

SUSTAINABILITY INTELLIGENCE (SI): A SYSTEMIC MINDSET THEORY TRANSFORMING GLOBAL DENIM INDUSTRY

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Abstract

This research paper introduces Sustainability Intelligence (SI) as a systemic mindset theory to transform the global denim industry by integrating sustainable practices. The research focuses specifically on the mindset elements of SI, particularly the SI Navigator (SIN) and Systemic Intelligence Synthesis (SIS), which guide professionals in navigating sustainability challenges. By addressing capacity building through systemic thinking and capability development via conscious cultivation, the SI mindset provides a comprehensive approach to embedding sustainability into the industry. This research explores how denim professionals can integrate systemic sustainability frameworks into their decision-making processes to achieve long-term organizational transformation. A qualitative methodology combines semi-structured interviews and focus group discussions with industry experts across the global denim supply chain. The data were thematically analyzed using the constant comparative method to identify recurring themes and patterns related to implementing the SI mindset. This paper contributes to the broader framework of Sustainability Intelligence by demonstrating the practical application of SI's mindset elements, offering insights into how denim organizations can foster sustainable growth and navigate complex sustainability challenges within the global fashion system.

Keywords: Sustainability intelligence, Systemic mindset, Denim industry, Fashion system, Systemic theory

1. Introduction

1.1 Sustainability Intelligence (SI)

The fashion industry must install systemic frameworks to explore, understand, and organize sustainability, manifesting its underlying economic, social, and environmental implications (Elkington, 2013; Maksimova, 2024). Enhancing fashion system standards to strive for sustainability demand remains a pluralistic and wicked issue spanning cross-industry patterns in the fashion supply (Rittel and Webber, 1973; Fletcher, 2010, 2014; Goworek *et al.*, 2017). Although individual efforts for sustainable practices are evident sporadically across the denim industry, the open concept of fashion sustainability persistently formulates its objectives and priorities (Gardetti and Torres, 2017, p. 3; Muthu, 2017). The fashion industry's modern supply systems lack a deep and holistic understanding of sustainability, entailing innovation in products, processes, and professions evolving in the global denim business. Such innovation can pave the way for more definitive ethical business management solutions and foster shared values for large-scale companies and emerging sustainable start-ups (Todeschini *et al.*, 2017). The research introduces the Sustainability Intelligence (SI) framework as a critical evaluation of the industrial, cultural, and ecological values engaging with paradigm transformation for the broader part of the global denim industry (see subsection 1.3). SI addresses the complexity arising from the multidimensional fashion sustainability context and heterogeneous design of the international denim trade, integrating the industry's potential with emerging markets, automation, digitalization, and regulations (Annapoorani, 2017; Fletcher and Tham, 2019; Fletcher, 2022).

1.2 Sustainability Intelligence (SI): Mindset

With its transformative potential, the adaptive nature of the paradigm acts as a catalyst for organizational systems, pushing the boundaries of its propositions for fashion sustainability values and goals in industry and society (Meadows,

1999). It is a mindset for Sustainability Intelligence (SI), which explains the fundamental characteristics of a business model's ecological and societal relationships, highlighting how its processes deal with sustainability issues over a range of local and global scales (Kates *et al.*, 2001). The SI mindset identifies underlying patterns of fashion sustainability values with a broader and democratic approach informing transformative business trajectories. For example, 'The Earth Logic Plan' by Fletcher and Tham (2019) sources holistic fashion sustainability strategy with a pluralistic approach integrating interdependent multiple centers of attention that may range from finance management, technical advancements, human and non-human life concerns, natural processes, social realities, and beyond. However, unlike the Earth Logic Plan, the SI mindset is not immediately a radical metaphor for envisioning an explicit context of ecological value from the multiple centers of knowledge, as mentioned above. Instead, the SI mindset guides business management decisions towards radical sustainability views like the earth logic plan (Fletcher and Tham, 2019) as a transition discourse dealing with the multiple systemic interactions that automatically emerge as the fashion business processes at the social level and as the processes organized by the system design initiatives of management at organizational level (Escobar, 2018, p. 152).

The SI mindset attempts a new way of designing to orient the transition towards fashion sustainability (Irwin, Kossoff, and Tonkinwise, 2015) with the lens of industry system management synergizing the role of managers and designers as a convergence between the radical forms of knowing for example, the earth rising perspective mentioned by (Fletcher, 2022) and a reflexive way of existing with a strong approach for sustainability (Nilsen, 2010). The SI mindset integrates the technocentric and eco-centric fragmentations of sustainable development (Ashby, Smith, and Shand, 2017, p. 63), making the concept of SI a step further to enhance the transition design frameworks recommending no lifespan of a sustainable solution and a constant comparison of all short-term,

mid-term or long-term sustainable solutions form the fashion sustainability knowledge sources (Irwin, 2015). Under the complex fashion system, the SI mindset examines a key question: how meaningful criteria of management decisions and organizational policies should be designed for a more responsible fashion business, envisioning substantial and feasible success level of sustainability development frameworks (Broman and Robèrt, 2017).

7.3 SI components: SIN and SIS

SI is fundamentally built around two critical components: the SI Navigator (SIN) and the SI Synthesis (SIS). The SIN guides professionals in navigating sustainability challenges,

encompassing decision-making SI elements such as systemic thinking, consciousness cultivation, actual cost, informed distance, active equivalence, conscious business cycles, systemic change, and systemic behavior. These elements collectively foster the SI aspects of mindset, competence, adaptation, and transformation essential for SI pragmatism (Singh, in preparation, 2025), which is a systemic and pragmatic mechanism to integrate decision-making for sustainability across the denim trade systems and implies that pragmatism is not only involved in the research design and methodological framework (see section 2) but also becomes the primary character of SI framework giving a novel character to sustainability strategies and systems at the organizational level. Fig. 1 virtually explains SI's pragmatic mechanism.

