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Sustainable fashion tech innovation: A case study of Bolt Threads' redefinition of fashion systems, design activism and social entrepreneurship

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Abstract

This research article explores the transformative journey of Bolt Threads, a pioneering biomaterials firm operating at the intersection of biotechnology and fashion. First, the research paper sets the background and provides the research question. Second, the existing literature is reviewed to investigate sustainable entrepreneurship within the fashion industry, exploring sustainable fashion concepts and highlighting sustainable entrepreneurs' challenges. Third, the research paper examines Bolt Threads as a case study to redefine fashion systems, design activism, cultural sustainability, design for social change and social entrepreneurship. The case study thoroughly examines Bolt Threads' founding story, business model, innovative technologies and strategic initiatives, underscoring the company's dedication to sustainability and technological advancement. This case study analyses Bolt Threads collaborations with renowned fashion brands, financial strategies, the potential for industry-wide adoption and outlook. Bolt Threads demonstrates that sustainable innovation requires thinking beyond traditional materials and methods. This approach shows that transformative change in sustainability involves looking outside the industry's usual practices and integrating technology in unexpected ways, which can lead to groundbreaking materials that still align with fashion's functional and aesthetic standards. Partnerships with major players help start-ups accelerate market acceptance, increase consumer trust and create broader demand for sustainable products. These alliances demonstrate that aligning with influential brands can be a strategic move for sustainable companies seeking scalability and industry-wide adoption.

Keywords: Fashion design, Sustainability, Social awareness, Social responsibility, Biotechnology

Introduction

Mehta (2024) cites Deborah Golden, Deloitte's U.S. chief innovation officer, who said, "*Innovation readiness encompasses more than just adopting new technologies, tracking specific metrics, or embracing the latest buzzword."* In other words, innovation readiness goes beyond surface-level actions or superficial changes. This quote highlights that innovation readiness goes beyond adopting new technologies or following trends. Instead, it requires a more profound commitment and understanding of innovation. Bolt Threads, a company focused on sustainable materials, such as micro silk, Mylo™ and B-silk protein, aligns with this quote by demonstrating an integrated approach to innovation.

This research paper addresses the following research question: How do emerging sustainable fashion tech start-ups, exemplified by Bolt Threads, contribute to the redefinition of fashion systems, incorporating design activism, cultural sustainability and social entrepreneurship, and what role do designers play in navigating and influencing policy for sustainable fashion practices? By integrating design activism, cultural sustainability and social entrepreneurship concepts, this research offers a novel approach to understanding sustainable fashion systems beyond environmental considerations, encompassing broader societal impacts and ethical dimensions inherent in the fashion industry's evolution. The aim is to gain valuable insights to

effectively address the sustainability challenges in fashion and textiles. As an outstanding sustainable fashion tech start-up, Bolt Threads plays a crucial role in reshaping fashion systems, advocating design activism, promoting cultural sustainability, driving design for social change and embodying principles of social entrepreneurship. This research paper addresses the innovative technologies employed by Bolt Threads, such as the biofabrication of silk through the fermentation of yeast, which challenges traditional material production methods (Seltenrich, 2015).

Literature review

This literature review aims to provide a comprehensive understanding of the nuances within sustainable entrepreneurship in the fashion industry, exploring the concepts, trends and challenges that define this evolving landscape.

Sustainable fashion: Concepts, diverse perspectives and entrepreneurial influence

The fashion sector, with a global valuation of $1.3 trillion and employing over 300 million individuals, is a crucial economic force and a significant contributor to the global GDP (Amed & Berg, 2018; BCG, 2019). Amidst intense competition and growing uncertainty, firms within this vast industry must adapt swiftly to remain competitive, as highlighted in market analyses by prestigious consultancy firms such as McKinsey, Deloitte Group and BCG (Gazzola et al., 2020). Additionally, with advancements in medicine and other factors leading to a rise in global life expectancy, fashion brands have a unique opportunity to cater to both younger and older demographics simultaneously, emphasizing the need for diversified business strategies and marketing approaches (Gazzola et al., 2020).

Sustainability is emerging as a prominent concept in the fashion industry, aiming to address its shortcomings. While academic groundwork in this area has been established by scholars such as de Brito et al. (2008) and Fletcher (2010), there remains a lack of consensus on the definition of sustainability, which can be interpreted differently based on various perspectives and contexts (Henninger et al., 2016). Multiple approaches representing a comprehensive range of sustainability considerations in the fashion industry have been proposed, encompassing both environmental and social dimensions (Henninger et al., 2016; Köksal et al., 2017; Mukendi et al., 2020).

Concepts such as eco-fashion, slow fashion, green fashion, ethical fashion and sustainable fashion have emerged as prominent approaches to addressing these concerns (Mukendi et al., 2020; Thomas, 2008). According to Hofman et al. (2022, p. 4), citing Kozlowski et al. (2018, p. 183), entrepreneurs, particularly fashion designers and founders, play an essential role in promoting sustainability within the fashion industry. Many of these entrepreneurs are driven by personal beliefs and values, aiming to provide alternatives to the mass market and challenge the practices of fast fashion players (Kozlowski et al., 2018, p. 183), as highlighted by (Hofman et al., 2022, p. 4). This underscores the importance of individual commitment and values in propelling the sustainable fashion movement (Hofman et al., 2022, p. 4).

Textile consumption trends

From 1990 to 2018, the data indicate that the actual prices of footwear and clothing in the United States plummeted by half (Ryan, 2021). Moreover, a recent report from the European Union (EU) has underscored the significant environmental and climate change impact of textile consumption, ranking it as the fourth-highest contributor, following food, housing and mobility (Glasner, 2023). Textiles also represent the third-highest water and land-use consumption category (Glasner, 2023).

In response to these challenges, the EU has introduced a sustainable and circular textiles strategy, aiming for all textile products introduced to the market by 2030 to possess the qualities of being "durable, repairable, and recyclable" (Glasner, 2023). Additionally, these products should consist of recycled fibres, be free of hazardous substances and be manufactured in adherence to social rights and environmental considerations (Glasner, 2023). Highlighting the environmental and climate change repercussions of textiles, particularly their standing as the fourth-largest contributor (Glasner, 2023), underscores the urgent need for innovative solutions. In this context, Bolt Threads' biofabrication of silk and unwavering dedication to sustainability (Seltenrich, 2015) seamlessly align with the imperative to address these challenges.

Challenges faced by sustainable entrepreneurs

Sustainable entrepreneurs and small businesses encounter significant customer interaction challenges (Hofman et al., 2022). Given the diverse forms and approaches of sustainable fashion, entrepreneurs and small business managers struggle to predict and align customer and stakeholder expectations with their ideas and concepts (Kozlowski et al., 2018; Todeschini et al., 2017; Štefko & Steffek, 2018).

This complexity within sustainable fashion makes it challenging for businesses to anticipate consumer preferences accurately. Moreover, sustainable fashion companies face a continuous demand from the market for new products featuring innovative design elements (Hofman et al., 2022). Discovering innovative aspects of sustainable materials, functions or production methods for each new fashion season poses a difficulty (Rindova et al., 2005). However, effectively addressing this challenge can enhance a company's reputation and create new value propositions (Rindova et al., 2005). Ultimately, successfully managing the quest for innovation in sustainability can provide a competitive advantage for fashion companies (Rindova et al., 2005).

Golden, as cited by Mehta (2024), underscores the current era in which various technologies, industries and ideas converge, emphasizing the value of diversity in thought and expertise (Mehta, 2024). Organizations can access a more comprehensive range of ideas and resources by engaging with a broader ecosystem that includes internal resources and external partners, such as start-ups, academic institutions and competitors (Mehta, 2024). Recognizing the importance of incorporating social aspects of sustainability into business models is fundamentally a cultural factor (Hristov et al., 2022). However, a significant challenge to effectively integrating social dimensions into business models is the prevailing managerial focus on short-term economic and financial outcomes, which undermines adopting sustainable values offering long-term benefits (Hristov et al., 2022). Achieving sustainability requires ongoing investments and a consistent focus on product and service quality, worker health and safety and equity and climate change (Hristov et al., 2022).

Methodology

A case study approach allows for a detailed and comprehensive analysis of a real-world example within the context of sustainable entrepreneurship in the fashion industry (Yin, 2009). The case study approach was chosen for two main reasons. First, it allows for an in-depth examination of a real-world example, providing rich and detailed insights (Yin, 2009) into the complexities of sustainable entrepreneurship in the fashion industry. Second, it enables researchers to explore the dynamic interactions between several factors (Priya, 2021) within a specific organizational context, such as business models, technologies and strategic initiatives.

Data collection methods: Online web publications

The chosen sources provide a comprehensive and diverse understanding of Bolt Threads, its founding story and the impact of its innovative technologies on the fashion and sustainability industries. Bolt Threads' official website, notably the "Bolt's Founding Story" and "Bolt Impact" pages, offers insights into the company's background, values and contribution to sustainability, as seen in Table 1. News articles from reputable sources, such as *Fortune*, *Business Insider* and *Forbes*, were included to provide external perspectives on Bolt Threads' breakthroughs, collaborations and industry influence and are also included in Table 1. Table 1 also includes articles from *Vogue*, *W Magazine* and *Business of Fashion*, which explore the broader impact of Bolt Threads' technologies on the fashion world, especially in collaborations with renowned brands such as Stella McCartney, Adidas, Patagonia and Lululemon. This research paper aims to draw on these varied sources to present a well-rounded analysis of Bolt Threads' trajectory and influence.

Rationale for chosen sources.

The chosen sources collectively provide a comprehensive overview of Bolt Threads' history, technological innovations, collaborations, industry impact and outlook. These diverse perspectives enable a well-rounded analysis of the company's role in the intersection of biotechnology and sustainable fashion.

Table 1: Identification and description of sources.

Source	**Description**
Bolt Threads' Founding Story	Insights into the company's origins, initial challenges and milestones, offering a foundational understanding of Bolt Threads' journey.
Fortune Article on Synthetic DNA	Explores potential technological breakthroughs, specifically synthetic DNA, providing insights into the broader technological landscape and its relevance to Bolt Threads' innovative processes.
W Magazine on Mushrooms in Fashion	Investigates the spread of mushrooms in fashion, offering a unique perspective on the sustainable future of the fashion industry, focusing on the role of mushrooms, an essential aspect of Bolt Threads' materials.
Business Insider on Spider Silk Necktie	Highlights a specific product, a spider silk necktie, shedding light on Bolt Threads' early ventures into creating commercially available products and its impact on the market.
Bolt Threads' Impact Page	Provides valuable information about the company's broader impact, including its sustainability initiatives and contributions to the industry.
TechCrunch on Fundraising and Patagonia Deal	Investigating the fundraising and dealing with Patagonia, this source provides insights into the financial and strategic aspects of Bolt Threads, which are crucial for understanding its growth and partnerships.
Vogue on Stella McCartney's Mushroom Leather Bag	Examines Stella McCartney's collaboration with Bolt Threads, providing insights into high-profile partnerships and integrating Bolt Threads' materials into renowned fashion brands.
Source	**Description**
Forbes Article on Mushroom Leather and Spider Silk	Investigates the broader implications of mushroom leather and spider silk in the fashion industry, providing a macro-level perspective on the industry trends that Bolt Threads contributes to.
Business Insider on Adidas' Mushroom Leather Shoe	Focusing on Adidas' collaboration with Bolt Threads on a mushroom leather shoe, this source offers insights into the adoption of Bolt Threads' materials by major brands and the potential market impact.

WWD on Mushroom Fashion Moment at Stella McCartney Store	Provides real-world examples of the application of Bolt Threads' materials in a retail setting, offering insights into consumer reception and the practicality of these materials.
Forbes Article on Bolt Threads' SPAC Deal	Discusses the recent financial move of Bolt Threads, offering insights into its valuation, financial strategies and future.
Business of Fashion on Lululemon's Mushroom-Based Yoga Accessories	Examining Lululemon's incorporation of Bolt Threads' materials in yoga accessories, this source illustrates the practical application of Bolt Threads' innovations in consumer products.
Bolt Threads' Silk Protein Technology Page	Detailed information on Bolt Threads' Silk Protein technology, providing insights into the company's diverse biomaterial portfolio.

Based on the information provided in Table 1, it is evident that Bolt Threads has embarked on a remarkable journey of innovation and collaboration within the fashion industry. From its founding story to its recent special purpose acquisition company (SPAC0 deal, Bolt Threads has demonstrated a commitment to sustainability, technological advancement and strategic partnerships. Incorporating mushroom-based materials and spider silk into products by renowned brands such as Stella McCartney and Adidas signifies the industry's acceptance and adoption of Bolt Threads' innovations. Furthermore, the practical application of Bolt Threads' materials in retail settings, as seen in Lululemon's yoga accessories, highlights their potential for widespread consumer appeal.

Case study

Bolt Threads, a biomaterials firm, operates at the intersection of biotechnology and fashion (Cumbers, 2019). Bolt Threads focuses on developing materials derived from biological sources, such as proteins or other organic compounds (Elkington, 2019). The company leverages nature as inspiration, employs advanced biotechnology and generates innovative solutions to create sustainable materials (Cumbers, 2019). Traditionally, silk production has been limited to silkworms and spiders. However, at Bolt Threads, the process involves fermentation tanks using yeast, sugar and DNA code derived from spiders (Alsever, 2017). The company addresses resource challenges through products such as spider silk, mushroom leather and silk proteins (Cumbers, 2019). Bolt Threads has developed advanced technology and infrastructure for producing proteins at scale (Elkington, 2019). This innovative approach results in a material spun into fibres akin to traditional methods for silk, rayon and polyester, claimed by the company to surpass steel in strength, exceed spandex in stretchiness and be softer than silk (Alsever, 2017). Overall, Bolt Threads exemplifies the transformative potential of sustainable fashion tech start-ups in reshaping industry practices and promoting environmental responsibility.

Overview of the business model

Bolt Threads, a start-up that specializes in synthetic spider silk products (Robinson, 2017), has a business model that revolves around creating sustainable materials inspired by nature (Cumbers, 2019). The business originated in 2009 when the co-founders Dan, David and Ethan embarked on a venture combining their expertise in microbial silk production and microfluidic devices (Bolt Threads, 2017). Encouraged by their participation in the Idea to IPO class at UCSF, the trio secured research grants, became tenants at the QB3 Garage start-up incubator and later expanded into a larger incubator space in San Francisco (Bolt Threads, 2017). Since 2009, Bolt Threads has been a frontrunner in biotechnological innovation and has embraced the trend of mushroom fashion (Gore, 2021).

As the global fashion industry, valued at around $3 trillion, increasingly gives precedence to sustainability and transparency, the synthetic biology biomaterials sector stands to gain (Cumbers, 2019). Identifying a void in consumer products within the fashion industry, CEO Dan Widmaier prioritized Bolt Threads' mission to introduce new materials inspired by nature to tackle challenges in the consumer marketplace (Gore, 2021). Widmaier acknowledges Mother Nature as a remarkable example of a perfectly circular materials economy, spanning four billion years (Gore, 2021).

Recently, Bolt Threads planned to merge with a special purpose acquisition company (SPAC) called the Golden Arrow Merger Corp (Feldman, 2023). The SPAC is led by investor Timothy Babich, a former professional at Goldman Sachs (Feldman, 2023). After the merger, Bolt Threads will change its name to Bolt Projects Holdings (Feldman, 2023). CEO Dan Widmaier will retain his position in the new company, while co-founder David Breslauer will continue as the Chief Technology Officer (Feldman, 2023). The deal attributes a pro-forma enterprise value of $346 million to Bolt Threads and was expected to be completed in the first quarter of 2024 (Feldman, 2023).

Examination of innovative technologies employed

Bolt Threads is associated with spider silk because it focuses on creating synthetic versions of this material. However, the real breakthrough lies in a different realm: beer and cheese production (Seltenrich, 2015). Rather than directly mimicking the silk production process of spiders, Bolt Threads has engineered a yeast strain (Seltenrich, 2015). When combined with sugar and water and fermented in a similar process to that of beer or cheese, this yeast produces proteins that closely resemble those found in spider silk (Seltenrich, 2015).

These silk-like proteins are then extracted and processed further, resulting in fibres that can be spun into threads suitable for knitting or weaving (Seltenrich, 2015). The company's innovation involves harnessing the natural properties of yeast to create a sustainable and scalable alternative to traditional silk production methods (Seltenrich, 2015).

Innovative materials

The following section provides an overview of each technology's unique features, such as the use of mycelium in Mylo™ as a sustainable substitute for leathers, the biodegradable and clean beauty aspects of B-Silk protein™ and the eco-friendly nature of Micro silk™ as a vegan silk alternative.

Mylo™ material

Mylo serves as a mycelium-based substitute for both synthetic and natural leather. The production of Mylo™ involves using less harmful chemistry, a design aimed at minimizing lifecycle impacts and implementing rigorous ethical labour and production practices (Bolt Threads, n.d.-a). Mylo™ incorporates environmentally friendly chemistry, is designed to reduce life cycle impacts and adheres to rigorous ethical labour and production standards (Bolt Threads, n.d.-a). Mylo™ supports the United Nations' Sustainable Development Goals on Decent Work and Economic Growth, Industry, Innovation and Infrastructure and Responsible Consumption and Production (Stella McCartney, 2023). Mylo™ is certified as primarily composed of materials derived from renewable sources found in nature (Bolt Threads, n.d.-a).
The certification confirms that the ingredients used in Mylo™ are biobased, meaning that they come from renewable biological sources such as plants or microorganisms (Bolt Threads, n.d.-a).

B-silk protein™

B-silk™ is a biobased and vegan polypeptide, meaning that it is derived from renewable biological sources and contains no animal-derived ingredients (Bolt Threads, n.d.-b). B-silk™ has been clinically proven to deliver positive results in skincare, hair care and colour cosmetics (Bolt Threads, n.d.-b). B-Silk™ performs better than silicone elastomers in beauty and personal care products (Bolt Threads, n.d.-b). B-silk's™ distinctive molecular structure is a lightweight, protective barrier against environmental stressors, such as pollution and blue light, for both skin and hair. Scientific research has proved that B-silk™ can offer protective benefits against these factors when incorporated into skincare, hair care and colour cosmetics products (Bolt Threads, n.d.-b).

Micro silk™ material

Micro silk™ fibre is a vegan alternative to silk, created from environmentally friendly ingredients such as water, sugar, yeast and salt (Bolt Threads, n.d.-b). The technology behind Micro silk™ fibre has moved away from using petroleum-based polymers and unsustainable processes (Bolt Threads, n.d.-b). Instead, it embraces sustainable practices and avoids non-biodegradable fabrics, focusing on renewable inputs and closed-loop production methods.

Case studies of successful projects or collaborations

Bolt Threads has successfully collaborated with major fashion brands to incorporate micro silk into their collections. Bolt Threads has achieved success and collaborations with many renowned brands, including Stella McCartney, Adidas, Patagonia, Vegamour and Lululemon. In July 2019, Stella McCartney and Adidas introduced the Biofabric Tennis Dress (Bolt Threads, n.d.-b). The dress was made using a blend of micro silk and cellulose fibres, specifically designed to be fully biodegradable (Bolt Threads, n.d.-b). As a result, the dress can naturally break down into harmless components in the environment, reducing its environmental impact after use (Bolt Threads, n.d.-b).

Patagonia

Bolt Threads collaborated with the outdoor clothing company Patagonia in 2016 (Kolodny & Dilet, 2016). This collaboration aimed to kickstart the creation and design process of products that integrate Bolt Threads' innovative and visionary threads (Kolodny & Dilet, 2016).

Stella McCartney

Stella McCartney, a luxury brand renowned for its commitment to sustainability and anti-animal product stance, has collaborated with Bolt Threads since 2017 (Webb, 2022). Their inaugural commercially viable product resulting from this partnership was the Frayme Mylo bag (Webb, 2022). The SoHo store celebrated the release of the Frayme Mylo collection in 2022 (Roshitsh, 2022). The event featured prototypes of products like the Falabella bag and trousers, all part of the collection retailing at $3,500 (Roshitsh, 2022). The Frayme Mylo collection uses Bolt Threads' Mylo material derived from mycelium as a sustainable alternative to leather (Roshitsh, 2022).

Adidas

Adidas has partnered with Bolt Threads to develop innovative vegan alternatives for its leather shoes (Williams, 2021). The classic Adidas Stan Smith shoe has been redesigned utilizing the unique properties of Mylo™, a mushroom-based leather made from mycelium found in mushroom roots (Cumbers, 2019).

The latest model of the Stan Smith Mylo footwear, released in 2021, features an environmentally friendly, sustainable, fully mushroom leather body and a natural rubber midsole (Williams, 2021).

Lulumelon

In July 2021, Lululemon introduced its initial yoga accessory line crafted from Mylo™ (Sergison, 2021). The collection includes an innovative yoga mat constructed from undyed Mylo, intricately woven to create varied patterns that offer hand and foot placement guidance during yoga sessions (Sergison, 2021). The Meditation and Yoga Mat Bag and the Barrel Duffel Bag exhibit Mylo™ in intricately braided handles, zipper pulls and premium embellishments throughout (Sergison, 2021). In October, Lululemon initially committed to using the sustainable Mylo™ material, joining the Mylo™ consortium (Sergison, 2021). This consortium, consisting of members such as Stella McCartney, Adidas and Kering, involves investments and grants exclusive access to the Mylo™ material (Sergison, 2021).

Eighteen B and Vegamour

In recent years, Bolt's primary product moved to B-silk™, a biobased ingredient in skincare and cleansers inspired by spider silk (Feldman, 2023). Initially, Bolt produced its skincare line, Eighteen B, but has since shifted to selling its ingredients to other brands (Feldman, 2023). B-silk™ is now featured in brands such as Vegamour and is available at Sephora stores across the United States. Bolt holds 34 patents for B-silk, with an additional 131 pending (Feldman, 2023). B-silk™ is designed as an environmentally friendly alternative to silicone elastomers, which are non-degradable chemicals and constitute a market estimated at $4 billion, according to Bolt (Feldman, 2023). Vegamour, a vegan beauty brand, collaborated effectively with Bolt Threads to launch the GRO Revitalizing Shampoo and Conditioner in November 2020 (Bolt Threads, n.d.-b). These products utilise B-silk™ protein, enhancing their formulations with its rejuvenating properties (Bolt Threads, n.d.-b). The inclusion of B-silk™ protein creates a nourishing moisture barrier, resulting in increased volume and shine, all without using animal-derived keratin or synthetic polymers (Bolt Threads, n.d.-b).

Potential for industry-wide adoption

The potential for industry-wide adoption lies in the scalability of Bolt Threads' biotechnological processes. Partnerships with influential figures and significant players in the fashion industry play a crucial role in facilitating wider recognition and application of eco-friendly materials such as Micro silk™, Mylo™ and B-silk™. The potential for industry-wide adoption is significant, given Bolt Threads' successful collaborations with major fashion brands. The partnership with Stella McCartney, a prominent luxury brand known for its commitment to sustainability, has resulted in the creation of commercially viable products such as the Frayme Mylo™ bag, signifying that those eco-friendly alternatives to traditional materials are gaining traction in the fashion industry. The collaboration with Adidas to produce the Stan Smith Mylo shoe, a vegan alternative made from mushroom-based "leather", further highlights the industry's openness to adopting sustainable materials.

Furthermore, Bolt Threads' focus on B-silk as a biobased ingredient for skincare and cleansers, incorporated into brands like Vegamour that are available at Sephora, indicates the potential for widespread adoption in the beauty and cosmetics sector. The shift towards eco-friendly alternatives in the skincare industry aligns with increasing consumer preferences for sustainable products. Finally, the impending merger with Golden Arrow Merger Corp. and the formation of Bolt Projects Holdings position the company for further growth and potential collaborations. As Bolt Threads continues to innovate and establish itself as a leader in

biomaterials, industry-wide adoption of its sustainable solution is likely, especially as significant brands seek alternatives to traditional materials focusing on environmental responsibility.

Discussion

This section explores the multifaceted impact of Bolt Threads', highlighting its innovative technologies, collaborations with prominent fashion brands, financial strategies and the company's strategic vision, as discussed in the previous section. This in-depth analysis delves into the core elements that define Bolt Threads' influence on the sustainable fashion landscape, shedding light on its pioneering role in redefining fashion systems, driving design activism, fostering cultural sustainability and embodying social entrepreneurship and social change principles.

Bolt Threads is an exemplary sustainable fashion tech start-up that exemplifies a paradigm shift in the fashion industry's approach to sustainability. The literature review established that sustainability in fashion is multifaceted, encompassing environmental and social considerations together with various concepts such as eco-fashion, slow fashion, green fashion, ethical fashion and sustainable fashion. Moreover, the involvement of entrepreneurs, particularly fashion designers and founders, is highlighted as pivotal for the industry's sustainability (Hofman et al., 2022; Kozlowski et al., 2018).

Bolt Threads' business model revolves around creating sustainable materials inspired by nature and addressing challenges in the consumer marketplace (Cumbers, 2019). The case studies of successful collaborations with major fashion brands such as Adidas, Stella McCartney, Patagonia and Lululemon underscore the impact of emerging sustainable fashion tech start-ups in reshaping industry practices. The challenges faced by sustainable entrepreneurs, as highlighted in the literature review, are mirrored in the complexities faced by Bolt Threads. Anticipating customer expectations, achieving continuous innovation and integrating social dimensions into business models are recurrent themes. This research paper recognizes that incorporating social aspects into business models is a cultural factor and that short-term economic focus can hinder long-term sustainable practices (Hristov et al., 2022).

- *Innovative technologies and design activism*
  The pioneering use of synthetic spider silk, mycelium-based materials and biodegradable proteins by Bolt Threads showcases design activism in action (Robinson, 2017). Bolt Threads' innovative adoption of synthetic spider silk, mycelium-based materials and biodegradable proteins is a testament to the influential role of design activism in the fashion sector. The company's commitment to leveraging biotechnology for sustainable fashion challenges the traditional norms of material production in the industry (Cumbers, 2019).

- *Cultural sustainability and redefinition of fashion systems*
  Collaborations with renowned brands such as Stella McCartney, Adidas and Lululemon highlight the cultural sustainability of Bolt Threads' innovations (Webb, 2022). By integrating its materials into mainstream fashion, the company contributes to redefining fashion systems, influencing consumer perceptions and fostering a shift toward sustainable alternatives (Sergison, 2021).

- *Design for social change and social entrepreneurship*
  Bolt Threads' approach aligns with design for social change by addressing environmental concerns and promoting cruelty-free alternatives (Cumbers, 2019). The company's commitment to ethical

labour and production practices and collaborations with sustainability-focused brands demonstrates social entrepreneurship at the intersection of technology and fashion (Kolodny & Dilet, 2016).

- *Industry-wide adoption and future outlook*
  The case studies of successful projects and collaborations underscore Bolt Threads' potential for industry-wide adoption (Webb, 2022). The partnerships with major fashion brands signal a broader acceptance of sustainable materials in the industry, indicating a shift towards more environmentally conscious practices (Feldman, 2023). These partnerships indicate a transition towards a more significant consideration of environmental factors and a growing emphasis on sustainability in industry practices.

- *Financial strategies and growth*
  Examining Bolt Threads' fundraising deals with companies like Patagonia and the recent SPAC deal with Golden Arrow Merger Corp provides insights into the financial strategies and growth trajectory (Feldman, 2023). This economic aspect is crucial for understanding how sustainable fashion tech start-ups can navigate the industry and gain widespread acceptance.
- *Diverse biomaterials portfolio*

  Bolt Threads' diverse biomaterials portfolio, including Mylo™, B-Silk protein™ and Micro silk™, showcases the versatility of their technologies (Bolt Threads, 2017). This diversity contributes to the adaptability of their materials across various industries – from fashion to skincare – indicating an integrated approach to sustainability.

- *Consumer reception and practicality*
  The inclusion of sources such as *WWD* on Mushroom Fashion Moment at Stella McCartney Store and *Business Insider* on Adidas' Mushroom Leather Shoe provides insights into real-world examples of the consumer reception and practical application of Bolt Threads' materials in retail settings (Roshitsh, 2022). Understanding how consumers interact with these innovative materials is essential for assessing their long-term viability.

- *Strategic vision and future*
  The information on Bolt Threads' SPAC deal and the formation of Bolt Projects Holdings sheds light on the company's strategic vision and future (Feldman, 2023). This aspect is critical for evaluating the long-term impact and sustainability of the company's business model.

Conclusion

In conclusion, this research paper not only explores the trajectory and influence of Bolt Threads as an emerging sustainable fashion technological start-up but also delves into the broader themes of sustainability, design activism and the role of entrepreneurs in redefining fashion systems. This detailed analysis of Bolt Threads' technologies, collaborations, challenges and industry-wide potential supports critical thinking in the context of sustainable fashion systems and aligns with the outlined research question. Bolt Threads stands out as an exemplar in the fashion industry, leading the redefinition of fashion systems by introducing pioneering and sustainable materials. The company's unwavering commitment to design activism, cultural sustainability and social entrepreneurship actively moulds the fashion industry's

practices, instigating a paradigm shift towards the widespread adoption of sustainable alternatives. Bolt Threads not only underscores the potential of sustainable fashion technology but also establishes an influential precedent for the industry, exemplifying the transformative efficacy of conscientious and environmentally friendly practices.

