10.3197/JPS.63799977346493

PEER REVIEWED ARTICLE

Evaluation of circular strategies and their effectiveness in fashion SMEs in Ghana

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Abstract

Circular economy strategies may appear practical for business but are complex in application. Country-specific situations, taking into consideration the cultural dimensions, aid the practicality of such strategies. As part of a longitudinal research, this study sought to identify and evaluate circular strategies that could be integrated into selected fashion SMEs in Ghana. An in-depth qualitative case study was adopted to engage nineteen owner-designers of SMEs through interviews and observations. The owner-designers must have formal businesses, have been running their retail stores during the last decade and operate within the two major cities in Ghana where population growth supports economic activities. Life extension strategies were adopted for the study. The indications were that the majority of owner-designers of fashion SMEs, although practicing some circular strategies unknowingly, were not motivated to formally integrate the practice into their businesses. Cost, time, labour and consumer attitudes and

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behaviour were factors considered to undermine the effectiveness of adopting and implementing circular strategies in these firms. Creation of awareness of circular strategies and models for their implementation are needed to enable practitioners to imbibe circular economy principles in fashion SMEs in Ghana.

Keywords: Fashion, circular strategies, evaluation, small to medium scale enterprises, cultural environment.

1. Introduction

The fashion industry is on a mission to remodel its production away from the linear model to contribute to preserving the environment and its social foundations for future generations (Steffen et al., 2015). The United Nations Agenda 2030 has heightened the call for fashion to intensify aligning its practices towards reduced consumption and production (SDG 12). Studies have shown overwhelming support for the Circular Economy (CE) (Accenture, 2016; Ávila-Gutiérrez et al., 2019) mainly due to its contribution towards the separation of biological and technical nutrients under cyclic industrial metabolism. The incorporation of the principles of the CE in the links of the value chain of the various sectors of the economy strives to ensure circularity, safety, and efficiency. The framework proposed is aligned with the goals of the 2030 Agenda for Sustainable Development regarding the orientation towards the mitigation and regeneration of the metabolic rift by considering a double perspective. Firstly, it strives to conceptualise the CE as a paradigm of sustainability. Its principles are established, and its techniques and tools are organised into two frameworks oriented towards causes (cradle to cradle; Fuchs, 2016; Kirchherr et al., 2017; Koszewska, 2018), which seeks to aid the use of resources in a regenerative manner (Ellen MacArthur Foundation, 2013). According to Global Management Consultancy Accenture, CE approaches have the potential to add as much as US$6 trillion to global economic growth by 2030. Apart from the economic benefits, the CE is touted as aiding employment generation and business opportunities significantly, and more importantly eliminating waste (Nijman-Ross et al., 2023) that accompanies the linear production model. Focusing on the CE principle of the 3Rs (Reduce, Reuse and Recycle) implies many materials are reclaimed for use instead of extracting virgin raw materials.

1.1 The fashion industry in Ghana

Garment production has existed for many years, but the fashion industry in Ghana is a recent phenomenon which is steadily growing. The industry is primarily composed of micro and small to medium-scale enterprises with a few large-scale firms (Ghana Statistical Service, 2016). The majority of producers cater for the domestic market, with custom-made clothes sold directly to consumers. About a decade ago, retail outlets operated by fashion firms whose owners doubled as designers emerged. Small to medium-scale firms are championing the rise of retail outlets, significantly situated in the two capital cities of Ghana. These two cities have the largest population and highest economic and social activities. As with selling seasons in Europe and America, owner-designers have predominantly adopted four selling seasons. Although these selling seasons are not weather-related, a quarterly approach is adopted to ensure that new collections are developed to bring excitement to the shop floor.

The owner-designer concept is a development that is advantageous to the practice of CE strategies since it is characterised by flexibility in decision-making as a result of direct involvement in major decisions at the design stage. Also, there is the likelihood of adapting to change more quickly than large-scale counterparts (Claxton and Kent, 2020; Di Lodovico and Manzi, 2023; Karell and Niinimaki, 2020). SMEs are seen to provide employment and economic growth, hence adopting the principles of the CE presents numerous benefits while enhancing their competitiveness. While there is a host of research especially from the global north on the fashion industry adopting a sustainable approach, particularly the CE (Nijman-Ross et al., 2023) the reverse is true of the fashion industry in Ghana. Nijman-Ross et al. (2023) identified several countries that have adopted the CE, including Germany, Finland and China, citing authors from the UK, USA, China and the Netherlands, but none from Africa. While research on garment production in Ghana is common, few have covered sustainability and the CE. James and Kent (2019) and Amankwah et al. (2023), although focusing on sustainability and the CE, did not touch on fashion businesses integrating the CE into their practices. Fashion sustainability and the CE are grey areas in Ghana. As asserted by Nijman-Ross et al. (2023), research on the CE is low but there are initiatives in some African countries such as the establishment of the African Circular Economy Alliance (ACEA), and a study carried out by the African Development Bank (AfDB). In Ghana, a report for the Tony Blair Institute for

Global Change highlighted the need for the adoption of the CE as a means of curbing waste (Ahiable and Triki, 2021). That notwithstanding, some strategies of the CE are, in the authors' opinion, practised informally.

As part of a longitudinal research project, the study presented in this article evaluates the adoption of circular strategies (CS) from the perspectives of owner-designers of SMEs, and the interventions necessary for take-up. To effectively address the issue, the research questions posed were: which CE strategies are culturally and technologically effective in selected fashion SMEs in Ghana to enhance sustainable fashion production? How do opportunities and challenges in the local environment affect the adoption and implementation of CE principles? This research significantly contributes to perspectives on CE adoption while highlighting how the local environment in Ghana impacts the prospects of CE in achieving sustainability.

2. The review

This section presents a review of sustainable strategies focusing on the CE. It presents a narrative on the adoption of sustainable approaches in Africa and Ghana in particular. It draws on the Sustainable Fashion Innovation Framework and the Sustainability Framework; and their application to the CE. These sub-themes provide a context for evaluating CSs in fashion SMEs in Ghana. It also brings to the fore how the cultural dimension shapes the adoption and implementation of specific CSs in Ghana.

