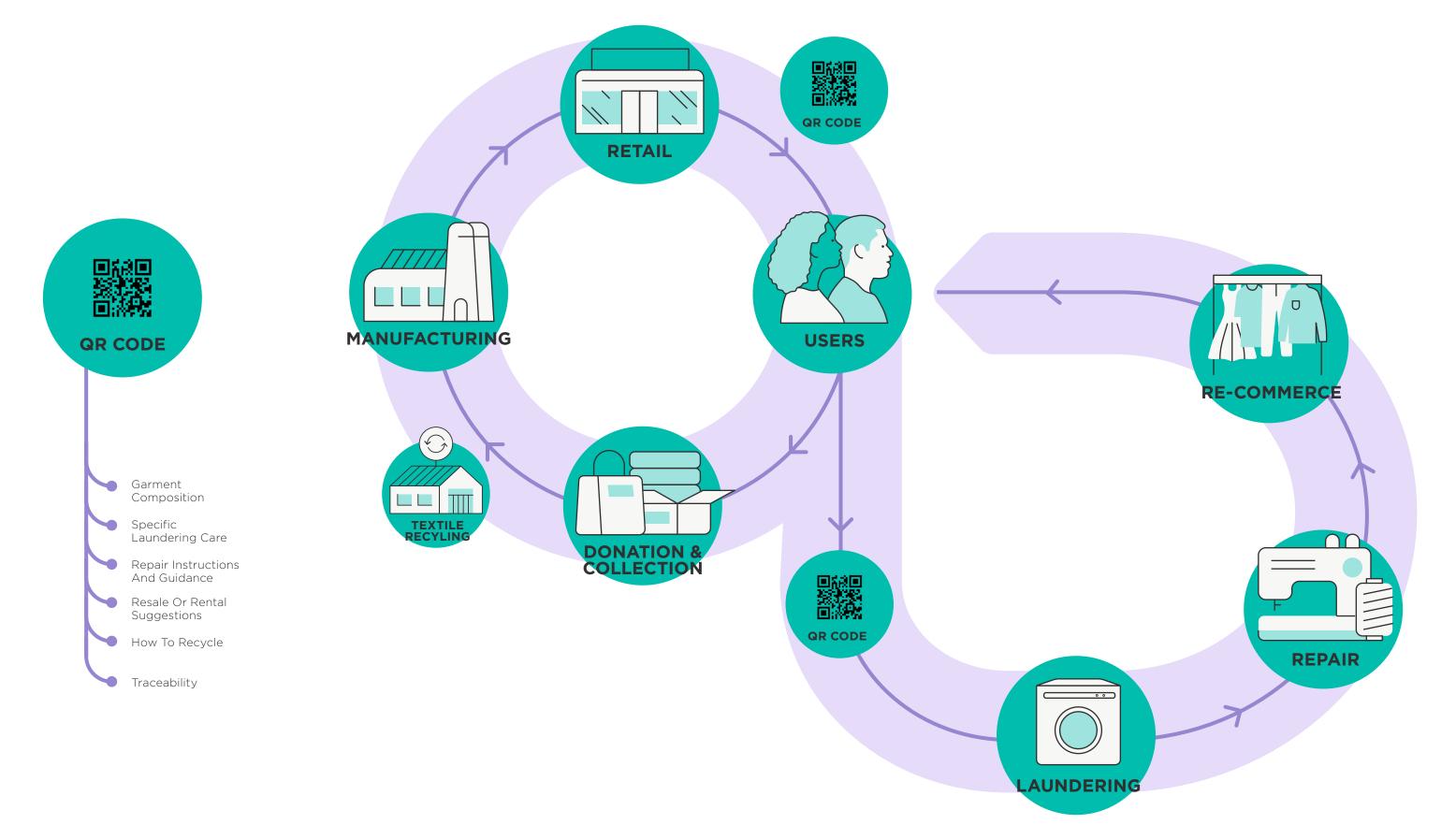**Technology interventions for consumer empowerment – Potential State**

QR CODE
- Garment Composition
- Specific Laundering Care
- Repair Instructions And Guidance
- Resale Or Rental Suggestions
- How To Recycle
- Traceability

RETAIL · QR CODE · MANUFACTURING · USERS · RE-COMMERCE · TEXTILE RECYLING · DONATION & COLLECTION · QR CODE · LAUNDERING · REPAIR