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Effects of rural entrepreneurship on community development in Zambia

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Abstract

Rural entrepreneurship plays a crucial role in fostering the development of rural communities and nations at large. This study aimed to investigate the role of rural entrepreneurship in delivering community development. The study employed a quantitative approach, in which a structured questionnaire containing four indicator variables identified from the literature was administered to 197 respondents drawn from entrepreneurs involved in agriculture, retail, building construction, transportation business and metal fabrication operating in the rural areas of Copperbelt province, Zambia. The data were analysed using exploratory factor analysis (EFA) and regression analysis. The EFA results revealed that entrepreneurship was explained by four factors: entrepreneurial characteristics, business conception, business realization and business operation. However, the regression analysis established that of the four factors explaining entrepreneurship, only two factors, entrepreneurial characteristics and business operation, were significant in predicting community development in Copperbelt rural areas. Overall, this paper reaffirms that entrepreneurship plays a critical role in rural community development, leading to improved living standards, employment opportunities, alleviation of poverty and reduced rural-urban migration. Rural entrepreneurship is an essential stimulant of economic growth in developing countries.

Keywords: Community, Development, Entrepreneurship, Rural areas

Introduction

Rural areas are envisioned as carefree farmlands and grasslands dotted with small business stores, few social amenities and tight-knit communities. Rural areas in the Global South are diverse regarding topography, natural resources, culture and economy. According to researchers, extreme poverty levels, little economic activity and the absence of critical infrastructure and essential services characterise rural areas (del Olmo-García et al., 2023; Ihejiamaizu, 2019; Jarinaa & Manida, 2024). Historically, agriculture and other resource-based industries have been at the centre of economic activities in rural areas. In developing countries, most agricultural activities are labour-based and subsistence-level, offering little economic growth. At the commercial scale, increased mechanization has led to increased levels of unemployment (Goetz et al., 2018). Development is further hampered by low literacy levels, exacerbated by rural-urban migration, where those with some skill migrate to cities for better economic prospects. These issues point to resource-deficient rural areas, with inadequate infrastructure such as roads, water and power supply networks, insufficient human capital and limited access to credit finance (Goetz et al., 2018; Stadel, 2019).

Rural entrepreneurship has gained significance as a local development approach with solid potential for job creation as well as improvements in quality of life (Fortunato, 2014; Galvao et al., 2020). Scholars have found a correlation between entrepreneurship and rural development (Abhijith, 2021; Lakshmanaswamy & Jasmine, 2023; Pato, 2020; Rajsinghot et al., 2024). The argument is that entrepreneurship has a multiplier effect in rural regions because it results in skill diversification among the rural population, attracts new inhabitants, drives market innovation and stimulates growth (Galambos & Amatori, 2016; Galvao et al., 2020; Pan et al., 2024). Therefore, this study sought to investigate the effects of entrepreneurship on community development in rural areas, with the Copperbelt province of Zambia as the study area.

Rural entrepreneurship

Entrepreneurship is a broad concept with numerous definitions and meanings. The definition of entrepreneurship is still a source of contention among scholars. The idea of entrepreneurship is multifaceted, denoting different things to different people. Entrepreneurship comprises interconnected processes of vision, transformation and invention, necessitating a great deal of energy from the individual. It also stimulates economic growth in any setting (Akiri et al., 2016; Ekanem, 2024). Rural entrepreneurship entails creating new value by utilizing resources from a given environmental setting (Lebambo & Shambare, 2020; Sharma, 2024). Rural entrepreneurs focus on creating a new organization that introduces new products, serves or creates a new market or utilizes a new technology in a rural environment. It also involves pulling resources together to respond to unmet market demands and an ability to create and build something from practically nothing. Thus, rural entrepreneurs carry out entrepreneurial activities by establishing industrial and business units in the rural sector of the economy (Kushalakshi & Raghurama, 2014). Rural entrepreneurship is one of the most essential inputs in the economic development of a country; this cannot be overemphasized, especially in countries in the Global South, where a considerable number of the population live in rural areas. Rural entrepreneurship is considered one of the solutions to reduce poverty, migration, economic disparity and unemployment and to develop rural areas and backward regions. In the Global South, rural areas are isolated, economically poor, and unmechanized (Okeke & Nwankwo, 2017).

Further, these areas lack critical infrastructure, such as roads, telecommunications, internet connectivity and electricity and water supply networks. Proponents of rural entrepreneurship opine that it is a strategic development intervention that could accelerate the rural development process. The literature review underscores the importance of entrepreneurship in stirring development in rural areas and points out critical issues for consideration, as summarized in Table 1.

Table 1: Summary of reviewed works on entrepreneurship for rural development.

Author(s) and year	Title of research	Key issues
Lakshmanaswamy & Jasmine, 2023	An empirical study on the role of rural entrepreneurship on socio-economic development among rural mass	Highlights the importance of rural entrepreneurship in better income-generating opportunities and serves as a means for the effective allocation of local resources

Author(s) and year	Title of research	Key issues
Jarinaa & Manida, 2024	Exploring the impact of rural entrepreneurship development in India's MSME sector	Advances in investment in infrastructure and technological advancements to unlock the full potential of rural entrepreneurship
Candelario-Moreno & Sánchez-Hernández, 2024	Redefining rural entrepreneurship: The impact of business ecosystems on the success of rural businesses in Extremadura, Spain	Resources tailored to rural entrepreneurship must be created, leveraging the area's endogenous resources and growth models
Sima, 2015	Sustainable rural development through rural entrepreneurship	Emphasizes the importance of strategic planning, feasibility and market studies and analysis and the need for a unique package of resources to exploit the opportunities
Pato, 2020	Entrepreneurship and innovation towards rural development evidence from a peripheral area in Portugal	Underscores the role of the community in the entrepreneurship and development process; fosters creation of a culture of entrepreneurship based on local and endogenous resources; Training and financial support
Pan et al., 2024	The impact of entrepreneurship of farmers on agriculture and rural economic growth: Innovation-driven perspective	The need to adopt specialized incentives and support measures to create a favourable atmosphere; Strengthen innovation; Build a distinctive innovation and entrepreneurship education system; Promote the effective integration of technologies
Ihejiamaizu, 2019	The role of entrepreneurship in rural development in Cross River State, Nigeria	Utilization of local resources and reduction of rural-urban migration; Provision of incentives to rural entrepreneurs in the form of tax relief and concessions; Infrastructure development and maintenance in rural areas encourage trade and business transactions and serve as stimuli in boosting the rural economy
Abhijith, 2021	Role of entrepreneurship in rural development – An analysis	Rural entrepreneurship is one of the solutions to reduce poverty, migration, economic disparity and unemployment and to develop rural areas and backward regions

Author(s) and year	Title of research	Key issues
del Olmo-García et al., 2023	Determinant factors for the development of rural entrepreneurship	Bank financing is essential for the development of rural entrepreneurship; The policy should focus on increasing investment in innovation and development that promote the discovery of opportunities in rural areas
Dzapasi, 2019	Role of government in rural entrepreneurship to economic development: The case of Murewa Rural-Mashonaland East Province, Zimbabwe	Need for effective rural entrepreneurship policy; Awareness programmes; Partnerships
Rajsinghot et al., 2024	Strengthening sustainable rural development through entrepreneurship: An Indian perspective	It is a more effective method of eradicating poverty and hunger, sustainable health and well-being, enhancing gender equality, quality education and decent work conditions, and promoting innovation in industries

The reviewed literature shows gaps in the relationship between individual entrepreneurship and community development elements. This suggests that efforts to develop rural communities through entrepreneurship must be further explored. Therefore, this study sought to investigate the effects of entrepreneurship on community development in rural areas and consequently identify the main predictors of the same.

Approaches to community development

Community development is a process that focuses on cultivating and enhancing a community's actions collectively to bring about improvements in social, cultural, economic, physical, political and environmental aspects of a community's life. Community development gives individuals and organizations within a society the ability to better their lives (Buye, 2021). Community development approaches are holistic and grounded in the ideologies of inclusivity, equity, empowerment, social justice and upholding human rights (Ledwith, 2016; Uddin, 2024). The following approaches are used in community development: needs-based, problem-solving, participatory, asset-based, power-conflict, welfare and rights-based.

Asset-based approach

This approach begins by first considering what is available in the community. Then, it builds on the assets and capacities of community members instead of focusing on what is lacking or deficient in a particular community. It emphasizes recognizing the strengths and resources of local people in developing communities. The approach relies on community members identifying and building their asset mapping strategy before turning to external partners (Chinyowa et al., 2016). It advances the ability of external resources to be relied upon once communities develop their assets. In attracting external resources, the partnership is encouraged more than just being recipients (Khadka, 2012). It perceives external stakeholders as responsive co-investors and co-creators in community-level action. Creating partnerships points to the political nature of capacity and asset growth. The major thrusts of the approach hinge on

partnerships, capacity building, networking, and communities identifying, leveraging and managing the evolutionary stages of development (Arefi, 2008; Nel, 2020). The development approach anchoring this study builds on this approach.

Needs-based approach

Delivering development takes a top-down approach and assumes that the community is broken and thus requires external support to fix problems. A needs-based approach assesses the needs of communities through needs surveys to identify and quantify deficiencies and develop solutions to meet the identified needs (Khadka, 2012). In the process, the participation of community members is often ignored, and top leaders create policies. Here, experts quantify and assess the community's perceived needs when designing developmental programmes. In this approach, organizations and funders are the leading investors; money from the investors drives the development process. The relationship between the communities and external organizations is vertical, with communities seen as recipients (Nel, 2020).

Participatory approach

The participatory approach focuses on educating and encouraging people to engage in the development process. It proposes that people should be involved in every development project or programme stage, from inception to completion (Buye, 2021). It enables the poorest and marginalized people to participate in development efforts. Community involvement aims to empower individuals by improving their abilities and skills, allowing them to interact with the development process and decide their needs. Participatory mechanisms are a crucial model for giving people a representative and democratic voice in decision-making, which benefits their welfare and health (Riswan & Beegom, 2021). The major thrust of this approach is building the capacity of local communities through information sharing, skills training and organization to achieve effective participation and sustainable development.

Right-based approach

This approach uses established and accepted human rights standards as a common framework for assessing and guiding sustainable development initiatives. It involves systematically applying human rights principles during all programme policy development and implementation (Kindornay et al., 2012; Noh, 2022). According to this approach, human rights abuses need to be dealt with as they have made people suffer and kept in poverty. Thus, this approach translates people's needs into rights and recognizes the human person as the active subject and claim-holder. It recognizes that all people, including those living in poverty, have the right to be involved in processes that impact their lives; it promotes equality and non-discrimination, focusing on vulnerable or marginalized people (Moseli, 2022).

Problem-solving approach

The problem-solving approach focuses on different methods that can be used to create different solutions for the problems faced by communities (Kwong & Kan., 2017). According to this approach, agents of development, such as service providers and external entities, usually enter the community due to the problems and needs of the community that need to be met (Buye, 2021). It emphasizes confronting the problem, arguing that the tendency to avoid allows an escape from difficulties or dependence on others to solve the issues.

Other approaches include the power-conflict approach, which fosters creating harmonious communities by coming up with solutions that seek to address conflicts, especially those with the potential to slow down

or impair development. Also, the welfare approach seeks to interact with working communities to enhance their capacity, consequently improving their well-being (Buye, 2021).

Role of entrepreneurs in community development

In many places worldwide, entrepreneurship is increasingly recognized as a promising response to economic challenges, such as a lack of jobs and waning economic vitality in rural and developing areas. Different community development projects and programmes have quite distinct implications for community development. At the heart of anti-poverty work is often a concern for community development and the participation of low-income people. It entails continuous improvement of social, economic and environmental standards, thereby maintaining an attractive environment, having a vital social structure that promotes collaboration, equity and liberty, and having an essential economy that is diversified, competitive and accessible (Gilchrist & Taylor, 2016).

From a social perspective, community development has been linked to ensuring equity and the equitable distribution of resources and opportunities (Banks, 2019; Hale et al., 2019). Social equity is also central to Winston's (2022) analysis of social aspects of community development. It includes social equity, which involves fair distribution of resources, avoiding exclusionary practices and allowing residents to participate fully in society. Winston (2022) also posited that social equity entails meeting the basic human needs of the present so they can participate in society while protecting the quality of earth's life-support systems on which the welfare of current and future generations depends more so that the development is inclusive, well planned, governed and promotes a high quality of life with equality of access to decent quality services for all (Winston, 2022).

Economically, regardless of the definition used, economic development is often associated with creating jobs and wealth and improving quality of life. From this perspective, community development concerns the community's ability to be self-reliant, mobilize and build assets to sustainably improve their quality of life (Gallardo, 2015). Furthermore, entrepreneurs significantly impact local economies by helping to connect them to the larger global economy (Gherghina et al., 2020; Malizia et al., 2020). Beyond the direct economic value of entrepreneurship, Hassan et al. (2017) and Marques et al. (2019) found that entrepreneurial activity motivated by rural artisan professions or tourism can also contribute to the enhancement of local resources, cultural heritage and quality of life. Entrepreneurial activity of all origins creates new jobs and wealth that have spillover benefits into the greater region (Guerrero et al., 2016; Stuetzer et al., 2018).

Zambian scenario

Zambia is a middle-to-low-income country with a population of around 20 million. Zambia, like most Sub-Saharan countries, grapples with the scourge of poverty, which has continued to affect people, especially in rural areas. The World Bank estimates that 75% of Zambia's impoverished people live in rural areas. As of 2022, the extreme poverty level in rural areas stood at 65.1% compared to about 22.4% for urban areas, almost three times higher. This implies that 65.1% of households in rural areas could not meet the cost of the basic food basket (Zambia Statistics Agency, 2022).

A study by Muya et al. (2017) revealed that only a tiny percentage of the rural population had access to water points that met the prescribed standards for safe water. Further, despite the growing mobile network, its growth in rural areas was limited by poor infrastructure. In contrast, the internet service

quality was graded as being poor. Moreover, rural roads in Zambia are abysmal and in deplorable condition. Drains are missing, or where they exist, they are narrow, inadequate and not constructed correctly. Bridges are missing, old, inadequate, poorly constructed and usually poorly maintained (Tembo et al., 2020).

The government aims to stimulate economic growth and development of rural areas, just like in many other countries. Communities, governments and other stakeholders need to collaborate to implement strategies that aim to improve the living conditions of rural people. Among these strategies is boosting socioeconomic conditions through rural entrepreneurship (World Bank, 2020). Regarding the development ideology, Zambia has been on a neoliberal trajectory since 1991, emphasizing allowing the markets to be fully involved in the development agenda. This sits well with the asset-based approach to community development, which, in a way, opines limiting the state's role but rather fosters community empowerment and partnerships (MacLeod & Emejulu, 2014).

Theoretical approach

The theoretical framework anchoring this paper is based on economic theory. Economic theory classifies entrepreneurship as both a function and a personality attribute. As a function attribute, entrepreneurship is viewed as any occupation/endeavour that employs the business principles of production, trade and distribution in its operation or undertaking (Bennett et al., 2019; Zucchella & Urban, 2019). Further, entrepreneurs are viewed as people who may not be inventive but as innovators with fresh marketing concepts that can stir economic growth (Juliana et al., 2021). According to Ferreira et al. (2020), the entrepreneur actively employs all sorts of innovative techniques in the economic system to gain a competitive advantage over possible competitors in the market environment. Entrepreneurship is thus essential in economic development because of its quick responsiveness to technological needs and the ability to improve innovation to fulfil demand (Coulibaly et al., 2018). An entrepreneur is also viewed as a self-employed individual who bears the risk and provides for their economic fulfilment. Across various industrial revolutions, the concept has evolved to include the need for adequate administrative or managerial skill sets. From an economic theory perspective, the entrepreneurship literature focuses on the economic value of entrepreneurship and relates the competitive character of overall marketing forces to the entrepreneur's inventive approaches. The argument is that an entrepreneur's inventive abilities stem from their environment and economic conditions, which exist as the leading progression in incremental, experimental, and evolutionary ways (Malerba & McKelvey, 2020).

Selection of indicator variables

The variables/constructs adopted in this study were informed by similar studies by Radipere (2014), Jiménez et al. (2015), Peprah et al. (2017), Kerr et al. (2018), Vasan (2020), Sahinidis et al. (2021), Edwin et al. (2021), Gyimah and Lussier (2021), Saah (2022), as well as del Olmo-García et al. (2023). Common attributes/constructs explaining entrepreneurship were identified from the literature and categorized into four primary constructs/variables: entrepreneurial characteristics, business conception, business realization and business operation. For each variable, measurement items were equally identified from the literature, as shown in Table 2.

Table 2: Variables and measurement indicators informing the conceptualization.

Variable	Measurements indicators	Authors
Entrepreneurial Characteristics	Age influences the ability to run a business	Vasan, 2020; Sahinidis et al., 2021
	Entrepreneur level of education	Jiménez et al. 2015; Saah, 2022
	Personality matches the business	Kerr et al. 2018; Li et al., 2020; Edwin et al. 2021; Meng et al., 2022
	Culture affects the way the business is run	Radipere, 2014; Peprah et al. 2017
Business Conception	Driven by innovations	Hessels, 2019; Ahmad et al., 2022; del Olmo-García et al., 2023
	Conducting market surveys to identify business opportunities	Timmons et al., 2004; Gyimah & Lussier, 2021; Lin et al., 2018; Murphy et al., 2019
	A business plan is prepared before launching the business	Gyimah & Lussier, 2021
	Market completion analysis is considered before the commencement	Timmons et al. 2004; Gyimah & Lussier, 2021
Business Realization	An organizational structure is developed at the time of starting a business	Harlin & Berglund, 2021
	Registering with all necessary institutions	Kumar & Borbora, 2016
	Market partnerships and synergies	Gyimah & Lussier, 2021
	A team of people with the proper knowledge and skill set is constituted to run the business	Ibrahim, 2010; Hessels, 2019; Gyimah & Lussier, 2021
Business Operation	Quality goods and services	Dhaliwal, 2016; Dzogbenuku & Keelson, 2019
	Commitment to business	Wang et al., 2015
	Business satisfaction	Przepiorka, 2017
Community Development	Lowers unemployment levels	del Olmo-García et al., 2023
	Improved health of citizens	Muhammed & Abubakar, 2019
	Improved quality of life in the community	Cusack, 2019; Muhammed & Abubakar, 2019
	Improved level of education	Gyimah & Lussier, 2021; del Olmo-García et al., 2023

The conceptual framework adapted for this study had four independent variables: entrepreneurial characteristics, business conception, business realization and business operation. The dependent variable in the framework is community development. Based on the literature and the preceding theory, the researchers hypothesized that community development is influenced by entrepreneurial characteristics, business conception, business realization and business operation, as presented in Figure 1.

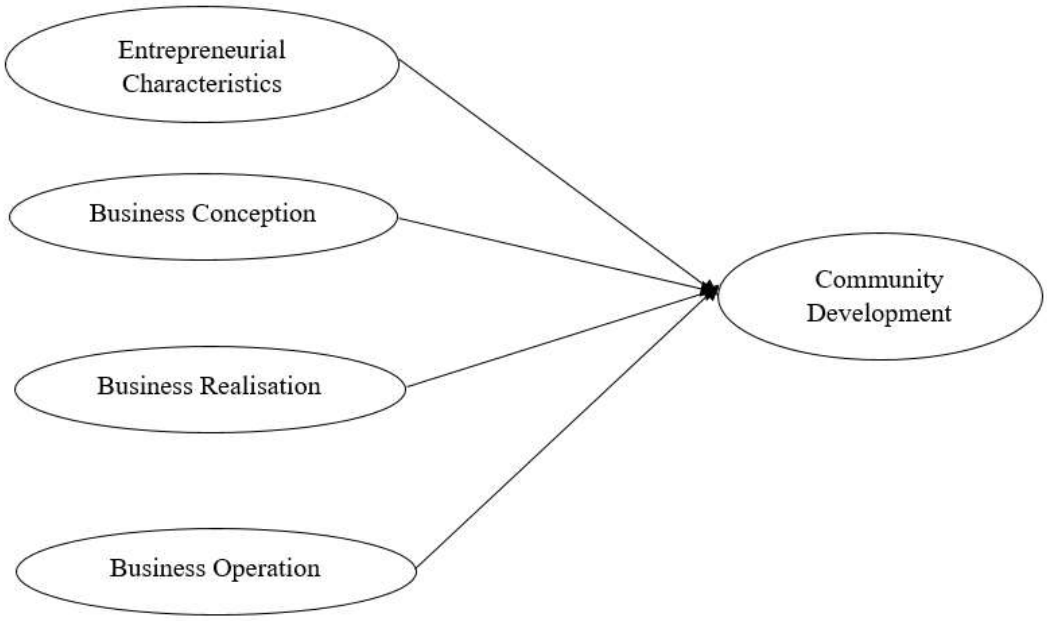

Figure 1: Conceptual framework.

The following four relationships were hypothesized:

Hypothesis 1
Ho: Entrepreneurial characteristics have a considerable influence on community development.
Ha: Entrepreneurial characteristics have no considerable influence on community development.

Hypothesis 2
Ho: Business conception has a significant influence on community development.
Ha: Business conception has no considerable influence on community development.

Hypothesis 3
Ho: Business realization has a significant influence on community development.
Ha: Business realization has no considerable influence on community development.

Hypothesis 4
Ho: Business operation has a significant influence on community development.
Ha: Business operation has no considerable influence on the community.

Research methodology

This study adopted a cross-sectional descriptive design with a quantitative approach. Data were collected using a structured questionnaire containing closed-ended questions from 197 respondents who were purposively sampled and drawn from the rural districts of Copperbelt province. These included entrepreneurs in agriculture, retail (comprising those involved in buying and selling), building construction, transportation business and metal works (welders and fabricators). The extensive literature review informed the development of the questionnaire (instrument) used for the data collection, in which variables used to explain rural entrepreneurship for community development were identified and included in the questionnaire. A summary of the respondents' composition is shown in Table 3.

Table 3: Nature of respondents' businesses.

Business type	n	%
Retail (buying and selling)	45	22.8
Agriculture	48	24.4
Transportation business	15	7.6
Building construction	24	12.2
Mining	3	1.5
Services	22	11.2
Metalworks	5	2.5
Manufacturing	14	7.1
Others	21	10.7
Total	197	100.0

The data were analyzed using exploratory factor analysis, regression analysis and analysis of variance (ANOVA). Factor analysis was carried out to explain the extent to which each item in the dataset was associated with the respective factor (variable). Further, regression analysis was carried out to evaluate relationships between the independent and dependent variables (community development). The hypotheses were tested using multiple regression analysis and standard F and tests at 95% significance level.

Results

Exploratory factor analysis (EFA)

EFA was conducted to assess the uni-dimensionality and reliability of each factor. The extraction and rotation methods of principal components with Varimax rotation were specified. The results revealed that the attributes of all the factors had Kaiser-Meyer-Olkin (KMO) values of 0.605, which is slightly below the 0.7 threshold but still acceptable. Bartlett's test of sphericity was found to be significant (p = 0.000), as shown in Table 4. This indicated that the factor analysis was appropriate (Rehbinder, 2011; Chisumbe et al., 2022). The KMO and Bartlett's test of sphericity are used to determine the suitability of data for factor analysis and whether the variables in the dataset are appropriate for extracting meaningful factors.

Table 4: KMO value.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin measure of sampling adequacy		.605
Bartlett's test of sphericity	Approx. Chi-Square	2242.145
	Df	276
	Sig.	.000

Factor loadings were calculated for each variable. The factor loadings denoted the relationship between the items (statements) under each variable and the extracted components that explained their variation. The items not shown in Table 5 were 'deleted' for not loading at all, double loading and loadings below 0.5.

Table 5: Variables and factor loadings.

Factors/variables	Undeleted items	Factor loadings
Entrepreneurial Characteristics	Age influences the ability to run a business	0.837
	Level of education helps run the operations of the business	0.733
	Personality matches the business	0.880
	Culture affects the way the business is run	0.885
Business Conception	Promotes innovations	0.624
	A market survey is conducted to identify business opportunities	0.548
	A business plan is prepared before launching the business	0.827
	Market completion analysis is considered prior to commencement	0.819
Business Realization	An organization structure is developed at the time of starting a business	0.807
	Register with all necessary institutions such as PACRA, Banks and ZRA	0.875
	Development of market partnerships and synergies	0.788
	A team of people with the proper knowledge and skill set is constituted to run the business	0.510
Business Operation	Market penetration, quality goods or services	0.727
	Commitment to business	0.781
	Business satisfaction	0.835
Community Development	Lowers unemployment levels	0.614
	There is improved health of citizens	0.860
	There is an improved quality of life in the community	0.717
	Improved access to education	0.778

The total variance explained was 84.62%. This implies that a more significant percentage of the variation in the scores on the Likert scale was explained. All these statistics affirm that the data's validity was good, the research instrument was well prepared and the respondents understood the questions. Furthermore, good validity indicates that the research instrument sufficiently evaluated the phenomenon of rural entrepreneurship and community development. Table 6 shows the reliability statistics for the five main variables considered in this research.

Table 6: Reliability statistics.

Variable	Cronbach's alpha	No. of 'undeleted items'
Entrepreneurial characteristics	0.704	4
Business conception	0.837	5
Business realization	0.644	2
Business operation	0.694	3
Community development	0.672	4

Different methods of determining reliability are used by different scholars in different situations and settings to assess the reliability of the data; this study employed consistent reliability. This method involves determination of the Cronbach's alpha coefficient. Entrepreneurial characteristics and business conception had Cronbach's alpha values above 0.7, indicating strong reliability. Business realization, business operation and community development had Cronbach alpha values slightly below 0.7, but they were good enough, as they were above 0.5. Overall, the collected data were highly consistent and reproducible. The respondents answered the questions similarly and consistently.

Regression analysis

The regression analysis evaluated relationships between the four independent variables (entrepreneurial characteristics, business conception, business realization and business operation) and the dependent variable (community development). The strength of relationships was determined by calculating the Pearson correlation coefficient (R). The research model was evaluated using ANOVA and the model summary. All statistics were generated based on a 95% confidence interval. The relationship between each predictor variable and the dependent variable was determined based on the Pearson correlation coefficients. Table 7 shows the Pearson correlation (R) values for each relationship. The P-value to denote the significance of the relationship was calculated for each value of R.

The relationship between entrepreneurial characteristics and community development was positive, linear, slightly above average and significant ($R = 0.645$; $P = 0.000$; $P < 0.05$). The relationship between business conception and community development was positive, linear, weak and not significant ($R = 0.037$; $P = 0.679$; $P > 0.05$). Similarly, the relationship between business realization and community development was positive, linear, weak and not significant ($R = 0.062$; $P = 0.488$; $P > 0.05$). The relationship between business operation and community development was positive, linear, average and significant ($R = 0.648$; $P = 0.000$; $P < 0.05$). The analysis revealed that only entrepreneurial characteristics and business operations significantly influenced community development in the Copperbelt rural area. In contrast, business conception and realization did not significantly influence community development.

The relationships between four demographic variables (gender, age, education level and business tenure) and community development were tested. The statistics in Table 7 reveal that gender had a weak and insignificant relationship with community development ($R = -0.108$; $P = 0.168$; $P > 0.05$). Age had a slightly below average, linear and significant relationship with community development ($R = 0.397$; $P = 0.000$; $P < 0.05$). The highest qualification had an average, linear and significant relationship with community development ($R = 0.538$; $P = 0.000$; $P < 0.05$). Tenure of business had a weak, linear and insignificant relationship with community development ($R = 0.037$; $P = 0.371$; $P > 0.05$).

Table 7: Correlation coefficients.

		Community development	Entrepreneurial characteristics	Business conception	Business realization	Business operation	Gender	Age	Education Level	Tenure of business
Pearson correlation	Community development	1.000								
	Entrepreneurial characteristics	.645	1.000							
	Business conception	.037	.356	1.000						
	Business realization	.062	.271	.134	1.000					
	Business operation	.648	.433	.596	.433	1.000				
	Gender	-.108	-.234	.186	-.528	-.249	1.000			
	Age	.397	.311	.234	.683	.420	-.359	1.000		
	Education level	.538	.373	.181	.265	.579	-.443	.221	1.000	
	Tenure of business	.037	.295	.192	.123	.099	.059	.185	.133	1.000
Sig. (1-tailed)	Community development	.								
	Entrepreneurial characteristics	.000	.							
	Business conception	.679	.001	.						
	Business realization	.488	.007	.117	.					
	Business operation	.000	.000	.000	.000	.				
	Gender	.168	.018	.048	.000	.013	.			
	Age	.000	.002	.018	.000	.000	.001	.		
	Education level	.000	.000	.052	.008	.000	.000	.024	.	
	Tenure of business	.371	.004	.043	.136	.189	.302	.049	.118	.