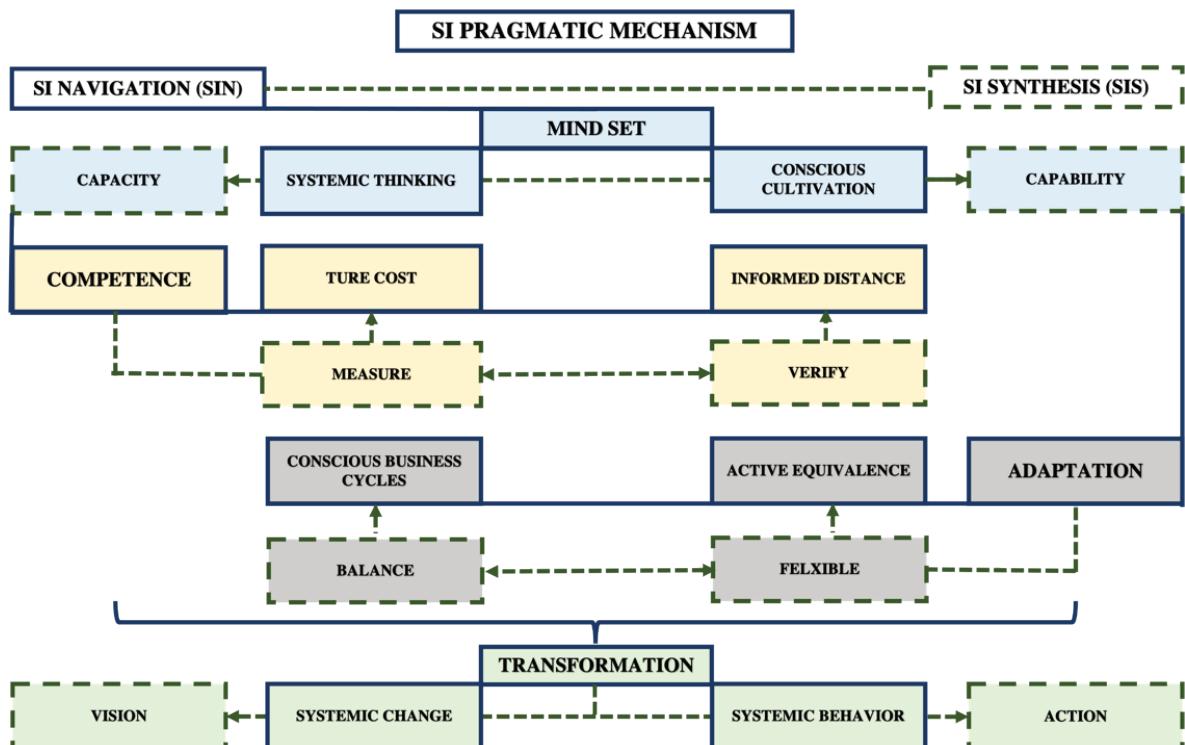


Fig. 1 SI pragmatic mechanism (Singh, in preparation, 2025)

SIS integrates these decision-making attributes with policy formulation, creating an interrelated pattern that informs the four aspects of SI. This integration translates sustainability insights into actionable strategies and initiatives. The SIS process involves understanding the relationships between capacity and competence, measurement and verification, balance and flexibility, and vision and actions. This holistic approach aims to synergize management decisions and organizational policies towards a responsible fashion business, thereby envisioning substantial and feasible success levels within sustainability development frameworks.

This research paper focuses explicitly on the *SI Navigator* (SIN) mechanism and the SI Synthesis (SIS) process, concentrating on the mindset elements of the broader Sustainability Intelligence (SI) framework developed in the author's PhD thesis (Singh, in preparation, 2025), while the SI framework itself incorporates several additional SI elements mentioned above. Within the SI framework, the SIN mechanism provides a structured roadmap for integrating the SI elements into decision-making processes. In contrast, the SIS process ensures that strategies are continuously refined and adapted based on real-world insights.

2. Methodology

The research utilizes a qualitative approach, combining semi-structured interviews and focus group discussions to explore how professionals integrate sustainability into the global denim industry's practices, policies, and decision-making through the Sustainability Intelligence (SI) Mindset. The study captured diverse professional perspectives directly from the international denim sector, focusing on systemic thinking and conscious cultivation as foundational mindset elements of the SI pragmatic framework, which involves understanding and organizing sustainability to promote innovation in products, processes, professions, and systems within the denim industry. The research interpretivism and

pragmatism emphasize practical solutions and actionable knowledge, making it suitable for developing strategies and tools that industry stakeholders can implement (Morgan, 1997; Elkjaer and Simpson, 2011; Saunders, Lewis, and Thornhill, 2015). The data gained from research informants were thematically analyzed (Braun and Clarke, 2021) with a constant comparative method given by (Glaser and Strauss, 1967). From the literature review identified, SI Questions (SIQ) will inform the line of inquiry for semi-structured interviews, followed by the SIQ from interview analysis to further investigate in a focus group to develop an SI frame.

2.1 Data Collection

Semi-Structured Interviews:

Eight interviews were conducted with professionals with extensive experience across various sectors of the denim industry, including design, production, chemical management, business strategy, and compliance. These participants were carefully selected based on their work experience and achievements in sustainable practices within the denim sector (Refer to participant demographics in Table 1)

Focus Group Discussions:

Four focus group sessions were held, with twenty participants in total. These discussions provided a collaborative environment where industry professionals exchanged insights on the opportunities and challenges of embedding sustainability into the denim industry. The participants represented a range of professional roles, allowing for a comprehensive view of sustainability practices in the industry (Refer to participant demographics in Table 2).