Figure 5: Technology interventions for consumer empowerment – Potential State
Source: Institute of Positive Fashion, 2023

> **We need to be careful of greenwashing - making garments last longer through QR code info. Don't let it just turn into a marketing story. The QR code needs to say where it came from and what it is made of, not only just how to take care of it**
>
> Lewis Shuler, Head of Innovation, Alpine Group

> **When we used QR codes previously, the challenge was people didn't always know they were there. To successfully implement storytelling is very important. Maybe next to the QR code it says, 'if I'm broken, scan me'…. It is also about the brand being transparent enough to provide supply chain data for the QR code.**
>
> Patrick McDowell, Creative Director & Founder of Patrick McDowell

Case study:
Avery Dennison

Operating for over a century, this global player provides B2B physical and digital information solutions across multiple industries including automotive, pharmaceuticals, medical device equipment, apparel and footwear. They provide physical and digital labelling, QR codes, NFC's, RFID's and other unique digital tags. They have formed partnerships with brands at all price levels, powering end-to end-traceability, transparency and creating direct communication channels. This includes:
The digital care label contains product care information and material composition. Consumers can scan the swing tag's QR code at point of sale, and post purchase. The combination of these tools shows the item's history, provides guidance on garment care, allows for enhanced consumer engagement and constructs in-depth data points for the brand. Furthermore, this decreases the risk of a product ending up in a landfill, helps to advance circular processes and provides a greater level of authenticity.

A prior collaboration within lingerie and sleepwear used RFID and QR codes combined on swing tags. The RFID showed stock availability, inventory accuracy and the flow of purchases and returns. For the user experience, the QR code enabled instant access to short videos which provided insight into the garments production. This shows the combined power of deploying more than one technology capability for both consumer and B2B purposes etc.

They also collaborated with Upwest, a consumer facing USA lifestyle brand, who joined forces with B2B organisation **Recircled,** who create apparel and footwear from repurposed materials. Together they contracted Avery Dennison to embed an innovative digital care label which informs users on how to up-cycle products and partake in a circular product system.

Digital ID technologies - RFID tags, QR codes, NFC tags - are integrated into clothing, packaging, labels, or applied at pallet level, and connected to our atma.io product cloud, so that every time a product is scanned, the event is recorded. Brands can assign, manage, and track the item throughout its lifecycle, and benefit from AI-driven analytics and real-time insights to inform business decisions. Brands can also use this technology to create 'digital product passports' for their products, in line with incoming EU legislation. In this way, as garments are produced, bought and sold, the information about their components and recyclability isn't lost, but instead is made easily accessible to all stakeholders.

Max Winograd, VP Digital Solutions, and Michael Colarossi, VP Innovation, Product Line Management and Sustainability, Avery Dennison

Case study:
EON

With a mandate to solve the challenge that faces many brands: not being able to answer the question of what happens to their products once they leave the store, EON is an enterprise software solution providing Digital ID's that allows brands to continuously generate data and profit from products after they are sold. Digital IDs create a way for brands to switch the current incentive model of commerce by generating more revenue from a single physical good across its lifecycle.

The Brand UX:

Brands create and manage Digital IDs using EON's Product Cloud. The information stored in these Digital IDs can be seamlessly integrated to partners within their product cloud network to access and exchange data required for new and existing services, experiences and circular business models such as resale, recycling and rental.

The EON Product Cloud enables communication and connectivity across the retail value chain, from resale and sorting to separating and recycling through Digital ID. Brands and their partners exchange essential product and material data to transition to circular business models, and track post-sale events to understand what actually happens to their products.

It also provides a way for products to be turned into assets that generate royalties, relationships and data throughout their entire lifecycle. Items connected to their Digital ID's can be instantly authenticated, provide after-sale services and customer experiences, plus support sustainability with continuously updated data. Their wider goal is to see all physical product having a Digital ID, to change the incentive of fashion brands from selling a large quantity of goods over to producing quality products that continually generate revenue throughout their lifespan. Partnerships with brands include:

EON's collaboration with Pangaia:

This took data associated with physical garments to create digital passports via QR codes to accelerate closed loop manufacturing. They focused on traceability, transparency, and sustainability to inspire the consumer to make more responsible choices. Additionally, Pangaia utilised EON's Circular Product Data Protocol to empower resale, recycling and sorting partners with access to data to propel products from one lifecycle to the next. This also allowed Pangaia to be armed with the pertinent data to build a closed loop circular system for current and future product lines.