The combined effect of the predictor variables, entrepreneurial characteristics, business conception, business realization and business operation on the dependent variable was tested, and the related statistics calculated are presented in the model summary shown in Table 8. The overall relationship between the independent and dependent variables was linear, positive and significant (R = 0.727; P = 0.000 < 0.05). The model's coefficient of determination (R square) was 0.528, which shows that the variation in community development explained by the independent variables was 52.8%. The remaining 47.2% of the variation would be explained by factors not considered in this research.

Table 8: Model summary statistics.

Model summary									
Model	R	R-squared	Adjusted R-Squared	Std. error of the estimate	R-squared change	F change	df1	df2	Sig. F change
1	.727[a]	.528	.504	.39430	.528	21.292	4	76	.000

a. Predictors: (constant), entrepreneurial characteristics, business conception, business realization and operation.

ANOVA was another technique used to evaluate the model developed for the research. This was done by evaluating the fit between the conceptualized relationships and the collected data. A summary of the ANOVA statistical results is presented in Table 9.

Table 9: Analysis of variance.

ANOVA[a]						
Model		Sum of squares	Df	Mean square	F	Sig.
1	Regression	13.241	4	3.310	21.292	.000[b]
	Residual	11.816	76	.155		
	Total	25.057	80			

a. Dependent variable: Community development

b. Predictors: (constant), entrepreneurial characteristics, business conception, business realization and business operation

The F-value for the model was significant at a 95% confidence interval with α at the significance level of 0.05. Thus P < α; 0.000 < 0.05. The results indicated that the data suited the model and that the model developed for the current research was significant.

Hypothesis testing

The research tested four hypotheses. The testing was done by comparing the P-values with the significance level (α). Since the confidence level was 95%, the significance level was 5% (0.05). The decision rule for the hypotheses was not to reject Ho, the null hypothesis if its P-value is smaller than the level of significance (P < or P < 0.05). Table 10 shows the null hypotheses for all key relationships, the respective statistics and the conclusion for each test.

Table 10: Hypothesis test statistics.

Null hypothesis	P-Value vs sig. level	Conclusion
There is no significant relationship between entrepreneurial characteristics and community development	0.000 < 0.05	Rejected
There is no significant relationship between business conception and community development.	0.679 > 0.05	Accepted
There is no significant relationship between business realization and community development.	0.488 > 0.05	Accepted
There is no significant relationship between business operation and community development.	0.000 < 0.05	Rejected

Null hypothesis 1: There is no significant relationship between entrepreneurial characteristics and community development, which was rejected empirically (P-value < α; 0.000 < 0.05). It was inferred that there was a significant relationship between entrepreneurial characteristics and community development. On the contrary, null hypothesis 2: There is no significant relationship between business conception and community development, was accepted (P-value > α; 0.679 > 0.05). It was inferred that there is no significant relationship between business conception and community development. Null hypothesis 3: There is no significant relationship between business realization and community development was accepted statistically (P-value > α; 0.488 > 0.05). It was inferred that there was no significant relationship between business realization and community development. Conversely, null hypothesis 4: There is no significant relationship between business operation and community development, was rejected statistically (P-value < α; 0.000 < 0.05). It was upheld as it is and worthwhile to infer that there was a significant relationship between business operation and community development.

Discussion

Influence of entrepreneurial characteristics on community development

Entrepreneurial characteristics had a significant relationship with community development. Its variable coefficient for predicting community development was equally significant. Further, the associated hypothesis: There is a significant positive relationship between entrepreneurial characteristics and community development was statistically supported. The implication is that the attributes of entrepreneurs, such as age, education level, personality and culture, contribute significantly to the ability to do business and community development. Overall, the entrepreneurial characteristics were impactful. The findings are supported by Li et al. (2020) and Meng et al. (2022), positing that to speed up economic development in rural areas, it is essential to build up the critical mass of first-generation entrepreneurs. The characteristics of entrepreneurs in the Copperbelt rural area helped them contribute to community development. These findings agree with Kerr et al. (2018) and Edwin et al. (2021), emphasizing the importance of entrepreneur characteristics on community development.

Influence of business conception on community development

The relationship between business conception and community development was found to be weak and not significant. Furthermore, the hypothesis that business conception has a significant relationship with community development was not statistically supported. The implication is that efforts made at the conception stage of the business were not translating into community development. Another possibility is that the businesses were not effectively defined. This could be attributed to failure to properly document the business idea, poor definition of the business concept and limited knowledge and skills

on the part of some of the businesspeople involved in rural entrepreneurship. This result contrasts with studies by Lin et al. (2018) and Murphy et al. (2019) on the significance of business conception on rural entrepreneurship.

Influence of business realization on community development

The relationship between business realization and community development was found to be weak and not significant. Furthermore, the hypothesis that business realization has a significant relationship with community development was not empirically supported. The implication is that efforts made when realizing or setting up the businesses were not translating into improved community development. Another possibility was that the coordination and organization were not effectively done at the beginning. This could be attributed to limited use of tools such as organization charts, poor formalization of the business with bodies such as the Patents and Companies Registration Agency (PACRA), the Zambia Revenue Authority (ZRA) and banks and limited knowledge and skills on the part of some of the personnel involved in business realization. The finding that business realization did not significantly influence community development is contrary to what Ibrahim (2010) found on the role played by rural entrepreneurship in employment generation, showing that rural entrepreneurship has a high potential for creating new jobs, considering the vast resources in rural areas.

Influence of business operation on community development

Business operation had a significant relationship with community development. Its variable coefficient for predicting community development was equally significant. Further, the associated hypothesis: business operation has a significant relationship with community development was statistically supported. The implication is that the attributes of business operations focusing on commitment, providing quality goods or services needed by the market and having business satisfaction from running the business contributed to overall entrepreneurship and community development. These results suggest that commitment to running a business is significant in explaining entrepreneurship and predicting rural community development. On the importance of commitment, the results agree with Wang et al. (2015). Similarly, the results agree with Dhaliwal (2016) and Dzogbenuku and Keelson (2019) on the need to provide quality goods or services which respond to the market in explaining business operations as an entrepreneur thereby contributing to community development.

Conclusion

This paper reaffirms that entrepreneurship plays a critical role in rural community development, leading to improved living standards, employment opportunities, alleviation of poverty, utilization of local resources and reduction of rural-urban migration. Specifically, rural entrepreneurship is an essential facilitator of economic development, especially in rural areas. The relationship between rural entrepreneurship and community development was assessed in this study, and the findings showed that rural entrepreneurship significantly influences community development in rural areas. Therefore, the authors recommend investing in critical infrastructure such as roads, telecommunications and electricity infrastructure in rural areas to attract entrepreneurs and stimulate rural community development.

Though exciting and valuable findings have emerged from this study, they are not without limitations. Consideration should be given to the following limitations concerning this current study. First, the research was conducted in Copperbelt province only; therefore, it is recommended that a similar research study be

conducted in another geographical location from another developing country. Second, additional factors or constructs can be considered to improve the conceptualized framework.

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Small, local, open, connected: Exploring cosmopolitan localism in sustainable fashion design

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Small, local, open, connected: Exploring cosmopolitan localism in sustainable fashion design

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Abstract

The fashion design sector stands to gain from embracing cosmopolitan localism (CL), allowing designers to merge global trends with local cultures. This strategy fosters distinct, sustainable identities that resonate with their communities. This literature review focused on sustainable fashion design practices, searching the literature in databases that included Google Scholar, IEEE Xplore, ACM Digital Library, SpringerLink and ScienceDirect. The review emphasizes the relationship between traditional craftsmanship, innovation and minimizing environmental impact through global and local collaborations. Of 169 articles that met the basic eligibility criteria—focusing on sustainable practices such as ethical sourcing and consumer engagement—only five authors discussed CL. This reveals a notable gap in the literature regarding the in-depth application and evaluation of CL in sustainable fashion design. Nonetheless, key principles are apparent, such as strengthening supply chain connections to promote ethical practices, fair wages and sustainable sourcing; fostering meaningful consumer relationships through narrative-driven brand communication and values-based messaging to build brand loyalty and encourage lasting purchasing behaviours; and participating in global sustainability initiatives while remaining informed about best practices and industry standards. This clarifies how supply chain dynamics and consumer engagement impact sustainable fashion. This review examines recent applications of small, local, open, and connected (SLOC) principles in sustainability research, emphasizing their role in adapting global influences on local cultures and values. Furthermore, it emphasizes the interrelations among supply chain dynamics, consumer engagement and global sustainability frameworks in promoting a more sustainable fashion industry.

Keywords: Sustainable fashion, Sustainable design practices, Cosmopolitan localism

Introduction

Cosmopolitan localism is a concept that blends global perspectives with a strong connection to local communities (Manzini & M'Rithaa, 2016). It emphasizes preserving and promoting regional cultural diversity while fostering cross-cultural exchange and understanding. Combining global ideas and ethics with local cultural traditions and identities aims to create a sense of belonging to a global community while appreciating local distinctiveness (Corsini & Moultrie, 2021). Cosmopolitan localism originated in the 1990s as a response to "cultural evaporation" (Sachs, 1999). Since then, it has evolved into a framework for sustainable design practices, integrating global viewpoints with local commitments (Manzini, 2011). This approach encourages using local materials, traditional techniques and renewable energy sources to reduce environmental impact while preserving cultural identity (Fiala, 2019). A key concern is that ideas like cosmopolitan localism, which are gaining traction in design, are still quite new in fashion and must establish strong conceptual foundations. In seeking a new direction, an integrated approach to sustainability

recognizes that empowering local communities through sustainable practices may result in a fairer distribution of benefits and help address social justice issues (Schismenos et al., 2020) while also driving a move towards a more inclusive, equitable and resilient fashion industry in which fair trade initiatives dominate. This, in turn, may ensure that producers, especially those in developing countries, receive a fair price for their work, helping to address inequalities in the fashion industry.

To unlock the full potential of cosmopolitan localism in fashion, it is vital to identify and analyze its integration into sustainable fashion practices. Researchers and designers can create more effective strategies for sustainable and culturally relevant fashion by understanding the specific methods aligned with cosmopolitan localism. Investigating the challenges and opportunities of implementing cosmopolitan localism in the fashion sector can guide future research and policy development. There has been a notable growth in publications about sustainable fashion in recent years. The current research reviews the literature to assess how this growth includes a focus on merging global knowledge with local fashion sustainability needs, thereby implicitly reflecting some core aspects of cosmopolitan localism. This article explores the connection between fashion theory and practice, as discussed in the available literature, and the principles of cosmopolitan localism, highlighting its importance for achieving sustainability in the fashion industry. Specifically, this research seeks to answer the following questions:

RQ1 - Which sustainable design practices have been documented within a cosmopolitan localism framework?
RQ2 - How do these practices address sustainability's local environmental, social and economic aspects?

Identifying what might be termed 'cosmopolitan localism' in sustainable fashion practices

Cosmopolitan localism is too imprecise and widely contested to serve as a definitive register of interactions between local communities and other communities, either for a historical empirical inquiry or as an ethical mandate (Simpson, 2005). It is, therefore, not obvious how the idea might have been incorporated into the scholarship of fashion without a deeper analysis of how the ideas that lie implicit in the framing have been discussed in the literature. Without such analysis, it becomes difficult to derive coherent strategies that account for how culture, economy and ecology might be implemented so that the fashion industry might have a less negative long-term influence on the environment, as Moorhouse and Moorhouse (2018) recommend creating in the context of sustainable development, and at the same time so that sound design ideas, such as those discussed by Fletcher (2010), might be conceived and implemented to promote social change and create more sustainable products in the fashion industry.

For example, one solution widely touted has been slow fashion for sustainability and ethical fashion practices (Jung & Jin, 2014), where slow fashion is a vision of sustainability in the fashion industry based on current values and aims (Fletcher, 2010). However, a nuanced understanding of whether and how a proposed solution like slow fashion would incorporate all the variables involved must, of necessity, be based on the acknowledgement that the challenges of incorporating sustainable design practices are broad and multifaceted and that addressing these challenges will require a collaborative effort from designers, corporations, legislators and society (Di Monte-Milner & Breytenbach, 2014). It would seem at first glance that this is almost impossible to do without one of at least two pre-existing circumstances:

- A centralized entity should provide coherent and coordinated guidance for the widespread adoption of slow fashion or
- Develop a conceptual framework that incorporates several factors from different locations and practices within the fashion industry. Such a framework would allow stakeholders to create tailored strategic plans suited to their contexts, promoting better practices (Peirson-Smith & Craik, 2020).

Option 1 is unlikely because no global system currently supports a strategic approach to sustainable design. For sustainable design methods to be successfully implemented, they must encompass environmental, social and economic considerations to mitigate negative impacts on ecosystems and enhance social well-being.

While Option 2 offers a pathway for addressing these challenges, it necessitates a clear understanding of the relevant variables to develop a framework to support efforts to overcome difficulties. This, in turn, could lead to a more sustainable future that safeguards our environment and enhances everyone's quality of life.

Additionally, before advocating for slow fashion as a solution to sustainability, it is crucial to find a creative balance that connects a specific community while remaining receptive to global exchanges of ideas, people and products, which aligns with the principles of cosmopolitan localism. This entails acknowledging the importance of sustainability and recognizing the challenges that hinder the effortless integration of sustainable fashion design practices. A thorough understanding of the fashion industry's landscape is vital to facilitate social innovations that contribute to the establishment of strong, decentralized socio-technical systems, as suggested by cosmopolitan localism. This approach requires examining the interrelation of ideas, culture and physical presence. The current literature review is the starting point for mapping recent research on sustainable fashion design practices. It does so by integrating various theories related to cosmopolitan localism into sustainable fashion design. This includes transcending geographical barriers while preserving local identity and promoting environmental responsibility, as noted in the literature. This framework enables designers to create environmentally conscious clothing that also highlights the unique cultural heritage of their communities.

Identifying and reviewing the literature

The starting point for this analysis is a South African take on cosmopolitan localism, which, in the first instance, lies in a comparative study by Dickson et al. (2016) in consideration of the extent of industry stakeholders' involvement in sustainability and their demand for sustainable apparel and textile products from South Africa. This study demonstrated that several local environmental, social and economic hurdles inhibit sustainable fashion design practices, which suggests a challenge to the universal application of Manzini's (2011) framework for achieving local environmental sustainability. Manzini's (2011) framework, a fundamental contribution to sustainable design, presents a comprehensive approach considering social, environmental and economic factors. This paradigm emphasizes creating products and systems that meet functional requirements and contribute to a more sustainable and fair future (Manzini, 2011). It encourages designers to analyze a product's complete life cycle, from material extraction to disposal, and to seek opportunities to reduce environmental effects while increasing social benefits. Manzini's methodology, which adopts a "systems thinking" perspective, enables designers to produce unique solutions that manage difficult challenges and promote sustainability.

This challenge to universality suggests a need for a deeper exploration of the rich and complex epistemic terrain that encompasses the burgeoning field of sustainable fashion design to better identify the extent to which recent scholarship on sustainability implicitly reflects the tenets of cosmopolitan localism as fostering

community engagement and a sense of shared responsibility for long-term development (see Bonsu et al., 2022; Fiala, 2019; Kossoff, 2019; Opoku et al., 2022; Schismenos et al., 2020).

In an initial informal review, it soon became apparent that only some authors have dealt specifically with its fashion application. This pre-empts the need to illuminate the possibilities and challenges inherent in applying this design philosophy to this domain, grappling with environmental responsibility and cultural expression. The most effective approach for this was deemed to be a comprehensive bibliometric analysis by way of a qualitative literature review and qualitative analysis based on the methodology proposed by Yang et al. (2017), following the steps of review planning, conducting, finding and reporting.

Identifying the relevant studies

The literature was gathered from the Google Scholar, IEEE Xplore, ACM Digital Library, SpringerLink and ScienceDirect databases and the design-specific database, ProQuest Design and Applied Arts Index. We also explored open-access repositories, such as ResearchGate and Academia.edu. Combining these databases ensures a thorough search and captures studies from various academic disciplines and research communities that offer different perspectives on cosmopolitan localism in fashion.

After the initial searches, the results were filtered by publication date, relevance and publication type, such as research articles, book chapters and conference proceedings. We prioritized studies that explicitly addressed the intersection of cosmopolitan localism and sustainable fashion design. We also looked for studies that delve into specific aspects of interest, such as cultural representation, local production systems or environmental impact. Articles that only superficially mentioned social factors, with a significant emphasis on environmental sustainability, were excluded. Later, we used a snowballing technique to analyze references from relevant studies and identify new sources. We further considered grey literature, such as reports, white papers and industry publications.

Several initial broad searches with keywords related to design practices, fashion sustainability and similar words were identified to examine existing knowledge on various sustainability challenges in fashion design. The search period from 2014 to 2024 was used to gain a clear view of the literature over the past 10 years. We identified several studies that examined sustainable fashion in general. Few studies, however, focused on cosmopolitan localism in fashion, while most studies presented case studies of fashion sustainability focused on environmental concerns across the Global North. None of these articles focused on the Global South, particularly Africa. Studies covered China, the United Kingdom and the United States.

Relevant studies were selected using keywords. We started with the core terms *design practices* AND *cosmopolitan* AND *localism* AND *fashion* AND (sustainable OR sustainability OR balanced OR sustainable OR continual OR feasible OR supportable OR continuous OR viable) AND (challenges OR issues OR threat) AND (incorporation OR embodiment OR fusion OR integration).

As this resulted in only a small number of articles, we decided to expand the search to include search terms from the domains of social design and sustainable design, including [[“Fashion”] AND [all: “design practices”] AND [all: cosmopolitan] AND [all: localism sustainable]] OR [all: sustainability] OR [all: a feasible] OR [all: supportable] OR [all: viable] AND [all: challenges] OR [all: issues] OR [All: threat] AND [all: incorporation] OR [all: fusion] OR [all: integration] AND [title: fashion] AND [Title: sustainable] AND [e-publication date: (01/01/2018 to 23/02/2024)]. These searches sought literature at the intersection

of these domains that consider design and social sustainability (see Figure 1). All articles were examined up until February 2024. In Google Scholar, the first two pages for each search were retrieved for screening.

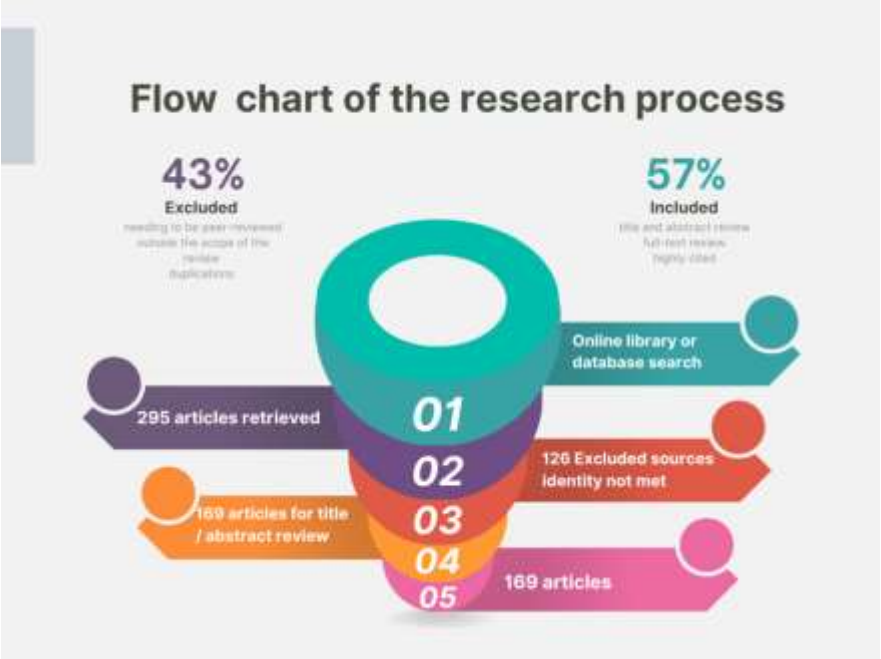

Figure 1: Flow chart of the research process.

The material was found in multiple online libraries and databases, including ScienceDirect, ACM Digital Library, SpringerLink, Google Scholar and IEEE Xplore, and 295 articles were retrieved. The title and abstract screening resulted in 126 sources (80 conference proceedings, 35 books, three book chapters, four reviews and four other reports) being excluded for reasons such as needing to be peer-reviewed, being outside the scope of the review, or being duplicates. This left 169 articles that proceeded to the next stage, in which their titles and abstracts were reviewed, resulting in 169 relevant articles that moved on to a full-text review on the basis that they were highly cited and relevant to fashion design practices and the founding ideas of cosmopolitan localism.

Overview of materials

Most articles are case studies (156 articles), conceptual articles (seven) or review articles (six). This is consistent with the emergent nature of this topic in that many articles are still exploring and clarifying the role of design concerning fashion sustainability.

Regarding the research context, most articles focused on environmental sustainability instead of fashion sustainability. While environmental sustainability addresses a wide range of issues, fashion sustainability specifically targets the fashion industry's environmental impact, with 34 articles not specifying the context. Fashion sustainability seems well suited to community-based projects where social relations are essential in design. The articles focused on projects in the Global North, with only a few from the Global South; however, many articles emphasized the relevance of sustainable fashion in designing for marginalized people. For example, Corsini and Moultrie (2021) noted: "Designers connected to this movement generally focused on disadvantaged industries of society, using alternative and appropriate technology and encouraging an efficient use of resources" (p. 8).

Figure 2: Theoretical illustration of the literature.

Results: Themes that emerged

The content analysis of the final 169 documents selected in the current study gave an overview of the literature supporting the "sustainable design practices" ideas, which were grouped into themes, namely Evaluation of sustainable fashion, Sustainable design practices, Successful adoption of sustainable design practices and Cosmopolitan localism.

Evaluation of sustainable fashion

The evaluation of sustainable fashion will be discussed based on the environmental and social difficulties of implementing sustainable practices within the fashion industry. This presents a shift away from the conventional methods of the fashion industry, which often contribute to environmental and social issues. Sustainable fashion focuses on minimizing the negative impacts of the fashion industry while promoting environmental and social responsibility. Adopting environmentally and socially responsible approaches throughout the whole life cycle of apparel and accessories is called "sustainability in fashion" (Thomas, 2020). Sustainable fashion design is closely aligned with the United Nations Sustainable Development Goals (SDGs). The fashion industry's significant impact on the environment and society drives the need for sustainable design strategies to mitigate these negative effects and foster a more sustainable future. While there are 13 SDGs, this study focuses on the interconnection between SDGs 8 and 9. SDG 8 advocates for sustained, inclusive and sustainable economic growth alongside full and productive employment and decent work. In contrast, SDG 9 aims to develop resilient infrastructure, promote inclusive and sustainable industrialization and encourage innovation. The interplay between strong infrastructure and industrial development is vital for job creation and economic opportunities, which ultimately support SDG 8's decent work and economic growth objectives. Furthermore, a skilled workforce is crucial for driving innovation and establishing a sustainable industrial framework, thus aiding SDG 9. Sustainability in fashion transcends individual components; it encompasses a holistic integration of sustainability principles throughout the

product life cycle. This thorough approach seeks to minimize the industry's environmental footprint and advance ethical practices across the supply chain.

Sustainability in fashion requires addressing multiple interrelated concerns, such as environmental impact, ethical labour practices, the circular economy, social impact and conscious consumerism (Khan et al., 2016). Pioneering works by Fletcher (2008), Sull and Turconi (2008), Clark (2008) and De Brito et al. (2008) initially appeared in the management literature around 2008. This became apparent after the Rana Plaza factory catastrophe on 24 April 2013, which was a tragic and significant event in the history of the garment industry (Ayatullah Hosne Asif, 2017). This eight-storey commercial building in Dhaka, Bangladesh, housed several clothing companies and other enterprises. The collapse resulted in one of the deadliest industrial disasters, claiming over 1100 lives and injuring countless more, primarily garment workers. This tragedy brought global attention to the unsafe working conditions and labour rights issues prevalent in the global garment industry, especially in developing countries like Bangladesh, a central hub for clothing production. The disaster catalyzed a significant shift towards sustainable fashion and ethical industrial practices (Ayatullah Hosne Asif, 2017).

The literature indicates that sustainability in fashion requires a comprehensive vision to identify opportunities for sustainable practices in fashion and design. This vision transcends focusing on just one industry element, highlighting the importance of a holistic and integrated approach. Central to this vision are sustainable design practices that foster the creation of fashion products that are environmentally and socially responsible, paving the way for a more sustainable future in the industry. Seasonal trends can impose restrictions on clothing design, limiting silhouettes and constraining creative concepts. Designers often draw motivation from challenges—such as difficult situations or disagreements—alongside opportunities for improvement or for introducing ideas previously overlooked. The effectiveness of sustainable design practices is heightened when they adopt an integrated approach throughout the product development journey. This broad perspective guarantees that environmental and social sustainability are embedded in the product's foundation, leading to more responsible, innovative and competitive offerings in a dynamic market. Thus, designers must recognize the potential outcomes of their design choices, underscoring the critical role of design function. Design decisions can have profound effects on fashion practices. Over the past two decades, sustainable design approaches have gained significant recognition, urgency and acceptance.

An overview of the structural development of the industry must be examined to research new design approaches and ways to produce value (Ræbild, 2021). Examining the fashion industry's structural evolution will enable designers and researchers to better understand sustainability-related challenges and opportunities within the sector. This insight can guide the creation of innovative design methods and strategies tailored to each country, fostering value that aligns with environmental and social sustainability objectives and ultimately promoting positive transformation in the fashion industry (see Fletcher, 2010). Textile and apparel production volumes have altered substantially during the last decade. However, there is inadequate research to identify the hurdles and challenges in putting sustainable design into practice (Hur & Cassidy, 2019). To overcome these challenges and promote sustainable design in fashion, increased research, collaboration and information sharing are essential. Researchers, practitioners and policymakers should unite to close the research gap, establish and advocate best practices and foster transparency and accountability across the industry. Such collaboration is crucial for steering the fashion sector towards more sustainable and responsible methodologies. South African fashion designers can enhance their environmental responsibility by incorporating transformable design techniques, such as garments that offer two or more functional and aesthetic variations (Rahman & Gong, 2016).

Sustainable design practices

Sustainable fashion design focuses on how designers can influence change through their main collection practices and their alignment with life cycle design strategies. Designers are crucial in promoting sustainability by making informed material choices and designing garments that last. When considering the social aspect of sustainable fashion, two important points emerge:

- There is a notable lack of consumer awareness about sustainability and relevant information on fashion products;
- The aim is to enhance consumer understanding of sustainability through effective communication, especially within South Africa.

Sustainable fashion design requires actions at each stage of the design process, from concept development to strategies for sourcing, recycling, reusing and repairing materials and new production technologies (Ban, 2020). Emphasizing the importance of integrating sustainability into the design process, designers must adjust their mindsets to function as promoters for the industry's transformation (Agarwal, 2020). Sustainable design practices, such as zero waste, upcycling and reconstruction can be applied in fashion education to prepare the next generation of designers to address industry challenges and opportunities (Medcalfe & Miralles Miro, 2022). The fashion industry has faced significant challenges in balancing global sustainability goals with local community needs. While numerous global practices, such as design for sustainability, grassroots innovation, frugal innovation and transition design, have been developed to address these challenges, a disconnect between these approaches and local realities must often be addressed.

There is a strong correlation between sustainable practices and financial performance in fashion companies, showing that increased sustainability results in improved economic outcomes (Kam & Yoo, 2022). To ensure sustainability control within the entire fashion design cycle, all manufacturing processes, including finishing, should be conducted within a fashion company or a partnership company that can control every manufacturing process to ensure sustainability. Customers need help to distinguish between sustainable and non-sustainable fashion products due to the non-transparent labelling method used even for sustainable fashion (Daukantienė, 2023). This literature revealed the various global practices proposed for sustainable fashion, delving into the concepts of design for sustainability, grassroots innovation, frugal innovation and transition design, examining their potential contributions to sustainable fashion. By understanding these approaches, we can gain valuable insights into how to bridge the gap between global sustainability goals and local community needs within the fashion industry.

Successful adaptation of sustainable design practices

To develop a sustainable fashion industry, new technologies must be incorporated, collaborative consumption must be practised and existing clothing must be upcycled. Arrigo (2021) highlights that collaborative consumption provides an affordable and sustainable form of consumption. New technologies, such as microbial enzymes and bio-pigments, offer opportunities to minimize the environmental impact of textile production (Mazotto et al., 2021). Additionally, upcycling existing garments, as advocated by Gupta et al. (2021), can contribute to a more sustainable approach to fashion design. According to Murzyn-Kupisz and Hołuj (2021), fashion designers play a crucial role in making fashion more sustainable. Comprehensive fashion education should equip designers with the necessary knowledge and skills. It is possible to develop a theoretical framework that addresses the sustainability problem in the fashion industry by incorporating aspects such as collaborative consumption, technological advancements and upcycling to encourage sustainable design practices (see Monyaki & Cilliers, 2023).

