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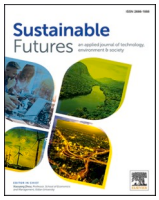

Factors for scaling a circular supply chain for clothing locally and nationally in the UK

Catriona Tassell El Baz, Żaneta Muranko, Eevee Zayas-Garín, Gareth Loudon, Sharon Baurley *

Centre for Materials Science & Culture, Royal College of Art, Rausing Research Building, 15 Parkgate Road, London SW11 4NL, UK

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ABSTRACT

The fashion and textiles industry operates a global supply chain that causes harm to the environment, emitting pollution and generating waste across all stages of production, consumption and disposal. The implementation of a local circular economy would reduce impact, shorten import and export distances while retaining the value of materials through practices like reuse and recycling. However, current local ~~and~~ circular initiatives operate in a system that is incomplete to provide sufficient support structures for their operations, meaning they are often small, fragmented, and at risk of cessation. To address this, five focus groups with fashion industry stakeholders were conducted where factors for scaling at a local and national level were discussed. Data analysis revealed 17 factors for scaling, two of which were unique to scaling nationally. These offer ways for local circular clothing supply chains to stabilise, speed up, grow, replicate, transfer, spread, scale up and scale deep. The results provide a new insight on how to increase the scale and transformative impact of local circular initiatives emerging in towns and cities across the UK. The research is useful for the industry and policymakers in informing the development of purposive interventions that seek to step beyond current niche and fragmented solutions and build circular systems that can overtake the current linear, energy intensive, pollutive and waste generating system. Significantly, this will facilitate a shift away from global production and distribution, to grow more locally and systemically robust initiatives at the local and national scale.

1. Introduction

Contributing to greenhouse gas emissions and therefore climate change, the fashion industry is often criticised for its detrimental impact on the environment, reliant on excessive quantities of raw materials and resulting in high volumes of waste [1–3]. Current production and consumption are linear in nature (i.e. clothing is made, used, and disposed of as waste to landfill in a one-directional chain). The supply chain is also globally distributed, meaning that manufacturing tends to take place in the low-cost global south (e.g. China, Bangladesh, India, Pakistan, Vietnam, Cambodia, Sri Lanka and Myanmar) before products are imported by other countries, including the UK, further contributing to emissions in transportation [4]. Based on the full lifecycle, the overall carbon emissions and water usage for clothing sold in 2021 in the UK alone was estimated at 29.4 million tonnes and 7.4 billion cubic meters respectively, highlighting the scale of the problem [5].

Circular economy is a concept of a socio-technical system where the goal is to retain materials in use for as long as possible in order to bring about a positive social and environmental change. In the context of textiles, circular economy can be established through interactions of actors across the supply chain phases, from fibre production, through to use and end-of-life (Fig. 1). Circular economy strategies present ways to reduce emissions and waste, either through biological cycles whereby materials break down and are absorbed back into the earth, or technological cycles whereby the value of materials is retained through practices like reuse and recycling [7]. In addition to regenerating natural systems and reducing energy and emissions along the supply chain, the circular economy also offers financial opportunities through material cost savings, innovation and employment [8]. When applied on a local scale, reshoring can contribute to local economies. ReLondon [9] estimates that the circular economy could create an extra 284,000 jobs in London and contribute £24.2bn by 2030. The reshoring movement has suggested that domestic supply chains could also ensure greater control and superior quality [10–12]. Environmentally, they have the capacity

* Corresponding author.
E-mail address: sharon.baurley@rca.ac.uk (S. Baurley).

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to better match supply and demand, resulting in reduced resource consumption, waste and emissions from production [13]. Further still, localisation would reduce complexity, thereby increasing supply chain visibility, transparency, and capacity to respond more dynamically to sustainability issues [14] as well as reducing transportation distances and offering greater resilience to global supply chain disruptions.

Although there are an increasing number of circular initiatives in fashion, such as Patagonia's repair programme and H&M's recycling scheme, they are often small-scale and described as "fragmented" [15]. Despite exemplifying that some sustainable services are being offered by well-known companies, initiatives are more often developed by independent fashion designers and small brands who embrace a slow fashion movement [16,17]. Gwilt et al. [18] also note that innovations in technologies and practices that attempt to counter dominant fast fashion trends often address separate sections of the system (e.g. a new production method in manufacturing or recycling process at end of life). Given the delays, fragmentation, small scale, and lack of joined up sustainable systems, as well as the lack of literature on scaling circular supply chains locally and nationally, it is imperative to understand how best to grow and link up these initiatives for a more effective transition.

The researchers of this study were based at the Royal College of Art's Textiles Circularity Centre (TCC), formed to conduct interdisciplinary research that envisions a circular future for the fashion-textiles industry and generate insight to facilitate implementation in the UK. For this study, the aim was to uncover factors for scaling a circular supply chain for clothing at both the hyper local (i.e. town) and national level, where