Individual users/ consumers UX:

Consumers are able to access information about how products are designed, manufactured and distributed along with additional brand services such as repair, styling and buy-back. Consumers can thus gain better information to power better purchasing decisions, and be more connected with the brand throughout their use of the product.

Digital ID technology solve for the biggest barriers to sustainable business model transformation. It provides brands the technology to engage customers and extend the use of products, steward products through new business models such a resale, rental, recycle and bring transparency and traceability to the origins and lifecycle of products and materials. With Digital IDs, simple products become intelligent assets — allowing brands, customers and partners in the circular value chain to monetize and increase the utility and value of each product

Natasha Franck,
CEO and Founder of EON

Case study:
Cicon

Cicon is both a B2B and B2C circular fashion tool, positioned as a modern wardrobe concierge, using gamification and rewards to drive engagement. At B2B level, brands can digitise products and earn affiliate commission on all post-sale activities their customers engage in: care, repair, rent, resell.At B2C, the app helps users look after their wardrobe easily, measure its ongoing environmental impact, create revenue from it as an asset class, then dispose of it in a sustainable way. Each action on the app prolongs items' utility and lifetime, informs and empowers consumers to act on their values, makes commission for fashion brand partners, and income for all associated service providers such as dry cleaners and repairs or resale services.

The step by step of their service is: i) brand submits its product catalogue or a shortlist of stock keeping units (SKU's) such as hero items, best sellers or a capsule collection they wish to start with. ii) Cicon create a QR code embedding product data such as materials, origins, impact and care. iii) those QR codes are added to product and/or packaging. iv) QR codes are submitted to consumers at point of sale (either brick and mortar via receipt or via email for e-commerce). Consumers then register their purchases within an app, and take relevant actions around care, maintenance, repair, donation, recycling or resale accordingly,

They collaborated with West 14th, a luxury leather brand headquartered in Australia,The brands heirloom styes were featured in providing a circular concierge service, empowering their clientele to extend the life of their garments. The aim was to increase community engagement online and offline by utilising local services for cleaning, repair, rent, resale and donation.

Consumer engagement is still wired solely for upselling customers with new items. While some brands offer, and monetise repair and take-back schemes, there can be a long time between needed repairs and the end of life. For example, customers need to clean their items, which is a much more frequent endeavour: Almost none of these activities are as yet monetised by brands. The [peer-to-peer] rental market is on the rise, where customers see their wardrobe as a monetisation opportunity. By accessing CICON services, brands can engage with their customers on a weekly basis referring them to the right care product, cleaner, repairer, rental partner, resell service or recycling - supporting the full life cycle of the products.

Tanya Mulesa,
Founder of Cicon

Conclusion

In order to drive towards circular fashion ecosystem target outcomes, plus stay relevant and future-proofed, brands should embrace digitalisation and emerging approaches to innovate on all fronts, including sustainability. There is a well understood link between digital competence and financial returns. This has been evidenced by examining which fashion brands emerged the strongest from the pandemic. Those that scaled their digitalisation capabilities ahead of their competition have outpaced their competition.[136]

In order to gain or retain competitive advantage through smart deployment of technology and software innovation, we have identified three core pillars for all brands as they consider their sustainability goals:

1

High quality data across the supply chain is imperative for sustainability goals, and driving greater connection between citizens and their product for enhanced longevity and durability.

Brands should invest in suppliers' and manufacturers' ability to provide quality data[137]: Depending on where a material or product was made, the quality of relevant sustainability data varies widely. Empowering key players in the supply chain to be transparent and accurate will become an increasing value-add at point of sale plus drive further awareness and accordant behaviour change with consumers. This may require technology such as real-time video capture in fields where crops are grown or other upstream facilities. It may also require forensic scanning at fibre level closer to the Tier 1 of the supply chain in order to encourage more accurate reporting further down the chain. High quality data will become a competitive advantage for all types of suppliers.