Fashion sustainability aims to turn the fashion industry into a more responsible and ethical system, combining environmental preservation, social equality and economic viability (see Mukendi et al., 2020). This holistic strategy considers the entire life cycle of fashion goods and aims to benefit both people and the environment (Adamkiewicz et al., 2022). According to the literature, sustainability is usually related to contributions to economic, ecological and social factors (see Daukantienė, 2023). Despite well-documented negative environmental repercussions, the contemporary fashion system is still based on industrial capitalism, which is increasing resource throughput; in contrast, business, cultural tastes and ideas on desirability and realism all influence fashion purchasing (Fletcher, 2012).

This study suggests that more than technological innovations are needed to achieve true sustainability in the fashion industry. While technology can improve efficiency and reduce environmental impact, it may only address some underlying issues. This research emphasizes the importance of adopting the small, local, open and connected (SLOC) approach, which involves reducing environmental impact and improving quality control, shortening supply chains, reducing transportation emissions and supporting local economies. It also fosters collaboration, knowledge sharing and transparency within the industry and creates strong relationships between designers, artisans, consumers and communities (Radclyffe-Thomas, 2018).

Cosmopolitan localism

The literature highlights subtle distinctions in how sustainability interrelates with cosmopolitan localism and recent innovations that could reduce the environmental footprint of fashion design practices. Engaging with sustainable fashion through cosmopolitan localism reveals key areas such as sustainability education, competitive careers within the sustainable fashion sector and eco-friendly alternatives to traditional design methods. Achieving sustainability requires enhancing our quality of life while adopting sustainable practices, using fewer natural resources and revitalizing our physical and social environments. (Mukendi et al., 2020). SLOC are the characteristics that drive cosmopolitan localism (Manzini & M'Rithaa, 2016). These constructs emerged from over two decades of dialogue and real-world experiences, proving that sustainable solutions can be achieved by starting with local concepts and the communities they serve (Semi, 2021). While enhancing the technical components of fashion design is crucial, more is needed to solve the industry's sustainability concerns. Merging global trends with local production (cosmopolitan localism) is a start in the right direction, but true sustainability requires an emphasis on eco-friendly materials and ethical manufacturing techniques. The literature should still contextualize these trends from the fashion design perspective. The SLOC characteristics offer a valuable framework for discovering sustainable solutions, emphasizing the importance of local involvement, community participation and small-scale initiatives that foster human connections, democratic processes and a sense of belonging (Mukendi et al., 2020). The four keywords encapsulated in SLOC characterize these emergent qualities and the cases of socio-technical innovation on which they are based.

Small, local, open and *connected* and their consequences are easily understood but provide a new picture of how a sustainable, networked society may take shape. Fletcher and Vittersø (2018) suggest that the emerging concept of sustainability contains valuable insights to support a local fashion movement. By explicitly understanding how it can redirect what is made and bought by bending it towards more diverse practices and small-scale producers with regional supply networks, we can show how cosmopolitan localism manifests in fashion design practices from a sustainability perspective.

In fashion, being localized, small, connected and open to others' ideas, culture and physical presence promises social innovations that actively contribute to realizing resilient, distributed socio-technical systems (Manzini & M'Rithaa, 2016). Cosmopolitan localism may describe the complicated relationship between being small and being open. Examining the "complicated relationship" between being local and open can lead to an original and insightful contribution to the field (Manzini & Cipolla, 2021, p. 391). The

industry can view the relationship between its broader social and environmental contexts through a cosmopolitan localism lens and respond with a systems-based approach that integrates the design of everything from the concept stage through design and development to clothing production in the design of fashion clothing (see Manzini & M'Rithaa, 2016).

Discussion

The literature review revealed a growing interest in sustainable fashion design, focusing on environmental and social impacts. However, a significant gap exists in integrating global sustainability frameworks such as design for sustainability, grassroots innovation and frugal innovation with local, community-based approaches. Integrating cultural elements into fashion design raises important cultural intellectual property rights considerations. Respecting and acknowledging communities' cultural heritage and ensuring fair compensation for using traditional knowledge and designs is crucial. By understanding and respecting cultural intellectual property rights, designers can create sustainable fashion that celebrates diversity and promotes social justice. While these approaches share a common goal of promoting environmental and social responsibility, their specific focus and implementation strategies differ. Design for sustainability emphasizes an integrated approach to the entire product life cycle, while grassroots innovation prioritizes local solutions and community engagement. Frugal innovation focuses on resource efficiency and affordability, and transition design seeks to guide systemic change.

A significant gap in the existing literature is the lack of a comprehensive framework that integrates social design, sustainable design and cosmopolitan localism within the fashion industry, particularly in South Africa. While numerous studies have explored individual aspects of sustainable fashion, there is a need for a more holistic approach that considers the interconnectedness of these elements. This research addresses this gap by proposing a framework combining cosmopolitan localism principles with sustainable design practices. It highlights three key areas: ways to address local environmental, social and economic aspects, key challenges and opportunities for implementing sustainable design practices and sustainable design practices in a cosmopolitan localism framework. These findings provide critical insights into developing economies' challenges in transitioning to sustainable practices.

Ways to address local environmental, social, and economic aspects

Establishing strong relationships within the supply chain is crucial for implementing the SLOC characteristics for cosmopolitan localism in fashion design, ensuring ethical practices and sustainable sourcing. Building authentic connections with consumers through transparent communication and value-driven messaging can foster brand loyalty and promote sustainable consumption. Participating in global sustainability initiatives helps to stay updated on best practices and industry standards. While significant research exists on sustainable fashion, there needs to be a greater understanding of specific design practices and their implementation within a cosmopolitan localism framework. This study aims to bridge this gap by providing a comprehensive overview of design practice modes, identifying key features, barriers and opportunities, and outlining research themes and sub-themes explored in previous studies. By addressing these knowledge gaps, this research contributes to a deeper understanding of sustainable fashion design practices and their potential to drive positive change within the industry.

Key challenges and opportunities for implementing sustainable design practices

Although many fashion designers support the idea of sustainability within local fashion design companies, the findings still mention the key challenges, such as the high expense of these practices, which makes them very disheartening to adopt fully. Key challenges in implementing sustainable design practices in the fashion industry include the high cost of sustainable materials, the complexity of supply chains and the need for consumer awareness and demand for sustainable products (Smith et al., 2014). Balancing aesthetic appeal with environmental and social responsibility can be challenging. However, opportunities

abound. Fashion designers can create stylish and eco-friendly garments by embracing sustainable materials, innovative design techniques and circular economy principles (Ceschin & Gaziulusoy, 2016). Working with ethical suppliers and openly sharing sustainability initiatives with consumers fosters trust and encourages demand. By investing in research and development, businesses can achieve remarkable innovations while supporting local communities, enhancing supply chain resilience and minimizing environmental repercussions. Increased collaboration between global strategies and local actions is vital to bridging the divide between theory and practice (Braungart, 2021). This entails encouraging collaboration among international organizations, governments, corporations and local communities to create and implement globally relevant and locally adaptive plans. We can expedite the transition to a more sustainable fashion business by combining global initiatives with local needs and capacities. SLOC is a potential solution that emphasises quality control, decreased environmental impact, improved community connections and increased design creativity. By incorporating SLOC principles, the fashion industry can transition to a more sustainable and ethical future.

Sustainable design practices in a cosmopolitan localism framework

Integrating sustainable design into a cosmopolitan localism framework provides a promising solution to the intricate challenges in the fashion industry (Opoku et al., 2022). This approach merges global insights with localized actions, encouraging innovation, community involvement and environmental stewardship. These findings corroborate the results of previous studies that have shown the absence of a comprehensive and integrated framework that unifies concepts and principles from social design and sustainable design within cosmopolitan localism (see Bonsu et al., 2022; Fiala, 2019; Kossoff, 2019; Opoku et al., 2022; Schismenos et al., 2020). The power of the SLOC principles lies in their ability to paint a visionary picture of a better future for society when considered as a whole. While the individual components of SLOC might be readily understandable, their full impact and feasibility become evident when significant forces for change come into play. This finding corroborates Bonsu et al.'s (2022) observations in their article "Cosmopolitan localism as a research framework for sustainability in graphic design practices".

Future research should regard cosmopolitan localism as a design trend emphasizing aesthetics and production techniques. In contrast, the present study identifies cosmopolitan localism as a research paradigm that serves as a framework for analyzing and comprehending the entire fashion industry. It underscores the necessity for stronger links between social design, sustainable design and cosmopolitan localism. This study suggests that this integrated approach could foster meaningful change. While traditional research often focuses on problem identification, this study prioritizes the potential to create actionable insights. Consequently, it offers practical recommendations for the fashion industry to enhance its responsibility and influence by exploring the connections among social, sustainable and cosmopolitan local practices. Recognizing the fashion industry's entrenched issues, this study aims to transcend superficial changes by proposing solutions that tackle these fundamental challenges using cosmopolitan localism as its guiding principle.

The findings highlight the drawbacks of depending exclusively on technology while stressing the importance of a small, local, open, and connected strategy. Over years of discussion and implementation, the SLOC principles have become a key framework for sustainability. As expressed by others, the SLOC model emphasizes local expertise and community involvement as essential foundations for sustainable solutions. Although technological innovation in design is vital, it alone cannot ensure total sustainability. Genuine sustainability, as suggested by various scholars, requires a comprehensive approach that includes cosmopolitan localism, merging global trends with localized production by utilizing environmentally friendly resources and ethical manufacturing methods. Consequently, the SLOC approach emphasizes the crucial contributions of local communities and small-scale production. While the existing literature often prioritizes

technology for achieving sustainability in the fashion sector, this study advocates a more comprehensive strategy, asserting that incorporating SLOC principles is essential to tackle the diverse sustainability issues facing the industry effectively.

Conclusion

Effective local initiatives and community collaborations can implement sustainable design practices, such as sourcing eco-friendly materials, ensuring ethical production and applying circular economy principles. Moreover, fusing traditional craftsmanship and local cultural elements into contemporary designs leads to unique and sustainable fashion products. However, challenges such as a lack of awareness, limited resources and infrastructure constraints may hinder the implementation of sustainable design practices in South Africa. Promoting education and awareness campaigns, providing financial support and incentives and investing in sustainable infrastructure are essential to overcome these challenges. By working together, designers, manufacturers, consumers and policymakers can drive the fashion industry towards a more sustainable and equitable future.

Future research should expand upon the newly defined sustainable fashion design practices. Despite the useful framework provided by Mukendi et al. (2020), pinpointing a precise definition of sustainable fashion in the existing literature proved challenging. Their definition serves as a solid foundation, yet it solely addresses social sustainability in design, omitting the potential for achieving social sustainability through design. After conducting this literature review, we propose that sustainable fashion design practices encompass designs that enhance individual well-being and support societal prosperity now and in the future, thereby establishing a framework for guiding future studies. The literature points to the complex but essential process of developing relevant metrics, strategies and tools necessary for implementing sustainable design principles (see Bonsu et al., 2022; Fiala, 2019; Kossoff, 2019; Opoku et al., 2022; Schismenos et al., 2020).

For example, Smal (2017) re-evaluates the strategies for environmentally sustainable fashion design practices. Hanusch and Birkhofer (2010) emphasize the necessity for practical tools and approaches that support social sustainability during product development. Although they do not provide a detailed methodology, their analysis of socially sustainable products offers a valuable starting point. Gomes de Oliveira et al. (2022) highlight the substantial gap between sustainability practices and their attractiveness to consumers. While their emphasis on health and safety is significant, it is essential to include a broader perspective on social sustainability, covering aspects such as community health, fair labour practices and cultural preservation, as emphasized by Bonsu et al. (2022), for a more comprehensive understanding. This limited focus highlights the urgent need for broader frameworks, such as the SLOC model, which acknowledges the interconnectedness of social, cultural, economic and environmental aspects within sustainable fashion design.

This study examines how interconnected local strategies shape design decisions in the fashion industry, displaying their potential to reduce environmental impact while remaining globally relevant. It provides a comprehensive summary of sustainable fashion design approaches, supported by an extensive literature review. However, it is important to recognise the constraints of the selected research method. Further investigation into the practical applications of cosmopolitan localism is essential. Designers must critically assess its various facets and address its implementation challenges. Considering the current emphasis on qualitative case studies, interviews, literature reviews, quantitative experiments and survey research in sustainable design, developing a unique theoretical framework offers a promising avenue for future

research. A theory-based approach could significantly enhance the understanding and application of sustainable fashion design practices.

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3D woven denim as an exemplary design manufacturing technique to shape sustainable fashion ecosystems

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3D woven denim as an exemplary design manufacturing technique to shape sustainable fashion ecosystems

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Abstract

Today's fashion industry is marked by rapid production, early disposal and low-quality materials, resulting in environmental harm and social injustice. Denim production involves a resource-intensive and extended supply chain with entrenched design practices, leading to substantial pre-consumer waste. To address these issues, emerging design manufacturing techniques hold promise for fostering alternative sustainable fashion ecosystems yet remain largely underexplored by the industry. The current work focuses on 3D weaving, an innovative niche design manufacturing technique that enables the production of near-complete garments, facilitating zero waste and reducing labour-intensive steps at the cut-and-sew stage. Employing a qualitative approach informed by the literature and empirical research with denim industry professionals, this study investigates the potential of this novel design manufacturing technique in the context of systemic change beyond merely introducing technological advancement as an intervention in the existing industry. The analysis reveals four fundamental components: industry-led change, relocalisation, reimagining denim design roles and consumer communication. These key components, synthesised with the literature, are discussed respectively. We illustrate how the niche design manufacturing technique can shape novel fashion ecosystems by providing an exemplary concept which concerns the collaborative establishment of a small-scale local supply chain for 3D woven denim garments. Through this example, we aim to ignite discussions on a further reimagining of the fashion industry, utilising similar alternative lenses that prioritise sustainability over ultra-speed, high efficiency and mass production in alignment with the United Nations Sustainable Development Goals 9 (Industry, Innovation and Infrastructure), 12 (Responsible Consumption and Production) and 17 (Partnerships for the Goals).

Keywords: Local production, Sustainable fashion innovation, Systemic change, Zero waste, 3D weaving

Introduction

With brands driving mass-produced, trend-driven and seasonal fashion, a constant fast fashion cycle is perpetuated, in which clothing is rapidly produced and disposed of (Niinimäki et al., 2020). In denim, fashion brands have sought to reduce market risks and enhance profitability by shifting their apparel manufacturing to lower-income countries (McCormick et al., 2014). This strategic move allows them to optimise costs while disguising the resource-intensive, complex and geographically dispersed supply chain involved in denim production and the accompanying significant social and environmental implications (Bick et al., 2018). Moreover, consumer attitudes have shifted, prioritising price over clothing heritage, so that impulsive and fast purchases of low-priced, disposable fashion dominate the landscape (Allwood et al., 2006; Niinimäki et al., 2020).

Over the past decades, it has become evident that the linear economic model in the fashion industry, characterised by high resource consumption, significant pre- and post-consumer waste and social injustice, is unsustainable (Niinimäki et al., 2020). To address the issues embedded in the 'make-take-waste' system, the concept of a circular economy, which aims to close energy and material loops, thereby eliminating waste and pollution, has gained significant attention. However, the fundamental design of denim products raises a crucial question, as its aesthetic expression has remained unchanged over the past 150 years. Conventional patternmaking for garments generates significant pre-consumer waste, with estimates suggesting that 10%–15% of the fabric is discarded during this design process (Enes & Kipöz, 2019). The cut-and-sew stage accounts for 15.6% of a garment's overall environmental impact throughout its lifecycle (Wennberg & Östlund, 2019), and this pre-consumer waste is often immediately sent for incineration or to landfill (Enes & Kipöz, 2019; Niinimäki et al., 2020). The persistence of such practices can be viewed as a design flaw, where the significance of introducing changes from the design stage is reinforced due to approximately 80% of a garment's environmental footprint being solely determined during this stage (Östlund et al., 2020). Exposing this design flaw becomes even more critical with the growing enforcement of the EU Extended Producer Responsibility policy, such as the 2023 Dutch enactment, which emphasises transparency, waste management, eco-design and product redesign (Ministerie van Infrastructuur en Waterstaat, 2023). The current work addresses the subsequent need to reassess the design and manufacturing processes associated with this long-standing and current fashion staple.

Alternative approaches are increasingly being explored to mitigate pre-consumer waste in garment design and production. The innovative niche design manufacturing technique of 3D weaving has disruptive potential and remains somewhat underexplored. 3D weaving can generate complex textile-based forms while weaving by utilising contemporary jacquard machinery (i.e. looms) to produce multi-layered, locally varied textile structures. By incorporating woven 'seams' into the structure, cutting open specific layers can generate larger fabric pieces that would typically require the joining or sewing of separate panels. As a result, the garment's form and function is integrated into its textile design, reducing the need for machining, minimising material wastage and streamlining the lay-up process (McQuillan, 2020). Figure 1 presents a simplified overview of the fabrication process and its potentially disruptive qualities to demonstrate how the 3D weaving approach facilitates a more sustainable manufacturing process. The technique generates a unique aesthetic through a radically different approach to pattern creation and output, challenging the enduringly uniform appearance of denim over the past decades. Considering alternative perspectives allows for questioning not only the conventional methods of textile design and manufacturing but also how they might enable entirely new ecosystems. This opens an opportunity to fundamentally reimagine the fashion industry, diverging from the paradigm of large-scale and hyper-efficient global production.

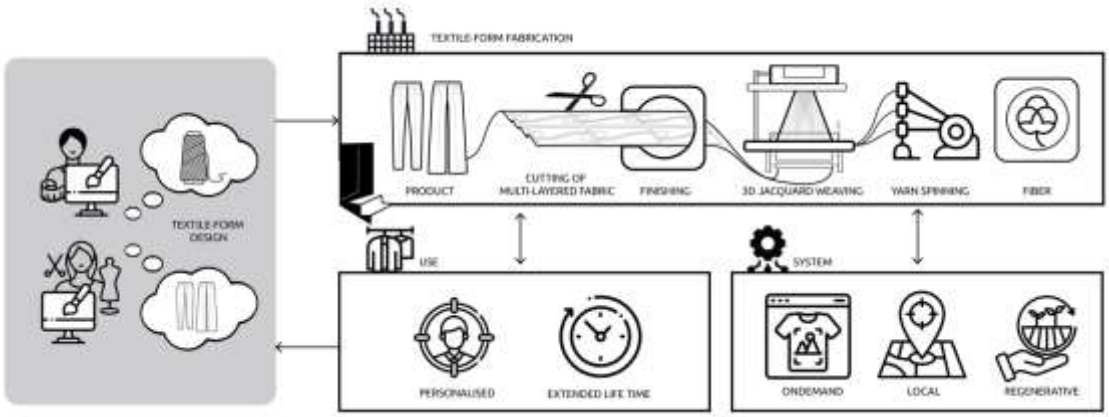

Figure 1: Simplified overview of the 3D weaving process and its potentially disruptive qualities.

Therefore, the current research aims to understand how a novel design manufacturing technique can shape more sustainable models for fashion through a systemic lens rather than relying solely on technological interventions within the existing fashion ecosystem, with the overall aim of fostering a debate on envisioning alternative pathways to industry transformation.

Related work

The next section introduces related work on 3D weaving and on systemic approaches toward fashion transitions, as well as on-demand production and relocalisation of supply chains. The section concludes by identifying a knowledge gap.

3D weaving

Notably, researchers and professionals in textiles and fashion are increasingly intrigued by the possibilities of 3D weaving, as exemplified by the work of McQuillan (2020), who has conducted experiments in creating zero-waste garments using weaving techniques, such as a T-shirt and trousers. Similarly, Vroom's (2022; as cited in McQuillan et al., 2023) 3D woven denim jackets demonstrated promise for more sustainable denim design (see Figure 2). However, limitations within currently available looms prevented them from achieving complete zero-waste goals at this early research stage. Furthermore, Weffan's (Slater, 2023) endeavour to establish a consultancy for 3D woven garments and Unspun's development of a specialised loom for automating 3D weaving, alongside their recently secured funding of $32 million to support expansion (Ewen, 2024), show a commitment to advancing this innovative technique. It is crucial to note that the current exploration of 3D weaving remains primarily within the realm of research, concentrating on material-driven design and production process enhancements. This emphasis overlooks its potential for broader transformation within the fashion industry.

Figure 2: A 3D woven denim jacket designed by Vroom (2022).

Related work in systemic approaches toward fashion transitions

Numerous initiatives have addressed the present challenges within the fashion industry and achieved transformative goals through a comprehensive, systemic perspective. One prominent example is Mistra Future Fashion, an European Union (EU)-funded project congruent with the EU's ambitious objective of establishing a fully circular fashion system by 2050 (European Commission, 2022; Wennberg & Östlund, 2019). Mistra Future Fashion investigates the promotion of sustainable consumer behaviour, policy change and enhancement of recycling processes for post-consumer textiles, thereby facilitating the transition from a linear to a circular and sustainable industry (Wennberg & Östlund, 2019). However, absent from this comprehensive approach is the incorporation of innovative and distinct techniques that hold the potential to play a pivotal role in steering the fashion industry towards alternative, reimagined holistic design manufacturing systems.

Recently, the Ellen MacArthur Foundation published *The Jeans Redesign*, a resource offering guideline for redesigning jeans that conform to circular economy principles. This report outlines specific design requirements for achieving goals related to durability, material selection, labour, ecosystem well-being and user empowerment through repair knowledge, as well as services, recyclability and traceability (Ellen MacArthur Foundation, 2023). However, a significant aspect of the textile industry's journey towards circular economy goals remains unaddressed: the generation of pre-consumer waste during the cut-and-sew process. Consequently, the systemic approach employed in the report can be deemed not yet 'fully complete*'.*

On-demand production and relocalisation

Given the lack of transparency and unethical practices in today's outsourced fashion supply chains, relocalisation is imperative. As Amed et al. (2019; 2022) emphasise, brands must reevaluate their growth strategies to suit specific geographic contexts better. Additionally, the problem of

overproduction - a staggering 30%-40% of all apparel (Magnusdottir, 2020) - stemming from brands creating consumer demand necessitates a shift towards on-demand production. On-demand production is well-suited for micro-manufacturing environments, where responsive, local demand-driven manufacturing is practical. This manner of production aligns with previous initiatives in reshoring textile production in the UK (Postlethwaite et al., 2022), emphasising the importance of establishing innovative, localised centres through reshoring efforts.

Due to its streamlined supply chain and integrated design manufacturing process, 3D weaving is well suited for micro-manufacturing and on-demand contexts. Exploring upskilling is essential for navigating the challenges of a forward-thinking industry (Postlethwaite et al., 2022). Establishing newly situated design-to-consumer models could serve as a foundation for further exploration of methods like 3D weaving, focusing on automation, efficient 3D prototyping, on-demand production and precise sizing requirements.

The examined related work suggests a gap. Effectively transforming the fashion industry demands a departure from current production practices and requires the redesign of multiple interconnected system facets (Murphy, 2022), redistribution of power dynamics, covering of actual costs and redefining perceptions of what is considered ‘fashionable’. The related work shows elements of importance in moving towards a more sustainable fashion system, either through addressing circular economy approaches focused on closing loops in later stages or through systemic design approaches in general aspects of the textile system. However, explicitly investigating how these different approaches tie in together and how interconnected system elements can be leveraged to exhibit the potential of niche innovative methods like 3D weaving towards reaching a window of opportunity (Geels, 2002) has not yet been illustrated. The necessary considerations and steps remain unclear, especially within the context of the ubiquitous yet rigid and deeply entrenched denim industry, presenting a significant gap to explore.

Given the unsustainable nature of the present fashion industry and the growing demands for transparency, on-demand production and circular economy practices, the current work explores alternative models that respond to these needs rather than current fast fashion principles. As 3D weaving emerges as a promising example for displaying how emergent techniques can stimulate more sustainable fashion models, critical components to unlock its potential will be clarified within the context of systemic change.

Methodology

The current study employs a qualitative approach that combines the literature and empirical research with various experts in the denim industry, incorporating both semi-structured and unstructured interviews, as well as co-creative sessions. The research addresses the question: What critical components are essential to unlock the potential of 3D weaving for alternative fashion design-to-consumer models in the denim industry?

The literature review informed the setup of semi-structured interviews with denim industry professionals. We maximised opportunities for unstructured interviews in casual settings, allowing for spontaneous interactions, by bringing a sample 3D woven structure by Vroom (2022) to present

the technique (see Figure 3), while benefiting from the principal researcher's familiarity with the semi-structured questions.

Figure 3: Sample of a 3D woven denim structure.

Based on the findings, we conducted an expert session with the research team to distil the key components necessary for fostering new fashion ecosystems. To mitigate the influence of the principal researchers' subjective interpretation, the findings were cross-referenced with the existing literature and scrutinised by the research team. Following Guest and McLellan (2003), a thematic analysis was performed, applying inductive codes to the qualitative data and clustering them to identify themes and patterns.

The analysis revealed critical considerations for implementing novel sustainable fashion models and informed how 3D weaving can be systematically leveraged for its potentially disruptive capabilities, providing insights for the industry. Additionally, co-creative sessions were held with industry professionals during a field visit. The previous considerations and the results of co-creative sessions, which were analysed in keeping with Sanders and Stappers (2012), were translated into a design. The design illustrates how emerging techniques can stimulate more sustainable fashion models from fashion design to consumer, particularly in the form of a local 3D weaving ecosystem. The Netherlands, where the research was initiated, serves as a relevant exemplary context due to its specialised knowledge in 3D weaving and established partnerships within the local textile industry. The House of Denim, a Dutch foundation interviewed in the study, could serve as another leverage point, as it already supports innovation through collaborations with researchers, brands and mills in the Dutch denim community.

We used the collected data according to Table 1, which demonstrates an overview of the research activities of the broader study in chronological order. However, the research relating to a user study, autoethnographic research and an additional interview was used solely to validate the proposed local 3D weaving ecosystem. These activities are part of a larger study on fostering sustainable fashion models and will be discussed in future publications.

Table 1: Overview of qualitative research methods.

Data collection method	Research source	Duration	Data analysis
1. Literature review	A broad range of empirical and theoretical articles selected.	-	Integrative review (Kutcher & LeBaron, 2022), deductive analysis for interview themes.
2. Semi-structured interviews	Industry experts at Kingpins Show: denim designers and brands, mills, sustainable material experts, traceability and certification experts, House of Denim and 3D weaving experts (n = 15).	20–90 minutes	Interpretivist, inductive coding, thematic analysis.
3. Unstructured interviews	Denim designers, representatives from Tonello and members from the educational field associated with two UK universities present at the Blackhorse Lane Ateliers (a UK-based denim mill) during an event (n = 18). Denim design and history professional (n = 1).	10–30 minutes over 4 hours Approximately 8 hours	Interpretivist, inductive coding, thematic analysis.
4. Co-creative sessions and semi-structured interviews	Industry experts during a field visit to Diamond Denim by Sapphire, a vertical denim mill based in Lahore, Pakistan (n = 8).	60–120 minutes	Interpretivist, inductive coding and thematic analysis according to "Analysis (clustering) on the wall" (Sanders & Stappers, 2012).
5.Semi-structured interviews	Users of 3D woven denim jacket (n = 20).	45–60 minutes	Interpretivist, inductive coding, thematic analysis
6.. In-depth auto-ethnographic research	Users of 3D woven denim jacket (n = 10).	4 weeks	Deductive analysis, autoethnographic research diary; interpretivist, inductive coding, thematic analysis.
7. Semi-structured interview	Expert in supply chain traceability (n = 1).	60 minutes	Interpretivist, inductive coding, thematic analysis.

Towards sustainable fashion ecosystems

Figure 4 displays the four key components – industry-led change, relocalisation, reimagining denim design roles and effective consumer communication – found essential for unlocking the potential

of 3D weaving through implementing alternative fashion models in the denim industry, with some components addressing multiple topics.