2.2 Data Analysis

The data collected from the interviews and focus groups by SI questions (Refer to SIQ in Tables 3 and 4) were thematically analyzed using the constant comparative method, based

on Glaser and Strauss (1967). This approach allowed a continuous contrast and comparison of the data, identifying recurring themes and relationships from the discussions. The analysis followed a four-step process:

Initial Categorization: Transcripts from interviews and focus groups were organized into initial categories based on key themes identified in the literature review.

Comparison and Grouping: The categories were refined by comparing similar, contrasting, or emerging patterns in the participants' responses.

Thematic Interpretation: The data were interpreted through continuous comparison to form a cohesive theoretical framework centered on the SI Mindset.

Final Framework Development: The final analysis stage integrated the findings from interviews and focus groups, resulting in a detailed understanding of the SI Mindset and its practical application in the denim industry.

The study received ethical approval from the University Research Ethics Panel, part of the Research and Enterprise Development Unit at Buckinghamshire New University, UK (ref: UEP2023FEB01 and UEP2022Jul04). In adherence to the university's guidelines and the UK General Data Protection Regulations (GDPR) for data sharing and storage, all findings are presented anonymously to protect participants' identities. To further ensure compliance with research ethics, pseudonyms have been assigned to all interviewees and focus group members. Table 1 (Semi-Structured Interviews) and Table 2 (Focus Groups) provide detailed participant demographics, including their roles, areas of expertise, and countries of operation. These tables are part of the data collected for the author's PhD thesis (Singh, in preparation, 2025). Anonymous citations based on these pseudonyms are employed throughout the paper to support the data analysis.

3. Findings

3.1 SI Navigation (SIN): Systemic thinking

"In the early days, we unknowingly did things that would now be frowned upon. It's up to your conscience to learn more and participate, but more awareness is needed." The Design Professional (Interview, 4 April 2023) highlights the importance of personal accountability and continuous learning in addressing sustainability challenges. This perspective aligns with the essence of systemic thinking, a key component of the Sustainability Intelligence (SI) mindset rooted in Fletcher and Tham's (2019) concept of 'grounded imagination' to address business transformation.

Unlike 'grounded imagination,' systemic thinking emphasizes an organization's attitude over knowledge capacity, embracing the complexity of sustainability. It focuses on creating sustainable solutions that align with organizational capacities, offering flexibility and balance rather than requiring an apparent intervention starting point (Holroyd, 2024). Convergence is central to systemic thinking, seen at multiple levels: collaboration between competitors (system design), knowledge exchange in processes (process design), and product durability (product design). The most significant convergence occurs between fashion management and design, with systemic thinking fostering responsibility and sustainability awareness, engaging the industry in a committed approach.

Systemic thinking supports organizations in navigating sustainability through creativity. It focuses on real-world constraints while promoting systemic awareness at product, process, profession, and system levels. It proposes convergence as a space and time capacity tool to address sustainability challenges (Krempl, 2014b; IPCC, 2023). As (Singh, forthcoming) notes, it encourages increased awareness across the denim industry, reflecting on the system as a reflexive, emergent entity rather than merely thinking systematically.

3.2 SI Navigation (SIN): Conscious Cultivation

The second SI element, *conscious cultivation*, builds on mental models and expert knowledge, as discussed in system theories by Bertalanffy (1968) and Senge (2006). It extends beyond these theories by focusing on individual capability development for systemic design at the professional level and fostering relational understanding within larger systems. Using constant comparative analysis (Glaser & Strauss, 1967), conscious cultivation maintains a dynamic and pragmatic structure.

Resonating with the insight shared by the business professional (Interview, 5 April 2023), 'the priority is to understand the philosophy behind the sustainability opportunities and strategies, the denim industry's environmental impact and what the options are to improve it.' Conscious cultivation involves fostering awareness through education and systemic thinking. It supports sustainable solutions across time scales (Irwin, 2015), promoting responsible practices that align with systemic thinking and unconventional mindsets in the fashion industry. It represents a fresh, evolving mindset within the system itself.

3.3 SI Synthesis (SIS): Mindset policy

The mindset policy addresses key questions by applying *Sustainability Intelligence (SI)* elements in a denim organization:

Systemic thinking asks: Where is the SI capacity in the industrial system? The research identifies SI capacity as the space and intervention needed by the SI synthesis (SIS) process.

Conscious cultivation asks: What capability is required to optimize SI capacity? The research identifies capability as the time and knowledge fashion professionals need to execute the SIS process.

The mindset policy represents the systemic convergence of capacity and capability, embodying the principle: 'Create capacity for capability and be capable for the capacity.' This guiding principle ensures that the system is always in balance and ready for growth.

4. Systemic thinking mechanism: Capacity building

Systemic thinking addresses sustainability complexity through self-realization and self-regulation, forming mindset policy's 'capacity' aspect (Capra, 2024). This involves incremental, continuous improvements, as noted by the US design consultant (focus group, 21 September 2023): "It's powerful... we must navigate creation and implement new information seasonally, constantly learning." Capacity building normalizes radical sustainability approaches by allowing organizations to make steady progress.