2.1 The fashion industry adopting CE principles

The fashion industry globally has been operating on a linear model: take-make-dispose (Ellen McArthur Foundation, 2013). Research has pointed out waste accumulation at each stage of the garment production process (Pingki et al., 2019; WRAP, 2017; Yalcin-Enis et al., 2019). Critical to the linear model is the amount of goods sent to landfill sites (Juanga-Labayen et al., 2022; Morell-Delgado et al., 2024) after each selling season. Clothes that could not be sold become solid waste, clogging rivers and causing other environmental problems (Bick et al., 2018). In low to medium-sized economies like Ghana, solid waste is a potential environmental health hazard, particularly due to the less robust municipal waste systems (Liyanage and De Silva, 2018). Akintayo et al. (2023)

lamented the challenges of solid waste management in Nigeria, a neighbouring country of Ghana. Significant concerns are growing about landfilling garments in both developed and developing countries (Juanga-Labayen et al., 2022). Greater consciousness is required in the fashion industry to avert such excessive environmental harm and attempt to reduce reliance on virgin resources through recovery processes. Bick, Halsey and Ekenga (2018) asserted that the average American throws away approximately eighty pounds of clothing and textiles annually, occupying nearly five per cent of landfill space. As far as fashion production is concerned in Ghana, such statistics are not readily available. As the industry in Ghana is envisaging growth in the coming years, precautionary measures need to be taken, and the CE provides a potential remedy (Ahiable and Triki, 2021; Nijman-Ross et al., 2023). But how do these factors that trigger sustainable practices in the fashion industry affect developing nations like Ghana?

The fashion industry in Ghana is arguably in the developing stage where operations appear dissimilar to developed economies. Output, technology and know-how, among other things, are comparatively low (Senayah, 2018). The World Bank (2012) raised pertinent questions about the preparedness of developing countries like Ghana for green practices, including: Will technology allow developing countries to pursue a less environmentally damaging development path than industrial countries? What is the best way to manage growth with scarce fiscal resources, limited planning, and technical know-how? In practising the CE, these are key questions the operators of fashion SMEs must consider in making critical decisions.

It is easy to conclude that countries like Ghana are not at the point where vigorous sustainable fashion practices should be of concern. The industry is in the early stages of building structures to become vibrant. The World Bank (2012) identifies the flaws in the 'grow now, clean up later' argument. Therefore, heightened environmental concerns in advanced fashion jurisdictions should be a prompt for Ghana to develop sustainable strategies from the outset. In this regard, exploring Ghanaian fashion brands' perspective cannot be timelier.

2.2 Factors positioning Ghana for CE adoption

Raw material production, both natural and synthetic, is known to produce adverse environmental and social impacts (Sahimaa et al., 2023; Sandin and Peters, 2018;

Tang and Ho, 2023). With a looming shortage of raw materials (Accenture, 2016), a shift from a linear to zero-waste circular cycle is critical. In this regard, the CE focuses on products designed to enable reuse, components disassembled and durable pieces reassembled into new products, worn-out parts refurbished, and material recycled as well (Ellen McArthur Foundation, 2015). The call for CE is underpinned by a rise in demand from an increasingly affluent population (Hammad et al., 2019) exerting pressure on resources (Bhardwaj and Fairhurst, 2010; Niinimäki et al., 2020). The expected growth in the world's population will be accompanied by significant growth of the middle class in developing countries. The Business of Fashion (BoF) report (Beltrami et al, 2019) envisaged that, if consumers in developing countries buy more clothing as their purchasing power increases, clothing sales may rise significantly. Ghana as a developing country could benefit from the projected growth.

The Ghana Statistical Service (GSS) (2021) report on population and housing pegs Ghana's population at 30.8 million. According to the report, there has been a continuous growth in urban population, increasing, from 12,545,229 (50.9%) in 2010 to 17,472,530 (56.7%) in 2021 with almost half (47.8%) of the increase in the Greater Accra and Ashanti regions. These two regions are also the economic hubs of the country. National population density increased by 26 persons between 2010 (103/km^2) and 2021 (129/km^2), with Greater Accra experiencing the highest increase, of 445 persons (from 1,236/km^2 to 1,681/km^2). Moreover, the age structure of the population has witnessed a shift from the domination of children (0–14 years) to young people (15–35 years). The GSS report shows that nationally females (15,631,579) outnumber males (15,200,440) by 2.8% (437,139), while in urban areas this rises to 5.0%. Also, professionals constitute less than a tenth (8.4%, 837,989) of employed persons above the age of 15, 80% of whom are in urban areas and 60% under 35 years old.

These population dimensions positively impact the economic growth of the fashion industry in Ghana. With the increase in the youthful population and a steady growth of professionals in urban areas of developing countries, consumption of fashion products is thought likely to rise by 2023 (Beltrami et al, 2019). However, there is currently (as of 2023) a lack of research on clothing sales by fashion SMEs in Ghana to corroborate this.

The steady growth of urban professionals and the rise of clothing retail require that the fashion industry in Ghana prepares to initiate sustainable waste management practices, particularly the CE. The CE principles illustrated in the waste management framework (Kirchherr et al., 2017) have been adopted by firms such as Patagonia and Nudie Jeans. Pal and Sandberg (2017) asserted that strategies like repairs and refurbishment have started worldwide and are predominantly led by niche and small-scale redesign brands. In predominantly micro, small-to-medium scale fashion firms in Ghana, key lessons and success stories could be replicated. Fortunately, disassembly, redesign and repair/ alteration are traditionally practised in Ghanaian homes. As a culture of marriage in some tribes, brides are given sewing machines to enable the mending of clothes of family members so garments could be worn over extended periods and to reduce the financial burden of buying clothes regularly. Again, the huge importation of second-hand clothes in Africa (Lewis et al., 2017) and by extension Ghana, provides an enormous source of materials that could be disassembled and reused. These practices provide a foundation for formally introducing such models in fashion SMEs in Ghana.

2.3 Embracing circular strategies in Ghana

Stahel (2016) argues that Africa, and by extension Ghana, needs to build an industrial economy and therefore a transition into a circular economy will not be worthwhile. The World Bank report (2012) however, disagrees; it envisages an African economy which is robust in sustainable growth. While developing economies including Ghana seek to industrialise, they must consciously avoid unsustainable and reversible environmental damage. SMEs in Ghana must embrace the circular paradigm to avoid errors accompanying environmental, social and economic aspects of linear production, as their structures are not yet complex. While the World Bank encourages Africa to embrace sustainability, it also highlights the accompanying challenges, the lack of resources, technical know-how and the lack of sophisticated technologies. Twelve years after the World Bank report, the fashion industry in Ghana still lacks resources, technical know-how and sophisticated technologies to improve garment quality (Ghana Statistical Service, 2016; Senayah, 2018). Although the CE is achievable, there are barriers amidst economic opportunities that are untapped (Ellen McArthur Foundation, 2015). Bearing in mind the challenges associated with the practice of CE, which of the strategies might fashion SMEs adopt? According to the World

Bank report, one of the resources the local fashion industry lacks is the availability of material inputs. Can fashion SMEs recover unique materials from used clothes through disassembly for reuse or redesign?