To further engage citizens as co-custodians of responsibly made product, upstream data sets need to be either second party verified; or better, third party certified or audited. Advancement in technology capability means the age has passed when brands' own eco-friendly claims will suffice, hence there are increasing questions being asked of the information validity from brands aligning with coalitions that accept solely brand-generated claims. Trust therefore seems to be a new and evolving core currency for FMCG. Also, with the advent of increasing information sharing platforms, whistleblowing is increasingly easier from anywhere in the supply chain. Thus, a product's second party verification would be based on proof of invoices from suppliers, but ideally also third party auditors. There also needs to be an industry consensus on how to audit the auditors, and how often the audit or verification is required to be reviewed and renewed. In summary, traceability plus validity, with engaging storytelling laid over, are critical to securing citizen buy-in for sustainable consumption habits and driving down fashion's footprint.

To further gain trust from citizens and encourage their investment into responsible garment consumption and care, it starts with the brand leading by example. Thus the integrity of eco-friendly or sustainable claims at brand level should be aligned with established wider frameworks, rather than brands 'marking their own homework'[138]. This can be implemented in line with wider guidance such as the UK's Competition and Markets Authority's Green Claims Code.[139] Greenwashing has come under the spotlight in 2021 and 2022, particularly for fashion. All claims need to be measured against wider specific data sets, and in line with recognised frameworks and guidance, such as that outlined by either regulators or highly established and respected NGO's: examples being the UN, the Global Fashion Agenda, Textile Exchange, The Sustainable Angle, The Apparel Impact Institute.

2

Leverage QR codes to improve transparency and traceability, educate citizens, increase garment longevity and facilitate responsible gathering of customer data.

QR codes are widely recognised and used by citizens and deployed by brands of all sectors. Their position in the marketplace is established, and consumers are familiar and comfortable with them.

The criteria for whether QR code uptake and use is successful or not depends on what lives on the destination URL. QR codes themselves cannot be owned or patented as such. What is proprietary and relevant is what is housed in the QR code's destination site. And whether the code is static (content at the URL destination is fixed) or dynamic (content at the URL destination can evolve and change).

Successful storytelling is the key to engagement. Since this project addresses fashion, for which a core driver of success is visual value and aspiration, QR codes in the fashion sector will benefit from imagination and creativity in design, plus engaging and original functionality in the URL they direct users to.

QR codes being experiential can be a core driver to update and engagement. There are a myriad of ways to use unusual designs of the code itself (not the usual square) plus unusual locations, surfaces, public spaces and analogue processes that can engage the viewer/user. Some deployments have utilised the quality of mystery and reveal to drive engagement. Others are more overt. Both have their place depending on the target outcomes of the campaign/ the QR code's function and purpose.

> **Showing the process of how the garment was made was really important to us, and people are interested. We would need to get information from our suppliers, and then understand the process of importing data and how things are recorded. There needs to be an awareness throughout the supply chain that this topic is important…. Visualisation is really important, people don't engage with pure data, it needs to be interesting and visually engaging. So we would want it to be like a social media app.**
>
> Amy Trinh, Co-Founder, WED Studio

> **We were able to edit QR codes to make them unique to our brand, plus there is the option of embedding VR and interaction. I hope big brands will follow the innovation in SME's.**
>
> Marie Lueder, Founder of Lueder

> **Longer term we will be looking into technology and software solutions. Such as a digital product passport for garments. With that we can say where the cotton has been picked, and then list the whole supply chain process through the different tiers. We can then for example, include the EIM (Environmental Impact Measuring) score and where it has been shipped from, including the carbon footprint. In addition, the composition of the fabric and how to care for it for the user. We will need to have the right software.**
>
> Cristina Gilkes, Senior Director of Product and Sourcing, and Helen Webb-Carter, Fabric Sourcing and Development Manager, Boden

3

Stay abreast of developments with blockchain and Web3, leveraging them and entertaining and/or accordant gamified capabilities to empower citizens into interactive, digital-first collaboration on longevity and care.

Blockchain, while relatively nascent, could increasingly play a role going forward - for both a ledger and provenance and ownership/ repair/ resale history of any product. NFT's are gaining traction and have a future role to play when it comes to embedding repair, care and resale and disposal incentives for consumers.