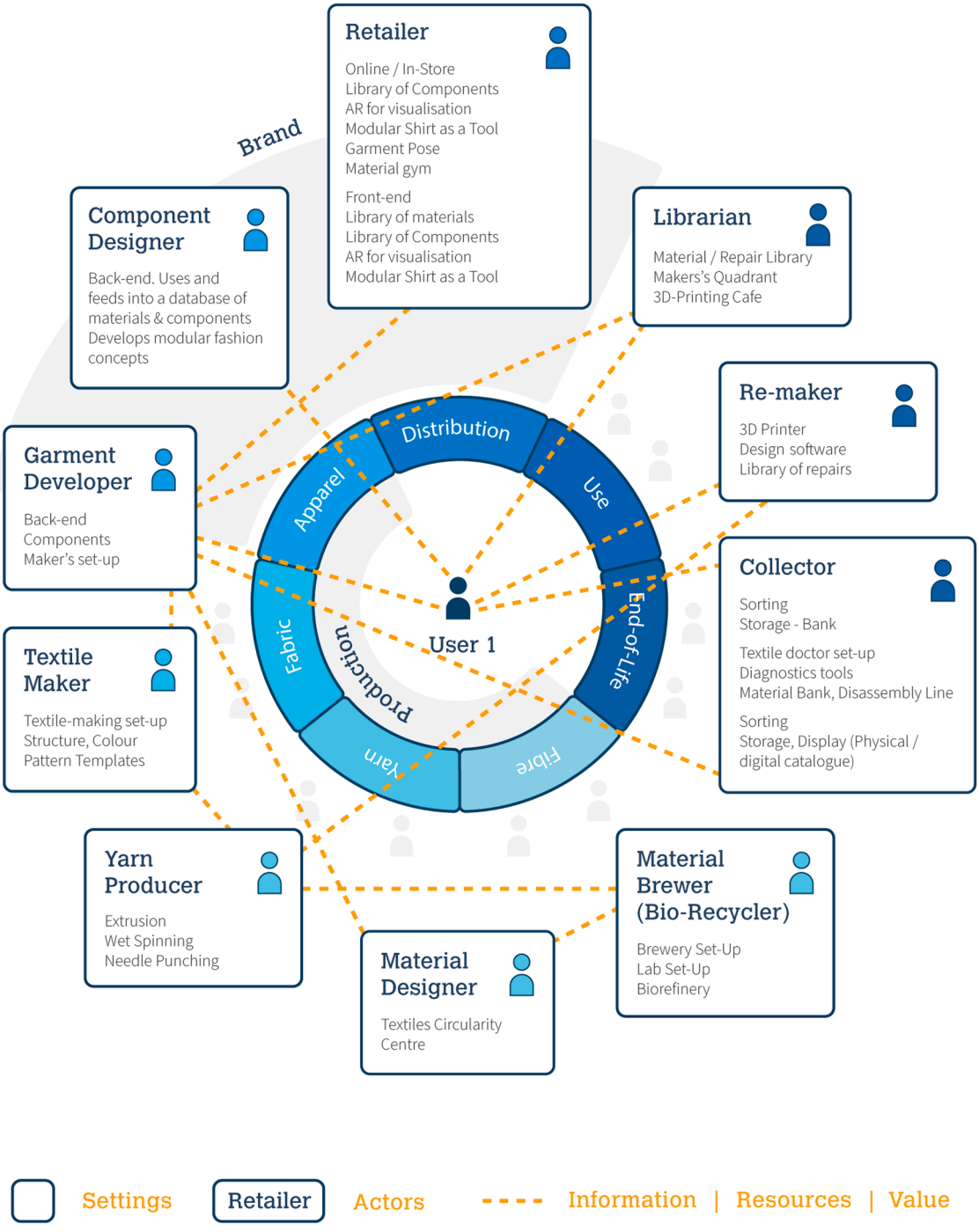

Fig. 1. System actors collaboratively enacting a circular economy of textiles [6].

circular initiatives work with one another to form a UK-wide network. The identified factors inform the areas of intervention development the industry and policymakers must target in order to support the growth of a complete, collaborative and resilient circular fashion system in the UK.

2. Background

2.1. Factors for scaling

The literature on sustainability initiatives points to a number of factors that can facilitate scaling. For example, despite e-retailing having perpetuated overconsumption, Buchel et al. [12] also describe digitisation as "a disruptive force that has allowed social innovations to flourish and alternative practices to emerge and scale up". It is interesting to note that, although growing, e-retail is still a smaller portion of the market share for the overall fashion industry (approximately one fifth of total sales in the UK) [19], yet is expected to account for half of all second-hand sales this coming year [20]. ThreadUp [20] suggests that the underlying reasons for digital platforms for peer-to-peer sharing, rental and resale, such as eBay, Depop and Vinted, contributing significantly to the growth of clothing reuse are financial, including cost savings for consumers who prioritise price, and the incentive of earning extra money through becoming a reseller. This indicates the importance in creating incentives for consumers and sellers to onboard, enabling the user base to grow. In addition to second hand markets, digitisation provides smaller brands, who offer niche sustainable products, access to wider audiences via social media and an opportunity to make direct sales to consumers [12]. Whereas digital platforms can increase reach within and beyond the local scale, localisation in itself is referred to as a factor for scaling sustainability transitions. One reason for this is that local supply chain infrastructure can facilitate shorter lead times [21]. Singh et al. [22] also link the increased ability to use waste products in the furniture industry to its often localised and therefore flexible production in comparison to the textile sector. This emphasises the importance of understanding how to scale and ensure the success of local initiatives.

Although not framed as factors for scaling as such, the more developed body of research exploring circular economy drivers in the fashion and textiles industry can also be consulted to understand what enables success in sustainability initiatives. Dissanayake and Weerasinghe's [23] systematic literature review synthesises the drivers of circular transitions in the fashion and textiles industry, concluding that rearranging the supply chain system is fundamental to this transition, which relies on the behaviour of its stakeholders. They list factors that help instigate behaviour change, such as access, knowledge and commitment of all stakeholders, clear communication, including through marketing and awareness campaigns, and (financial) incentives for returns. Even grassroots social action at a local level is described as being able to create the stimulus for larger scale systems change [24]. The role of technology is acknowledged by Dissanayake and Weerasinghe [23], providing a means to track and trace resources, enabling efficient reverse logistics for rental models, and leading to new innovative materials and processes, such as customisation aiding consumer decisions about the design and fit of clothing they purchase. The government is also key, with successful transitions requiring policy instruments that regulate material use, product design, manufacturing, distribution, consumption, and waste [23]. The EU's revised Waste Framework Directive [25] establishes a wide regulatory context, including for the UK-based businesses operating in the EU, who are obligated to the mandatory Extended Producer Responsibility for textiles. However, the UK-specific regulatory framework for the textiles circular economy is still lacking, with the industry participating in voluntary schemes, such as the UK Textiles Pact [26].

Many factors for scaling and success in the literature are presented individually or as siloed categories (e.g. digitisation as it relates to technology and innovation) [12]. However, the circular economy has been described as a 'system of subsystems', comprising resource flows, provisioning services, governance, regulatory frameworks and the political landscape, business activities and the market, infrastructure and innovation, and user practices [27]. Therefore, scaling requires a more holistic and integrated approach. Leventon et al. [28] use the onion metaphor to describe systems, whereby deep interventions applied to the inner system can be constrained by the outer layers and vice versa; therefore, transformation is required at all levels. As well as systems being connected, Buchel et al. [12] also highlight the necessity of collaboration. When actors work together, they have greater power to disrupt current structures and to stimulate and scale innovation.

The literature lacks a comprehensive study that identifies and discusses factors for scaling sustainability initiatives in the fashion industry. Further still, scaling is most often considered at the global level or in general terms, rather than locally and nationally, the latter being the focus of this study. This is an important distinction given that local circular economies have been said to differ depending on the opportunities and constraints faced in specific regional contexts and, therefore, develop their own ways of upscaling and outscaling [29].