2.4 Sustainable fashion innovation framework

Sustainable fashion innovation is a response to the linear mode. This new paradigm of imbibing sustainable fashion practices is expected to integrate the sustainable development framework (Ávila-Gutiérrez et al., 2019). To proceed with a sustainable fashion agenda requires an understanding of the concept of sustainability (Hur and Cassidy, 2019; Karell and Niinimäki, 2020). However, the sustainable development framework keeps evolving. The adoption of a framework is guided by the firm in question and the dimension of sustainability it seeks to achieve (Karell and Niinimäki, 2020). In this regard, the fashion industry has a range of approaches to sustainable fashion, including design for longevity, upcycling, slow fashion, product service systems, lean manufacturing, ethical trade and circular economy, among others (Bocken et al., 2014; Cooper et al., 2013; Ellen McArthur Foundation, 2013; Gwilt and Rissanen, 2011; Hernandez et al., 2019). However, such approaches still require further investigation as there are many overlaps (Pal and Sandberg, 2017) due to poor understanding regarding the strategies and heuristics for their implementation. For SMEs in Ghana to embrace sustainable fashion requires a clear knowledge of what the strategies are, and firms' capabilities to operationalise them.

The 'Sustainable fashion innovation framework' embeds the categorisation of impact levels (Bhamra et al., 2013; Schaltegger et al., 2012) that align with the waste management hierarchy (Kirchherr et al., 2017). The waste management strategy a firm adopts should align with the impact level expected to be achieved (Schaltegger et al., 2012). To effectively identify and evaluate existing strategies for application in the study environment, attention is given to the categorisation under the 3R (Reduce, Reuse and Recycle) framework of the CE (Ellen McArthur Foundation, 2013) to guide the selection of the strategies and their suitability for integration in fashion SMEs in Ghana.

Regarding the selection of strategies, it is imperative to consider how the materials available in the local environment influence the selection of strategies that prolong the lifespan of products made from them. Citing Lacy (2015), Fuchs

(2016) argues that if toxic resources are used to design a more reliable, longer-lasting product, it is still not fully circular. In an environment where sustainability in fashion is a grey phenomenon, awareness of what constitutes a toxic material is a challenge. In this context, considerations can be given to strategies such as adopting life extension and life optimisation, minimising resource usage and enabling easy assembly of fashion goods. In the context of the Ghanaian fashion landscape, garments produced for customers to pick up or sold at the retail store could be adjusted by either resizing, mending or redesigning. Even though this is an informal practice in Ghana, are SMEs willing to embrace CS formally as new business models; and are there any known frameworks to determine the impact levels of these businesses in Ghana?

2.4.1 Sustainability framework and the circular economy

In practising sustainability, a holistic approach must embrace all three pillars of sustainability (Environment, Social and Economic). However, for sustainable fashion, the three pillars require expansion. Kozlowski et al. (2019) argued that adopting sustainable models will require cultural and aesthetic dimensions to ensure that the people for whom the models are designed find them culturally acceptable and aesthetically pleasing to use over a long period. While arguing for their inclusion of cultural dimension to the existing sustainability pillars, Kozlowski et al. (2019) stated that sustainability concepts generally fail to differentiate among cultural systems, value systems, norms, behaviours and ideas. Culture is a significant consideration in sustainable development (Rayman-Bacchus and Radavoi, 2020; Sabatini, 2019; Zheng et al., 2021) which leads to partnerships being required to tackle the complex nature of sustainability and the CE. Incorporating the cultural dimension ensures fashion firms do not blindly adopt blanket solutions but rather consider local systems based on which sustainable circular models are integrated into their operations. Sustainable practices can be tailored to, but not captive to cultural context (Zheng et al., 2021). It is vital to adopt models through the lens of country-specific situations with considerations such as local culture, political climate, economy, and infrastructure (Kozlowski et al. 2019, Tremblay et al., 2017). These are critical factors to ensure selected models' integration and longevity.

The local production culture enables fashion SMEs in Ghana to primarily have direct engagement with customers even at the design stage. Therefore, it is fair to assume that they know their customers' cultural behaviour which could largely

influence firms' willingness to practise a selected circular model. A firm's business culture must align with the customers it intends to serve to make it profitable and sustainable. CSs ideally are not a mass production approach; hence firms' willingness to participate is a first step.

Given that these SMEs produce limited editions for retail, their owner-designers, by means of their business cultural environment, can project strategies that yield mutual benefits. Waste in the fashion industry finds a remedy in the CE principles. As SMEs develop an interest in establishing retail outlets, waste accumulation is a potential threat to environmental sustainability. As a developing industry, SMEs in Ghana could formally adopt CSs that are practised traditionally by Ghanaians and may not require sophisticated technologies. However, limited research in the CE in Ghana presents a challenge to the integration of CS models in fashion SMEs.

3. Methodology

The study sought to identify and evaluate sustainable strategies and their effectiveness in selected firms with specific reference to the 3Rs espoused by the CE. To gain insight into the phenomenon, a qualitative case study approach was adopted as this paves the way for an intensive analysis of specific details often overlooked by other methods (Kumar, 2011) and to explain participants' perspectives on the subject. The study did not seek to measure but rather to explain the phenomenon. Fashion businesses with their specific brand concepts will have different meanings and approaches to the subject. These different brands will present different perspectives (Creswell, 2013) on the study. The population for the study was SMEs in the two major cities of Ghana, and sampled fashion SMEs that have owners doubling as designers, have operated formal businesses within the last decade and have retail outlets.