The concept of *finite understanding*, drawn from General System Theory (Bertalanffy, 1968), emphasizes recognizing systemic boundaries such as time, space, and energy. This practical approach is reflected in the "low-hanging fruits" method, as the Dutch chemical advisor (focus group, 21 September 2023) highlights: "Fashion sustainability is continuous improvement... often starting with those low-hanging fruits you're aware of." However, as a Spanish designer points out, this approach risks creating fragmented sustainability efforts: "Brands market a green path, but all the responsibility and investment fall on the suppliers." Such finite understanding limits deeper, holistic change and can lead to isolated, superficial sustainability practices.

Systemic thinking avoids these pitfalls by promoting a broader, interconnected view across the denim supply chain, fostering practical solutions without pushing professionals into unsustainable extremes. As the Chinese retail advisor (focus group, 19 September 2023) explains: "Even with good intentions, doing less damage is still greenwashing...it's not really

helping." The *SI* framework emphasizes capacity building as an ongoing process at the product, process, and system levels. It integrates finite understanding, continuous improvement, and stakeholder engagement, helping organizations adapt and apply sustainability practices effectively while addressing the emergent complexities within the denim industry.

Conscious cultivation mechanism: Capability development

Conscious cultivation enhances organizational capacity by empowering professionals with sustainability knowledge and fostering responsible behavior within the denim industry. The US technology advisor (focus group, 19 September 2023) noted, "*Sustainability is now discussed at every level of the fashion system, from design to consumer awareness, with experts contributing in their areas.*" However, there's a need to develop capabilities that complement systemic thinking, as highlighted by the US business advisor (focus group, 21 September 2023): "*We need fresh approaches... we can't solve today's problems with the same methods that created them.*" This underscores the urgency of reconceptualizing business systems for regenerative capacities (Brundtland, 1987; Donaldson and Preston, 1995).

Conscious cultivation focuses on educating decision-makers to enhance systemic, sustainable capability. The Danish business specialist (focus group, 19 September 2023) explains, "*You should not make any products without some level of sustainability; even small improvements matter.*" The quote depicts a short-term conventional mindset set approach for sustainability (see subsection 3.4) and contradicts the above perspective from the Chinese retail advisor (focus group, 19 September 2023). It reveals the significance of aligning with conscious cultivation's goal to empower professionals to act responsibly and implement sustainability effectively.

A crucial part of capability development is the reciprocal relationship between an organization and its employees. As

professionals become more capable, they, in turn, contribute to the organization's learning and growth. This reciprocal relationship means that employees are learning units that foster the organization's systemic capacity (Senge, 2006). As the British washing specialist (focus group, 12 September 2023) notes: "*It's empowering to share knowledge and see people make better choices... I want to be accountable for that.*"

Conscious cultivation also fills knowledge gaps, as a Dutch chemical advisor (focus group, 21 September 2023) highlights: "*There's a huge gap between what students learn and what's needed in the industry...education must bridge this.*" This reciprocal learning between academia and industry is crucial for fostering a holistic view of sustainability, linking individual education to broader organizational capability.

Conscious cultivation, which incorporates continuous learning through constant comparative analysis (Glaser and Strauss, 1967), normalizes the radical complexity of systemic sustainability challenges. By drawing knowledge from multiple sources and fostering an interconnected understanding of systems, professionals can engage with sustainability beyond finite, isolated practices (Bertalanffy, 1968).

Ultimately, conscious cultivation creates convergence between the dynamic challenges of the fashion industry and professional capability, ensuring continuous learning and systemic understanding. It highlights the reciprocal relationship between individual growth and organizational sustainability, making it essential for addressing sustainability in the denim industry.

4.1 Mind conventions

The focus group findings reveal that the *conventional mindset* within mind policies critically impacts *Sustainability Intelligence (SI) Synthesis (SIS)*, limiting an organization's ability to implement effective sustainability practices. This mindset, described as unaware or short-term in its approach,

often prioritizes economic gain under a redefined version of sustainability (Irwin, 2015; Irwin, Kossoff, and Tonkinwise, 2015; Fletcher, Pierre, and Tham, 2019; Korhonen and Niinimäki, 2024).

The US business advisor (focus group, 21 September 2023) noted: "The conventional mindset is that people want to be involved in sustainability, but the information they use may or may not be true." Similarly, the US denim designer (focus group, 21 September 2023) stated: "It's dangerous when sustainability becomes a marketing tool, often used as a greenwashing tactic rather than a genuine commitment." These observations highlight how lacking a holistic, ongoing commitment leads to fragmented strategies. Danish digital designer (focus group, 12 September 2023) and Indian manufacturing specialist (focus group, 12 September 2023) echoed this, emphasizing that sustainability often becomes a superficial label disconnected from the entire life cycle of products.

The complexity of sustainability implementation, driven by multiple actors and the systemic nature of fashion, is another key challenge. The Dutch chemical advisor (focus group, 21 September 2023) shared: *"It's hard to determine what it means to be a sustainable factory or product because you often choose small, manageable improvements."* Similarly, a US denim designer (focus group, 21 September 2023) added: *"Sustainability has become an ethereal concept, one that feels unrealistic or meaningless."*

The SI mindset offers an alternative through an adaptive, error-friendly approach that accepts constant systemic emergence, as the systemic thinking and conscious cultivation mechanisms explain. SI Navigation (SIN) combines these elements to foster an unconventional mindset, allowing organizations to explore and develop new systemic strategies for sustainability continuously. This continuous convergence at all levels—product, process, profession, and system—mirrors

nature's existential adaptability, as suggested by social scientists (Miller, 1973; Capra, 2002).

In summary, Sustainability Intelligence (SI) aims to move beyond the conventional mindset by encouraging organizations to adopt an open, evolving view of sustainability guided by the systemic principles of *S/N* and *S/S*. This approach transforms the denim industry by creating closer, more informed connections to sustainability goals.