A future combination will comprise enterprise software plus analogue tech, housed on the product, (e.g. QR in the near term then later RFID and NFC in the medium and long term) combined with NFT's for rewards or incentives and loyalty. This will likely be the way that brands will tackle a 360 degree sustainability offering. To the same ends, first AR and then VR will become the norm. Brands that have embraced technology ahead of competition, will find it easier to target their audiences across multiple channels, with multiple service offerings. The impact on consumers will be they have all the tools and information, plus the motivation required, to play a key role in bringing down the existing approximately 30% of environmental impact that happens in the post-transaction phase.

There's a lot of stakeholders to get on board – you would need the innovation team, materials team, merchandisers - so many levels of buy-in. If a lot of small companies did it, it would help encourage the bigger brands. It's going to take a mass of SMEs to start this. If all of them are doing it, then why wouldn't bigger brands follow? They would feel that pressure.

Lewis Shuler, Head of Innovation, Alpine Group

Credit: Tove

Conclusion

Credit: Joao Maraschin

In summary:

Software is needed that sits across the entire lifecycle, or else multiple software tools that can connect compatibly with each other, bringing together the material input in traceability and inputs to the consumer use phase, to enable greater care, repair and maintenance.

The ability to reach mass and scale across all market segments is the target scenario. Innovation in technology is currently best deployed within: i) forward looking higher end players, ii) progressive SME innovators (and iii) influential, well resourced volume players. This leaves the rest of the industry behind this curve. In time they will hopefully see the necessary cultural shift and resources within their organisations to align with the future. New technology and software which enables everything from authentication, traceability and the sharing economy will transition down into the mid and lower ends of the market eventually, as where luxury leads, the rest of the industry tends to follow.

As digital passports and other traceability tools become mandatory or a legal requirement, they will be a key solution to converting fashion towards sustainability. They will inevitably force brands to address any gaps in their sustainability policy. In future, a product passport will be a key value driver and converter to sales, and any brand unable to provide a moderate level of traceability and transparency will lose demand and interest from stakeholders, including: investors, consumers, retail or wholesale partners, suppliers, employees, and digital audiences**.**

Building on the now, in future, big data will be almost omnipotent for any organisation. Once brands can engage users, they stand to benefit infinitely from the insights into patterns and trends that data will give them about their current and wider consumers' product usage. As part of a responsible data approach, citizens rights to consent, privacy, security and ownership must be prioritized, by implementing values and practices of transparency and openness. The aim being that the brand use of data is to create products that fulfill citizen needs and facilitate garment longevity in the correct way.

Excess consumption or lack of care for clothing cannot be solved without examining the deeper emotional or psychological appeal it brings citizens. Revised narratives around how circular fashion systems can bring comparable pleasure and joy via a more durable product,is required. The promotion of circular and sharing business models whereby product is designed for longevity, durability and multiple re-use and rewear, could culminate in the desired target outcome of a circular ecosystem.

In time, technology, including enhanced data systems, will drive societies towards a 'show, don't tell' expectation from those they purchase from, whether that be within B2B or B2C purchasing. Evidence from brands provided digitally will speak for itself, while users who can demonstrate their contribution and demand transparency enabling technology to empower closed loop systems.

In future, sustainably driven actions by citizens to reduce their impact could be incentivised through leveraging the power of digital tools and social media[140]**.** A bright future for fashion could include a gamified interface or digital initiative whereby every time a user makes an informed choice around garment care, maintenance, repair and disposal (or resale/ rental), they are able to share their progress and reduced impact through an interactive online platform. They could be further motivated, engaged and supported by detergent brands, washing machine manufacturers and fashion brands.

Credit: Tove

Recommendations for Industry-wide change

Empower brands to communicate what sustainable products means to their customer. Production needs to follow the adage that developing a product or process is 'sustainable' if its process of creation meets the needs of the present without compromising the ability of future generations to meet their own needs[141].

Build in longevity and durability at the design phase and test in the production phase. According to research by Vanish, the principal reason clothing in the UK is discarded is that the item is worn out[142]. But if clothes were made to last longer and did not wear out so fast. If a typical garment stayed in active use for nine months longer it would extend their average life to three years. While of course the industry already has various textile and durability testing protocols in place, the above indicates it would benefit from raised and unified standardisation requirements across markets.

Experiment with modular clothing as part of sustainability initiatives. Modular clothing is clothing that can be disassembled or amended, such as a jacket with removable sleeves. In addition to adding versatility to a capsule wardrobe, the benefits of modular fashion include the ability to only launder specific soiled areas and ease of repair. Brands can also reach a broader size range with less over-production, with greater allowance for fluctuations in size and shape[143]. However, for modular clothing to be sustainable it must lead to a reduction in units produced while using cleaner materials and processes. Citizens would need be informed towards a shift in mindset, to see modular clothing as fashionable and as an investment.