3.1 Data collection and analysis

A purposive sampling strategy (Maxwell, 2012) was adopted to ensure that data was collected from respondents who fit the description. Hence a snowball technique according to Cohen, Manion and Morrison's (2007) definition was employed in reaching 19 respondents; 6 from Kumasi and 13 from Accra as presented in Table 1. As data collection occurred amid the COVID-19 pandemic, recorded interviews were conducted via Zoom and telephone (9), along with 10

face-to-face interviews. Interview questions sought to find out the approach to garments that did not sell during previous seasons and whether materials could be recovered based on Research Question 1. Again, the opportunities and challenges that could influence participation in CE were of interest to answer Research Question 2. The interviews lasted an average of 21 minutes. The scripts were cleaned and coded line-by-line in an iterative manner using inductive and deductive coding techniques with the Nvivo software. To conceal respondents' identity, the owner-designers were coded alphabetically to read, e.g., 'ODA'. The results were categorised using thematic content analysis. The themes that emerged were: techniques in managing retail pieces; feasibility and consideration of adopting CS; material recovery and CS; and opportunities and challenges in practising CS. Along with the interviews was an observation of stitch types, style and embellishment techniques lending themselves to the adoption of the CSs.

Table 1. Background of selected firms

Characteristics	**Accra**	**Kumasi**
Location	13 (68%)	6 (32%)
Size	Small 10	Small 2
	Medium 3	Medium 4
Category	13 formal business	6 formal business

4. Results and discussion

This section is divided into four sub-sections. Firstly, results on techniques for managing retail items are presented and discussed. Secondly, results on the feasibility and consideration of adopting CS are presented and discussed. Thirdly, results on material recovery and the practice of CS are presented and discussed. Fourthly, results on opportunities and challenges in practising CS are presented and discussed.

4.1 Techniques in managing garments sold in retail outlets

To ensure that clothes are significantly bought during selling periods, retailers usually adopt strategies like discounting and clearance sales. Even though there

are no distinct selling seasons in Ghana, retailers do have clothes hung on racks for extended periods. During this period, certain techniques are adopted to either sell or discard the clothes. To this end, respondents were asked to share their thoughts on how they managed garments during and after each selling period to avoid environmental waste, as captured in Table 2.

Table 2. Techniques in managing retail items

Approaches	**No. of Respondents**
Discount/clearance sale, redesign	3
Discount/clearance sale, donation	2
Discount/clearance sale, stored to re-introduce	1
Discount/clearance sales, pop-up stores	2
Discount only	5
Redesign and donation	1
Discount/clearance sale, redesign, donation	1
Discount/clearance sale, redesign, reuse fabrics recovered, donation	1
Discount/clearance sale, redesign, and stored to be re-introduced	1
No option applied	2
	Total: 19

Table 2 demonstrates that the conventional method of discounting and clearance sales was the most popular approach, followed by redesign and donation. These three were mainly combined. Only two respondents indicated that none of the approaches was used because of the limited items produced. Particular to CS was redesign, which appeared five times in combination with other approaches and was considered a positive development for this study. The reasons for the approaches or otherwise were captured as follows:

> We make major sales; we do the first quarter, and if we cannot clear everything, we do the second or third quarter. If some pieces did not sell, something must be wrong with them. So, do we add some beads; or do we make the sleeve short or long? After it goes to sale three times and is still not selling, we bag it up and give it to an orphanage. But rarely would we have a big bag; usually, we have about 20 or 40 pieces at the end of the year that did not even sell during clearance sales. (ODP)

A respondent mentioned that 'we bring them back and redo them; and then usually, if we cannot sell because a particular style is going out of fashion, we store them until a later date; that is the strategy'. To add to the techniques adopted, another respondent mentioned that 'mostly when we have a clearance sale, we do a 50% discount or sell at very cheap price. But if some are not sold out after the sale, I give them out or use the fabric to do something else by ripping the garment apart'.

Approaches to managing clothes at retail were adopted for economic reasons, considering the triple bottom line. None of the respondents indicated adopting a technique with environmental or social sustainability in mind. Worth noting was the redesign under the CS. However, from observation, the respondents did not consider the aesthetic and functional renewal of the clothes during the design stage. Applying CS becomes an afterthought (Gwilt and Rissanen, 2011) often resulting in material waste or excessive time consumption when disassembling or redesigning; an observation that defeats the sustainable approach. Again, the limited quantities produced also implied smaller volumes of clothes to manage at retail, hence integrating the redesign concept as a business model seemed unattractive. However, cumulative numbers over time could be significant (Williamson et al., 2006). Donated garments, which could become a useful avenue for material recovery, could be channelled through the reuse-redesign concept. With firms positioning themselves to upscale production, introducing CS provides a solid foundation as business practices are not entrenched, paving the way for flexibility (Di Lodovico and Manzi, 2023). SMEs are likely to make sustainability a core of their mission and business model (Claxton and Kent, 2020, Kozlowski et al., 2018).

4.2 Feasibility and consideration of CS adoption

Based on the knowledge of the techniques adopted to manage clothes at retail, it was imperative to interrogate the possibility of introducing circular models in the management of garments that could not be sold. To this end, the respondents were asked which of the circular strategies were feasible and could be considered for adoption per their current practices. Six strategies were presented to the respondents. It came out that twelve mentioned redesign, six repair, seven reuse, and twelve disassembly. However, a combination of strategies was indicated as feasible for adoption. The outcome is presented in Table 3.

Table 3. Feasibility and consideration of CS adoption

Circular Strategies	**No. of Respondents**
Redesign	3
Redesign, repair, disassembly	2
Redesign, reuse, disassembly	5
Redesign, reuse	1
Redesign disassembly	3
Redesign, repair, reuse, disassembly	1
Redesign, repair	1
Repair, disassembly	1
Repair	1
None of the strategies	1
Resale	0
	Total: 19

Respondents expressed their thoughts on the strategies mentioned as captured in the following excerpts:

> Sometimes we have clients who bring garments they bought or were custom-made to be redesigned because they do not fit in them anymore. So recently a client brought one of such garments with a

> piece of fabric to redesign it from the waist to the knee, and also the sleeves, so the person can wear it again. The fabric of the garment was still in good condition. (ODN)

For another respondent,

> Sometimes when customers order clothes for events like shoots or second dress for weddings, they don't wear them again. They bring them and we redesign them into simpler styles they can wear for other purposes. I do that a lot. So, we can now consciously do that because I was doing it without thinking about it or knowing it was a sustainable approach. (ODF)

One respondent also mentioned that 'Mostly we do for our customers, especially the cuffs and collars of shirts that have faded or worn out; we redo them, sometimes with different colours, textures or patterns'.

Even though most of the respondents indicated that CS was feasible, they expressed reservations about disassembly, repair, and reuse/resale. The following are excerpts on the concept of disassembly;

> The time required for ripping the seams of a garment can be used to make something that will sell three or four times more than a product made using this concept.