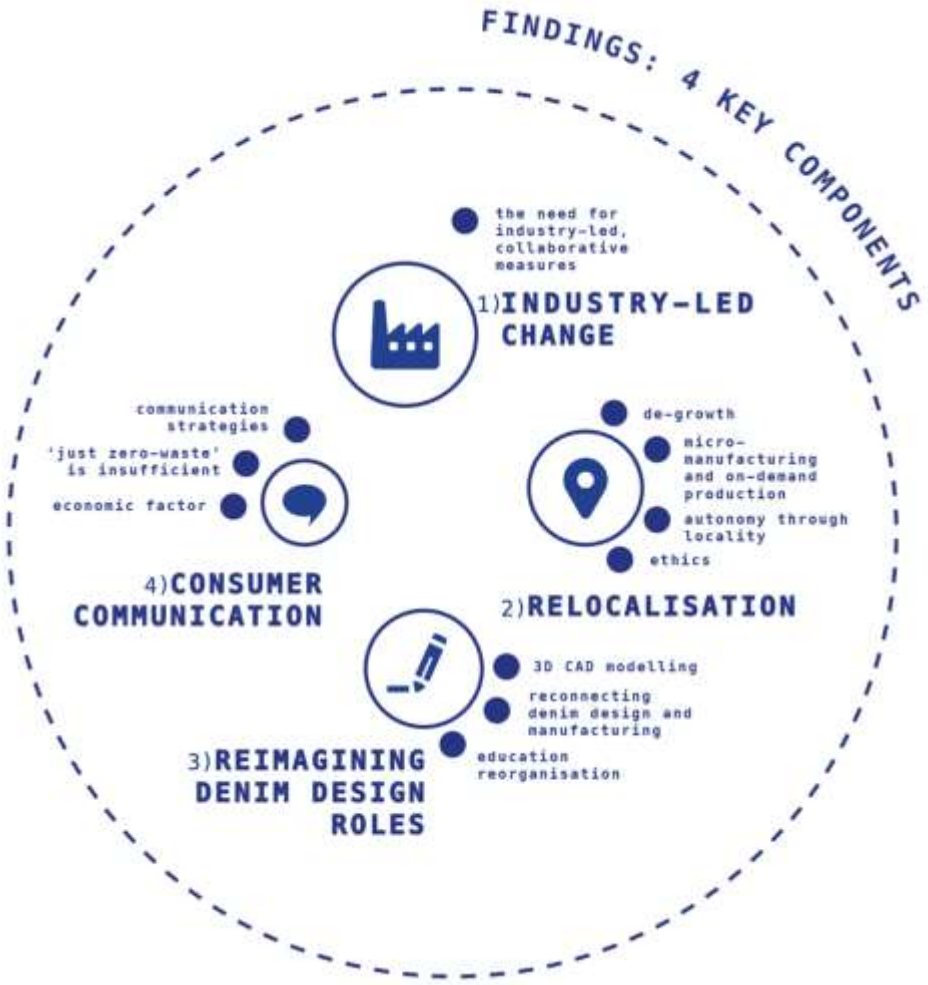

Figure 4: Four critical components unlocked the potential of the 3D weaving technique towards systemic change.

The industry-led change component emphasises the necessity for proactive and coordinated efforts within the denim industry to drive sustainable transformation, fostering collaboration and incentivising brands to initiate change rather than solely relying on shifting consumer behaviour. Relocalisation involves shifting production and sourcing practices to local or regional contexts, aiming to reduce mass production cycles, lower the transport footprint, enhance transparency, ensure supplier autonomy, employ micro-manufacturing contexts and support self-sustaining local economies. Reimagining denim design roles highlights the importance of redefining the responsibilities of denim designers within the context of manufacturing, embracing a holistic, creative and multidisciplinary approach that integrates sustainability considerations into the design process. Effective communication with consumers is crucial for successfully utilising 3D weaving practices in the denim industry in alternative fashion models of implementation in a transparent and informative manner to raise awareness, educate consumers about sustainable choices and enable higher trust in the sustainable information conveyed. We elaborate on each critical component and its sub-elements in the next section.

Industry-led change (1): The need for industry-led, collaborative measures
Through the literature research and the interviews conducted in this study, it was found that overall, consumers need to recognise fashion as a practical and meaningful necessity rather than objects of short-lived pleasure (Allwood et al., 2006; Niinimäki et al., 2020). However, relying solely on changing consumer behaviour through sustainability narratives to disrupt the fast fashion ecosystem was found to be insufficient. An example is the prevalence of unverified sustainability claims by many brands, which has resulted in greenwashing practices and, subsequently, consumer scepticism (Marrucci et al., 2021). The findings of the expert interviews match this connotation.

Another finding from the expert interviews is that most consumers are currently not inclined to pay a higher price for sustainable garments, as stated by the denim mill Diamond Denim by Sapphire, the denim designers from Endrime and Wrangler and the Blackhorse Lane Ateliers owners. The study reaffirmed that consumers cannot be easily categorised, and even those with a higher perception of sustainable awareness can find themselves making consumption choices based on price rather than sustainability considerations, pointing to a value–action gap (McDonald et al., 2012). Similarly, Niinimäki (2010) suggests that the abundance of cheap clothing deters consumers from buying pricier options, while misaligned expectations around eco-fashion between brands, designers and consumers may also contribute to this gap.

The interviews with industry experts revealed that consumers are not solely responsible for driving demand in the fashion industry. Fashion brands play a pivotal role by constantly fuelling the market for new cycles and seasonal trends, resulting in mass-produced and overstocked items, with marketing techniques employed to stimulate the psychological needs of the consumer. Moreover, mills were found to be highly responsive to and dependent on the demands of fashion brands, yielding to their influence in every decision they make. This dynamic persists even when mills actively strive to invest in sustainable technology and practices on their own accord. Despite their efforts, the ultimate authority lies with brands, exerting significant control over supply chain choices and operations.

While brands retain significant control over supply chains, the current study revealed that a small and tightly knit community of modern denim mills and designers associated with established denim brands actively collaborate and are willing to invest in sustainable practices. This level of collaboration within a small community is unique in the textile industry and present behind the most globally spread fashion staple. By leveraging this collaborative mindset and the shared commitment to sustainability among this group of modern denim mills and designers, innovative approaches and alternative models for denim can be explored.

Relocalisation (2a): De-growth
Globalisation often leads to a decrease in centralised manufacturing clusters as labour-intensive processes are outsourced to various subcontracting chains in countries with lower associated costs, resulting in a dispersion of economic activities. The resulting problems, such as overproduction, transparency, unregulated work environments, cultural appropriation and a high distribution footprint in garments, show the need for localising supply chains. While some advocate the concept of “de-growth” as a beneficial solution for the environment, it may not provide practical strategies

for redefining the fashion industry. The interviews with industry professionals showed that the notion of de-growth fails to motivate proactive measures towards change. This is due to the perceived absence of clear benefits, with many believing it would ultimately result in diminished business opportunities. It was also clear that any incentive implemented is recommended not to undermine the powerful hedonistic and psychological enjoyment derived from fashion at the consumer end (Environmental Audit Committee, 2019). Hence, a more favourable approach would involve considering the relocalisation of structures across the globe, forming new self-sustaining economic ecosystems. This argument suggests that future leading fashion brands could proactively optimise the value chain by focusing on two key aspects: nearshoring and automation.

Relocalisation (2b): Micro-manufacturing, on-demand production and autonomy through locality
The interviews conducted with the denim mills and a 3D weaving expert also revealed that apart from facilitating the exploration of innovative production methods, 3D weaving has the potential to support process automation in micro-manufacturing contexts. By consolidating multiple steps in traditional supply chains, such as weaving, cutting and sewing, into a single process (i.e. a highly reduced number of steps), 3D weaving could serve as an example of localised innovation hubs that integrate design and manufacturing. This aligns with McQuillan's (2020) approach to zero-waste system design in a similar context. Moreover, local material opportunities could be explored. By bringing users, makers and the production process closer while integrating their values, a stronger symbolic bond could be formed between garments and consumers, potentially leading to a desirable shift in consumer behaviour, such as extended garment use (McQuillan et al., 2018). Accordingly, exploring how 3D weaving could enable on-demand approaches in local contexts and establishing a system for user participation could be valuable. It is important to note that 3D weaving alone may not provide a comprehensive solution for system change, relocalisation and user involvement, but it could serve as an initial case example, potentially initiating a catalysing effect in the broader industry.

The Blackhorse Lane Ateliers, operating as a smaller-scale, locally based denim mill in London, has demonstrated that more significant control over the supply chain can be achieved within this locality. Notably, their recent adoption of Tonello's ozone and laser machines and their autonomy in fabric selection highlight independence from their client brands' influence.

Relocalisation (2c): Ethics
While reshoring outsourced manufacturing may seem promising, it carries ethical risks. Bringing production back without careful planning could harm overseas businesses and workers, endangering their livelihoods. Although retraining programmes are suggested, it remains unclear who will hold responsibility, what they would include or which markets workers could be retrained for. Additionally, "rebuilding" can be misleading, as many former industrial districts no longer exist, requiring new supply chains to be created from scratch. Instead of abruptly withdrawing from existing arrangements, a collaborative approach involving knowledge transfer and partnerships with overseas mills could be pursued. Cultivating immaterial resources such as knowledge, design, information and logistics could stimulate and prevent the decline of traditional manufacturing industries in industrial districts and help form new economic, decentralised models.

Reimagining denim design roles (3a): 3D CAD modelling and reconnecting design and manufacturing
In recent times, denim designers have become increasingly aware of the rising prominence of emerging 3D software, which offers notable cost-effectiveness and creative freedom. They acknowledge that this development will likely change their work methodologies significantly. Anticipated shifts in priorities and company initiatives are already on the horizon. The use of 3D prototypes will redefine the sampling process. Furthermore, brands are expected to redirect their attention towards core products and embrace the concept of capsule collections, emphasising on-demand, true-to-size production.

Incorporating 3D weaving as part of currently evolving design roles can be seen as an opportunity within the denim industry, as it coincides with emerging perspectives. However, denim designers have highlighted the challenges of adapting to new tools, innovative manufacturing methods and 3D prototyping, especially when there is a significant disconnect from the production process. Traditionally, denim design has been relatively detached from manufacturing, suggesting a need for future integration. A report addressing the reshoring of supply chains to the UK, co-authored by one of the interview participants, calls for the establishment of open-access labs, Living Labs and networked collaborative manufacturing models (Postlethwaite et al., 2022). These initiatives could provide the necessary upskilling opportunities to meet the challenges of a forward-looking industry. Establishing such models could provide a platform for further exploring methods like 3D weaving in the context of automation, efficient 3D prototyping, on-demand production and accurate sizing requirements.

Reimagining denim design roles (3b): Education reorganisation
There is increasing recognition that educational restructuring is necessary to keep pace with the evolving role of denim design. In the UK, universities and prominent denim designers have acknowledged this need and are actively promoting the challenge of redesigning education by introducing integrated master's programmes tailored to this purpose. The significance of educational restructuring is evident in other instances, such as fashion designers pursuing double major programmes to cultivate cross-disciplinary skills and drive innovation (Faerm, 2018). The University of Leeds has provided another notable example of educational involvement in fashion design through the establishment of a collaborative research centre dedicated to 3D weaving, supported by the European Regional Development Fund (University of Leeds, 2023). Weffan, a 3D weaving expert interviewed in this study, has previously partnered with this centre. In the Netherlands, the team of innovative fashion design researchers is growing in the context of industrial design engineering. For the Dutch denim and fashion market, this notion could be an opportunity for similarly partnering industry and education with the innovation centre of Leeds.

The success of a denim designer extends beyond technical skills. It is crucial for students and established designers to join transdisciplinary programmes that offer a strategic balance between building new skills, integrative design manufacturing methods and unique storytelling. This equilibrium between the 'what' and the 'how' enables future denim designers to effectively translate societal trends and emotional values into fashion design trends in alignment with the evolving nature of the industry (Faerm, 2018).

Consumer communication (4a): Communication strategies
Reliable communication is crucial to support consumer understanding and the acceptance of new sustainable products and models. In this study, the literature findings and interviews with industry experts further reestablished this topic of importance. There is limited knowledge regarding the precise reporting and communication of sustainability efforts within fashion brands (Watanatada & Mak, 2011; Yan et al., 2010). This scarcity of knowledge is compounded by the lack of a standardised definition of sustainability at the EU level (Marrucci et al., 2021). Furthermore, Chan and Wong (2012) suggest that fashion consumers are often unfamiliar with the availability of sustainable fashion, indicating the need for relevant information to be easily accessible. Without sustainability knowledge, many people still rely on environmental messages by fashion brands regarding this topic at the time of purchase (Teona et al., 2019). Consequently, with the upcoming EU-wide Green Claim Directive (European Parliament, 2023) prohibiting misleading environmental claims, attention could shift to developing effective communication strategies.

Consumer communication (4b): 'Just Zero Waste' is insufficient
Sustainability information about 3D woven garments needs to encompass material choices, origin, chemical usage and labour practices to build consumer trust. As many industry and user participants reported, consumer scepticism may stem from awareness of greenwashing. Trust erodes when a brand's sustainability claims conflict with its actual practices, leading to perceptions that sustainability efforts are merely reactive to consumer demand (Ellen et al., 2006). Regarding 3D woven denim, collaborating with value-driven brand partners and ensuring full transparency across the supply chain is crucial.

Consumer communication (4c): Economic factors
Consumers can be willing to pay more for well-supported sustainable garments but may still resist excessively unreasonable prices, as noted in the literature and in the industry discussions with Diamond Denim by Sapphire and Blackhorse Lane Ateliers (Chan & Wong, 2012). Beyond affordability, sustainable products can gain value through design and quality (Camacho-Otero et al., 2019). A favourable combination of low price and appealing design might lead to a preference for garments that reflect sustainable fashion attributes but are in fact not sustainable. However, the latter indicates a strength of 3D woven garments, forming a distinct product category due to their unique visual appearance compared to traditional denim, making them not easily replaceable.

Some consumers seek to construct an ethical identity, fulfilling psychological needs and a desire for self-expression. Consumers perceive an advantage in a socially responsible lifestyle when purchasing branded products they associate with sustainable activities (Niinimäki, 2010). This suggests that the unique visual appeal of a 3D woven garment could be effectively combined with a compelling and transparent sustainability narrative. However, this sustainable narrative needs to address all life cycle stages – from design decisions to garment disposal. Making consumers part of the decision-making process by bringing them closer to the origin of their garments through local production and adapting marketing content to be informative and educational in terms of sustainability could help build stronger relationships between stakeholders and begin to encourage responsible consumption habits.

These findings represent important considerations for the industry as a whole and demonstrate how techniques can contribute to systemic change.

Exemplifying an alternative fashion ecosystem through 3D weaving denim

To showcase the transformative potential of innovative design manufacturing techniques, the findings have been translated into the design of an alternative, local fashion ecosystem for 3D woven denim situated in the Netherlands. Central to this design is the idea of new forms of collaboration, where relevant ecosystem actors find and support one another. Figure 5 presents a simplified overview of these actors, where 3D weaving serves as the focal point of the local research lab. The stakeholders displayed include governmental and non-governmental actors, educational institutions, denim brands and denim suppliers.

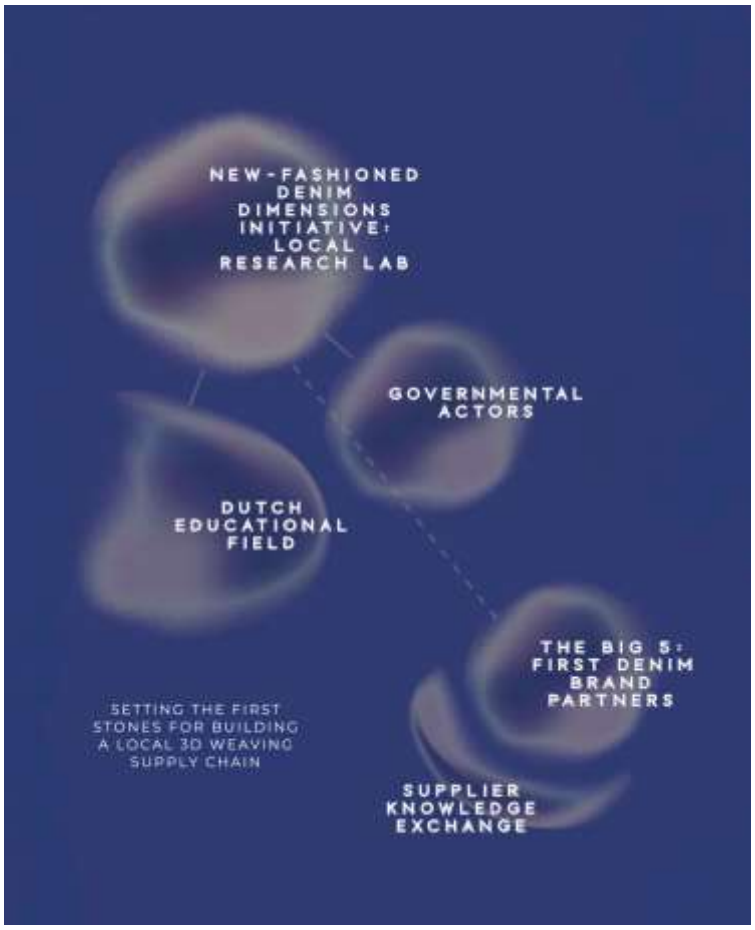

Figure 5: Simplified collaborative ecosystem structure to foster pathways to alternative fashion ecosystems.

To turn vision into action, ecosystem actors need access to the strategies required to navigate the complexities of redesigning the fashion industry. An essential first step is identifying other stakeholders within the local context to be explored and within the broader industry. Engaging in dialogue with stakeholders through immersive fieldwork, where both systemic change and perceptions of the innovative technique are addressed, will enable the identification of critical components for transformative leveraging.

In this novel ecosystem, only small-scale, fully transparent and vertical production (from spinning to final garment) takes place, adhering to the highest sustainable production standards at every production step. The concept reflects considerations of material, environmental, financial, technical, ethical, communicative, consumer, educational, governmental, business and circular aspects. Through the collaboration, denim brands are granted access to the distinctive 3D weaving technique under certain conditions, incentivising them to pursue and drive local, sustainable and transparent practices. However, the ecosystem could serve as a starting point for brands to adopt holistic approaches encompassing various operations, catalysing forward-thinking and localised design strategies beyond 3D woven denim as a singular product category.

To clarify the actions needed to establish the collaborative ecosystem structure, the design includes a comprehensive road map with specific, actionable steps[1]. This road map guides actors through the actions of co-creating a 3D woven denim ecosystem dispersed on a timeline, highlighting practical aspects such as funding, branding, retail, certification, knowledge partnerships and consumer communication. An additional overview further specifies the responsibilities of each ecosystem actor[2]. This road map offers resources to help stakeholders define roles and collaborate in leveraging innovative techniques to reimagine the industry, serving as a pioneering example rather than a universal blueprint.

Conclusions and recommendations

The current work explores leveraging emerging fashion design manufacturing techniques to shape novel and sustainable fashion ecosystems. In recognition of the adverse environmental and social effects of modern fashion production, we underscore such techniques' broader significance beyond technical innovation in driving meaningful transformation. This study combines empirical research from the denim industry with a review of the literature to identify four key components for implementing innovative fashion models. The work focuses on the niche technique of 3D weaving as an exemplary case for addressing the industry's prevailing challenges through its zero-waste, on-demand and local production capabilities, fundamentally challenging traditional denim design practices and enabling reimagining of supply chains. The findings inform the creation of an exemplary local, sustainable and collaborative fashion ecosystem centred around 3D woven denim in the Netherlands, as part of a broader study exploring additional vital aspects of developing alternative fashion ecosystems.

Given the limitations within the timeframe of the current research, it is advisable to expand the scope of investigation by exploring local contexts beyond the Dutch market, incorporating diverse geographic, political, socioeconomic and cultural considerations. Future research could delve deeper into establishing knowledge exchange partnerships with current fashion suppliers to facilitate an ethical transition towards localised and self-sustaining ecosystems worldwide. Furthermore, exploring alternative economic models for driving industry-led change that depart from the current capitalist system might offer more unconventional solutions to sustainability concerns beyond relying on new product creation, profitability and reputation. Additionally, testing on-demand production models locally can yield insights into personalised, made-to-measure principles and

enhance consumer engagement, fostering stronger emotional connections to garments. Further exploration of 3D woven zero-waste design opportunities in textile industries outside denim or fashion, such as architectural and automotive textiles, is also recommended.

Existing knowledge about resource and energy usage in denim production – for instance due to high transport footprints, commonly used materials and resource-intensive supply chain steps – highlights the need to reconsider production methods. 3D weaving could serve as a less energy-intensive option by preventing unnecessary fabric production, reducing the number of supply chain steps and facilitating local production. However, we recommend conducting a lifecycle assessment (LCA) in the future to compare the two approaches.

We demonstrate how fashion ecosystems can emerge by integrating novel techniques within local, on-demand and collaborative contexts to reduce pre- and post-consumer waste while enabling small-scale sustainable fashion production infrastructures close to consumers. With elaborate critical considerations and an exemplary design with actionable steps, aimed at opening avenues for future investigation and advancement in the field beyond 3D weaving, the current research particularly contributes to Sustainable Development Goal (SDG) 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption and Production) and SDG 17 (Partnerships for the Goals) (United Nations Secretary-General, 2024).

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Housing, entryways and social architecture in poor borderlands of Mexicali

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Housing, entryways and social architecture in poor borderlands of Mexicali

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Abstract

This article presents a methodological approach to the insecurity associated with urban peripheries, using the western area of Mexicali, Baja California as a case study. Its focus is on the security of homes, the urban environment and inclusive communities, which serve as a protective mechanism, ranging from collaborative reinforcement of fences with recycled materials to neighbourhood surveillance networks that protect homes. Using the architectural design as inspiration, a prototype of security portals was created, highlighting the importance of local construction knowledge, recycling of materials and using interconnections between the home and the street. The dataset consists of field research conducted between January 2023 and June 2024. A triple method of analysis was used: (1) classification of facades within a polygon of several neighbourhoods in the Centinela area; (2) descriptive statistics based on a survey of perceived security in each street of the study area; and (3) participatory workshops to design urban strategies using materials obtained in the surroundings. The result is a proposal for entryways referred to as 'sidewalkdesign' because it combines the transition between the home, the sidewalk and the street, promotes neighbourhood spaces for meeting and cooperation and, most of all, ensures that homes remain safe through physical barriers and natural surveillance.

Keywords: Social architecture, Popular housing, Entryways, Mexicali

Introduction

Historically, the western periphery of Mexicali has been known for its informal settlements and self-built houses. The acquisition and formalization of land for housing have resulted in a significant influx of individuals who are most vulnerable into this part of the city. During the late 20th century, migrants from southern Mexico settled in deprived areas surrounding Mexicali and Imperial Valley (Méndez, 2021). This has resulted in a precarious yet diverse neighbourhood actively working to overcome urban challenges such as deficits in infrastructure and services. Family members in the border region often built their homes with materials considered trash, such as discarded construction materials and agricultural materials from American farms.

Over the last few decades, a neighbourhood in western Mexicali named Centinela has seen rapid growth in self-built homes. We conducted a series of neighbourhood meetings and workshops following the principles of participatory design and community architecture to gain an understanding of and empathy for the lifestyle of the residents in these communities. Applied research was conducted in the Centinela´s neighbourhoods by architecture students and residents. We wanted to develop strategies and housing improvements that can be implemented collaboratively by architecture students, urban planners and anyone else who can work directly with precarious communities in the future.

Housing systems are composed of the interactions between actors related to housing development, delivery and operation within the broader urban context (Ayub et al., 2020). Urban interconnection, as a system or network connecting different parts of a city, is collectively shaped by actors and their interactions. Urban peripheries are characterized by a variety of cultural models, and housing developments often follow organic forms associated with self-construction and progressive construction (Hernández, 2023).

For urban design and development, hierarchical (top-down or bottom-up) and network (peer-to-peer) analyses are both critical (Figure 1). According to this perspective, urban development can be optimized by integrating infrastructure, delivering essential services, improving accessibility to public spaces, improving mobility and strengthening social inclusion.

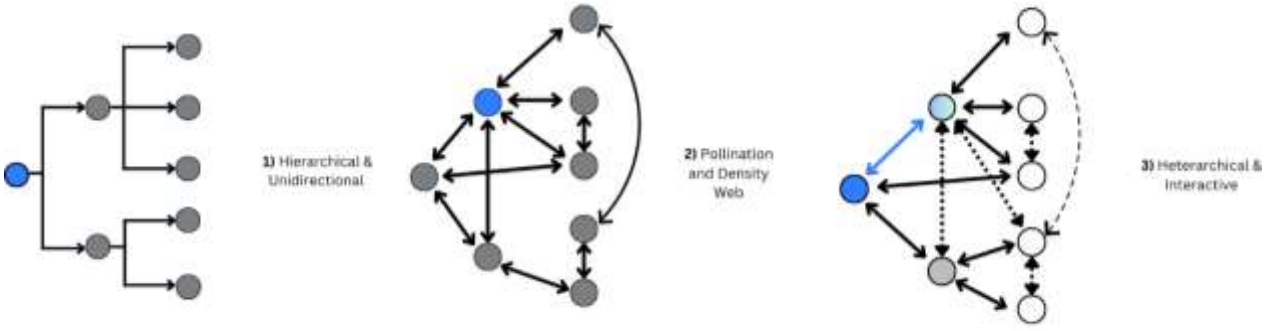


Figure 1. Social structures and interactions.
Source: Based on Cumming, 2016.

Due to the diffuse nature of urban expansion along the Mexicali border, analysing the physical systems intercepted by public transportation, pedestrian paths, bicycle paths and passageways on more minor scales, such as colonies and neighbourhood centres, is necessary. Additionally, examining how urban dynamism develops concerning the density of schools, hospitals, parks and markets is crucial. Likewise, social sciences and architectural design contribute to a thorough understanding of peripheries. Both disciplines are increasingly vital in protecting and enhancing the urban periphery.

During the early 1900s, when the border city was established, the western neighbourhoods of Mexicali were separated. In the 1950s, when the Bracero Programme was implemented, the eastern and southern areas were emphasized, and in the 1990s, the industrial project mainly focused on the east side. Several neighbourhoods, such as Centinela and San Pablo, remained low in density and isolated from the rest of the city (Map 1). However, urban fringes become focal points of cultural and ethnic practices in borderlands, not only as a place where economic and political forces manifest against a complex social dynamic, but also as a centre of those forces (Holguín, 2011).

Map 1: Housing density in the Centinela area, Mexicali, 2024.

One of the most critical concerns of contemporary cities is providing a comfortable and safe public space. Despite the emphasis on "eyes on the street", as the sociopolitical activist Jane Jacobs proposed, this concern has remained constant in recent decades. As outlined in her 1961 book *The Death and Life of Great American Cities*, natural surveillance refers to the continuous surveillance conducted by residents and merchants in these areas from their homes towards the street to ensure that streets and urban spaces are well guarded. In Jacobs' view, given the importance that residents place on the urban environment to guarantee their well-being, they naturally become "ordinary guardians of the street", with the authority to deter inappropriate behaviour.

Natural surveillance can be considered from the perspective of four types of spatiality, which possess the following qualities: 1) contact spaces between buildings and streets; 2) attractive and appealing public spaces; 3) lighting spaces; and finally 4) broad walking areas. In terms of the peripheral situation, the scope of this theory lies in its proposal for security and coexistence in the neighbourhood that can be generated by building a fence, wall or natural border that connects the sidewalk to the street. The question is how this can be accomplished in an urban environment marked by precariousness. This is where neighbourhood-collaborative networks are vital in integrating design solutions, urban strategies and social organization for the well-being of communities.

In terms of the quality of public space on the street, Gehl (2010) proposes three fundamental ideas: *"Life comes first, then space, then buildings.";"The function of urban design is to make life easier and more pleasant for people"* and *"Streets and public spaces are the lifeblood of a city"* Gehl, 2010). However, in our contemporary world, urbanization is dominated by large-scale urban projects, which are carried out without significant consideration for social issues. University urban design studios provide opportunities for critical reflection on urban issues (Batuman & Altay, 2014).

Gehl's *Cities for People* (2010) illustrates the power of urban design when it emphasizes social interaction and human experience. As part of this work, Gehl identifies several key factors contributing to a people-centred approach to urban planning. Politicians and architects are responsible for adhering to human well-being in designing a city based on innovative technology. However, the key to urban design lies in people's imaginations and how they envision their children and grandchildren living there.

Based on communicative planning theory, urban planners must slow the planning process to increase participation and involvement (Calderon et al., 2022). As part of the security analysis in the poor areas of Mexicali, participation mechanisms were established between architecture students and neighbourhood organizations. To achieve participatory design, it is necessary to find ways to involve citizens in the process of making decisions about urban design and development.

Rather than treating participatory design as a methodology, it can be seen as a way to conduct any methodology (Udoewa, 2022). This paper proposes three types of participation: the designer as community member, the community member as designer and the community member as facilitator. By emphasizing citizen participation in the interventions, proposals will arise and be based on the community's needs and concerns since they are considered through participatory design workshops and empathetic dialogues throughout the process.

Materials and methods

This case study examines the Centinela area in western Mexicali and the citizen dialogue process it involve, based on ethnographic research inspired by Forester's (2017) emphasis on 'practice stories' and his pragmatic critical approach. Within the context of the case study, we examine what each resident does and how they cope with the challenges of living in their neighbourhood. The data collection process was undertaken between the years of 2023 and 2024, during the period of the dialogue between the residents and architecture students.

The analysis was carried out based on observations and decisions made during four meetings in which the design process was implemented. The architecture students drew illustrations depicting the condition of the houses and developed proposals for each family. We conducted five semi-structured interviews with neighbourhood leaders and informal discussions with the students involved in the design and implementation of the project. A semi-structured interview allowed the neighbourhood leaders to express themselves freely. The survey questions addressed community needs, perceptions of the proposed designs and potential effects on neighbourhood dynamics.

Safety barriers

Two aspects of security may be harmonious or discordant: subjective and objective. A subjective aspect refers to a person's perception of an event based on their assessment of its risk. Subjectivity is primarily characterized by the self-affirmation of "feeling safe" and is strongly influenced by self-confidence and trust in the environment. Conversely, the objective aspect of security is concerned with objective events that do not depend on the individual's perspective. From the double subjective and objective security factors, the city is typically considered "unsafe" primarily because the residents and neighbours stigmatize it subjectively. As an objective tool for assessing risk and insecurity in a city, colony or neighbourhood, crime statistics and urban diagnoses provide objective figures that complement these assessments.