Offer citizens better options for circularity. Steps taken in the design process allow for more efficient reprocessing post-use and an increase in the longevity of garment life cycle through design. To maximise the economic and environmental potential of circular business models products need to be designed and made to be physically durable, emotionally durable and need to be able to be remade and recycled at the end of their use. 60% of fashion executives have already invested or plan to invest in closed-loop recycling in 2021[144].

Utilise higher quality, more durable materials. Given that approximately 60-80% of a product's eventual impact is incurred in the design phase, once all fashion manufacturers are able to embed this level of responsibility into their design process, they can contribute to a vast reduction on fashion's environmental impact[145]. The financial resources needed to transition to cleaner, greener materials and sustainable practices for labor must be seen as a longer term investment in future proofing, as opposed to a negative high cost.

If brands are unable to achieve a closed loop, then they should design with a clear path to recycling or down-cycling, or any other means by which the brand takes ownership to ensure their garments do not end up in landfill or, due to excess charity sector donations, eventually being a burden on developing economies. This has been proven to work in the US, even with a generic fashion items as challenging to recycle or down cycle such as lingerie[146].

> **To have multiple sizes is a big investment, so I use double zips in jackets which can be adjusted to provide different sizes within one garment. We are using more mono materials, which are better for recycling than blends. We are also developing a mending kit for the next collection to provide to customers, ideally we would also like to provide a video link about how the garment can be adapted and repaired.**
>
> Marie Lueder, Founder, Lueder

Share brands' genuine eco-conscious efforts, however elementary. The alternative is 'green-hushing', driven by fear of exposure or scrutiny, which only perpetuates a cycle of fashion and its consumers and audiences not joining forces to drive change. It has been shown time and again that consumers, especially the Gen Z cohort, are willing to pay more for items made in line with their values[147]. Eco-conscious marketing, as long as it complies with the Competition and Markets Authority's Green Claims Code, will generate further awareness and positively support behaviour change for all stakeholders.

Integrate powerful, engaging storytelling about sustainability attributes at wider down to granular levels. While sustainability and climate change is often communicated by media in seemingly abstract, dry and inaccessible metrics plus in a negative tone, to avoid 'death by data'[148] and encourage a liveable future, there lies an opportunity to engage citizens in this subject area by using tangible, accessible metaphors and visuals, based on a tone of optimism, solutions and hope. Since we live in a world now dominated by perceived information overload and reduced attention spans, the only way to cut through is to capture consumers' attention with concise, immediate and well-crafted storytelling[149]. This can be in sharp captions, powerful stills or short form video, ideally with interactivity built in using accessible functionality.

More and more customers are asking for storytelling: they want to know who made their clothes, and how - it brings a product to life. It's about making sure we have all the evidence and documentation to be confident to communicate stories to customers

Catherine Loader, Sustainability Specialist, John Lewis and Partners

The best thing is to mix emotional storytelling with great design. Emotional connection to garments is key: it's one of the most important things.Telling stories through QR codes can really help.

Patrick McDowell, Creative Director & Founder of Patrick McDowell

Credit: Joao Maraschin

Appendices

Credit: RAEBURN

Appendices: Glossary

The key terms and concepts used throughout the report are reflective of those used in CFE Phase 1 Glossary. Additional terms and concepts used in this report are detailed below. These have been determined based on a range of sources as cited in the list of References.

Term	Report definition
1.5 degree pathway	A scientific estimate that indicates limiting global warming to 1.5 degrees Celsius above pre-industrial levels would reduce the odds of initiating the most dangerous and irreversible effects of climate change.
2015 Paris Agreement / Accord	A legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016. Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industry levels.
Athleisure	A hybrid clothing category that combines athletic with casual, everyday styles, for example jogging bottoms in athletic fabrics.
Avatar	A digital image or graphic representation of a user, often deployed in online games, chats, etc.
Biodegradable	Material capable of being decomposed naturally by bacteria.
Built in / planned obsolescence	A policy of deliberately planning or designing a product with a finite lifespan, so it will become obsolete or non-functional after a certain period[150].