2.2. Logics of scale

In addition to the specific factors for scaling sustainable and circular initiatives in the fashion industry, outlined in Section 2.1, there have been efforts to understand the logics of scaling sustainability transformations more broadly. Within this body of literature, the definition of scaling as a synonym for (often economic) growth is questioned [30]. For example, Lam et al. [31] prefer the term 'amplification processes', extending beyond the number of sustainability initiatives to account for an increase in transformative impact too, thus also considering changing values and mindsets. Their integrative literature review synthesises amplification frameworks to put forward a model comprising eight processes situated across three categories: amplifying within (stabilising, speeding up), amplifying out (growing, replicating, transferring, spreading), amplifying beyond (scaling up, scaling deep). While these are illustrated in Fig. 2 of Lam et al.'s article [31], here is a brief description of each category and process:

- Amplifying within: processes that seek to increase the impact of one specific initiative by stabilising its existence (i.e. deeply embedding in context, increasing resilience and prolonging impact) or speeding up its impact (i.e. increasing pace and efficiency).
- Amplifying out: processes that seek to increase the impact of initiatives by involving more people and places through growing (i.e. increasing the impact range in a similar context), replicating (i.e. duplicating an initiative in another context), transferring and spreading (i.e. implementing a similar but adapted initiative in a similar or dissimilar context respectively).
- Amplifying beyond: processes that seek to increase the impact of initiatives by scaling up (i.e. reaching higher institutional levels) and scaling deep (i.e. changing values).

With the literature lacking a comprehensive study of factors for scaling circular economy locally and nationally, this study investigates: *how to scale distributed networks of localised circular supply chains for clothing at both the hyper local (*i.e. *town) and national UK-wide level to realise the goal of the UK fashion industry becoming circular?*

3. Method

In order to understand how to scale localised circular supply chains for clothing, focus groups with industry stakeholders were conducted. Focus groups are described as 'controlled Group Discussions' [32] within which participants are 'operating under the shared assumption that the purpose of the discussion is to display opinions to the moderator' [33]. Focus groups were deemed appropriate given the importance

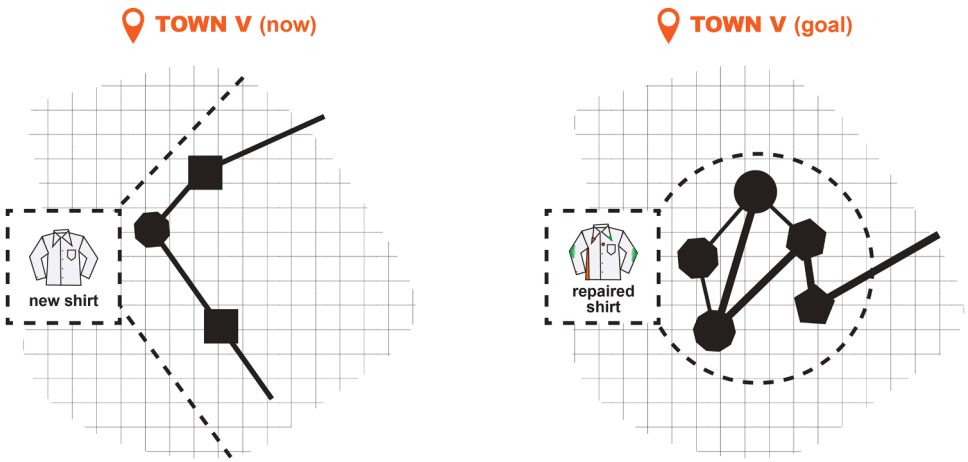

Fig. 2. Illustration symbolising current and preferred future scenarios.

of social networks, connectivity and collaboration to the future fashion system under study, with groups key to its realisation [32]. This study was granted ethical approval from the Research Ethics Committee at the Royal College of Art.

3.1. Participants

Diverse perspectives were targeted through the recruitment of stakeholders from across the clothing supply chain, including citizens, businesses, governmental and non-governmental organisations (NGOs), and research institutions who are actively adopting (or wanting to adopt and help others to adopt) circular economy principles for clothing. Purposive sampling was used as a recruitment strategy to target and select individuals with those range of characteristics. Recruitment messages were distributed via the TCC's social media channels (LinkedIn, Instagram, X), asking followers (a proportion of which was assumed to have the characteristics of target participants) to take part in research that aimed to further understand how to scale a circular, place-based distributed supply chain for clothing at a local and national level in the UK. Participants were required to be 18+ years of age, and able to provide their own consent. However, there were no further qualifying factors. Upon registering their interest using an Eventbrite link included in the social media posts, they were asked to complete a screening survey, also hosted on Eventbrite, responding to a series of multiple choice questions (date availability for workshops, ethnicity, length of time in profession) and open ended questions (name of organisation, description of role in the textile supply chain, gender identity). Following this, those selected received an email with the date and time they had been allocated, and with a request to respond and confirm their attendance in advance.

Following a pilot focus group held in January 2024, which enabled a reflection on the proposed questions and format of the session, five focus groups were scheduled between January 29th and March 5th 2024. The reviewed focus group format was designed to engage with the same research questions as the pilot, albeit with a more concise protocol aligned with the scope. There were 14 participants in total (Table 1), with 1–5 participants in each individual focus group (A: 1, B: 3, C: 1, D: 4, E: 5). Participants were allocated to the focus groups based on their selected availability, which led to a mix of actors in each group. Professional roles included SME business owners, business and supply chain consultants, operations coordinators, designers, artists, tailors, upcyclers, researchers, lecturers, policy specialists, and local authority employees. In groups A and C, where only one participant attended, a member of the research team took part in the discussion, in order to provide the grounds for a dialogical flow of ideas necessary for ideating ways of scaling up distributed networks in a similar manner to the rest of the groups. However, their contributions have not been considered in our findings to avoid a closed loop between research design and results.

Table 1
Study participant's roles, organisations and pseudonymised IDs.

Group	Role	ID
A	Journalist and consultant (sustainability and supply chains for fashion)	A1 *
B	Tailor/maker and technical instructor	B1
	Consultant in circular design and innovation	B2
	Repairer/upcycler/maker/designer	B3
C	Founder at digital passport company for fashion	C1*
D	Textile sculpture artist	D1
	Supply chain manager/consumer	D2
	Circular economy professional in supply chains	D3
	Operations coordinator at brand	D4
E	Head of policy for fashion and textiles at university	E1
	Responsible for textile collections at local authority	E2
	Circular economy researcher in supply chains	E3
	Social entrepreneur in clothing reuse	E4
	Consultant/strategist/lecturer in creative industries	E5

* Attended by a member of the research team to aid a dialogical flow of the session.

3.2. Focus groups

The focus groups were held at the Royal College of Art in Battersea, London. Before starting each focus group, physical information sheets were distributed to each participant, detailing the purpose of the study; describing the content of the discussion and their involvement; indicating the low-risk nature of the study by confirming their contributions would be pseudonymised, treated confidentially and sensitive information would not be shared; and highlighting the benefits of the research. Participants were given the right to withdraw at any time without consequence, and it was made clear that they were not obliged to answer any of the questions. At this stage, signed consent was obtained, confirming participants' acknowledgement of the information sheet and agreement to audio and video recording. The focus groups, which lasted approximately two hours including an introduction (3.2.1) and main discussion (3.2.2), were facilitated by one senior researcher, and observed by another member of the research team. A version of the protocol included in Appendix A was printed out to guide the session, while the canvas in Appendix B served as a backdrop for mapping actors and amplifying relationships between them.