In the process of urban expansion, the periphery of metropolitan areas has been characterized by processes of “sub-urbanization”. Before the real estate boom and the peripheralization of social housing, it was widespread to establish industrial complexes, recycling and waste management centres and complementary services for the city, such as agricultural land, farms and livestock production, among others, in these areas. Peripheries are usually characterized by social groups with a mix of urban and rural residents, and their perspectives tend to blend to promote exchange and the development of subjective security networks. Due to the constant movement of populations in urban peripheries, essential services are often delivered late to meet residents’ needs. Due to the late arrival of services, several additional problems arise since deficiencies are corrected when precariousness has already generated new issues that cannot be solved by simply installing infrastructure or urban equipment.

As a result of government neglect, not only has the physical condition of these neighbourhoods deteriorated, but the stigmatization processes for these communities have also been contaminated with prejudice as a result of the constant dissemination of images of neglected spaces, as well as the classification of urban edges as “dangerous areas” or “no-go zones” (Figure 2).

Figure 2: Perceived fear in the Centinela area, Mexicali, 2024.
Source: Based on a survey from 16 streets (avoiding walking on the streets, carrying valuable objects and leaving home alone).

Theorists concerned with security and urban planning have offered a variety of explanations for how security can be maintained or how insecurity increases in some urban enclaves. First, criminologists published the “broken windows” theory in 1982. In their article, Kelling and Wilson (1982) clarified that crime is not affected by the income level of a neighbourhood, because if a window is broken or a house is not repaired, the impression will be that no one is in charge, which will result in more broken windows and more crimes.

Broken windows are a visual indication of disorder and minor crimes committed through vandalism. Most concerning is that these minor crimes trigger discourses that negatively impact subjective security and shape people's perception of these environments. In cities, the urban periphery is the least protected area by police security, which can lead to the failure of police to control and impose repercussions on minor crimes that characterize them. This can trigger other crimes or create the proliferation of cells and gangs that claim urban enclaves. In "broken windows", the perception of insecurity and criminal networks in the suburbs leads to urban disorder and discourages societies from regaining security.

The Centinela area, located west of Mexicali city, has been referred to as a place of insecurity because it has become normalized that it is a place where crime is prevalent and crimes are committed. The fieldwork conducted by Universidad Autónoma de Baja California students since August 2023 revealed that the main problems in this area are not related to crime but to precarious housing, a lack of services and deterioration of public space and the environment, based on surveys and photographic records. Residents also associate risk with leaving the house alone, walking through the neighbourhood and walking to take the bus (Figure 3).

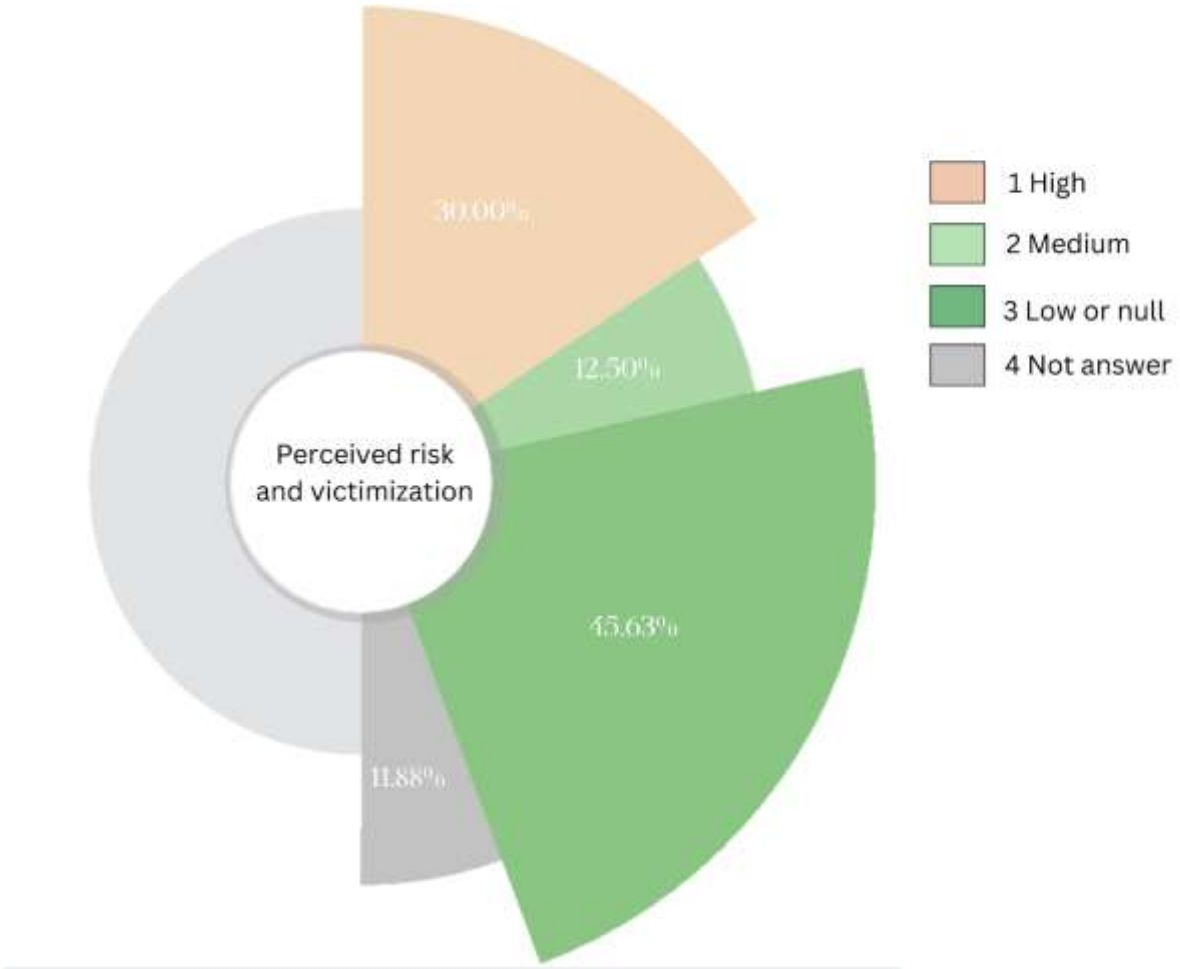


Figure 3: Risk and victimization in the Centinela neighbourhoods, Mexicali 2024.
Source: Based on a survey from 16 streets (leaving the house alone, walking through the neighbourhood and walking to take the bus).

A decline in social relations and insecurity has also accompanied the deterioration of physical spaces in Centinela´s neighbourhoods. In each neighbourhood, such as Centinela, Ampliación Centinela and San Pablo, a neighbourhood committee is responsible for determining and negotiating solutions with

government agencies. Doing so convinced some government entities, in partnership with the neighbours, to undertake improvements to some of their spaces, such as the community park, which was renovated in 2024.

Based on the architectural study of a sample of homes, we could better understand the living conditions of many families. Research projects have provided funding for several housing and urban space improvement initiatives, including fencing, street furniture, roof improvements and, if possible, the construction or restoration of some houses.

As opposed to the notion of “broken windows”, which implies that spaces, such as housing, streets or parks, are slowly degraded as they are neglected, there is also the possibility of progressive rescue and improvement when people are enthusiastic and committed to enhancing their small areas. Upon accumulating needs in the periphery, people prioritize housing deficiencies at the expense of urban infrastructure and public spaces. Even though most homes are considered habitable, they were built using self-construction techniques and recycled materials to resolve deficiencies (Images 1 & 2).

Image 1: Recycled door.

Image 2: Recycled steel roofing sheets.

The effects of social disorganization on the urban periphery

A person’s ideas and actions are influenced by their family environment, their neighbourhood networks and the environment in which they live. Several Chicago School of Criminology authors, including Clifford Shaw and Henry McKay (1942), proposed an explanation for the degradation of these urban enclaves based on social disorganization theory, which was developed in 1942 to focus on the environmental conditions that affect the development of a person in criminology. According to their theory, the environment in which one grows up reflects the behaviours and thoughts one exhibits in response to that environment.

Shaw and McKay argued that crime is the result of abnormal living conditions (high poverty levels and poor health). Disorganization can take several forms: (1) Community control breakdown, when a neighbourhood loses control, causing people to adapt to new circumstances; (2) Uncontrolled immigration, in which immigrants often settle in disadvantaged communities; (3) Factors related to social deprivation, such as divorce, illegitimate births and a higher percentage of males; (4) Lastly, various patterns of criminal behaviour appear in marginalized and poor neighbourhoods where sub-societies often exist, and citizens have a precarious way of life.

Based on the articulation of the broken window theory and the social disorganization theory, a series of conclusions are reached concerning the Centinela's neighbourhoods. In the first place, certain areas that have experienced elevated levels of neglect have a higher level of crime, which helps to explain the lack of control and progressive degradation of the physical and social environment. However, as the theory of social disorganization demonstrates, the environment plays a crucial role in determining an individual's development, even more so when dealing with individuals who grow up in poverty and violence, as is the case in the precarious polygons on the western periphery of Mexicali.

Using photographic analysis, the condition of the fences in the study area was determined by collecting and analyzing photographs of the streets. The fences were classified by type of material and level of quality. Using recycled materials from the same area, a design proposal and a tentative budget for the intervention have been created, preserving the aesthetic values of the urban image and architectural design while putting the community at the centre of the process through three participatory workshops. The analysis found that 234 fences were made of chain link, 233 fences were made of iron, 2 fences were made of tyres and 49 were a combination of recycled materials (Table 1).

Table 1: Materials used in fencing. Centinela neighbourhoods, Mexicali, June 2024.

Street	Galvanised chain link	Wrought iron	Recycled (tyres, timber, steel shades, etc.)
ARISTOTELES	30	44	2
APOLO	40	36	5
EUQUIDES	15	8	4
EUCLIDES	7	1	1
ESQUILO	6	10	2
PITAGORAS	17	13	3
PLATON	6	9	0
SATELITE	12	6	1
SOCRATES	8	9	3
SOFOCLES	33	29	7
CRATER	3	5	2
SAN CRISTOBAL	6	3	1
SANTA LUCIA	21	24	9
SAN PABLO	5	3	4
ATOTONILCO	3	8	2
TECATITLAN	13	15	0
ZIHUATANEJO	9	10	0
IXTAPA	15	7	5
TOTAL	**234**	**233**	**52**

Fieldwork was conducted to determine which houses were in a critical state regarding their physical boundaries. An exploratory walk was conducted along some of its streets to classify houses, sidewalks, vegetation, parks, fauna and some interactions with community members (Images 3–8).

Image 3: Fences made from recycled zinc galvanized roofing.

Image 4: Doorways made from recycled zinc galvanized roofing.

Image 5: Entryways made from recycled wood and homemade stucco.

Image 6: Fences made from brick.

Image 7: Fences made from recycled timber.

Image 8: Doorways made from recycled iron.

Many homes had to cover their lower fences with mesh, sheets, wooden pieces or concrete coatings. Many neighbours said they had to prevent stray dogs from getting into their houses by cutting some wood (as shown in Image 7), and in the same way, many had to do the same, as we could observe that many of the houses had significant but aggressive dogs to “protect” them. However, this also creates a reflex to something dangerous since the sense of security is also lost.

Furthermore, seven houses were surveyed and analysed, one of which was built by its owner using recycled materials, including wood, cardboard, mesh and sand. The woman established her construction methods, insulating the walls with garbage, constructing a foundation that has served her well over the years, plastering partition walls and constructing other walls out of blocks. Even though the house is not in the best condition at present, it is entirely habitable and has been kept up for 32 years despite the seismic conditions of Mexicali. Here is one area where we would like to intervene and support her in improving her safety and quality of life.

Interacting with Centinela’s residents allowed us to better understand other homes, their adaptations and the measures taken to resolve the precariousness of the area. Additionally, the residents shared their traditional construction methods, and in the Integral Design II workshop, it was decided to combine these methods with more technical components. By analysing the fences and their materials, different security options were selected. Residents can obtain these items quickly and without making a significant financial investment.

As part of the interaction with the residents, the architecture students came up with a variety of ideas regarding the possible rehabilitation of their homes including new materials and systems. During their visit to the residents' homes, the residents shared their experiences, made their opinions known and provided feedback on how the students should approach their proposals. The students and residents maintained a constant correspondence via telephone, which further contributed to the exchange of ideas and the sharing of expectations.

The residents presented critical conditions from their perspective, and the students were given a printed presentation that included comments from residents. The site analysis and comments of residents indicate that one of the most critical conditions of these communities is the fences, which are made from discarded materials, giving them a second life and increasing security. Even though many of the houses in the Centinela area do not have fences suitable for protecting their interiors, it is essential to emphasize that the inhabitants have been very creative in solving problems over the years. A physical barrier in the home is necessary; it serves as a security barrier and shows the need to provide a façade of greater significance, even becoming a point of coexistence.

A team of students was assembled to analyze the houses in need of fencing and develop some proposals that would be presented to the community later in such a way that the community selected the one they liked the best while retaining the urban image of the colony, while integrating construction methods and materials from the area. We created fences using existing and reusable materials within the Centinela area, beginning with wooden pallet modules and following extensive research, proposals and evaluations.
A portal-based project is proposed, which connects the houses with the street and provides a space for coexistence on the sidewalks. The proposal is embodied in a prototype that articulates a bench with the fence and a threshold, as described in the following subsection.

Designing sidewalks

The proposal involves recovering materials found in the Centinela neighbourhoods, such as wooden pallets, rubble, wooden pallets, steel sheets, chicken wire and even earth used to construct adobes. By doing so, we can reduce the consumption of new materials, which results in the treatment of those materials, resulting in more significant pollution. As a result of recovery, we are enabling people to give these materials above a second life and, by doing so, provide ecological support to the environment. The proposal is titled "Sidewalk Design". As a result of our transition between housing, sidewalk and street, and by applying the theories we have already mentioned, we can create a public/private space, leading to coexistence on the sidewalk, which is very typical of the border region of Baja California. Using the collected materials, wooden modules are made from pallets or galvanized sheets (Figures 4 and 5), followed by a catalogue allowing potential customers to assemble their fences based on their preferences from assembling wooden modules to finishing the surfaces with mosaics, paints, plasters or mortars.

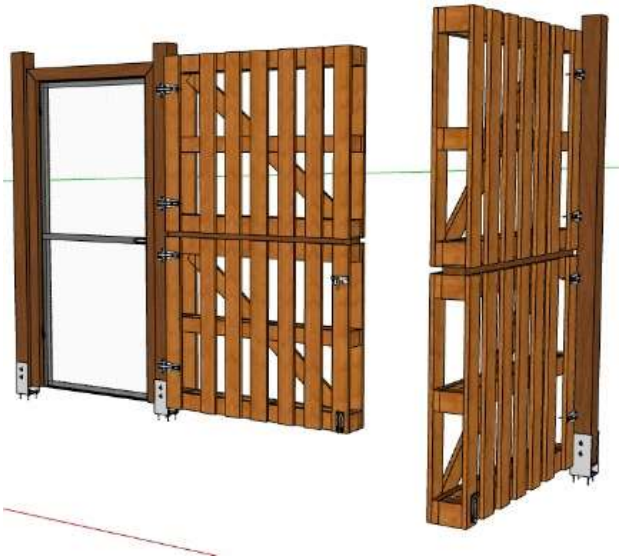


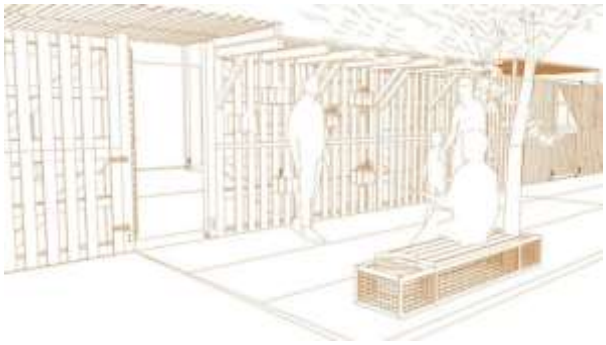
Figure 4.

Figure 5.

Starting from a small foundation, we will create the anchorage using Simpson methods, a method widely used in wood construction in the United States. Since 4x4" wooden beams are readily available and inexpensive in Mexicali, obtaining wooden pallets is no problem. Wooden pallets are used in the transportation of materials so they are often discarded, and many recycling facilities can be found near the border.

To facilitate self-construction, the fences were designed to be easy to assemble, and workshops were conducted so that people within the Centinela area could learn how to construct these fences more efficiently, thus generating a positive impact on their work area by helping to build more fences, which will lead to job opportunities within the neighbourhood. Participatory approaches were used to identify local interests and improve local development and planning activities.

The main objective of this proposal, as shown in Images 9 and 10, is to create a safe and peaceful environment by using fences (in this case assembled from pallet modules, with the posts anchored to the ground with light foundations) and implementing urban furniture consisting of gabions, as well as planting appropriate vegetation and placing a small cover and transitioning from the street to the sidewalk. Achieving a better social and urban environment has been made possible by applying this philosophy. The ability to personalize the fence with respect to the catalogue makes it unique and more personalized, increasing its value for customers.



Images 9 & 10: Pallet design alternatives.

Conclusion

Through participatory design, architecture students can work with residents from poor urban areas to come up with solutions for the problems they are facing. Based on an applied research project involving peripheral urban precarious communities, the studio projects and actions had a chain impact on small communities and had a double benefit for architecture students. In addition, implementing a project based on these criteria and integrating citizens allowed us to expand our vision regarding the peripheries of urban areas.

As a result of participatory design, each detail shared with the community can be used as an excellent opportunity to contribute to the improvement of the city where we live and study, in addition to providing an applied solution to what is usually discussed and proposed in architectural design workshops during professional architectural studies.

When it comes to designing with people, what is considered to be one of the scarcest resources is time. This is because university planning is driven by deadlines that differ from neighbourhood dynamics as well as residents' availability of time to collaborate with teachers and students. Despite the slow progress, the contribution is filtering through as a "grain of sand" so that one day it can no longer be a "dangerous neighbourhood", "crime zone" or "Don't go there, they kill there". For architecture students, one of the most outstanding achievements is empathizing with the inhabitants of their city and deepening the role of architecture in such situations, where, despite the multifaceted nature of the problems, the importance of architecture cannot be overstated.

With the efforts and proposals already made and going forward, a safer, more harmonious neighbourhood is expected. By empowering residents, participatory processes enable them to continue working on their projects even without designers. Although this has been the case, faculty, students and residents will constantly work together to ensure that these achievements are constantly adjusted and improved so that they remain relevant for a long time to come.

This project was well received by the university students, and it certainly sparked a new interest in some students. However, the most significant effect was to get a younger generation interested and excited about learning new skills in collaboration with residents of their own city. Additionally, the university students found that they gained a greater understanding of background and learning differences, as well as improving their ability to work with diverse groups of individuals. According to them, their communication skills had developed significantly, and they could apply it to other projects, whether at university or at work, particularly with people with less skill or less ability to use design language. Additionally, a professor with experience in teaching participatory design to residents will be able to provide valuable advice to some of their future students.

This small project provides a simple alternative that recovers local knowledge and relates it to a participatory design exercise accessible to residents. A similar exercise can be developed in architectural workshops to encourage the next generation to go beyond the ambition of design that focuses on the transformation of a city spontaneously and explosively. Architects need to reinvent themselves from creating spectacular spaces for photography and magazines to incorporate people into the design process to improve their environment as we go through a generational change.

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Sense and sensitivity: Reflections on social design education after III ESDA DESIS Social Design Days

Cecilia Casas-Romero

"Education is a weapon of mass construction".
Marjane Satrapi, Persepolis, 2000

The idea of compiling this supplement for DISCERN Journal arose after the celebration of the ESDA DESIS SOCIAL DESIGN Days' third edition in March 2024, attended by seven international professors who are experts in teaching social design. The Escuela Superior de Diseño de Aragón (ESDA) is a small educational institution with 300 students and 70 teachers, but with the particularity that more than half of the staff are involved in social design educational projects. In 2022, ESDA became part of DESIS and from its ESDA DESIS Lab, these projects are launched. Then, students, while learning the established curriculum, co-design with marginalized groups, such as refugees, minor offenders or homeless persons. It is a win-win situation. The intense motivation of the teachers comes from the experience of observing, on a microscopic level, how the student connects empathetically with each marginalized person with their name and surname.

However, not everything is sunshine and colour. Complexity is always present, and there are obstacles to overcome. The social designer does not intend to replace the social educator, the social worker, or the art therapist, but from his or her position to use his or her skills as a designer to generate positive social change. Here, we have a collection of reflections that emerged from these brilliant minds after this experience of the III ESDA DESIS SOCIAL DESIGN Days. They are teachers and researchers whose contributions show that through education and design, there are opportunities to mitigate the injustices of the society in which we live.

Images 1 & 2: II ESDA DESIS Social Design Days Programme. Photos and Programme by Inés Marco.

Lorraine Gamman came up with the idea for this collaborative supplement, which Susan Melsop and all the rest instantly seconded. It has also become true thanks to the generous

offer of Nicos Souleles, co-editor of DISCERN Journal. The introduction by Ezio Manzini, founder of DESIS, explains the necessary shift of design generation for social innovation from the city centres to the margins, counting on vulnerable groups, which explains and gives essential support to our work. Nicos Souleles writes about the relevance of embedding the Sustainable Development Goals in the curriculum and how to do it. Lorraine Gamman and Francesco Mazzarrela elaborate on the urgency of considering complexity, context and ethical considerations, for instance, when dealing with power dynamics. They reflect on the importance of being cautious and respectful and offer tools to overcome prejudices and bring empathy. Yanki Lee unfolds the logic of evolving from designing “for”, “with” and “by” to design “as” the others and how this leads to a more-than-human design approach by interacting with objects. Susan Melsop writes about the value of teaching social design as an act of care that can raise awareness and empathy in the students. Finally, Canan Akoglu reflects on the moment after the project ends, the importance of avoiding abandonment and teaching our students to build sustainable relationships over time. We do not forget to mention Bori Fehér, who also attended and left her mark on the event but could not contribute to this supplement for personal reasons.

These writings navigate between reflection and the sensitivity that at the same time is required and gained when we participate in this kind of educational experience of social design with students, who, as teachers and researchers, are our raison d'être.

Biography Cecilia Casas-Romero

Cecilia Casas holds a degree in Law (UNED) and an MA in Sociology of Public and Social Policies (Unizar). She teaches Photography and Social Design at the Escuela Superior de Diseño de Aragón (ESDA). She coordinates ESDA's DESIS Lab, which develops a sui generis programme involving more than a third of ESDA’s teachers. Together with the ESDA DESIS Lab Core Team, she organises ESDA DESIS SOCIAL DESIGN Days, which bring together leading figures in social design education worldwide. Her ongoing PhD deals with defining a model for educational institutions to teach social design to create a healthy work environment. She applies the social uses of artistic photography and the photovoice methodology to her work with disadvantaged communities. ccasas@esda.es, esdadesislab@esda.es

A double shift: Design for a new kind of social innovation

Ezio Manzini

The objective of this conference was significant and timely: "*Achieving social justice and improving the lives of those who have been less fortunate*" (III ESDA DESIS Social Design Days, Program 2024) is the most critical topic to be discussed today. In this short introductory note, I would like to articulate this statement concerning design for social innovation.

1. The concept and practices of design for social innovation slowly emerged about 15–20 years ago. In that period, two independent but interrelated events occurred: Design began to be recognized as an activity applicable to physical artefacts and systems of relationships (services, communication and all kinds of interactions). And an unprecedented wave of social innovation appeared: Groups decided to break their isolation and collaborate. By doing so, they could obtain valid results for themselves, their community, society and the environment. After a while, someone in the design community recognized this phenomenon and its potential in the transition towards an ecological and just society.

This is how design for social innovation was born: Not a new design discipline but an orientation that all the design disciplines (services, communication, product, interior and environmental design) can adopt. An approach characterized by three main choices: (a) to look at people (also) as bearers of resources and capabilities; (b) to consider them (also) as nodes of collaborative social networks; (c) to recognize promising ways of thinking and acting that, in the complexity of the contemporary society, already exist. Those initiatives can be seen as concrete steps in our transition.

2. Today, 20 years later, this approach to design is recognized and practised everywhere in the world. In these same years, design for social innovation matured and evolved. Thus, it moved from the promotion of single promising initiatives to their systematization and convergence towards new broad common scenarios: new ideas of welfare (community welfare), new ideas of cities (the city of proximity) and a new relationship with the network of life of which we are part (social innovation and recognition of what is not human).

In these 20 years, however, the limits of this social innovation and the design that stimulated and supported it have also emerged. The first limit depends on the fact that social innovation requires time, energy and attention from those who practise it: the time, energy and attention necessary carefully (re) to build the social networks on which it is based. Experience tells us that these resources are not uniformly distributed: some are rich in them, and others are poor. The social innovation we know of was born and developed among those rich in these resources.

The second limit, connected to the first, is that the social innovation we have known so far was born and developed mainly among groups of people operating in modernized and globalized cities. That is, in what is, or instead has proclaimed itself to be, the centre of contemporary society.

3. Now, it is vital that both limits are overcome. That is, social innovation and design for social innovation need to involve those who, until now, have not had the opportunity to access these collaborative practices. And their field of action must be extended to those territories which,

up until now, have been considered the outskirts of the planetary metropolis. All this must be done not only because a large part of the planet's population lives there but also because, if we must look for new ways of doing and thinking, it is often from the periphery rather than from the centre that they can emerge.

Images 1 & 2: Workshop "Define your Quarter" in the main square of the deprived area of San Pablo in Zaragoza. Photos by Lucía Rodriguez (left) and Abril Oliva (right).

This double shift of the centre of our action (from those rich in time, energy and resources to those who are poor in these and from the centre to the peripheries) should characterize our future action.

This is what was discussed at this conference. And I hope this discussion will help prepare the ground for a new wave of social innovations: a social innovation capable this time of reaching everyone, everywhere.

Biography Ezio Manzini

For over three decades, he has been working in the field of design for sustainability. Most recently, his interests have focused on social innovation, a significant driver of sustainable change. From this perspective, he started DESIS, an international network of design schools active in the design field for social innovation and sustainability. He is President of the DESIS Network and Honorary Professor at the Politecnico di Milano. He has been a guest professor in several design schools worldwide (in the past decade): Elisava-Design School and Engineering (Barcelona), Tongji University (Shanghai), Jiangnan University (Wuxi), University of the Arts (London), CPUT (Cape Town) and Parsons -The New School for Design (NYC)
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Workshop: Sustainable Development Goals (SDGs) and design curricula

Nicos Souleles

The Sustainable Development Goals (SDGs) are 17 global goals established by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development. These goals address various challenges, such as poverty, inequality, climate change, environmental degradation, peace and justice. Each goal focuses on a different area, for example, ending poverty, ensuring clean water and sanitation, promoting gender equality, combating climate change and fostering economic growth and innovation. The SDGs are interconnected and require collective action to achieve a more sustainable and prosperous future.

The prevailing rhetoric in the related literature is that higher education (HE) has a unique and critical role in delivering the SDGs through several strategies, including education for sustainable development (ESD), employment for implementing the SDGs, capacity building and mobilising young learners, research on the SDGs, technological innovations, as well as through contributions to civic, societal and community-level initiatives. For many universities, the SDGs are essential to their stated missions.

However, several studies have identified challenges in embedding SDGs in the multifaceted operations of universities. For example, there is often a lack of support from management, indifference among academics, no environmental committee to promote SDGs and no appropriate opportunities for personal and professional development for faculty members. In addition, few studies have examined pedagogical approaches that embed SDGs into education. From these limited studies, one can identify widespread and ongoing debates about the cross-curricular approach versus the development of stand-alone courses dealing with SDGs.

Specifically for design education, a recent report (*Design Economy – The Green Design Skills Gap*) by the Design Council (designcouncil.org.uk), based on feedback from a sample of 1,068 UK designers working across design disciplines in the United Kingdom, concluded that only 46% of designers are proficient or experts in 'design for planet skills'. In addition, fewer than 50% feel that their education has enabled them to design for environmental impact.

One way to address this skills gap among design educators is to acknowledge that the curricula of these disciplines can be updated, and this entails complementary training that reinforces the role of individuals in the face of social, economic, and environmental issues that advocate sustainable development. To this end, training faculty is a fundamental initiative to bring about this change in mentality and offer a process of training learners and developing the appropriate mindset and agency among them.

With all the above in mind, the opportunity to offer a workshop for design academics under the title 'Sustainable Development Goals and Design Curricula' during the III ESDA DESIS Social Design Days was a welcome invitation. Another contributing factor in accepting the invitation was the overall approach towards social design at ESDA (Escuela Superior de Diseño de Aragón), which is bottom-up and not top-down. Thus, design academics have

a sense of ownership towards social design initiatives, and the management has the foresight to allow these initiatives to flourish.