Capsule collection	A condensed version of a designer's vision, often limited edition, which transcends seasons and trends by being functional / commercial. They often focus on construction and delivering key looks, without the styling and theatrics of a show[151].
Capsule wardrobe	A small collection of clothes that can be put together in different ways and includes everything you would normally need to wear[152].
Carbon neutrality	Balancing the level of carbon emissions produced with an equal level of carbon removal through the shift to new energy sources, changes in industry processes, circular business models and carbon offsetting.
COP 26	The UN's 26th Climate Change Conference, which took place in Glasgow, UK in October and November 2021.
COP 27	The 27th session of the Conference of the Parties of the UNFCCC, where countries came together to take action towards achieving the world's collective climate goals as agreed under the Paris Agreement and the Convention. The conference took place from 6-20 November 2022 in Sharm el-Sheikh, Egypt[153].
COVID-19	Covid-19 Coronavirus disease 2019 (Covid-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 and was classified a pandemic by the World Health Organization on March 11, 2020.
Deadstock	Old, leftover and over-ordered fabric often purchased from other designers or warehouses, which is diverted into new garments rather than landfill.

EU Carbon Border Tax	On 14 July 2021, the Commission adopted a proposal for a new Carbon Border Adjustment Mechanism which will put a carbon price on imports of a targeted selection of products so that ambitious climate action in Europe does not lead to 'carbon leakage'. This will ensure that European emission reductions contribute to a global emissions decline, instead of pushing carbon-intensive production outside Europe.
European Green Deal	A set of proposals adopted by the European Commission adopted to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.
Fair Trade	A system of certification that aims to ensure a set of standards are met in the production and supply of a product or ingredient. For farmers and workers, Fairtrade means workers' rights, safer working conditions and fairer pay[154].
Generation-Z (Gen-Z)	Demographic cohort born circa 1996–2012, following the Millennial generation.
Greenhouse gas (GHG) emissions	Greenhouse gases vented to the Earth's atmosphere as a result of human activity; includes carbon dioxide and equivalents that can cause climate change.
Greenwashing	A PR tactic used to make a company or product appear environmentally friendly, without meaningfully reducing its environmental impact[155].
Industry value chain	The fashion value chain from raw material production, processing, manufacturing, transport and retail to product use and end of use. It does not take into account emissions related to secondary activities such as fashion shows and the back-office operations of individual companies in the value chain.
Maximalist	Belonging or relating to a style in art, design, etc. that uses the largest range of materials and colours possible, and very complicated shapes or forms[156].

Metaverse	The envisioned future iteration of the internet that is made up of 3D virtual spaces linked within a perceived virtual universe. In a broader sense, it often refers not just to virtual worlds, but rather the full spectrum of virtual worlds, augmented reality and the internet.
Millennials (Generation-Y/ Gen-Y)	Demographic cohort born circa 1982–1995, also commonly referred to as Generation-Y (this name is based on Generation-X, the generation that preceded them).
Near-field communication (NFC)	Wireless short-range communication technology allowing rapid information transfer between two devices containing NFC chips.
Non-fungible token (NFT)	A unique digital asset, e.g. a photo, video, audio or other digital item that can represent art, music, in-game items etc. Blockchain technology is used to establish a verified and public proof of ownership.
Organic	Not using artificial chemicals in the growing of plants and animals for food and other products[157].
Provenance	The place of origin of something (i.e. a product)[158].
Sharing economy	A new business model for the fashion industry that involves hiring, swapping or subscribing to clothes services could be part of the solution.
SKUs	Abbreviation for stock-keeping unit: a number or set of numbers given to a product to show which particular one it is. SKUs are usually printed along with a bar code[159].
Traceability	The ability to trace products, components, and materials, as well as the social and environmental conditions in which they were made, along with the whole supply chain, including after use[160].
UN SDG's	The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership.

Upstream operations	Such as materials production, preparation, processing and manufacturing.
Web3	Web3 is the next phase of the internet following Web 1 (static web pages) and Web 2 (user generated content and social media). The concept behind Web3 is a decentralized ecosystem based on blockchain that would verify transactions, thus eliminating the need for a centralized intermediary. Web3 will allow fashion designers and brands to tap into blockchain technology whether its to build new communities, sell NFTS, or innovate and create new apps and technologies themselves.

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