3.2.1. Overview, definitions and introductions

Prior to the main discussion, the facilitator provided a short

overview of relevant preceding research conducted by the TCC and outlined the aim of the session: To explore how to scale distributed networks of localised circular supply chains for clothing. The current scenario and future goal were depicted to participants by showing an illustration symbolising current and preferred future scenarios (Fig. 2). Scale was defined as *the multiple ways in which a system can transform to reach a certain goal*, with the stated goal being '80 % of citizens in the region to acquire reused clothing or reuse-enabling services, instead of new'. Definitions of several other key terms to aid the discussions were offered:

- Town centre: a local area where the needs of a circular clothing supply chain are met.
- Localised network: a system of interconnected people, technologies and places that share resources, information and value.
- Distributed network: a circular supply chain in which different localised networks share resources, information and value.
- Actors: people, technical elements, processes, places.
- Relationships/connections: links between actors through which they exchange resources, information and value.

Following on from this, participants were invited to introduce themselves to each other, sharing their professional background and contributing to a short discussion on how they fit into the current textiles supply chain.

3.2.2. Main discussion

The moderator then framed the main discussion, which sought to identify how to scale the localised circular supply chain for clothing to realise the goal of an 80 % uptake. Participants were asked to discuss factors to scale across two dimensions, first for a town centre that they envisaged they were all part of together, and second for national realisation across the UK. In the town centre, a series of prompts helped to guide the conversation:

- How would you connect with each other to achieve the goal?
- What would you exchange? (e.g. resources, information, value)
- How does the system need to scale up to achieve the goal?
- What other actors would be needed?
- What drivers are needed to scale in those ways? How do they influence the system?

After a 10-minute break, another set of prompts helped to guide the conversation when it shifted to consider the factors to scaling nationally:

- What systems are needed to achieve the goal?
- How do these systems and specific nodes within them connect to help each other?
- What is the scale of this system needed to achieve the goal?
- What are the drivers needed to scale up the distributed network?

The questions were used in a semi-structured and open way, with the aim for discussions to evolve organically and consider any factors that participants brought to the table based on their own knowledge and experiences.

The focus groups were brought to a close either when the conversation came to a natural conclusion and there were no more ideas to discuss or when the time limit had been reached (maximum two hours). To conclude, participants were offered five minutes to make any final comments and reflect on key takeaways before being invited to an optional networking and refreshments session (which may have provided an incentive for some of the participants to take part in the research).

3.3. Data analysis

Thematic data analysis was carried out by an academic researcher with expertise in the circular economy and sustainable consumption. With the aim to reduce moderator bias, the data analyst did not have prior involvement in the study, including developing the methodology or facilitating focus groups. However, after the initial coding had taken place, the core research team were consulted throughout the analysis process, contributing to discussions on theme development and refinement, ensuring that the final framing felt authentic to their experience of listening to the focus groups first hand (Fig. 3).

After data collection and audio transcription, the six stages outlined by Braun and Clarke [34] were used to carry out a thematic analysis. In the first step, familiarity with the data was gained through watching and listening to each of the video and audio recordings, and reading the transcripts in full, collating any initial reflections on emergent factors for scaling in towns and across the UK. Atlas.ti software for qualitative data analysis was used in the second step to re-read the transcripts and systematically generate initial codes. This process involved highlighting any quotes that referred to a driver for scaling and tagging them with a short description (i.e. a code), resulting in 531 quotes and 189 codes which were sometimes the same for multiple quotes. The codes also distinguished whether they had been discussed in relation to scaling a localised circular supply chain in a town or across the UK. However, when searching for themes (step three) and inductively grouping codes by similarity, many of the factors for micro (town) and macro (UK) scaling overlapped and were combined in these instances. Each of the initial 24 groups of codes created were given a description and theme that synthesised the codes. The initial themes (groups) were reviewed (step four) with members of the core research team, resulting in any thematically similar groups being combined, streamlining the number of themes from 24 to 17. Before writing the report (step 6), the final themes were defined and named (step 5). First, this involved deductively positioning them under Lam et al.'s [31] categories and processes (see Section 2.2). Having been developed based on a review of the literature on amplification frameworks and with a focus on scaling sustainability initiatives, Lam et al.'s [31] integrative typology was deemed valuable to help frame our fashion-specific results and anchor them to a previously recognised theory. It also reinforces that the scaling sustainability initiatives in the fashion industry are not only tied to increasing numbers but also the creation of transformative change (i.e. amplifying beyond). Once the 17 themes were positioned in this way, final names were established with reference both to the original codes and to the language used in Lam et al.'s [31] categories and process descriptions (e.g. growing, replicating, transferring, spreading).

4. Results

Overall, 17 factors for scaling were identified. An overview of these is presented in Table 2, showing the spread of factors related to the processes of *stabilising* (5) and *speeding up* (3) in *amplifying within; growing* (2), *replicating* (1), *transferring* (2) and *spreading* (1) in *amplifying out*; and *scaling up* (2) and *scaling deep* (2) in *amplifying beyond*. Whilst the focus groups indicated that most factors have the potential to scale a place-based circular supply chain for clothing both at a hyper-local (i.e. villages and towns) and national (i.e. UK-wide) level, two factors were discussed solely in relation to scaling nationally, indicated by an asterisk in Table 2. The following subsections present each group of factors in more detail and in the order presented in Table 2, aided by quotes from the focus groups.

4.1. Amplifying within

The first category, *amplifying within*, refers to processes that increase the impact of specific initiatives, such as through prolonging (i.e. *stabilising*) and accelerating (i.e. *speeding up*) impact.