5. Discussion: SI Mindset application

A *mind policy* links professionals' sustainability knowledge with an organization's capacity for implementation, converging organizational activities at various levels in the fashion system. Mind policies focus on planning unconventional, inclusive, and innovative sustainable practices, enabling denim organizations to set and achieve long-term sustainability goals. As (Fletcher and Tham, 2019), the Dutch chemical advisor (focus group, 21 September 2023) put it, *"It's an endless journey... it's a continuous process of trying to become better."*

Mind policies improve individual awareness and knowledge, fostering self-regulation at both organizational and industrial levels (Capra, 2002; Irwin, 2015). Conscious cultivation identifies necessary knowledge and responsible actions, while systemic thinking directs where these sustainable interventions should be prioritized. Together, these mechanisms guide continuous capacity building and capability development, which is critical for shaping organizational mindsets (Krempl, 2014a).

In the SI framework (Singh, in preparation, 2025), the SI mindset becomes systemic research with a pragmatistic stance driving its holistic approach for sustainability as a 'Synthesis In Navigation Gathering Holistic' (SINGH) view, which proposes the synthesis of multiple sustainability perspectives, pragmatically navigating complex fashion systems to inform

decisions. The Dutch chemical advisor (focus group, 21 September 2023) notes, *"It's hard to define sustainability... it's about continuous improvement and becoming better."* It reflects the need for an adaptive paradigm, where dynamically complex (Senge, 2006) fashion sustainability issues require ongoing engagement.

The SI mindset application provides a pragmatic framework for systemic solutions, where sustainability implementation is seen as a continuous interaction between mindset and system. The capacity for systemic intervention depends on how much space is covered (through systemic thinking) and the knowledge/time gathered (through conscious cultivation). The *informed distance* an organization covers represents its sustainable growth, with higher interaction between mindset and system leading to better long-term sustainability outcomes. As the US denim designer (focus group, 21 September 2023) shares, *"We need to do things in a different way... it requires significant changes."*

The SI transformation represents the peak of this interaction, where a balance between the organization and the fashion system leads to the highest form of sustainable change. Ultimately, the SI mindset application shows that no fully sustainable or unsustainable organizations exist, only varying levels of sustainable systemic interactions. Each organization must focus on conscious decision-making within the global fashion system, striving for balanced, meaningful sustainability strategies.

6. Conclusion

The Sustainability Intelligence (SI) mindset offers a transformative approach to integrating sustainability into the denim industry. This framework fosters capacity building and capability development at both organizational and professional levels through the dual mechanisms of SIN and SIS. SI provides a pragmatic strategy for addressing sustainability challenges,

encouraging long-term systemic change while avoiding fragmented, short-term approaches. By promoting continuous learning and systemic convergence, SI ensures that denim organizations remain adaptable and forward-thinking in their sustainability efforts. Ultimately, SI helps bridge the gap between sustainability theory and practical application, leading to more responsible, informed business practices within the global fashion industry.

7. Figures and Tables

Table 1 Semi-structured Interviews: Participant demographics (Singh, in preparation, 2025)

SR.	ANONYMUS CODE	ROLE	DESIGNATION	ORGANIZATION	yy	PROFESSIONAL ACHIEVEMENTS	COUNTRY	DATE
1	DESING PROFESSIONAL	DENIM GARMENT DESIGNER	PRESIDENT	GLOBAL DESING CONSULTANCY	49	1. HAVE 2 PATENTS IN GARMENT CONSTRUCTIONS AT USA 2. CREATIVE DIRECTOR FOR A USA BASED PREMIUM BRAND 3. CREATIVE AND DESING DIRECTOR FOR 2 OTHER REPUTED DENIM BRANDS	UNITED STATES OF AMERICA	4 APRIL 2023
2	BUSINESS PROFESSIONAL	DENIM INDUSTRY CONSULTANT	DENIM HEAD	GLOBAL DENIM BUSINESS CONSULTANCY	39	1. VISITING FELLOW AT A REPUTED HK BASED FASHION INSTITUTE 2. VICE PRESIDENT & HEAD OF DENIM PRODUCT FOR A LEADING DENIM BRAND 3. BUYING AND PRODUCT DIRECTOR FOR FEW OTHER DENIM BRANDS	CHINA	5 APRIL 2023
3	PRODUCTION PROFESSIONAL	DENIM PRODUCTION	CHIEF COMMERCIAL OFFICER	TEXTILE MANUFACTURING	29	1. ACHIEVED SEVERAL INNOVATIONS IN FIBER RECYCLING 2. INCLUDED IN 50 MOST INFLEUNTIAL PEOPLE IN DENIM INDUSTRY 3. LAUNCHED A SOCILA MEDIA PROGRAM ON DENIM INDUSTRY	UNITED STATES OF AMERICA	1 MAY 2023
4	WASHING PROFESSIONAL	DENIM GARMENT WASHING AND DYEING EXPERT	GENERAL MANAGER	DENIM MANUFACTURING AND EXPORTS	27	1. SUSTAINABILITY AMBASSDOR FOR A UK BASED RETAIL BRAND 2. GLOBAL DIRECTOR OF DENIM EXPORTS 3. DENIM WASH EXPERT FOR GLOBAL AND PREMIUM DENIM BRANDS	BANGLADESH	28 MARCH 2023
5	CHEMICAL PROFESSIONAL	CHEMICAL SUSTAINABILTY EXPERT	SENIOR IMPLEMENTATION MANAGER	FASHION COMPANIES COLLABORATION	23	1. FOUNDER FOR A DENIM PRODUCT COMPONENT MAKING COMPANY 2. SUSTAINABILITY MANAGER AT A FASHION ORGANIZATION 3. GLOBAL TEAM LEAD, CSR FOR AN AMSTERDAM BASED PREMIUM DENIM BRAND	UNITED STATES OF AMERICA	19 APRIL 2023
6	DYEING PROFESSIONAL	INDIGO DYEING AND TEXTILE AUXILIARIES EXPERT	FINISHING AND DYEING CHIEF	DENIM FABRIC MILL	15	1. ACHIEVED INNOVATION IN DYEING PROCESS OPTIMIZATION 2. INDIGO DYEING CHIEF FOR A TURKEY BASED DENIM MILL	TURKEY	15 JUNE 2023
7	COMPLAINECE PROFESSIONAL	COMPLAINECE CONSULTANT	ADVISOR	GLOBAL TEXTILE CONSULTANCY	45	1. COMPLIANCE CONSULTANT FOR A USA BASED RETAIL BRAND 2. VICE PRESIDENT FOR A PREMIUM USA BASED RETAIL BRAND	UNITED STATE OF AMERICA	13 APRIL 2023
8	ATELIER PROFESSIONAL	DENIM REPAIR ARTIST	FOUNDER	DENIM REPAIR STUDIO	10	1. REVIVED AN OLD JAPNESE TEHNCIQUE FOR REPAIRING DENIM 2. ARTIST FOR A AMSTERDAM BASED LUXURY DESING STUDIO	NETHERLANDS	19 APRIL 2023