ODQ, ODC and ODO supported this view. This group of respondents also opposed any practice that takes away production time and derails profit. 'ODC' added that:

> Already we are running a deficit of skilled labour for the main production; if we have enough labour, and there is demand, then we can establish a unit for it.

> Strategically, it's not sustainable for any business person. Although it sounds great in theory, it cuts into your production line. We tried in the past to have a unit to do repairs but was not lucrative. You cannot charge much for alterations, but the resources that it would require;

> hiring staff, machinery etc., are not commensurate with what the client is willing to pay. Someone might say it is another channel of income, but the income level and the effort going into it, do not tally.

However, there was a positive view on the repair strategy expressed as follows: 'I think we have the demand for the repair and alterations. We usually resize for items bought at our retail shop. So, we can now position ourselves to control that consciously.'

Feasible circular strategies indicated by respondents pointed to redesign, repair, reuse and disassembly. These strategies were practised, albeit unconsciously, and hence the respondents might have gained some level of experience in practice. The unconscious practice of some CS stemmed from respondents' unawareness of the CE and its principles. For designers to consciously integrate CSs, their firms would need to understand the negative impacts of production (Karell and Niinimäki, 2020). Again, the awareness of tools (Kozlowski et al., 2019), sustainable business case drivers (Schaltegger et al., 2012) and sustainable business model innovation techniques (Bocken et al., 2014) are required for the successful adoption and implementation of CSs in fashion SMEs in Ghana. Thus, the complexities of formally practising these sustainable business models represents a significant challenge (Di Lodovico and Manzi, 2023).

The lack of awareness revealed that respondents had no idea of impact levels (Bhamra et al., 2013; Schaltegger et al. 2012) or of the collaborations that guide the practice of sustainable approaches. Again, the strategies considered feasible were informed by the cultural environment within which these SMEs operate. Limited pieces being manufactured enabled these owner-designers to quickly innovate into new styles. However, this was motivated by a focus on the growth and expansion of business, not consideration of environmental and social aspects, which were not considered profitable. Also, direct customer engagement meant consumers could walk in to request some changes needed to garments bought from the shops. In this regard, the fashion SMEs in Ghana are more likely to contribute significantly to the adoption of CE than large-scale firms. This enhances their competitiveness in receiving the needed support from policymakers. However, there are currently no known policies that enable the practice of sustainability among fashion SMEs in Ghana.

Even though owner-designers informally practised some identified strategies, some difficulties have been identified as likely to hinder their formal adoption. The difficulties expressed were time, cost, labour, consumer perceptions and readiness to pay for the cost of garments. Labour availability was one of the significant hindrances, given that the current model, as Amankwah et al. (2023) argue, struggles to get the skill set needed for production. This feeds into the needed labour to disassemble, while the main production line is in progress. In addition, the cost of paying labour to disassemble a garment and the overheads incurred in re-designing were not profitable. Finally, the consumer's readiness to buy a redesigned garment was questioned as there is a lack of research (Hur and Cassidy, 2019; Kirchherr et al., 2017) on consumers' willingness to participate in CE. While these firms directly engage with clients and have a pre-informed idea of consumers' behaviour towards such initiatives, consumer research regarding the perception of CS is lacking in Ghana.

Again, while disassembly and redesign are adaptable, stitch types and patterns were observed to be possible setbacks. To enhance the aesthetics of garments, top stitches were commonly used, making disassembly unattractive. Straight stitches afford ease of disassembly, and loose garment styles provide adequate reusable fabrics. These factors could be considered at the initial stage and not as an afterthought, as proposed by Gwilt and Rissanen (2011). Careful consideration was deemed necessary if these strategies were to be formally adopted.

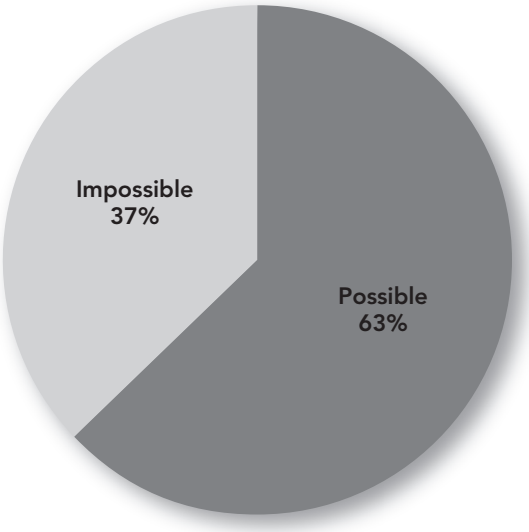
4.3 Material recovery and the practice of CS by SMEs

Material recovery requires chemical or mechanical processes. In an environment where technology is a challenge, disassembling garments through unpicking is possible and hence materials could be reused. Respondents were asked if they could recover materials either from their products or garments used by their consumers, or other brands. One out of nineteen respondents, recovered materials from garments that did not sell during the selling periods while eighteen had never considered it. Giving reasons for the lack of attempt, five respondents cited time wasting, three respondents mentioned cost, and one respondent said energy waste was associated with the disassembly process. However, ten respondents expressed the possibility of recovering materials from firms' unsold garments at the end of the selling period if the stitch and patterns lent themselves to the process.

Again, when respondents were asked if they could request their customers to bring back relatively little-used garments of their brands, all nineteen respondents were not enthusiastic about the idea. The responses given were revelatory. 'By the time they bring it, the fabric value will be low, and treating the garment will be more costly than making a new one'. Another respondent indicated that 'Here in Ghana, most people do not know how to care for their clothes; the fabrics to be recovered might not be in good condition.' For consumers to make sense of such garments, one respondent emphasised that 'Maybe post a video of how you go about the clothes and some certification to prove that the clothes had been inspected by a recognised body; that they are in good condition, etc; you have to build that confidence'.

Again, on material recovery, respondents were asked if they would be receptive to imported second-hand garments that have flooded the local market. Twelve of the respondents indicated this to be a possibility, while seven said it was impossible, as shown in Figure 1.