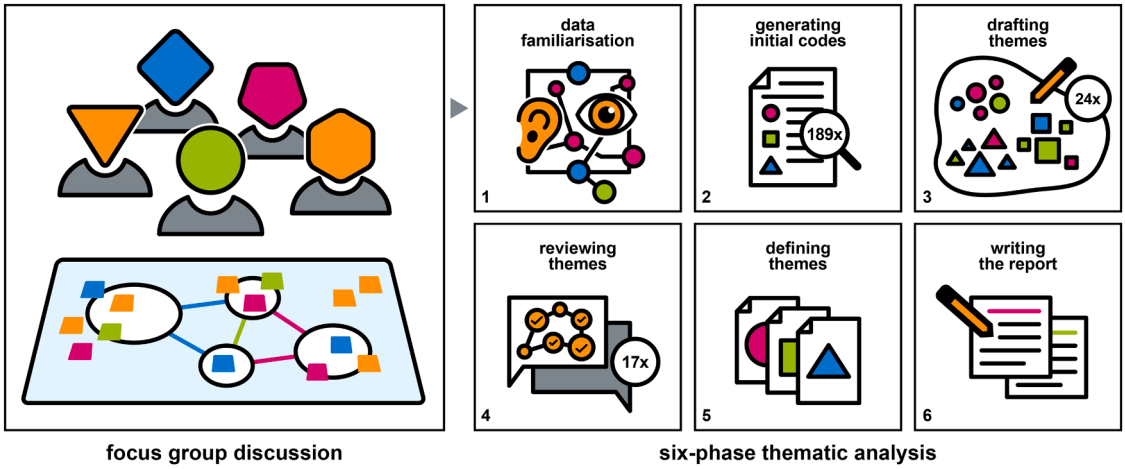

Fig. 3. Diagram illustrating the focus group and subsequent thematic analysis process.

Table 2
Overview of the 17 factors for scaling a distributed place-based circular supply chain for clothing identified in the thematic analysis, categorised by Lam et al.'s [31] typology of amplification categories and processes.

Category	Process	Factor for scaling
Amplifying within	Stabilising	1) Building niche local systems
		2) Building on pre-existing infrastructure
		3) Enhancing knowledge and skills
		4) Reinforcing consumer behaviour
		5) Extending the life of resources
	Speeding up	6) Reinforcing businesses through new models
		7) Reinforcing operations through sustainable money flows
		8) Enhancing efficiency of waste materials processing
Amplifying out	Growing	9) Growing (digital) networks
	Replicating	10) Sharing blueprint service hubs across localities*
	Transferring	11) Transferring resources between specialist services
		12) Transferring waste- as-resources between businesses
	Spreading	13) Spreading material supply and demand between localities*
Amplifying beyond	Scaling up	14) Reinforcing the legislation for circular practices
		15) Diversifying the actors involved in decision making
	Scaling deep	16) Building shared values and beliefs
		17) Connecting stakeholders to share knowledge

* Factors that were discussed solely in relation to scaling nationally.

4.1.1. *Stabilising*

Significantly, five of the 17 factors for scaling related to the process of *stabilising*. Two of these factors consider ways of embedding initiatives in specific contexts through capitalising on existing material and infrastructural opportunities. Factor 1 suggests *building niche local systems based on local material flows*. For example, participants considered how the demographic make-up of different areas could be used to predict which materials would be in greater abundance for recirculation; with "more children" in the London borough of Wandsworth, B3 described the need to adapt their local system for "school uniforms … babies' clothes, [and] dummies". Other types of specialised material flows discussed in the focus groups included areas for second-hand clothing like Brick Lane, and countryside villages "which might have a lot more outwear, like technical jackets" (B2). This factor emphasises parallel, hyper-local, self-sustaining systems that rely on already existing resources "where things don't need to exit and come back again" (C1).

In order to further capitalise on pre-existing opportunities, factor 2 acknowledges the potential of *building on pre-existing infrastructural and historical foundations*. This predominantly emerged in relation to regions and neighbourhoods previously known for their industrial capacity and involvement in the textile trade, such as "the huge facilities in Hackney Wick" (B1), "machinery that [has] been [in the Nottingham area] for a long while" (B1), "clothing factories… which used to be in Lancashire, in Yorkshire" (D1), and "Blackburn… where all the shredding happened" (B2). In addition to rebuilding old industry, participants also felt that current industries and services could be expanded and revitalised to help grow a distributed place-based circular supply chain for clothing. In terms of expanding services, B3 suggested making use of "cleaning centres" in the "hospitality industry" for large batch washing, B2 referred to the "amazing machines" (e.g. 3D printers) in university making spaces that could have slots open to the public, while A1 pointed out that dry cleaning services which already offer the capacity to mend, alter and reconstruct could simply grow. With regards to revitalising services, E3 felt that "dwindling" repair offerings already exist but have not changed for "30 years" and need to adapt in ways that bring new energy and motivate modern consumers.

Factor 3, *building knowledge and skills through education*, creates stability through increasing understanding and professionalising practice. The formal education system (i.e. school and university) plays a large role, with participants advocating for a core "climate change curriculum" (D1), articulating the need to teach children specific knowledge on how clothes are produced (B1) and skills like "how to repair" (E2). Anticipating future jobs (e.g. "waste inspector[s]", "people that enforce regulations", "people to check the product", "re-designers") will help in building programmes of study that directly support the scaling of a new economy (B2). Alongside education, other routes to build knowledge and skills included professional training through the "availability of apprenticeships" (D2), local in-person initiatives such as "3D printing workshops" (B2) "repair cafes", where "people who have skills within that area can come and hold a session and skill up the community" (E1), open access information through "social media or Google search" (D1), and public authority campaigns (E2).

In seeking to increase the number of people who participate in new ways of consuming, factor 4 suggests reinforcing *consumer behaviour through making circular clothing accessible, convenient and desirable.* Making services "hyper local" (D3) and "easy to find" (C1), such as through "planting little repair stations within existing shops or existing infrastructures… like second-hand shops or… train stations", was proposed to increase access, as well as offering "a selection of products that reflects society" (e.g. range of sizes) (C1). Access is also related to price, with A1 emphasising that "it's got to be affordable". Participants felt this to be particularly important in the context of "the cost-of-living crisis"

(B3), where sustainable options need to be "cheaper than buying new" to "combat the competition of cheap and fast fashion" (C1). Financial incentives were proposed through "preferential tariffs … if your household produced <2 kilos of rubbish a week" (C1), subsidised or "free repair" (D1) and "trade in schemes" (E1). As well as price matching, services should aspire to replicate the speed and efficiency of fast fashion because "people are so used to things being quick" (E4). The concept of a "super tailor" emerged as a vehicle to increase convenience, where multiple services (e.g. "hemming and cutting… laser-cutting, embroidery") are offered under one roof (C1). A1 likened this to "a local Turkish shop, which is a bakery, a butcher, an off-licence, a convenience store, a liquor store… a courier distribution point", serving as a "meeting point" where "everyone goes". In extension of this, hybrid digital-physical services both online and with a point of access in the community, increase ease through "digital tools" that enable users to "[book] a service" or "get quotes" (C1) and locate local stakeholders. Desirability was most discussed across the focus groups as a way to create a strong foundation for widespread engagement. In particular, making clothing "cool", "fun", "artistic", "artisanal" and "unique" (A1) would help increase consumer interest. Developing communications to include stories that "increase emotional longevity" (D2) would facilitate brand association. Further still, open-access data that makes impact "more tangible for wider citizens" (E5) would "empower [people] to see themselves as part of the solution" (E1). However, whilst this might resonate with more environmentally motivated consumers, B2 stressed that information needs to be adapted for "very different audiences".