Images 1 & 2: Workshop for teachers on 'Sustainable Development Goals and Design Curricula' at ESDA´s library. Photos by Andrés Jarabo.

For this workshop to have some educational value, it was approached pragmatically and not through abstract declarations of the significance of incorporating SDGs in design curricula. The participants workshopped their study guides and project descriptions in small groups, and when appropriate, they introduced awareness of the SDGs and the instructional strategies that promote them. The workshop was an enriching exercise because, once again, the participants demonstrated their willingness to create a culture of shared responsibility for social design in their remarkable design institution. Lifelong learning is an attitude.

Biography Nicos Souleles
Dr Nicos Souleles has held educational and administrative positions at universities in Australia, England, the United Arab Emirates and Cyprus. He has expertise in learning design, curriculum development, technology-enhanced learning, quality assurance, accreditation processes and integrating the Sustainable Development Goals into higher education curricula. His research interests encompass educational research, technology-enhanced learning in design, design education, learning design and design for social change. He coordinates the research lab Art + Design: learning lab - Design for social change. The lab has undertaken funded European projects in digital upskilling and multiliteracies, curriculum development for the Third Sector, cultural and arts entrepreneurship for marginalized women and sustainable assessments. He is co-editor-in-chief of DISCERN, the International Journal of Design for Social Change, Sustainable Innovation and Entrepreneurship.
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Co-designing Social Change – Reviewing some methods and tools

Lorraine Gamman & Francesco Mazzarella

Introduction

This short paper came about when engaging with Cecilia Casas, who asked us and Dr Yanki Lee to share co-design methods and tools at the ESDA (Escuela Superior de Diseño de Aragón) DESIS Social Design Days III (Zaragoza, March 2024) (Images 1 and 2). We were asked to discuss the involvement of participants in equitable co-creation and reflect on how best to manage the relationship between what Manzini (2015) calls 'expert designers' (those who are design trained) and what he calls 'diffuse designers' (those who are not trained in design yet play a crucial role in delivering democratic design solutions).

Manzini (2015) suggests designers should be 'facilitators', 'mediators' and 'catalysts' in the context of design for social innovation, but his work also recognizes that 'context is everything'. Drawing on our experience of social innovation projects with prisoners (Gamman & Caulfield, 2023) and refugees (Morgado and Mazzarella, 2024), we were aware that not all approaches to co-design can be automatically transferable to different political and geographic landscapes. We found it tricky to translate our UK-based approach for a workshop in a Spanish context, but a helpful dialogue developed with colleagues from ESDA, as follows.

Images 1 & 2: Lorraine Gamman and Francesco Mazzarella while introducing the workshop "Sharing Co-Creation Methods and Tools for Social Design". Photos by Lucía Rodríguez.

The designer's role

Design for social innovation is based on a paradigm shift, from designing *for* users towards designing *with* "experts by experience". Co-design refers to the creativity of designers and people not trained in design, working together in a social innovation or design development process, and has been going on since the 1970s (Ehn, 2017). Some contexts work well for co-design, but not all situations easily benefit or lend themselves to a collaborative design

process. Hence, the first discussion item was about how best to understand the context of engagement and decide whether to engage and question how to do so.

Von Bush and Palmas (2023) point out how the ideals of participation, empowerment and collaboration that underpin co-design intentions for democratic engagement can be corrupted by power, politics and market forces. Thus, the integrity of collaborative engagement and what it can deliver needs careful design. They argue that power relations are always around the participation table, some hidden and some in plain sight. Power can negatively impact the relationships between all collaborators involved in co-design if roles, values, and goals are not adequately clarified beyond lip service. So, when co-designing, all participants must carefully review how equitable and respectful engagement can work. We also need to inform ourselves about how to avoid hidden agendas that seek to manipulate participants, preventing participation from becoming tokenized rather than genuine.

Design framework

Francesco presented the 'Crafting Situated Services' methodological framework (Mazzarella et al., 2021), which equips the designer with cultural sensitivity when entering communities, making sense of sustainable futures, facilitating co-creation processes, and activating legacies towards community resilience and social innovation. This framework presents diverse roles (i.e. cultural insider, storyteller, sense maker, facilitator and activist) that a designer might play throughout a social innovation journey. The framework also presents a range of methods and tools that can be adopted/adapted to co-design meaningful social innovation with communities.

The workshop shared and discussed many tools: design ethnography, story-listening and storytelling, contextual interview cards, sensemaking, "what if?" approaches, future trend cards, stakeholder maps, storyboards, social business model canvas, action plans and more. The presentation inspired some ESDA colleagues to share additional techniques. For example, one workshop participant shared her experience of a project bringing together students and young/minor offenders, in which the students wrote a letter to their collaborator before engaging with them and received responses to inform the co-design process. Another participant discussed photovoice (Wang & Burris, 1997) as a method used in ethnographic research, consisting of giving cameras to people for them to capture the world through their own eyes. Our discussion raised many ethical issues and themes about techniques and "best practice".

Ice-breaking to foster co-creation

Breaking the ice of unfamiliarity or social discomfort helps people feel more relaxed when engaging with each other, but the process needs to be carefully designed and facilitated. How to foster dialogue or playful interaction between people, especially when working with marginalised and vulnerable groups, also needs thoughtful design facilitation.

We discussed our experience of routinely using ice-breaking exercises that can relieve some of the tensions in the room and overcome social barriers through activities such as games or light conversations. These tactics foster communication, build relationships and set a friendly and open tone for engagement. We use various ice-breaking techniques, including "body storming", "drawing without looking down" and many others.

To start the workshop discussed here, we used the drawing exercise. We gave each participant a blank sheet of paper and a pen and asked them to choose a partner and spend 1–2 minutes drawing each other. As facilitators, we instructed everyone to place the paper in front of them and prepare to draw their partner; however, they could not look at their paper while drawing but simply look at the person in front of them. The drawings that emerged from our session (see Images 3 and 4) showed that everyone can make marks and laugh. Unexpected results served as a wonderful way to spark conversations, break down barriers and enable us to start the workshop with a light-hearted tone. Each partner also wrote the person's name on their drawing and taped it to the wall to help us remember each other's names.

Images 3 & 4: Results of the drawing exercise used as an icebreaker.
Photos by Lucía Rodriguez.

Ethical engagement

Co-design projects often bring together students and diverse communities, including vulnerable people. Universities develop ethical protocols to prompt staff to consider potential risks for researchers and participants. Clear information about ethical processes and the rights of all participants must be addressed before co-design commences, including issues already raised and many others about consent, data use and withdrawal of participants from a project, etc.

The roles of facilitators and students in the process need clear and respectful discussion and agreement before projects commence. Our workshop highlighted the need to develop and adopt a framework of "ethics of care" (Gilligan, 1982) to collaborate with trauma-informed professionals who can deal with complex issues and promote engagement with professional counselling services both for participants and design researchers. The workshop highlighted the importance of acknowledging the positionality of all involved in such processes and the need to challenge one's privilege and prejudice.

We agreed on the importance of involving representative stakeholders in early dialogue and doing our best to ensure that those from marginalized groups can take part and access information. This might mean translating materials using plain language or providing assistive or visual technologies. Such projects also require "credible messengers" (Weber, 2022), i.e., people who have lived experience of different issues (for example, criminal justice

or immigration issues) in the design/research team, to bridge connections between people. Credible messengers offer an extra built-in reminder to acknowledge intersectionality, diversity and differences and creatively build trust among groups.

The case for empathy and active listening

In co-design projects aimed at social change, empathy is essential in understanding and sharing another person's feelings. Putting oneself in someone else's shoes (Krznaric, 2007) can make a difference. Recognizing and appreciating another person's emotions, experiences and perspectives often provokes a desire to help or support them (Gamman & Thorpe, 2015). However, market-led designers for over a century have used empathy to sell us things, so what we mean by empathy and how it correlates with inclusionary experiences of co-design needs definition.

Our discussion highlighted that empathy could feel patronizing if implicit feelings of perceived superiority, oversimplification or insincerity inform the process. Moreover, while understanding another person's world is essential, how that understanding is gained and facilitated needs thoughtful planning to design patronage and build equity of contact between all participants.

Active listening is crucial in such co-design processes because total concentration regarding what the speaker is saying enables the listener to grasp the content and emotional impact better. Rogers and Farson (1957) offer a process to ensure that active listening happens, pointing out that "seeking first to understand, then to be understood", reduces misunderstandings. When people feel fully heard and understood, trust and empathy develop between them. In our view, active listening and working directly with people in a context where equitable dialogue/respectful terms and conditions have been established is the best way to foster empathy and trust.

Conclusion

This short paper reflects on creative tools and methods to support co-designing for social change and democratizing design for social innovation. Overall, co-design has much in common with participatory action research (PAR), the dialogical processes of Paulo Freire (1970) and other design theorists. For over 50 years, PAR and co-design have sought to humanize research by challenging subject/object relations. We and our colleagues believe it can drive change and social justice by including those with lived experience/experiential knowledge of systems in transforming them.

Biography Lorraine Gamman

Dr Lorraine Gamman is Professor of Design at Central Saint Martins, University of the Arts London and Director of the Design Against Crime (DAC) Research Lab, founded in 1999 and supported by many stakeholders, including the UK's Design Council and Home Office. Gamman has delivered numerous research projects funded by the AHRC, EPSRC and the EU, among other funders, and works with artists, designers, policymakers, crime prevention practitioners, communities and prisons to deliver design education and research. She serves on several charities, including the Empathy Museum and UK's National Criminal Justice Arts Alliance (NCJAA), and is the author of many books, journal articles and reports.

Biography Francesco Mazzarella

Dr Francesco Mazzarella is a design researcher, educator and activist, striving to plant seeds

of hope and change, especially working with marginalized communities. He is Reader in Design for Social Change at the London College of Fashion, UAL. Francesco's research spans the fields of design activism, decolonizing fashion, textile craftsmanship, design for sustainability, social innovation and place-making. Francesco is a member of the Design Council Expert Network, a Fellow of Advance HE and Co-founder of the DESIS Cluster on 'Design from the Margins' and the Cumulus Working Group on 'Design Education for Social Change'.

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“Let’s Design AS the Others!” Exploring new social design practice for our inclusive future

Yanki Lee

If you are new to the field and you googled the term “social design”, Victor Papanek and Victor Margolin are two significant figures in the history of this field, promoting human-centred production (“Social Design”, 2024). Thus, in 1999, the Design Academy Eindhoven was transformed from a Dutch industrial design school into an international interdisciplinary design academy and began offering the first MA programme in Social Design. According to the Wikipedia entry on Social Design (2024), Boelen and Kaethler (2020) reflected this new definition as “[a] [new] materialist reading of social design, on one hand, complexifies the design process and on the other offers insight into meaningful forms of engagement” (p. 15).

The positionality of social design practice

Aligned with the New Materialist Model of social design, which seeks to break down any distinction between design society and argues that all designs are social, design researchers such as Sanders and Stappers (2014) referred to three types of relationship between designers and people, which they also mapped with the following timeline:

1984 – Design for people
2014 – Design with people
2044 – Design by people

This timeline also reflected my journey from an architectural designer to a design researcher: inclusive/universal design to participatory design to design research. My journey started in London in 2000, where I was a research fellow on Inclusive Design at the Royal College of Art (RCA). There, I ran an education programme to research and teach students how to design for people. This work focused on marginalized end users, those excluded by design at that time in the UK, i.e. older and disabled people. Along with my doctoral research, I was active within participatory design communities in the Scandinavian countries. Here, a solid political agenda favours design, with people working with citizens to fight for social justice and equality. In 2012, after a decade working in design and ageing/disability, I spent a year as a post-doctoral scholar at Tsinghua University, Beijing, where I worked with a naturally occurring retirement community (NORC). During this time, I collaborated with retired scientific professors in this group; they confirmed my questions on design practices for and with people and reinforced my ambition to advance and advocate the practice of design by people. I titled the study the “Ingenuity of Ageing” and used it to share insights into how we can enable ingenious older people to design by themselves for their ageing communities. Through this, we can be inspired by their ingenious solutions for our future ageing.

As an educator, I articulated and shared my experience with my students, providing a framework for them to reflect on their position. The aim was to enable them to become socially responsive designers. Instead of linear development, I encouraged my students or new practitioners to develop a broader understanding of different social design practices and critically apply them to different situations.

Design AS the others

In our rapidly changing world, I believe all practices should be situational and evolving, responding to needs. I started to explore new design practices, as I did with others when

I investigated how to evolve my practice from human-centred to more-than-human-centred design. This immersive practice also helps me rethink my human position and explore the otherness in design. As it was defined, “Otherness is the result of a discursive process by which a dominant in-group (“Us,” the Self) constructs one or many dominated out-groups (“Them,” Other) by stigmatizing a difference – real or imagined – presented as a negation of identity and thus a motive for potential discrimination” (Staszak, 2009, p. 2).

Images 1 & 2: Workshop for teachers in which Yanki Lee explains and displays tools to design AS others. Photos by Andrés Jarabo (left) and Cecilia Casas (right).

We applied this practice to our latest experiment, ‘Objects’ Talk: Empathic Ecologies Education Project’, a two-year funded project for us to work with 500+ youths exploring ways to work with non-human (living or non-living objects) and a way to immerse ourselves in those objects’ world (Lee, 2024). Alongside this work, since 2015, we have designed empathic tools enabling citizens to immerse themselves in the dementia world. This is essential to understand the disease and co-create new cultures where people can accept people with dementia and support their caregivers.

Biography Yanki Lee

Professor Yanki Lee is a global citizen who researches and teaches between Hong Kong, London, Växjö and Kolding. As a design activist with an architectural design background and the founder of Enable Foundation, a social design collective and education charity, Yanki co-designs things and exhibitions as co-creative tools that unlock wicked social problems through empathic design practice. Since her doctoral design research on inclusive and participatory design practice (2003-2007), she started self-reflective discussions about human-centred design practice, and now the discussion is extended from human to non-human and expanded to “design for/with people” or even “design as the others”.
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Reflections on teaching and learning for social design

Susan Melsop

On the afternoon of March 11, 2024, the spacious lobby of ESDA (Escuela Superior de Diseño de Aragón) was transformed into an exhibition hall as students, faculty, administrators, staff and guests filled the space for the III ESDA DESIS Social Design Days. On display in the atrium were posters, short videos, visual stories and design objects created by ESDA design students; these described their experiential learning with and in communities. Excitement about social design was palpable as design students presented their projects and described the communities in which they worked in mutually reciprocal ways. As an international visitor, a scholar of community-engaged design and a participant in the Social Design Days, The students demonstrated an educational foundation of social design praxis that emphasizes people, place and *potential* –rather than problems.

The ESDA students articulated social challenges, their processes for engagement and the impact of their – often collaborative – design work. This type of experiential coursework can create transformative learning experiences for aspiring designers. It can unite learners in collective, creative efforts toward critical causes and perhaps lead to an activist mindset. What students learn, the knowledge they glean, the skillsets they acquire and the curiosity and care they develop will affect and impact our collective capacities to empathize, adapt and thrive in an ever-changing world. In this regard, the role and responsibilities of an educator are paramount in driving this type of growth, transformation and adaptation. Educators can foster an evolution in consciousness and create opportunities for students to develop an ontology of care (Escobar, 2018) and a mindset toward radical relatedness (Gablik, 1992).

Images 1 & 2: Susan Melsop and Bori Fehér during the students' exhibition of their last term's works on social design. Photos by Lucía Rodriguez (left) and Pablo Calvo (right).

Indeed, what I witnessed from this exuberant display of students reflecting on their creative responses to community-based issues is foundational for the praxis of social design. This education can raise critical consciousness, ignite compassion for others and elevate collective creativity toward social justice. Paulo Freire reminds us, "…love is an act of courage, not fear, love is a commitment to others. No matter where the oppressed are found, love is a commitment to their cause–the cause of liberation" (Freire, 2000). In this context, the focus on how students learn resonates with the principle that education should impart knowledge and cultivate awareness and empathy. By emphasizing the development of curiosity and care, educators can guide students toward a deeper understanding of their role as citizen designers,

integral to transformative experiences in social design. This approach aligns with Escobar's notion of an ontology of care, as it encourages students to engage thoughtfully with communities, considering the implications of their design choices. Similarly, Gablik's concept of radical relatedness highlights the importance of interconnectedness, urging students to recognize their responsibilities within a broader social context.

Thus, educators can play a pivotal role in nurturing these transformative experiences, encouraging students to reflect on the development of their consciousness and embrace a mindset that prioritizes collaboration and social impact. This holistic approach prepares students to adapt and thrive and empowers them to contribute meaningfully to their communities in an ever-changing world.

Biography Susan Melsop

Susan Melsop is Associate Professor of Design at Ohio State University. Her body of research weaves place-based design–build pedagogy with eco-social justice issues. She is Co-Director of the DESIS Lab, Design for Social Innovation & Sustainability and recently served as a Faculty Fellow for Arts & Design Engagement at OSU. Her recent work, "Design Matters in Brazil", addresses human rights issues through design–build activities with the PopRua (National Movement for the Street Situation) as community partners. Her postgraduate studies in East Asian philosophies and Buddhism inform her approaches to engaged scholarship, contemplative pedagogy, and collaborative creative place-making.

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Teaching how to finish a project process in social design

Canan Akoglu

In design education, especially when addressing social issues, students work closely with communities facing vulnerability, such as loneliness, illness or forced migration. These projects are not just academic exercises; they involve real human connections and emotional investments. One of the most crucial aspects of social design education is teaching students to consider what happens to the relationships they build with citizens once the project ends. How do they prepare for their departure in a way that ensures that citizens are not left feeling abandoned? How do they ensure that the solutions developed can be sustained without their ongoing involvement?

As design educators, we must teach our students how to build meaningful, empathetic relationships, thoughtfully finish their project processes and manage their exit. By integrating strategies for long-term sustainability and relationship continuity into their learning, students can become responsible designers, leaving behind more than just completed projects—they will leave communities with more robust agency.

The first step in teaching students to manage these relationships is helping them understand the emotional and psychological dimensions of social design. Vulnerable topics such as loneliness, illness and forced migration touch deeply personal aspects of people's experiences. Citizens in these contexts often carry emotional wounds, and their interaction with the designer can be a source of hope or support. For students, entering this space requires great empathy and cultural sensitivity.

Images 1 & 2: On the left, a fashion design student from ESDA teaches a refugee from Venezuela how to use a sewing machine. On the right, a graphic design student shows her work to some refugees and classmates. Photos by Cecilia Casas.

We must encourage students to reflect on their roles as problem-solvers and as temporary participants in the lives of those they work with. By fostering this awareness, students will begin to see the long-term impact their departure can have on vulnerable citizens.

One of the most important lessons to teach students is the ethics of finishing a project process and leaving the context. As students complete their projects and prepare to move on, we must

teach them that their exit should be part of a thoughtful transition that ensures continuity and support for the citizens they have worked with.

This might be taught by embedding an exit strategy into every student project. We should ask the students to consider the following as part of their design proposals:

- Who will take over the project?
  Encouraging students to identify local leaders, community groups or partner organizations who can continue the work helps prevent projects from ending by only designing a good outcome. This could involve handing off responsibilities to local citizens who have been part of the design process or establishing partnerships with NGOs or government entities.

- How will the community sustain the solution?
  We need to teach our students to design solutions that the community can sustain after they leave. Whether providing resources, training or developing systems that empower citizens, students must ensure that their projects can be maintained long-term without their direct involvement.

- What emotional support structures are in place?
  When working on issues such as loneliness or illness, students should be mindful of the emotional impact of their departure. Teaching them to create support networks—such as peer groups, community-based services or connections to counsellors—ensures that citizens feel supported after the project ends.

Reflection is a powerful tool in design education. We can encourage students to reflect on the relationships they build with citizens during social design projects. How did their presence impact the people they worked with? What challenges did they face in building trust? Most importantly, what will happen once they are no longer present?

By encouraging students to write reflective journals, engage in peer discussions or present case studies of their projects, we can help them critically engage with the dynamics of entering and leaving vulnerable contexts. Reflection helps students develop emotional intelligence and ethical responsibility, which are both essential in social design.

Social design is not only about solving problems but about creating sustainable change. This involves training students to consider the future trajectory of their projects and the well-being of the people they have worked with. Teaching students to manage relationships in social design, mainly when working on sensitive issues such as loneliness, illness or forced migration, requires a holistic approach. It is about building empathy, teaching ethical exit strategies, encouraging reflection and emphasizing sustainability. By equipping students with these skills, we can prepare them to become designers who create meaningful solutions and leave behind communities with more robust agency, capable of continuing the work long after the designer leaves the context.

Biography Canan Akoglu
Canan Akoglu is Associate Professor and Head of the Design for People Master's Programme

at Design School Kolding in Denmark. She also has a shared research leadership role in the Lab for Social Design at the same institution. Akoglu has a background in architecture and a PhD in industrial design from Istanbul Technical University. Her main research interests include stakeholder engagement, co-design, service design and social design in health, social care and well-being. Before her current position, Akoglu was co-founder of the Department of Industrial Design at Ozyegin University in Istanbul.

From left to right, Nicos Souleles, Canan Akoglu, Cecilia Casas-Romero, Susan Melsop, Lorraine Gamman, Yan Ki Lee, Bori Fehér and Alberto Franco. Francesco Mazzarella, the seventh participant, was not present when this photo was taken. Photo by Lucía Rodríguez. (11-12 March 2024)

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Heroic Journeys: on design for empowerment and narratives of social change

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Heroic Journeys: on design for empowerment and narratives of social change

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Abstract

Can empowerment be designed? Designers often claim to empower the people and communities they work with, yet there is little critical discourse on how empowerment is defined, facilitated and achieved in social design projects. This paper draws on social and political theories to redefine empowerment within design for social change, positioning it as a political activity to address power imbalances and foster individual and collective potential. To guide best practices in design-led interventions, we present four Design for Empowerment (DfE) principles grounded in Empowerment Theory and introduce Heroic Journeys, a conceptual framework co-created with community organisers and social designers through participatory design workshops. This approach facilitates the implementation of power analysis and narrative techniques to uncover diverse stories of change, advocating for design practices that are transformative, inclusive, and responsive to the contextual complexities of design for social change projects.

Keywords: Design for empowerment, Power analysis, Change narratives, Design projects

Introduction

Empowerment is a foundational concept in design for social change, where projects aim to co-create solutions to social issues, reduce inequalities, and enhance quality of life. These projects are often considered vehicles for individual and collective empowerment, fostering civic leadership and broader participation in public life (Björgvinsson, Ehn & Hillgren, 2010; Noel, 2023; DiSalvo, 2012).

However, while all social change work is inherently political, not all is genuinely empowering. The design literature reflects this disparity, with some instances where empowerment is grounded in political theories of change, particularly those centred on emancipation and social justice (Rezai & Erlhoff 2021), contrasted with others where the term 'empowerment' is used superficially (Lundmark & Jonsson 2021; Volpi et al. 2024), lacking thorough analysis of its achievement (Zamenopoulos et al., 2021; Avelino, 2021), or where underlying design assumptions and biases, such as those related to gender norms, social practices and the interconnected dimensions of power and tensions that emerge with 'expert design' in community settings are not openly addressed (Mazé, 2019; Costanza-Chock, 2020). When these factors are overlooked, we risk unintended consequences such as the reinforcement of existing power structures – including designers' privilege and power to shape society (Santamaria, 2023) – that stem from well-meaning but flawed social design interventions, and, at its worst, resulting in project failure (Avelino & Wittmayer 2016).

Moreover, the planning and reporting of empowerment often fail to reflect its complex developmental and political nature (Avelino, 2021). For instance, frameworks like the Theory of Change, widely adopted in design for social change (Simeone et al., 2023), tend to perpetuate hegemonic positions by fixing agreements, expectations, and outcomes rather than functioning as adaptive tools for ongoing reflection. As Mulgan (2023) highlights, the term 'theory' itself can be alienating in specific social design contexts, evidencing issues of control and exclusion. While such tools favoured in design projects may satisfy management and funders' metrics, they are frequently disconnected from empowerment's core

principles and language (Avelino, 2021). There is a critical need for greater awareness, transparency, and accountability regarding how empowerment agendas are assumed in social design projects, what kind of empowerment is being supported, and how the strategies to facilitate design-led empowerment have emerged.

In this paper, we revitalise the discourse on empowerment in design for social change, placing its inherently political nature at the forefront. We advocate for a deliberate, open and strategic positioning when projects aim to foster and articulate empowerment through design, emphasising the importance of adopting empowerment constructs and language when planning, evaluating, and reporting on empowerment within and across disciplines and practices.

First, we briefly present the historical roots of empowerment theory and its fundamental principles. We review foundational social and political theory concepts, which are being adopted for empowerment research and practice in community development and organising. Second, we explore various manifestations of empowerment in design, using examples from seminal politically engaged design literature. The purpose is to problematise understandings and practices of empowerment in design and discuss correlations to broader literature. Third, we propose four 'design for empowerment' principles for our literature analysis. Last, we present 'Heroic Journeys', a conceptual framework for implementing these principles within social design projects. The framework was co-developed with designers and community organisers through three participatory workshops to create common ground between design and other disciplines focused on social transformation and change.

In sum, we propose a novel design for empowerment approach that positions social design as a form of *political activity focused on empowerment processes*, understood as journeys of transcendence (of the psychological and systemic barriers) implied in human development, the process of expanding people's freedoms and opportunities, improving their well-being, and enabling them to lead fulfilling lives.

On power and empowerment

The broader literature from community psychology, political theory and psychology offers conceptualisations and language on empowerment that can inform social design.

Empowerment theory

The concept of empowerment has its roots in the 1960s and 1970s, particularly within discourses of oppression and emancipation (e.g. Alinsky 1971; Freire 1971). Seen as vital to social justice, empowerment enhances autonomy and self-determination by fostering self-efficacy, supportive relationships and advocacy for individual and collective interests. This made it a focal point for rights and environmental activists, policymakers and the helping professions as a post-modern approach to challenging the status quo. These conceptualisations and ideas also influenced design (e.g., Papanek, 1971). In the 1980s, Julian Rappaport (1987) formalised the concept, defining empowerment as a process by which individuals, organisations, and communities gain mastery over their lives. Community psychology adopted it as a central tenet, emphasising power distribution and gaining control through collective action and community engagement. The 1990s and 2000s saw the concept broadened by scholars like John Friedmann and Robert Chambers, who incorporated political and economic dimensions, highlighting the role of structural changes and participatory methods (1992). Feminist scholars, including Patricia Hill Collins (2000), introduced intersectionality, exploring how overlapping systems of oppression (e.g., race, gender, class) impact individuals' experiences of power and empowerment. Marc Zimmerman (2000) further advanced the

understanding of empowerment as a values-based, structured approach with the formulation of Empowerment Theory, comprising the following fundamental principles:

1. *Enhancing possibilities*: Empowerment expands individuals' and communities' capacity to take action and effect change. An increase in personal, interpersonal, and political power.
2. *Community focus*: Where mediating structures, like community organisations, play a critical role in facilitating empowerment.
3. *Reflexivity*: Developing a critical awareness of personal values and the socio-political environment, understanding and shifting power dynamics to gain equity and justice.
4. *Emphasis on language and narratives*: Personal and communal narratives are potent resources. Empowerment-oriented language can shift perspectives, revealing fresh solutions.
5. *Operative principle*: Fostering self-efficacy and community change, promoting environments where individuals feel capable and supported in action.

Further, Zimmerman (2000) usefully organised empowerment processes and outcomes at three levels: individual, organisational and community (Table 1). Thus, Empowerment Theory provides a robust framework for organising knowledge, ensuring its relevance beyond temporary trends (Rappaport, 1995; Zimmerman, 2000). Consequently, it has been widely adopted across many disciplines, including community organising (Speer & Hughey, 1995), due to its flexibility for application (Joseph 2020).

Table 1: Empowerment levels of analysis (Zimmerman, 2000).

Levels of analysis	Process ("empowering")	Outcome ("empowered")
Individual	Learning decision-making skills	Sense of control
	Managing resources	Critical awareness
	Working with others	Participatory behaviours
Organisational	Opportunities to take part in decision-making	Effectively compete for resources
	Shared responsibilities	Networking with other organisations
	Shared leadership	Policy influence
Community	Access to resources	Organisational coalitions
	Open government structure	Pluralistic leadership
	Tolerance for diversity	Residents' participatory skills

Power analysis

Empowerment Theory holds that power is dynamic and expandable (Rappaport, 1987). Therefore, identifying power dynamics within a specific context is essential both before and during interventions aimed at redistributing or shifting power. In this section, we review and synthesise key theoretical concepts adopted by disciplines focused on social change as a foundation for conducting effective power analysis.

Power, a complex and historically contested concept, is difficult to define. More recently, political theorists such as Lukes (2005), Haugaard (2021) and Gaventa (2021) have argued that it is more beneficial to integrate theories into 'dimensions' through which to momentarily focus on various aspects of power such as agency, structures, systems of thought and social ontology.