Figure 1. Possibility of recovering materials from second-hand. Authors' construct



Expressing their perspectives on second-hand materials, three respondents indicated that they were unaware of some fabric names, compositions and classifications. Two respondents believed that process disclosure would ensure consumer confidence, while four respondents noted that consumers would be unwilling to patronise the products if process disclosure was pursued. Similarly, in recovering materials from customers' relatively used garments, two respondents believed that pre-treating the worn garments for use in new production would be costly. However, two respondents believed that certification of the process could be given to boost consumer confidence. On the condition of second-hand products (garment / fabric), six respondents notably mentioned fabric stock or store-rejected garments as an attractive proposition for consideration. Table 4 provides a perspective.

Table 4. Respondents' perspectives on material recovery from second-hand garments

Perspectives on second hand recovery	**No. of Respondents**
Fabric composition	3
Process disclosure	2
Process disclosure renders the product unattractive	4
Costly treatment process	2
Ensuring process certification	2
Preference for fabric stock	6
	Total 19

Again, with twelve respondents indicating the possibility of recovering materials from second-hand garments, they were asked about the attractiveness of establishing a warehouse. Seventeen respondents deemed it as a welcome idea, however, with the caveat that the products must be in good condition. Some respondents had this to say: 'Industrial waste could be considered. When it comes to fabrics, we are all lacking. So, if somebody can source fabrics/garments and have an open day for sales, it will minimise direct sourcing from these factories polluting the environment.' Another respondent confirmed by saying; 'that will work because we buy fabric stock which is relatively scarce on the market and is

also unique considering our brands, unlike the bulk imports coming from Asia'. Questioning the benefit of having a warehouse to stock second-hand materials, a respondent opposed earlier respondents saying, 'It is possible to have a warehouse; but as far as they are considered used clothes, for me, it's difficult'

One of the benefits of practising the CE is the economic value as more revenue generation has been associated with CE. However, for owner-designers of SMEs in Ghana, additional costs could be incurred due to low-skilled labour, uncertainty about demand and the time required to work on these items. These factors make the practice of CS unattractive and costly. Apart from the cost, material value was seen as a contention, particularly with how local consumers handle garments during the use phase. The humid environment requires that consumers wash clothes regularly. These washed clothes are continuously exposed to sunlight, which weakens the fibres and also leads to colour fading. Another important factor is the cultural beliefs and superstitions associated with transferring personal clothing to another, especially a non-family member. Environmental and cultural conditions (Kozlowski et al., 2019) were seen as significant hindrances to the reuse concept.

Associated with reuse was the concern about pre-treatment cost and process certification to boost consumer confidence. While the transparency of the process is one of the key indicators in sustainable strategy practice in developed countries, as championed by the Global Reporting Initiative (GRI), the majority of respondents believe process disclosure would make circular products rather unattractive to the consumer, bringing the element of culture into play. The concerns regarding disclosure confirm Di Lodovico and Manzi's (2023) observation of the difficulty with transparency when it comes to sustainability practices. The lack of regulations exemplified by the impact level frameworks (Bhamra et al., 2013; Schaltegger et al., 2012) hampers the practice of the CE as owner-designers have no guiding principles to relate their processes to the attainment of sustainability. A level of awareness among these producers and customers is necessary for imbibing the sustainability concept, justifying the assertions by Hur and Cassidy (2019) and Kircherr et al. (2017) about the need for designer and consumer awareness creation.

From the perspective of the study of the environment, material recovery for reuse is possible with imported second-hand garments or fabric stock. Reusing

garments from second-hand apparel – through a redesign strategy exists among some firms and confirms the ease of adopting a recovery strategy. The challenge is sourcing these second-hand garments in the required volume, and scouting for preferred pieces is time-consuming. To this end, establishing a warehouse to facilitate the sourcing of rare pieces was welcomed. In other jurisdictions such as Brazil, textile banks are providing the bridge between manufacturers, waste management companies, fashion designers and fashion firms to enable stocking, sourcing and reusing of fabrics. Collaborations with textile firms overseas could enable direct sourcing of required quantities in assorted fabrics for warehousing. For SMEs typically producing smaller quantities, product exclusivity is important; warehousing rare fabrics will add to their competitiveness while contributing to solving environmental issues.

However, second-hand garments have been a threat to environmental health, especially in countries that have difficulty managing solid waste. Apart from local challenges with waste management, transporting the garments impacts negatively on climate health (Morell-Delgado et al., 2024). Jacometti (2019) emphasises high fuel consumption and significant emissions of greenhouse gases as a result of the transportation of goods. While these are major issues with second-hand garments, the government of Ghana has yet to put in place policies that guide the creation of products sustainably.

4.4 Opportunities and challenges in practising CS

To ensure that SMEs embrace circular strategies, the study sought to find the opportunities that can be harnessed to enhance participation. It was gleaned from the data that, even though all the respondents ran retail shops, sixteen respondents had regular direct engagement with end customers by running retail and providing custom-made products. The advantage of direct customer engagement was seen as a starting point, as summarised by a respondent; 'In our small way, we have to play our role, because definitely, we have contact with the client, and what we are talking about goes back to the client.'

Having indicated the feasible CSs as shown in Table 3, and the opportunities available, it became necessary to know the challenges that may come with consciously adopting and implementing a strategy. Most of the respondents reiterated considering redesign, reuse and repair. However, the concept of

CS was new to them and, though they practised unknowingly, certain factors needed to be examined, and are summarised as follows; 'The challenges are more of capacity and awareness on the part of consumers and willingness to pay for service.' To add to capacity and awareness, a respondent added that; 'We are still looking out for labour, get a bigger space, so we can adopt and implement a sustainable strategy. Once that structure is in place, we can be conscious about it.' Again, another hinted that; 'In the first place, we need to get a design model that we can use for the implementation and then probably get the market base to hold on to that production level for a long time'. To consolidate the views stated earlier, one respondent highlighted that; 'It's just the know-how. We are not in the sustainability business, so we may not know how to go about it. We are familiar with the concept, but how to put it in a proper structure will be our challenge.'

It came to light that, for the majority to get involved in practising CSs, six respondents indicated that there should be mandatory participation so it does not become an individual initiative, with the government providing support systems; 'so this is like a collective side of things; we all can decide to have a level of sustainable fashion value or practice. I think that will also help. It can even be compulsory.' As there is no compulsion for garment producers to practice sustainably, a respondent shared that, 'At this point, I doubt if I can do that unless everybody is on board.' This assertion was supported by another, who opined that, 'It must be implemented so that it's not an option anymore, so it becomes a law with legislative backing.' A respondent brought two dimensions that could aid effective implementation: 'I think if the market is made for it, it becomes easier for everybody to practise. Again, currently, what the government puts in place does not fully support businesses such as fashion to engage in sustainability.'