Finally, by *extending the life of resources through using high quality, durable materials,* factor 5 helps to meet the goal of life extension and increase the impact reduction potential of circular clothing. E2 discussed the need to "shift the focus on quality" because people "will not be interested to buy low-quality garments as reusable when they can buy it as brand new". A1 stated that "more simple cotton fabrics… are more hard wearing", believing a focus on "utility" would be important in scaling an economy that relies on the continued cycling of longer lasting materials.

4.1.2. Speeding up

Also part of *amplifying within*, three factors for scaling related to *speeding up.* The first two factors offer ways to increase business adaptability and efficiency. Factor 6 proposes to *reinforce businesses through new models and markers of success.* This includes "social enterprise business structure[s] rather than… private compan[ies]" (D2), "collaboration as opposed to competition" (E2), and "shifting the conversation from GDP growth to reusability growth… [and] environmental gain" (E2). E1 expanded on this further to include "concepts like the well-being economy or good growth" and the inclusion of a "productivity" metric -how long [a product] is in use, how many users it's had".

Factor 7 addresses financial considerations, suggesting to *reinforce operations through a sustainable in-flow (*i.e. *investment) and out-flow (*i.e. *wages) of money* for "commercial viability" (B2). Avenues to funding covered grants from "local councils" (B3) and "spaces for very low rent" (B1), "government loans" (C1), investment from "the companies who are profiting off [the linear economy]" (D2) to aid "better… public image" (D4) and "Foundations" (E3). In the process of scaling, E3 advocated for "distributed wealth", where profits "belong to the community" to ensure a fairer future with participants who feel more invested. Similarly, D3 believed it would be more feasible to "make [the new system] hyper local if it's publicly funded".

Acceleration of impact is also made possible through more efficient infrastructure that can cope with the quantity of *materials through diagnostics, drop-off, sorting and reprocessing* (factor 8). First, in order to increase the number of participants dropping off materials, infrastructure needs to be accessible and attractive, with a range of options to suit different preferences, such as "pickup points", "free-post" (C1) and "official [doorstep] textile collections" operated by councils (B2); diverse drop-off locations, including community hubs like "schools" and libraries" (B2); and "discount voucher" incentives that encourage routes to circularity over disposal (C1). Digital diagnostics systems could also equip consumers with knowledge about different circular options for individual items. A1 proposed new "visual recognition" technology where "you can walk in and scan your garment", deciding whether to "send it to a recycler if… it's beyond repair because that's what the app's told you". This could even detect the source of damage, such as stains (e.g. wine), offering personalised maintenance instructions for effective life extension (C1). Despite new innovations in technology for sorting currently being developed and tested, operational machinery that can "quickly" sort and recycle at scale is needed (C1) for "commercially viab[ility]" (B2). Similarly, in order to scale a distributed place-based circular supply chain for clothing, "huge storage" capacity is required to ensure reusable clothing can be kept in a national system, rather than relying on exports (D1). Finally, material pathways need to be mapped to quantify "how many textiles are moving through the system" (A1); to build distribution networks of artisans who can add value (e.g. embroidery) to unwanted clothing streams, such as unsold stock (A1); and to ensure "clothing can be redistributed to people in need" by "waste inspectors" (B2).

4.2. Amplifying out

The second category, *amplifying out*, refers to processes that increase impact through involving more people (i.e. *growing*), and increasing the number of initiatives, including both initiatives that are dependent on existing ones (i.e. *replicating*) and independent initiatives in a similar (i.e. *transferring*) or dissimilar (i.e. *spreading*) context.

4.2.1. Growing

One factor for scaling relates to the process of *growing*. Factor 9 seeks to increase the range of a distributed place-based circular supply chain for clothing by *connecting consumers to resources and services through (digital) networks*. On a hyper local level, this includes pre-existing networks, encouraging the exchange of clothing between friends and close-proximity communities: "I feel like that's very easy within the community because people are constantly ferrying things around from one family to another, or they know someone who needs something" (A1). Digital platforms facilitate connections both at the hyper local (e.g. "WhatsApp groups"; A1) and national level (e.g. "Vinted" and "Depop"; A1), helping to grow "wider networks" of redistribution, especially given that "availability might be smaller" and "you might not find what you're looking for" if restricted to certain regions (C1). In addition to peer-to-peer redistribution channels "brands can sell online" too (E2), with online business to consumer (B2C) sales further facilitating the growth of markets through enabling "a much greater reach" (E4). Further still, digital tools offer routes to grow the number of participants through open access to information, such as through "a directory" of businesses (A1), or apps and search engines that allow people to "take their smartphone and then ask a question and there is an answer" (E4).

4.2.2. Replicating

Factor 10, the *replication* of initiatives *through disseminating blueprint service hubs across localities,* only emerged in the focus groups when considering how to scale at a national level. C1 spoke about creating "a baseline setup" that can be "replicate[d] in more locations" (e.g. "a sewing machine, cutting tools, [and] a mirror" are required for "80 % of… alterations", and can therefore be seen as a toolbox when duplicating this model). In order to scale, even within one municipality, there needs to be multiple "separate isolated businesses but with a common function", such as "15 dry cleaners in Haringey Borough" (London), to enable the "accessibility of all the actors" (A1). Adding to this, D2 commented that a "base template… could be edited to the needs of the local demographic" to ensure that replication allows for some variation led by unique local requirements. Similar ideas were proposed through building a set of "case studies" which prove place-based circular supply

chains to be economically successful and show other localities what is possible (E1).

4.2.3. Transferring

Two factors consider how to scale through the transformation of resources as they flow through different nodes. By *transferring resources between specialist services*, Factor 11 presents a vision of connected actors that extend the life of clothes through sending items between each other for maintenance, repair, alterations and re-design. This can be enabled through partnerships between brands and specialist services (e.g. "Selfridges in central London … now has a dedicated space for repair and have partnered with Sojo, which is a start-up based in London as well"; E3). Similarly, A1, described dry cleaners as "the crossover fertile grounds … [sending] things off to someone else locally to dye and colour match garments", and C1 proposed a "hub-and-spoke model" where specialised services offered in towns and villages are the spokes that connect to hubs in bigger towns and cities, incentivised by commissions for referrals. In this way, different localities can also hone and operate different processes, transferring resources between them for "straight reuse", "disassembly for reuse of the components", "recycling into new materials" etc. (B2).