Table 2 – Focus groups: Participant demographics (Singh, in preparation, 2025)

SR	ANONYMOUS CODE	AREA OF DENIM TRADE	ORGANIZATION	DESIGNATION	YY	PROFESSIONAL ACHIEVEMENT	COUNTRY	DATE
1	DANISH BUSINESS SPECIALIST	BUSINESS	DENIM FABRIC MILL	VICE-PRESIDENT	25	FOUNDED CONSULTANCY ON CIRCULAR DENIM TRADE BASED IN DEMARCH DENIM SUSTAINABILITY LEADER FOR A REPUTED DENIM BRANDS IN DEMARCH MANAGED BULK DENIM FABRIC BUSINESS FOR MILLS BASED IN PAKISTAN	DENMARK	19 SEPTEMBER 2023
2	US BUSINESS ADVISOR	BUSINESS	DENIM GLOBAL TRADESHOW	CHIEF EXECUTIVE OFFICER	48	MANAGED A GLOBAL DENIM BUSINESS ORGANIZATION IN THE PAST 48 YEARS FOUNDED A GLOBAL DENIM TRADE SHOW BASED IN EU AND US WORKED WITH US BASED FASHION INSTITUTES ON DENIM EDUCATION FOUNDED A DENIM INDUSTRY EDUCATION FOUNDATION	UNITED STATES OF AMERICA	21 SEPTEMBER 2023
3	DUTCH CHEMICAL ADVISOR	CHEMICAL MANAGEMENT	SUSTAINABLE CHEMISTRY ORGANIZATION	SENIOR MANAGER	22	FOUNDER FOR A DENIM COMPONENT MAKING COMPANY SUSTAINABILITY MANAGER AT A FASHION ORGANIZATION GLOBAL TEAM LEAD, CSR FOR A PREMIUM DENIM BRAND	NETHERLANDS	21 SEPTEMBER 2023
4	SPANISH DENIM DESINGER	DESIGN	DENIM DESIGN STUDIO	FOUNDER	23	PARTNER AT A PORTUGAL BASED DENIM PRODUCT DESIGN STUDIO DESIGN HEAD FOR GLOBAL DESIGN AGENCIES BASED IN SPAIN DESIGNED FOR GLOBAL DENIM BRANDS	SPAIN	12 SEPTEMBER 2023
5	US DENIM DESINGER	DESIGN	JEANS BRAND	PRESIDENT	40	HAVE 2 PATENTS IN GARMENT CONSTRUCTIONS AT USA CREATIVE DIRECTOR FOR A USA BASED PREMIUM BRAND CREATIVE AND DESIGN DIRECTOR FOR OTHER 2 BRANDS	UNITED STATES OF AMERICA	21 SEPTEMBER 2023
6	US DESING CONSULTANT	DESIGN	JEANS BRAND	CREATIVE DIRECTOR	27	DESIGNED AND DEVELOPED FOR THE BEST US BASED DENIM BRANDS FOUNDED A DENIM DESIGN CONSULTANT FIRM IN US	UNITED STATES OF AMERICA	21 SEPTEMBER 2023
7	CHINESE RETAIL ADVISOR	RETAIL	FASHION INSTITUTE	VISITING FELLOW	40	VISITING FELLOW AT A REPUTED FASHION INSTITUTE VICE PRESIDENT FOR A LEADING DENIM BRAND BUYING DIRECTOR FOR FEW OTHER DENIM BRANDS	CHINA	19 SEPTEMBER 2023
8	INDIAN TRADE SPECIALIST	MARKETING	FASHION TRADING HOUSE	TEAM LEADER	25	MANAGED BULK PRODUCTION OF BEST EXPORT HOUSES IN INDIA MANAGED BUSINESS OF GLOBAL FASHION TRADING HOUSES BASED IN INDIA	INDIA	19 SEPTEMBER 2023
9	PAKISTANI PRODUCTION SPECIALIST	MARKETING	SUSTAINABILITY MARKETING	CREATIVE DIRECTOR	17	MANAGED DENIM PRODUCT BUSINESS FOR MILLS AND FACTORIES IN PAKISTAN AND BANGLADESH	PAKISTAN	17 OCTOBER 2023
10	INDIAN MANUFACTURING SPECIALIST	PRODUCTION	GARMENT PRODUCTION SOFTWARE	CO-FOUNDER	10	CO-INVENTED A CIRCULAR PRODUCTION SYSTEM FOR GARMENT MANUFACTURING	INDIA	12 SEPTEMBER 2023