Fashion SMEs in Ghana have the advantage of working closely with their customers on CE principles. This is very important as it encourages consumers to share their thoughts on what is produced for them and how (Kozlowski et al., 2019). Owner-designers have the opportunity to engage their customers more accurately than relying on consumer surveys. The CS integration is critical at the design stage. The issue of afterthought, as noted by Gwilt and Rissanen (2011), could largely be avoided; this will promote more accurately tailored products, hence reducing dissatisfaction accompanying mainstream products. However,

the practice of CE principles comes with challenges. There is no strategy for integration, as advanced by Bhamra et al. (2013) and Schaltegger et al. (2012). Some respondents advocated mandatory participation; a defensive approach, to ensure everyone is on board. In a space where little is known of sustainability (James and Kent, 2019; Amankwah et al., 2023) and regulation is non-existent, designers have little motivation to adopt CSs. The respondents practising some forms of strategy were not aware of CSs to enable a conscious practice, a situation that requires attention. Adopting any of the approaches needs to be carried out in tandem with a model for implementation to achieve successful integration. Currently, structures are not in place for an initial take-off. The World Bank's (2012) statement that Africa, and for this study Ghana, lacks resources, technology and technical know-how are still pertinent.

Summary of findings

The major findings emanating from the study are that owner-designers practise CS such as disassembly, redesign, reuse, repair/alterations unknowingly, due to their lack of awareness of the CE principles. Regarding Research Question 1, these strategies do not require sophisticated machines to operate. The awareness created by the informal practice, coupled with the application of less sophisticated technology represents an opportunity. However, the unattractiveness of formally integrating CSs in fashion SMEs in Ghana is due to cost, time and labour, and the lack of policy direction by the government to encourage adoption and implementation. Also, respondents' impressions based on regular interactions with consumers throw some doubt on consumers' willingness to accept products made with material recovered from used clothes. Again, non-consideration of CS at the initial stage of design makes life extension strategies difficult to adopt. There was no indication of an existing model to help fashion SMEs understand the impact levels of strategies they might wish to adopt. A considerable literature on sustainability and the CE is available concerning the West and the same is now required in Africa, and (in respect of this study) in Ghana in particular, to increase understanding of the concept, its application and implications.

5. Conclusion

Fashion production is a commercial activity focused on the economic dimension, and, until recently, has relegated the social and environmental dimensions to the

background. As it is a basic human necessity, the growth in population, particularly in the two major cities in Ghana, will require an increase in the production and consumption of clothes. The steady rise in designer clothing retail outlets meeting the demands of urban professionals will further add to the growth of the clothing industry, potentially exacerbating existing waste management issues. When a growth in consumption is unavoidable, then a circular perspective might provide a viable strategy to achieve sustainable consumption and production. Evaluating a firm's current process for sustainability helps to identify lapses and the sustainable circular strategy a firm can adopt to bring value. Based on research questions proposed for the study, life extension strategies such as Redesign, Repair, Reuse and Reduce are informally practised. These strategies require basic production equipment and are informal clothing care practices of the average Ghanaian. Regarding challenges and opportunities – internally, CS could be formally introduced to fashion SMEs in Ghana, supported by experiences gained through informal practices of some strategies and direct consumer engagement over the years; externally, adoption could be hindered by cultural beliefs and attitudes of local consumers as opined by respondents. However, effective implementation is dependent on government policies towards the achievement of sustainability in the coming years. Sensitisation efforts for awareness creation and a model for implementation are critical factors that must be addressed to provide the enabling environment for fashion SMEs in Ghana to operate sustainably. It is fair to say that the principles of the CE are not new to Ghana, but the dimension of environmental sustainability is. The effectiveness of CS in fashion SMEs in Ghana largely depends on understanding the relationship between practices and sustainability. As a new phenomenon, efforts from the government, industry practitioners and the citizenry are fundamental to understanding the complexities and roles of all stakeholders towards the success of CE in Ghana. Collaborative efforts from all stakeholders (Di Lodovico and Manzi, 2023) are required to tackle the complex nature of sustainability and the CE to enhance the environmental and social health of communities.

Study limitation

Consumers' exclusion from the study stems from the basis that, with CE principles, consumer participation is largely influenced by the willingness of fashion SMEs to provide service. Hence, as a new phenomenon in the Ghanaian fashion industry, owner-designers' perspectives were deemed essential to trigger conversations

and subsequent research into consumer perspectives and government policies required to aid the adoption and successful implementation of the CE in Ghana.

Declaration of conflict of interest
The authors declare no conflict of interest with the study.

References

Accenture. 2016. 'From Rhetoric to Reality'. Circular Economy Index of Dutch Businesses. Accenture, pp. 1–32: https://www.circle-economy.com/resources/the-circular-economy-index-from-rhetoric-to-reality (accessed 13 April 2020).

Ahiable, K. and C. Triki. 2021. Tackling Ghana's Textile-Waste Challenge: https://institute.global/advisory/tackling-ghanastextile-waste-challenge (accessed 4 Jan. 2021).

Akintayo, T., J. Hämäläinen, P. Pasanen and I. John. 2023. 'A rapid review of sociocultural dimensions in Nigeria's solid waste management approach'. *Int. J. Environ. Res. Public Health* 20: 6245. https://doi.org/10.3390/ijerph20136245

Amankwah, A.M., E. Appiah, C. Frimpong and A. Kent. 2023. 'Examining the structure of the fashion industry in Ghana in ensuring the successful adoption of a sustainable approach'. *SUSTINERE: Journal of Environment & Sustainability* **7** (2) (2023), 161–75. https://doi.org/10.22515/sustinerejes.v7i1.304

Ávila-Gutiérrez, M.J., A. Martín-Gómez, F. Aguayo-González, and A. Córdoba-Roldán. 2019. 'Standardization framework for sustainability from circular economy 4.0'. *Sustainability* **11** (22). https://doi.org/10.3390/su11226490

Beltrami, M., D. Kim and F. Rölkens,. 2019. The State of Fashion. Business of Fashion and McKinsey & Company: https://www.mckinsey.com/~/media/McKinsey/Industries/Retail (accessed 4 March 2020).

Bhamra, T.A., R.J. Hernandez-Pardo and R. Mawle. 2013. 'Sustainability: Methods and Practices', in Stuart Walker (ed.) *Handbook of Design for Sustainability*. London: Bloomsbury. pp. 106–20.