Following on from this, whereas Factor 11 aims to keep resources in a closed loop system (i.e. end of life clothing is reused or recycled into new clothing), Factor 12 suggests that scaling is also dependent on *transferring waste materials from one business to another to use as input*. This goes two-ways and whilst, on the one hand, clothing waste can be used for purposes in other industries, the waste of other industries can also be utilised in clothing production. For example, "you can use off cuts to make insulation" in the construction industry (B3) and, on the flipside, "you can make textiles from biowaste such as coffee grounds" (B3).

4.2.4. Spreading

As with Factor 10, Factor 13, *spreading material supply and demand between localities*, was only recommended as a vehicle to achieve national scaling. With certain types of clothing likely to be more prevalent and accumulate in certain localities (e.g. outdoor wear in countryside villages (see Factor 1 for more information), resources may sometimes need to be redistributed and exchanged to meet supply and demand in different contexts (E4; B3). Different types of context also feed into the positioning of different systems infrastructure. In order for the proposed scenario to reach a capacity that serves 80 % of the population, warehouses and reprocessing facilities would need to be positioned in low-density areas because "there's no space for them inside the city" (D2) and "it's more expensive" (D3). To scale efficiently, despite placing emphasis on localisation, B2 still saw "smaller places feeding into the cities in terms of getting the quantities together [for] reuse and recycling".

4.3. Amplifying beyond

The last category, *amplifying beyond,* refers to processes that reach higher institutional levels (i.e. *scaling up*) or change values (i.e. *scaling deep*).

4.3.1. Scaling up

Two factors suggest how to *scale up*. In order to reach higher institutional levels, *the implementation of circular practices needs to be reinforced through legislation*, as presented in Factor 14. Legislation included legally imposed financial (dis)incentives, like "subsid[ies]" for repair, as introduced in France (C1); "VAT reduction" (E1) and "money back" schemes for returned resources (D2); and "charging for returns" (D2). It also covered business expectations, incentives and restrictions, such as information "transparency" (E2); making items that are "repairable" (D2); "extended producer responsibility tax" to "add cost to low quality products" (E2) and "cut overproduction" (E5); "tax incentives for certain types of companies" (C1); and a ban on export waste (E2). Particularly prominent was the discussion on product passports, which were seen as a key tool in scaling to facilitate the "exchange of information about a product" between actors (C1). This was presented as a scaling tool through making it "easier and quicker" for tailors to deconstruct and repair garments, enabling fairer pricing and authentication for resell, and the correct categorisation by sorters and graders (C1). Overall, a clear UK-wide "vision or strategy" was deemed important to ensure that legislation is effectively used "to achieve goals" (B2).

Scaling up can also be achieved by Factor 15 through *diversifying the number and type of actors involved in decision making*. As well as the introduction of central government legislation that applies at a national level, local councils are key to a more place-based approach with the suggestion to appoint "circular economy representatives… in each borough" (A1) who act as "local ambassadors… taking the reins and responsibility" and "really engag[ing] their network" (E5). With a more in-depth understanding of their electoral district, members of parliament can get involved with local initiatives and "take [their insights] back [to Westminster] and use these things as a case study for scaling up" (E1). In this way, they are knowledge brokers, taking "all of the knowledge that the rest of the system has… to the people that need to be influenced… to make decisions" (E1). In addition to official representatives, grassroots actors were also considered essential to scaling, with bottom up "community champions" lobbying governments to implement change (B2).

4.3.2. Scaling deep

The process of scaling deep relates to changing values. Factor 16 indicates that it is not just about changing values but about *building shared values and beliefs*. Having a "common goal" (B3) means that "you're always by default thinking of the community and thinking about your impact on others" rather than "just thinking of yourself as an individual" (A1). Several mechanisms were put forward to achieve this "mindset shift, not just for consumers … but also for brands" (E5), including local in person "events where there's a shared interest" (B3); "a network, which has regular meetings and an agenda with goals to achieve" (B2); and "algorithms … [to] connect people who have similar taste" (A1). Focus group participants acknowledged that, despite aiming for shared values and beliefs, in order to scale, onboarding and communications should still account for individual differences, "market [ing] it as a campaign to make people want to participate for the benefits that they're going to receive" (B3). For example, whilst "collecting [and sharing] data" on "plastic consumption" might inspire some people to participate as a way to protect the environment (C1), others will need different incentives like "more jobs" (B3).

Finally, Factor 17 specifically focuses on how to change values through *connecting stakeholders to share and disseminate knowledge*. Various stakeholders were referenced in the focus groups. Based on her own experience, E5 discussed how educators could share knowledge with businesses through consultancy work and hosting consortiums or summits to brief industry: "In my role as an educator, I would also actively try to educate and share information… with my other clients… like startups or corporates [and] more established businesses". Knowledge exchange between specialists was discussed more broadly as a way to effectively replicate the learnings of already operational services in other localities and "increase [the] speed" of dissemination (E2). This included "talk[ing] to the huge textile recycling centres outside of London" and asking "what can we do if we had to have a smaller textile recycling centre in my area?" (B1), as well as "asking what tools and techniques might be needed" (C1). The role of experts in increasing the knowledge of the general public was also highlighted, such as "ask[ing] [the dry cleaner] for advice on how to fix something" (A1). However, experts were not always involved, as when individuals share information within their social networks: "if I'm new to the neighbourhood, I would ask in my … direct network to see if anyone can recommend [repair shops]" (E5). As well as "word of mouth" (D2), "tracking" (C1) was suggested as a route to knowledge exchange through anonymised

open access data, which could be shared through digital product passports (see Factor 14, Section 4.3.1, for more information). The need for global knowledge exchange was stressed as a factor for scaling. E5 noted that "innovation and expertise is not centralised" and "you might have someone working on biomaterials in California" who could provide solutions to problems experienced in the UK.

5. Discussion, limitations and further research

5.1. Identifying and differentiating local and national factors for scaling in the UK

The results of this study identify a more comprehensive and detailed list of factors for scaling sustainability transitions in the fashion and textiles industry than offered in already established literature. For example, although previous research does suggest digitisation as an enabler for alternative practices [12], such as through e-retailing, our results offer more nuance in the ways that digital tools can be harnessed for scaling. Digitisation ranges from social media and search engines to increase access to information, as outlined in Factor 3, through to damage detection software for personalised maintenance instructions that increase the efficiency of sorting and reprocessing in Factor 8, community and business e-retail platforms that connect buyers and sellers in Factor 9, and digital records containing information on a products lifecycle as a way to exchange knowledge between stakeholders in Factor 17. This reinforces the important role digitisation plays across multiple categories and processes for scaling, offering ways to stabilise, speed up, grow *and* scale deep. The digital tools identified by participants are sometimes even differentiated by local and national level scaling, as with neighbourhood WhatsApp groups connecting people who are often known to each other due to proximity, compared to resale platforms like Vinted and Depop, operating at a UK-wide scale and beyond (e.g. across Europe). On this note, although the focus of this research was the UK, it is likely that many of the factors for scaling are relevant to other countries too. Follow up research could replicate the methodology to understand the similarities and differences in other global contexts.