For example, the literature shows that conceptualisations such as 'power over', 'power to', 'power with' and 'power within' developed and refined by scholars in the fields of social and political theory are increasingly being adopted by various disciplines concerned with social transformation and justice (Pansardi & Bindi 2021), including design (Zamenopoulos et al., 2021). 'Power over' – often associated with domination – can manifest in many ways, such as influencing others' beliefs about their abilities and shaping self-perception, rights, and capabilities. 'Power to' (Arendt 1958) involves the ability to act, beginning with the awareness of the possibility of acting and developing skills and capacities for change. 'Power with' refers to collective action or agency; this concept relates to how individuals facing domination can collaborate, build shared understanding, and take collective action. Mary Parker Follett is often credited with its early conceptualisation; she contrasted it with 'power over,' emphasising the psychological and political power derived from unity (Eylon, 1998). 'Power within' (Starhawk, 1987) represents the confidence, dignity and self-esteem that comes from recognising one's situation and potential to address it. Individual empowerment allows people to represent their interests responsibly and self-determinedly, cultivating self-knowledge, self-confidence, and the ability to understand and claim their rights.

Lukes' 'three dimensions of power' – visible, hidden and invisible – is a helpful typology for analysing power in political decision-making and democratic participation (Lukes, 2005; Gaventa, 2006). Visible power refers to the formal rules, structures, authorities, institutions, and procedures of political decision-making, including how those in positions of power use these procedures and structures to maintain control. Hidden power controls who gets to the decision-making table and what gets on the agenda. These dynamics often exclude and devalue the concerns and representation of less powerful groups. Invisible power shapes meaning and defines what is acceptable, setting psychological and ideological boundaries of participation by subtly influencing how individuals think about themselves and their place in the world. It defines what is expected, acceptable and safe, perpetuating exclusion and inequality through socialisation, culture, and ideology processes. Empowerment, therefore, involves identifying mechanisms of oppression and control embedded within established social norms, roles and narratives and building our abilities to challenge these assumptions (Gaventa & Cornwall, 2008).

The importance of narratives in empowerment and change

The psychology and political science literature underscores the critical link between narratives and empowerment. Narratives are essential for sensemaking, allowing us to internalise and externalise change experiences (Nardon & Hari, 2021). Sharing stories helps identify power dynamics, positions of power, and disempowerment. Firstly, disempowering narratives—shaped by cultural norms, upbringing, and religion—can be actively reimagined. By reshaping the stories we tell ourselves, we can foster personal transformation and build power through a strengthened self-concept (Wilson, 2011). This involves going through a (self)transcendence process: overcoming internal and external limitations and embracing vulnerabilities to reach one's full potential. As Reed (2008) suggests, this journey leads to heightened self-awareness, inner power and more profound personal engagement. This perspective aligns with Foucault's (1979) assertion that power restricts possibilities and acts productively, enabling self-development and resistance to dominant discourses. Hayward's (1998) concept of "de-facing power," inspired by Foucault, emphasises that freedom from oppression lies in redefining boundaries and shaping new possibilities for ourselves. Narratives of change, therefore, document the journey toward greater autonomy, inner strength, and improved social, cultural and environmental conditions (Zigler, 2004; Kawai et al., 2023).

Finally, storytelling's impact surpasses intellectual arguments or theoretical transformation models (Alho, 2023). Narratives carry transformative power: to engage, mobilise, and spread alternative values and views that challenge the status quo discourses (Foucault, 1979). Stories foster solidarity and create pathways for

collective empowerment. By shifting mindsets and amplifying voices, stories of change hold the potential to drive meaningful and enduring transformation.

In Table 2, we summarise the dimensions of power discussed in this section, along with the corresponding pathways to empowerment proposed in the broader literature. These insights can inform and structure efforts toward empowerment in design for social change.

Table 2: Dimensions of power and practices towards empowerment.

References	**Dimensions of power**	**Definition**	**Ways to empowerment**
Wilson (2011) Hayward (1998) Starhawk (1987)	Power within	A person's sense of self-worth and self-knowledge.	Raising consciousness and awareness of self. Enhancing capabilities and autonomy.
Arendt (1958)	Power to	The unique potential of every person to shape their life and world.	Becoming aware that it is possible to act and progress towards acting. Developing skills and capacities and realising that one can effect change.
Follett (1924) Boulding (1989)	Power with	Finding common ground among different interests to build collective strength.	Joining with others through building shared understandings, planning and taking collective action.
Follett (1924)	Power over	Influencing what others think they can do or even imagine as possible. It extends beyond physical or verbal domination to affect how people view themselves, their rights, and their capabilities.	Fostering collaboration and unity, where differences are openly acknowledged and reconciled through creating new, shared solutions that respect and interweave differing desires and perspectives.
Lukes (2005) Gaventa (2003)	Visible power	Making and enforcing the rules.	Trying to change policymaking's 'who, how and what' so the process is more democratic, accountable, and responsive to diverse needs. Visible power is countered with political advocacy strategies and seeking access to formal decision-making processes.
	Invisible power	Shaping meaning, values and what is 'normal'.	Reimagining social and political culture and raising consciousness to transform the way people perceive themselves and those around them and how they envisage future possibilities and alternatives.
	Hidden power	Setting the agenda.	Strengthening organisations and movements of marginalised people, building collective power and leadership to redefine political agendas, and raising the visibility and legitimacy of issues, voices and demands that have been silenced.

Frameworks such as *Just Associates' Power Matrix* (Miller et al., 2006), the *Powercube* (Gaventa, 2021) and Collins' (2000) *Matrix of Domination* are good examples of theory-informed tools that have adopted these concepts. They are used for power analysis, planning and assessment of empowerment projects.

Figure 1: Powercube.net, a resource for understanding power relations in social change.

Towards design for empowerment

We now discuss the dimensions of power and ways to empowerment derived from broader literature (Table 2) in correlation to the design for social change praxis focused on empowerment. Insights of our analysis are then presented as a set of Design for Empowerment principles for best practice.

Empowerment in design for social change

Seminal literature in design for social change discusses self-empowerment and the *professional assistance* that enables individuals and communities to overcome feelings of powerlessness and lack of influence. It helps them recognise, mobilise, and use their resources to accomplish their objectives (Schneider et al., 2018). It also reveals how these concepts are entangled with the broader political aims of the socially oriented design projects. For example, community-based projects have been conducted to enhance democratic participation in design, moving beyond traditional approaches and assisting individuals and communities in controlling design processes, solutions, and outcomes (Rezai & Erlhoff, 2021). The Design Justice Network's pivotal work (Costanza-Chock, 2020) centres marginalised communities in the design process by empowering them to lead projects in collaboration with activist groups rather than imposing designs on them. This approach draws on Collins' (2000) Matrix of Domination theory, recognising the hidden 'power over' within designed systems and the embodied experience of disempowerment. It views these experiences as crucial motivations for action, where empowerment is understood as the capacity to resist and challenge these hidden power hierarchies.

Another significant body of work examines how design fosters participation in agonistic pluralism (Di Salvo, 2012), a democratic approach emphasising dissensus over consensus (Mouffe, 2002). By facilitating 'lively agonistic encounters' among diverse stakeholders (DiSalvo & Meng 2021), this work advocates for building 'power to' by creating public spaces where multiple voices are heard and conflict is managed civilised (Kraff, 2019). This work acknowledges hidden power hierarchies, yet it does not seek to resist them but to reveal them by making them hierarchized, performed, and debated (Bjorngvisson et al., 2010).

Still, some social design studies question the transferability of the democratically driven approaches to power and empowerment in non-Western contexts (Kraff, 2019) or where it could threaten the survival of marginalised communities (Gautam & Tatar, 2022). Instead, these studies focus on particular attention to building 'power within', for example, by revealing the strengths and assets of the dependent marginalised communities (Gautam & Tatar, 2022) or cultivating a community's craft capabilities rather than aligning their making practices with the market system. In this way, those previously silenced gain voice and agency through creative acts that leave lasting impacts on the world (Marques Leitão & Marchand, 2018; von Busch & Pazarbasi, 2018). However, while design literature emphasises approaches to developing capabilities, the focus is often on building external (skills/material) rather than internal (cognitive/psychological) capabilities and resources. We argue that design empowerment focused on developing people's self-knowledge and (self)transcendence is overlooked.

Finally, social designers claim self-empowerment by reflecting on their practice, such as embracing an alternative view to the pre-established aim of building 'power with' in each project (Popplow, 2021) and frameworks to explore positionality (Noel, 2023). We observe how design work that draws on feminist (Place, 2023; Costanza-Chock, 2018), indigenous (Tunstall, 2020; Sheehan, 2011) and critical perspectives inherently situates itself in the concepts of domination, colonisation, and patriarchy. Social designers like Di Salvo (2012) and Gautam and Tatar (2022) propose new participation configurations, identifying central issues and developing processes and resources to facilitate this. In these instances, designers explicitly discuss power dynamics or setting empowerment goals (Schneider et al., 2018). They recognise that designers possess 'power over' other stakeholders, particularly at the outset of a project (which underlies and influences the different types of power relations that emerge throughout a project) and at the end stages of evaluation and reporting (when outcomes and impact accounts are produced).

Despite the undeniable intentions of 'designing for empowerment' being expressed in many ways within design for social change, such discussions remain rare. Notably, many claims of empowerment in design literature lack theoretical grounding and consistent language with the broader empowerment literature (Zamenopoulos et al., 2021; Avelino, 2021). Consequently, most designs for empowerment activity appear disconnected from the wider context of social change and transformation work, negatively affecting design interventions' credibility and limiting interdisciplinary collaboration opportunities (Avelino, 2021).

While recognising the various forms of power is crucial for understanding dynamics and guiding design interventions, the design literature lacks theory-based tools for comprehensive power analysis. The methodologies that are significantly lacking are those that expose invisible and hidden power and formulate strategies to address these complexities. Adopting empowerment language, conceptualisations, and analysis tools from broader literature would facilitate discussions on power and empowerment in design projects, structuring objectives and making these concepts accessible to designers and stakeholders.

Design for empowerment principles

Drawing from design and broader literature, we propose four principles that position Design for Empowerment as a political activity and provide guidelines for best practices. These principles are grounded in Empowerment Theory values—enhancing possibilities, community focus, reflexivity, operative principles, and emphasis on language and narratives—and informed by relevant constructs from political theory (in Table 2).

DfE 1. Implementing power analysis to inform strategies

There is a need to understand power distribution in the project context to set empowerment goals and report on the nature and level of change. This involves acknowledging our positionality and identifying the power dynamics at play through critical discussions of power manifestations (power within/to/with/over, visible/invisible/hidden power). Such power analysis is crucial to inform empowerment goals, strategies and tactics for change. It also helps to address the politics of participation by paying attention to the asymmetries between stakeholders based on formal authority/power, wealth, social status, gender, age, prior knowledge and self-confidence (Cornwall & Coelho, 2007). This approach ensures the inclusion of diverse perspectives, providing equal opportunities to contribute to decision-making processes.

DfE 2. Setting clear empowerment aims and goals

Empowerment approaches stress the importance of community focus, where mediating structures (like community organisations) play a critical role in facilitating empowerment (Rappaport, 1987). This means exercising transparency and accountability in setting agendas and acknowledging the work's positionalities and other political aspects. This implies engaging with those involved from the initial stages of the project to discuss and negotiate expectations openly, defining the designer and the institution's role in catalysing change, and co-developing empowerment goals and strategies together. There should be clarity about what these might look like at individual, organisational and community levels (Zimmerman, 2000). Evidence of the empowerment process should be captured throughout the project, ideally in narrative form in the voices of those involved.

DfE 3. Focusing on human development: the empowerment process is a journey of transcendence

We conceptualise the empowerment process as a journey of transcendence by which individuals and communities are supported to overcome physical and psychological obstacles. Developing 'power within' is prioritised as a necessary condition for building 'power to' and 'power with.' While internal and external dimensions of power interact dynamically, the focus should be on developing individuals' capacity as 'agents of change' by helping individuals and communities recognise their strengths, value their knowledge, and understand their capacity to address their own needs and create solutions (Just Associates, 2015). This involves fostering self-leadership, discovering personal meaning and purpose, and building strong community relationships.

DfE 4. Adopting empowerment language and narrative methods as catalysts of change

Communal narratives and personal stories are powerful resources that significantly impact human behaviour (Rappaport, 1995). Narratives provide valuable insights into how people understand unfolding events, enabling individuals and groups to articulate their experiences, identify negative assumptions and behaviours, and frame/reframe understandings (Rappaport, 1995). Narratives are also meant to contest and subvert dominant discourses by disseminating new knowledge, serving as sources of both power and resistance (Prilleltensky, 1994; Gaventa, 2003). Therefore, it is essential to create opportunities for diverse narratives to emerge, where individual and collective experiences of empowerment can be articulated as transformational journeys. It is also necessary to adopt empowerment language and accessible tools such

as metaphors to facilitate sensemaking, identify values and power dynamics, and spot available resources.

Heroic Journeys, a conceptual framework for empowerment by design

While the principles presented above help us to organise knowledge, we align with McGee and Pettit's (2019) view that theory often remains inaccessible and of little practical use to those working on the frontlines of social change and the need to integrate academic theory with methodologies developed from the grassroots.

Accordingly, we engaged in participatory research through a series of workshops (Figure 2) to co-develop an accessible framework grounded in Design for Empowerment principles to support the empowerment process in social design projects in a manner that is both legitimate and democratic. Our research design is informed by the question: "What kind of framework can support the implementation of design for empowerment principles in social design projects?"

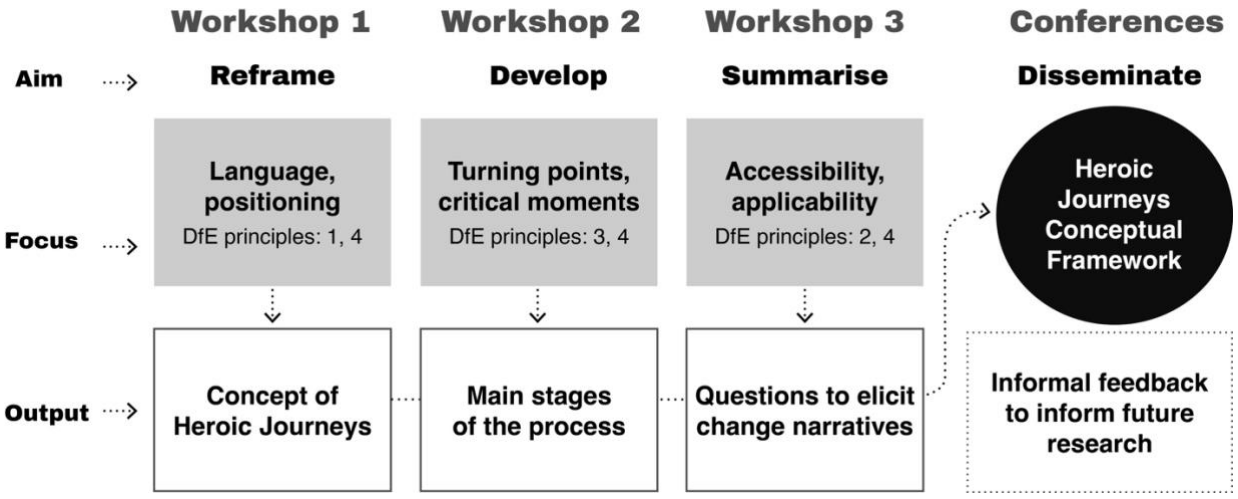


Figure 2: Heroic Journeys framework development.

Methodology

Abiding by DfE 4 (adopting narrative devices), our starting point was identifying a relevant narrative device reflecting the DfE principles and values. We were inspired by the familiar narrative structure of the Hero's Journey, popularised by Joseph Campbell in his book The Hero with a Thousand Faces (1949). This archetypal story structure, derived from ancient myths from diverse cultures, has universal appeal because it captures the key themes in individual self-development and maturation. It comprises four phases: departure from the familiar, initiation' through challenges and learning, unification symbolising transformation, and return with newfound wisdom or resources to benefit the community. As such, The Hero's Journey parallels the empowerment process, where overcoming internal and external challenges leads to personal growth, self-knowledge and a sense of purpose.

The framework was developed through iterative co-creation workshops (Sanders & Strappers, 2008) to bridge research and practice for social change and empowerment through a collaborative inquiry. As such, we followed purposive sampling, inviting participants with experience in design for social change and community organisers from Citizens UK (see Table 3). These participants shared an interest in understanding the perspectives of the 'other'. They had similar levels of experience in their respective fields of social change practice, which helped mitigate the potentially damaging effects of knowledge–

power relations (Moreno-Cely et al., 2021). Citizens UK organisers adopt a 'broad-based' approach to community organising, a political methodology rooted in civil society and based on the concept of power (Bunyan, 2018). They aim to identify and empower citizen leaders to mobilise their communities around issues they care about. Similarly, social design practitioners and researchers are committed to participatory principles and building stakeholder networks that co-create public value.

Table 3: Overview of research participants.

Participants	**Expertise of the participants**	**Workshops attended**
P1	Community organising, leadership, child culture, design	WS1
P2	Designer, User researcher, services design, semiotics	WS1, WS2, WS3
P3	Designer, Senior Design Researcher, has training in community organising	WS1, WS2
P4	Senior Lecturer, Storytelling	WS1
P5	Senior service designer, community projects	WS1, WS2
P6	Design researcher, social innovation, community projects	WS1, WS2
P7	Senior Community Organiser, engaged in design projects	WS1, WS2, WS3
P8	Community Organiser	WS1, WS2
P9	Community Organiser	WS1, WS2
P10	Senior Community Organiser, engaged in design projects	WS1, WS2
P11	MSc Design Innovation student (with industry experience)	WS3
P12	MSc Design Innovation student (with industry experience)	WS3
P13	MSc Design Innovation student (with industry experience)	WS3
P14	Community Organising and design	WS1
P15	Designer, service design	WS1
P16	Designer and Community Lead	WS2

Over a year, we conducted three online co-creation workshops with 16 participants (Table 3). Each workshop, involving 5-10 participants (with some participants attending more than one workshop highlighting their investment in the topic), focused on identifying, discussing and finding relationships between vital elements in the empowerment process grounded on DfE principles whilst parting from the Hero's Journey metaphor as a foundational structure. Creative activities – e.g. playing with metaphors, personas, mapping, and scenario building (Figure 3) incorporated into the workshops facilitated both 'knowledge exchange' and 'knowledge creation' between social designers, researchers and community organisers. This was done through dialogue, reflection (Reason & Bradbury, 2001) and collective meaning-making in interaction (Bridges & McGee, 2011). The virtual setup of the workshops allowed easy access to the materials and interactive tools, including templates and Miro board, which enhanced participants' engagement. Each workshop was video recorded and transcribed. Insights and outcomes from each workshop were synthesised by the researchers and shared back with the participants in the subsequent activity.

Figure 3: Workshop 1 – playing with metaphors of a 'superhero.'

Building on the participants' worldviews and lived experiences (Reason & Bradbury, 2001), each workshop attended to develop a particular aspect of the framework whilst contributing to its evolution.

In Workshop 1, we explored the use of language, expanding the meaning of heroes and heroism as it relates to the context of community work and social change. In Workshop 2, we built on the emerging concept of 'heroic journeys' by envisioning and capturing how it would facilitate a journey of 'obstacles transcendence' through a series of 'critical moments.' In Workshop 3, we developed a scenario to understand the framework's accessibility and applicability. We created probing questions as the best way to support each process stage. Finally, we synthesised and formalised the workshops' outputs into the *Heroic Journeys* conceptual framework (Figure 5).

Framework co-development process

The first workshop aimed to critically reflect on the Hero's Journey as the foundational structure and basic concepts concerning empowerment. The traditional notion of a 'hero' as patriarchal, male and characterised by physical strength and bravery was contested, but participants agreed on the notion of 'heroism' as a concept in its evolved understanding: emphasising selflessness, altruism, and service to others.

> *"The idea of a hero or superhero, such as a professional hero, can be damaging. Push people into this position to save the world. Still, at the same time, we are not protecting them because they are invincible… which they are not… this is different to an everyday hero doing something for their community with any resources they may have… there are also alternative journeys, such as the heroine journey, which usually is a quest for wholeness and overcoming stereotypes."* (Participant WS1, community organiser)

The idea of collective heroism also emerged, highlighting 'the hero-ship of peer groups and the power of the collective and multiple heroes' (participant WS1, designer) such as movements, organisations or communities that collaborate to tackle challenging social or political issues. In this context, we defined heroism as an attitude to embody courage, compassion, and moral leadership in overcoming adversity.

Figure 4: Workshop 1 Miro board

We discussed the process of transcendence and transformation. We conceptualised it as 'heroic journeys,' meaning that empowerment involves overcoming obstacles and limitations building inner and outer resources to gain greater self-determination and autonomy at individual and collective levels.

In Workshop 2, we discussed the 'critical moments' as they would structure the 'heroic journeys' from Workshop 1 – self-discovery, initiation, transformation, and reflection – concerning dimensions of power and ways to empowerment (Figure 4). The following insights arose:

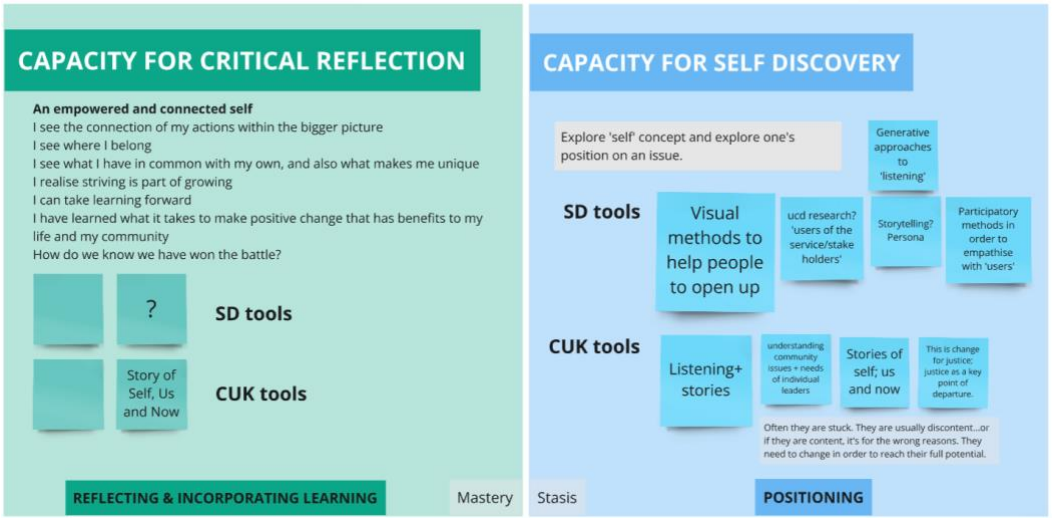
(1) *Self-discovery* – of one's power. Creating the conditions to build Power within. Focus on gifts, difference, passion, and purpose. We are exploring dissonance with self and its relation to systemic conditions. It involves self-examining currently held beliefs about personal power, systemic circumstances, and our personal view on them, understanding our story and recognising our disempowerment.

(2) *Initiation* – Validation of interdependency. Creating the conditions to build Power. Focus on overcoming internal challenges and attainable goals within the community. Testing and learning participatory and relational practices and exploring consensus and dissonance. It involves leaving the comfort zone, navigating the unfamiliar, taking small risks and understanding the value of collaboration: accepting guidance and valuing others who are different from us.

(3) *Transformation* – Moving from will to action, creating the conditions to build Power. Having built inner power, we can face external challenges via collective mobilisation and action. As the most significant fears are exposed and confronted, a vision of life or revival emerges from the triumph. There is usually a reward gained through overcoming one's fears. It feels like a rebirth that marks a clear separation between the old and new ways of being.

(4) *Reflection* – Internalising effects of action and repositioning. Creating the conditions to build Power over. Evaluation of learning, methods, new positionality, and identification of personal and collective challenges. A period of reflection, recollection, and internalisation of events. This space is where hopes have materialised, evidencing those other ways.

> *"... it is important to understand what people will volunteer their time for and what their interests are, their stories and background, and what are their political narratives and how hero[sic] journey can help them unpack the political narrative that allows them to dissipate the public life."* (Participant WS2, community organiser)



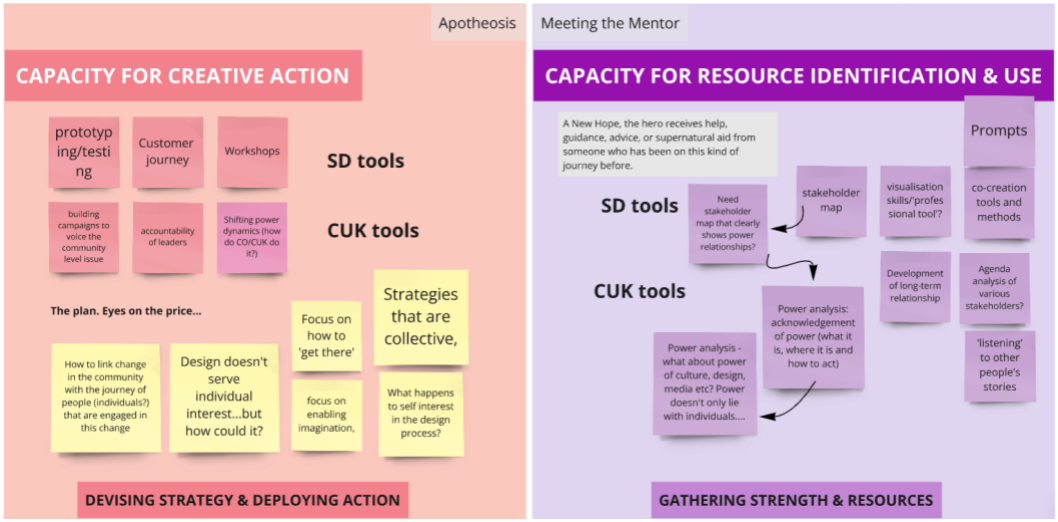


Figure 5: Workshop 2 – identifying 'key moments' of the Heroic Journeys framework.

In Workshop 3, we prototyped the framework as an accessible tool to organise and facilitate eliciting individual/community needs, values and stories through structured conversations (Figure 4).

> *"[As] we create the framework … we need to look at the probing questions … to start them on the journey of self-empowerment and transformation … to think about the logic between the questions for someone who is trying to get to [their] higher-self alongside others, I think that is the work of us … What probing questions can we sequentially ask to have them think about what matters to them, and also how they can create those powerful friendship groups that can help them along the way?"* (Participant WS3, designer)

Avelino (2021) suggests that asking questions facilitates a critical analysis of power, allowing 'inner stories' of empowerment to surface, be acknowledged and externalised. Building on this approach, we generated empirical questions to systematically explore power dynamics in processes of social change, where each stage of the heroic journey becomes a lens to examine a specific aspect of power and empowerment. The final, refined outcome can be seen in Figure 6.

Figure 6: Heroic Journeys, a Design for Empowerment conceptual framework.

Concluding remarks

This paper contributes to strengthening the approaches, language, and reporting structure of empowerment in design for social change. We argue that design-led social change projects that intentionally and openly engage in power redistribution are considered political activity towards enhancing individual and community agency (Jason et al., 2019). As such, our activity is not value-free. As we

collaborate with communities at the grassroots level, methods for planning and evaluating social design projects are necessary, particularly for reporting empowerment-focused interventions' impact on individuals and communities. Designers also collaborate with other disciplines – such as activists and community organisers – that share similar goals. Therefore, it is essential to establish a common ground to enhance interdisciplinary collaboration.

While empowerment cannot be designed, we can intentionally set the conditions and adopt best practices. To this end, we drew on principles, language and conceptualisations from relevant broader literature and summarised them to inform our proposed Design for Empowerment principles. To make these concepts actionable, we co-developed Heroic Journeys, a conceptual framework, through participatory and interdisciplinary knowledge sharing.

Limitations and future work

The framework development is rooted in practice (co-developed with social design practitioners and community organisers working on the 'frontlines'). Thus far, the framework has been shared with an international design community through a conference workshop (Santamaria, Kuzmina & Petersen, 2021) and the Service Design & Education Network Seminar (2022). The audience recognised that power can be one of the most uncomfortable and complex topics to address in social design projects. As a narrative, symbolic structure, The Heroic Journeys framework resonates with human experiences of growth, integration, and change. It can facilitate the exploration of complex and interrelated dimensions of power and empowerment. Participants identified its potential for mapping power dynamics, challenging the designer's role as a facilitator of pre-determined outcomes, eliciting diverse stories and supporting empowering vision-building within design practices. However, as the next step, it is essential to implement the framework across diverse live projects and contexts to evaluate its applicability, adaptability and impact on reporting design-led empowerment.

Future exploration includes integrating Design for Empowerment principles with other frameworks, such as the Theory of Change, to create a more comprehensive approach that leverages narrative, qualitative procedural, and logical methods while ensuring rigorous evaluation and impact measurement. The goal is to establish a community of practice dedicated to Design for Empowerment, fostering the exchange and development of methodologies, strategies, and experiences from diverse perspectives and paradigms.

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