SR	ANONYMOUS CODE	AREA OF DENIM TRADE	ORGANIZATION	DESIGNATION	YY	PROFESSIONAL ACHIEVEMENT	COUNTRY	DATE
11	US TECHNOLOGY ADVISOR	PRODUCTION	APPAREL PRODUCTION EQUIPMENT	MANAGING DIRECTOR	40	BUSINESS EXPERT IN COMPUTER-AIDED APPAREL TECHNOLOGY AND RETAIL. MEMBER ADVISORY BOARD FOR SEVERAL FASHION UNIVERSITIES, PUBLIC SPEAKER. DEVELOPED BUSINESS ACROSS SEVERAL COUNTRIES IN US, EU AND ASIA.	UNITED STATES OF AMERICA	21 SEPTEMBER 2023
12	BANGLADESHI PRODUCTION SPECIALIST	PRODUCTION	DENIM EXPORT HOUSE	CHIEF EXECUTIVE OFFICER	29	DENIM SUSTAINABILITY ADVISOR FOR INDUSTRIAL GROUPS IN BANGLADESH. MANAGED DENIM BUSINESS AND PRODUCTION ACROSS DENIM COMPANIES IN BANGLADESH, GERMANY, AND PAKISTAN	BANGLADESH	17 OCTOBER 2023
13	CANADIAN SOURCING SPECIALIST	PRODUCT DEVELOPMENT	DENIM RETAIL AGENCY	CO-FOUNDER	17	MANAGING DIRECTOR OF A DENIM TREND AND SOURCING AGENCY IN CANADA. MANAGED PRODUCT DEVELOPMENT FOR GLOBAL DENIM BRANDS	CANADA	21 SEPTEMBER 2023
14	INDIAN FABRIC SPECIALIST	PRODUCT DEVELOPMENT	DENIM MILL	HEAD OF DESIGN	20	DENIM FABRIC DESIGNER FOR BEST DENIM MILLS IN INDIA	INDIA	17 OCTOBER 2023
15	TURKISH PRODUCTION SPECIALIST	SUSTAINABILITY	DENIM FACTORY	SUSTAINABILITY DIRECTOR	15	WORKED ON SUSTAINABLE PRODUCTION OF REPUTED DENIM EXPORT HOUSES IN TURKEY	TURKEY	19 SEPTEMBER 2023
16	FRENCH SUSTAINABILITY PRACTITIONER	SUSTAINABILITY	DENIM FASHION COMMUNICATION	DENIM EDITOR	6	DENIM PRODUCT MANAGER FOR DENIM FACTORIES IN ARGENTINA. DENIM SUSTAINABILITY CONSULTANT FOR DENIM ORGANIZATION IN FRANCE	FRANCE	17 OCTOBER 2023
17	DANISH DIGITAL DESINGER	3D VISUALIZATION	COMPANY FOR DIGITAL FASHION SCIENCE	CHIEF GROWTH OFFICER	13	FOUNDER AND MANAGING PARTNER FOR A 3D MODELLING AND DIGITAL FASHION AGENCY. VISITING FELLOW IN A CHINA BASED REPUTED DESIGN INSTITUTE	DENMARK	12 SEPTEMBER 2023
18	BRITISH WASHING SPECIALIST	WASHING	DENIM ATELIER	WASHING LAB MANAGER	18	FREELANCE DENIM DESIGN AND WASH SPECIALIST FOR BEST DENIM FACTORIES IN UK. DESIGNED AND DEVELOPED DENIM PRODUCTS FOR GLOBAL BRANDS	UK	12 SEPTEMBER 2023
19	INDIAN LAUNDRY ADVISOR	WASHING	APPAREL FINISHING EQUIPMENT	MANAGING DIRECTOR	41	DEVELOPED A PIONEER IN THE PRODUCTION & LAUNDRY EQUIPMENT OVER 40 COUNTRIES	INDIA	19 SEPTEMBER 2023
20	ITALIAN WASHING SPECIALIST	WASHING	DENIM RESEARCH SERVICES.	DENIM SPECIALIST	30	DENIM WASH DESIGNER AND RESEARCH PROFESSIONAL AT REPUTED DENIM RESEARCH ORGANIZATION IN ITALY. DEVELOPED DENIM PRODUCTS FOR GLOBAL DENIM BRANDS AND COMPANIES ACROSS HUNGARY, ITALY, ROMANIA, TURKEY, AND TUNISIA	ITALY	17 OCTOBER 2023

Table 3 Semi-Structured Interview: Line of enquiry (Singh, in preparation, 2025)