In addition to digitalisation and technological innovation, other previously identified circular economy drivers in the fashion industry are present in the 17 factors for scaling (e.g. access, knowledge and commitment of all stakeholders; clear communication; marketing campaigns; incentives [such as financial]; grassroots social action; policy) [23]. However, once again, deeper insight is offered through the ways in which they can facilitate scale locally and nationally. For example, whilst local councillors are able to respond to the drivers and barriers experienced within each neighbourhood, such as building context-specific infrastructure, distributing funding to projects that hold most potential, and building closer and more trusting relationships with their electorate, central government holds the key to creating a national strategy and monitoring goals more broadly. The alignment with previous research helps to further establish and validate the body of literature on circular economy drivers and scaling factors for the fashion industry, whilst the added level of detail indicates the capacity of the method used and research focus to offer more specificity and an applied dimension for scaling circular place-based economies for clothing in the UK.

5.2. Using a pre-established framework for factor categorisation

Previous research on factors for scaling a circular economy in the fashion industry is sparse. Although there is overlap in the more established body of work on drivers, the definition of a driver (i.e. a factor that causes a sustainability initiative to happen) and a scaling factor (i.e. feature that can increase the size or magnitude of a sustainability initiative) differs. Therefore, using Lam et al.'s [31] previously established typology of amplification processes to categorise the factors for scaling helped to ensure the emphasis was placed on factors for scaling. The majority of factors were identified across the two dimensions of a town centre and UK-wide. For example, in Factor 1, niche local systems based on local material flows can be built for different towns in parallel across the UK. Similarly, whilst resources can be transferred between specialist services within one town (Factor 11), they can also be transferred between towns too, especially if each town decides to hone one particular area of specialism rather than attempting to take on all of the skills necessary for a comprehensive local circular economy. However, Lam et al.'s [31] framework also helped to highlight two amplification processes that relate solely to national scaling: replicating and spreading. These processes present ways to scale beyond one locality, extending the learnings from one area to another through creating a blueprint, and creating material flows between places that meet fluctuating supply and demand. As well as scaling processes (e.g. stabilising and speeding up) and dimensions (i.e. local and national), additional layers of factor categorisation could have helped to further differentiate between other elements, such as circular economy subsystems as put forward by Iacovidou et al. [35] (e.g. resource flows, infrastructure and innovation; see Section 2.1 for more information).

5.3. Utilising the factors identified to propose and test interventions

Lam et al. [31] note that an understanding of the amplification processes can shed light on the options for purposive interventions that can be implemented to support such processes. Whilst this research has achieved an in depth understanding of which scaling factors relate to Lam et al.'s [31] amplification processes, further research could build on these to develop a set of interventions. This would help translate the research more comprehensively, facilitating its application by various stakeholders, including local community groups, businesses and the government. Some of the quotes already help to expand on mechanisms for implementation, such as the suggestion to use offcuts for insulation and bio waste from coffee grounds to make clothing, exemplifying how to transfer waste materials from one business (sector) to another to use as input in Factor 12. However, these could be probed further to build a comprehensive set of actionable recommendations. Further still, longitudinal studies could map the success of different interventions in scaling circular place-based distributed fashion systems in towns and across the UK, building an understanding of which factors for scaling are most effective and why.

5.4. Focus group participants and interactions

Despite the facilitator's efforts to run the focus groups in a way that ensured everyone was included in the discussions and given an opportunity to voice opinions and ideas, there were instances where a more dominant voice emerged [32]. Although the focus group facilitator often encouraged all participants to contribute, opening out the discussion, prompting, or asking direct questions to help extract more detail on any shorter responses, when dominant voices did emerge and persist throughout the duration of the session, it is likely that the time available for others to express alternative views was reduced. However, communication between participants was always respectful and the discussions still enabled rich insights to be drawn. Another limitation stems from the differing number of participants across focus groups, ranging from 1–5. With only one participant, and despite a member of the research team taking part in the discussion to provide the grounds for dialogical flow of ideas, one session (A) was reminiscent of an in-depth interview as opposed to a focus group. However, on reflection, the research team felt that the insights were not dissimilar to the other groups and collectively decided to keep it in the dataset for analysis. With invitations being sent to 5–11 individuals per session, the aim was for participant numbers to be higher and more consistent across groups. However, the uncertainty that all sign-ups would turn up made this difficult, with 3–4 participants who had confirmed their attendance via email not showing for each slot.

In addition, with the overall sample size of 14 participants across the five groups, the research team observed data saturation, as the information collected in the final sessions did not provide any unique or new insights, deeming the sample sufficient to understand themes in the data. Finally, given that the data was collected in person at the Royal College of Art, participants were London based, reflected in the number of specific references to boroughs in the city (e.g. the young demographic of Wandsworth and second-hand clothing being prevalent in Brick Lane). With the intention to understand how to scale in any town in the UK, as well as at a national level across the UK, this could be seen as a limitation. Further research could seek to represent more diverse voices across the country to understand differences in local scaling beyond those informed by London living.

6. Conclusion

Moving beyond existing understanding of the driving factors behind a circular economy in the fashion and textiles sector, this paper uncovers 17 comprehensive *factors for scaling* a circular supply chain for clothing. These results move beyond factors that instigate sustainability initiatives, to establish how to grow the whole system of initiatives and increase their transformative impact. In addition, the results centre on local contexts, providing knowledge on how to scale the localised circular supply chains nationally in the UK. This is an important distinction given that local circular economies have been said to differ depending on the opportunities and constraints faced in specific regional contexts. The identified factors provide guidance for the industry and policymakers on purposive interventions that seek to step beyond currently niche and fragmented solutions, to build circular systems that have the capacity to grow and eventually overtake the current linear, energy intensive, pollutive and waste generating model. Significantly, it will facilitate a shift away from global production and distribution, to grow more locally robust initiatives at the local and national scale. Finally, the identified factors provide insightful examples of system scaling, thereby contributing a further explanation to Lam et al.'s typology of amplification [31]. With the limitations of this study, more research is still needed on the development of systems specifically in the context of local circular economies.

CRediT authorship contribution statement

Catriona Tassell El Baz: Writing – review & editing, Writing – original draft, Validation, Formal analysis. **Żaneta Muranko:** Writing – review & editing, Visualization, Validation, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Eevee Zayas-Garín:** Writing – review & editing. **Gareth Loudon:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Sharon Baurley:** Writing – review & editing, Supervision, Project administration, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Sharon Baurley reports financial support was provided by UK Research and Innovation. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.sftr.2026.101727.

Data availability

Data will be made available on request.

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