SUSTAINABILITY INTELLIGENCE QUESTIONS (SIQ): SEMI-STRUCTURED INTERVIEW METHOD
DOES THE COMPANY YOU WORK FOR PRODUCE MASS, SPECIALIST, OR NICHE MARKET PRODUCTS HAVE A SUSTAINABLE ETHOS THEY APPLY IN PRACTICE?
CAN YOU EXPLAIN YOUR ROLE IN THE DENIM INDUSTRY, AND HAVE YOU SEEN A CHANGE RELATING TO THE PROCESSES YOU ARE DOING IN RESPONSE TO SUSTAINABILITY?
HOW COULD YOUR PRODUCTION METHODS AFFECT YOUR SUSTAINABILITY PERFORMANCE, AND WHAT ARE THE RELATED PROBLEMS AND POSITIVES OF THESE PRODUCTION METHODS IN IMPLEMENTING SUSTAINABILITY?
HOW DO YOU, OR COULD YOU, CERTIFY THESE PRODUCTION METHODS RELATED TO FASHION SUSTAINABILITY?
COULD MORE EXPLICIT GUIDANCE BE PROVIDED TO ENABLE YOU TO MAKE POSITIVE CHANGES, AND WHAT IS YOUR PRIORITY?
HOW CAN WE ACHIEVE REGENERATIVE FASHION OR REGENERATIVE DEVELOPMENT WITHIN THE DENIM INDUSTRY?
HOW CAN WE DECIDE TO ENHANCE SYSTEMS IN THE DENIM INDUSTRY FOR IMPLEMENTING FASHION SUSTAINABILITY, AND CAN YOU IDENTIFY ANY BUSINESS RESTRAINTS FOR IT?
WHAT IS THE SIGNIFICANCE OF TRADITIONAL OR ARTISANAL KNOWLEDGE AND, ON THE OTHER HAND, AUTOMATION OF DENIM MANUFACTURING IN THE SUSTAINABILITY OF DENIM TRADE GLOBALLY OR ON A MASS LEVEL?
COULD YOU ENVISION A CO-DESIGN STRUCTURE BETWEEN THE DENIM INDUSTRY AND ASSOCIATED CONSUMERS?
WHAT INITIATIVES COULD A GOVERNMENT TAKE TO IMPROVE SUSTAINABLE PRACTICES FOR THE DENIM SECTOR?

Table 4 Focus groups: Line of enquiry (Singh, in preparation, 2025)

SUSTAINABILITY INTELLIGENCE QUESTIONS (SIQ): FOCUS GROUPS METHOD
WHAT WOULD YOU CONSIDER TO BE A CONVENTIONAL MINDSET WHEN WE TALK ABOUT SUSTAINABILITY IN THE FASHION SYSTEM?
DO YOU THINK THIS SHOULD BE CHANGED THROUGHOUT THE DENIM TRADE AND PRODUCTION? WHAT WOULD A SIGNIFICANT CHANGE FOR FASHION SUSTAINABILITY INCLUDE?
IF SUSTAINABLE PROCESSES INCREASE MANUFACTURING COSTS, HOW WOULD YOU FEEL OR IMPACT YOUR BUSINESS MODELS?
DO YOU THINK PRODUCTION VOLUME IMPACTS THE SUSTAINABILITY PERFORMANCE OF A DENIM MANUFACTURING PLANT, WHAT IS THE IMPACT OF THIS?
HOW DO WE HANDLE CUSTOMIZATION ON A MASS LEVEL FOR DENIM PRODUCTS, AND HOW DOES THIS IMPACT THE SUPPLY CHAIN OF DENIM PRODUCTS?
HOW IS THE MATERIAL COMPOSITION BEING CONSIDERED WITHIN THE DESIGN PROCESS OR IS THE DESIGN TEAM DIRECTING THE MATERIALITY OF DENIM?
ARE YOU AWARE OF CHEMICALS USED IN THE DENIM INDUSTRY THAT MAY HARM CONSUMER HEALTH? CAN YOU EXEMPLIFY? DOES THIS CONCERN YOU?
HOW CAN WE MEASURE THE SUSTAINABILITY PERFORMANCE OF A DENIM MANUFACTURER EXTERNALLY TO AVOID ANY MANIPULATION?
HOW DO YOU THINK THE SECTOR COULD SIMPLIFY CERTIFICATIONS ACROSS THE SUPPLY CHAIN OF THE DENIM INDUSTRY?
WHAT KNOWLEDGE ASSOCIATED WITH THE DENIM INDUSTRY DO WE NEED TO ADD TO THE FASHION EDUCATION SYSTEM TO ENHANCE FASHION SUSTAINABILITY FURTHER?
WHAT FURTHER INFORMATION COULD BE GIVEN TO CONSUMERS TO MAKE THEM BEHAVE MORE RESPONSIBLY?
IN WHICH AREAS SHOULD A DENIM DESIGNER EXTEND WORK TO DEVELOP SUSTAINABILITY PERFORMANCE FURTHER?
HOW CAN WE DIGITALLY PRESENT ALL THE FEATURES AND CHARACTERISTICS OF THE DENIM FABRICS?
HOW CAN WE OVERCOME COMPONENT VARIATIONS LIKE FIBRE QUALITY OR DYE SHADE VARIATION IN LOTS WHEN DIGITALLY PRESENTING AND MARKETING DENIM PRODUCTS?
APART FROM CIRCULARITY AND EDUCATION, WHAT ELSE CAN CONTRIBUTE TO THE REGENERATIVE DEVELOPMENT OF THE DENIM INDUSTRY?
HOW CAN THE GOVERNMENT INTERVENE OR DEVELOP SUSTAINABILITY POLICIES FOR THE DENIM INDUSTRY? WHAT NEEDS TO INCLUDE THE NATIONAL GUIDELINES FOR THE DENIM INDUSTRY?
WHAT CAN BE THE NON-APPAREL APPLICATIONS OF DENIM PRODUCTS ON A MASS LEVEL?
DO YOU WANT TO ADD ANY CRITICAL POINT YOU THINK WE HAVE NOT DISCUSSED IN THIS FOCUS GROUP ASSOCIATED WITH THE DENIM INDUSTRY OR FASHION SUSTAINABILITY? OR HOW DO YOU CONCLUDE THIS DISCUSSION IN YOUR OPINION?

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9. Conflict of interest

The author has no conflicts of interest to declare.

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