Bhardwaj, V. and A. Fairhurst. 2010. 'Fast fashion: Response to changes in the fashion industry'. *International Review of Retail, Distribution and Consumer Research* **20** (1): 165–73. https://doi.org/10.1080/09593960903498300

Bick, R., E. Halsey and C.C. Ekenga. 2018. 'The global environmental injustice of fast fashion'. *Environmental Health* **17** (92): 1–4. https://doi.org/10.1186/s12940-018-0433-7

Bocken, N.M.P., S.W. Short, P. Rana and S. Evans. 2014. 'A literature and practice review to develop sustainable business model archetypes'. *Journal of Cleaner Production* 65: 42–56. https://doi.org/10.1016/j.jclepro.2013.11.039

Bonilla Hernandez, A.E., T. Lu, T. Beno, C. Fredriksson and I.S. Jawahir. 2019. 'Process sustainability evaluation for manufacturing of a component with the 6R application'. *Procedia Manufacturing* **33**: 546–53. https://doi.org/10.1016/j.promfg.2019.04.068

Claxton, S. and A. Kent. 2020. 'The management of sustainable fashion design strategies: An analysis of the designer' s role'. *Journal of Cleaner Production* **268** (122112): 1–10. https://doi.org/10.1016/j.jclepro.2020.122112

Cohen, L., L. Manion and K. Morrison. 2007. *Research Methods in Education*. Sixth Edition. New York: Routledge. pp 19–24.

Cooper, T., H.A. Hill, J. Kininmonth, K. Townsend, M. Hughes, J. Shorrocks, A. Knox, T. Fisher and V. Saicheua. 2013. Design for Longevity: Guidance on increasing the active life of clothing. WRAP Working Together For A World Without Waste: https://www.researchgate.net/publication/313479112 (accessed 18 April 2020).

Creswell, J.W. 2013. *Qualitative Inquiry & Research Design*. Third Edition. Los Angeles: SAGE Publications.

Di Lodovico, C. and A. Manzi. 2023. 'Navigating sustainability in the fashion industry: Insights from entrepreneurial perspectives on collaborative approaches'. *Sustainability: Science, Practice and Policy*' **19** (1): 2242707 https://doi.org/10.1080/15487733.2023.2242707

Ellen MacArthur Foundation. 2013. Rethink the Future. Towards the circular economy. Economic and business rationale for an accelerated transition Vol. 1: https://www.ellenmacarthurfoundation.org/towards-the-circular-economy-vol-1-an-economic-and-business-rationale-for-an (accessed 18 June 2020).

Ellen MacArthur Foundation. 2015. Towards a circular economy: Business rationale for an accelerated transition: https://www.ellenmacarthurfoundation.org/towards-a-circular-economy-business-rationale-for-an-accelerated-transition (accessed 18 June 2020)

Fuchs, L. 2016. Circular Economy Approaches for the Apparel Industry. Thesis. University of St.Gallen Hochschule für Wirtschafts-, Rechts- und Sozialwissenschaften.

Ghana Statistical Service. 2021. Ghana 2021 Population and Housing Census: https://census2021.statsghana.gov.gh/dissemination_details.php?disseminatereport=MjYzOTE0MjAuMzc2NQ==&Publications# (accessed 7 Aug. 2022).

Gwilt, A. and T. Rissanen (eds). 2011. *Shaping Sustainable Fashion: Changing the Way we Make and Wear Clothes.* London: Earthscan.

Hammad, H., V. Muster, N.M. El-Bassiouny and M. Schaefer. 2019. 'Status and sustainability: can conspicuous motives foster sustainable consumption in newly industrialized countries'. *Journal of Fashion Marketing and Management* 23 (4): 537–50. https://doi.org/10.1108/JFMM-06-2019-0115

Hernandez, R.J. 2019. 'Sustainable product-service systems and circular economies'. *Sustainability* 11 (5383): 1–11. https://doi.org/10.3390/su11195383.

Hur, E. and T. Cassidy. 2019. 'Perceptions and attitudes towards sustainable fashion design: challenges and opportunities for implementing sustainability in fashion'. *International Journal of Fashion Design, Technology and Education* 12 (2): 208–17. https://doi.org/10.1080/17543266.2019.1572789

Jacometti, V. 2019. 'Circular economy and waste in the fashion industry'. *Laws* 8 (27): 1–13. https://doi.org/10.3390/laws8040027

James, J. and A. Kent. 2019. 'Clothing sustainability and upcycling in Ghana', *Fashion Practice* **11** (3): 375–96. https://doi.org/10.1080/17569370.2019.1661601

Juanga-Labayen, J.P., I.V. Labayen and Q. Yuan. 2022. 'A review on textile recycling practices and challenges'. *Textiles* 2: 174–88. https://doi.org/10.3390/textiles2010010

Karell, E. and K. Niinimäki. 2020. 'A mixed-method study of design practices and designers' roles in sustainable-minded clothing companies'. *Sustainability* **12** (11): 25. https://doi.org/10.3390/su12114680

Kirchherr, J., D. Reike and M. Hekkert. 2017. 'Conceptualizing the circular economy : An analysis of 114 definitions'. *Resources, Conservation & Recycling* **127**: 221–32. https://doi.org/10.1016/j.resconrec.2017.09.005

Koszewska, M. 2018. 'Circular economy – challenges for the textile and clothing industry'. *AUTEX Research Journal* **18** (4): 1–12. https://doi.org/10.1515/aut-2018-0023

Kozlowski, A., C. Searcy and M. Bardecki. 2018. 'The reDesign canvas: Fashion design as a tool for sustainability'. *Journal of Cleaner Production* **183**: 194–207. https://doi.org/10.1016/j.jclepro.2018.02.014

Kozlowski, A., M. Bardecki and C. Searcy. 2019. 'Tools for sustainable fashion design: An analysis of their fitness for purpose'. *Sustainability* **11** (13): 1–19. https://doi.org/10.3390/su11133581.

Kumar, R. 2011. *Research Methodology: A Step-by-step Guide for Beginners* SAGE Publications.

Lewis, T.L., H. Park, A.N. Netravali, H.X. Trejo. 2017. 'Closing the loop: a scalable zero-waste model for apparel reuse and recycling; *International Journal of Fashion Design, Technology and Education* **10** (3): 353–62. https://doi.org/10.1080/17543266.2016.1263364

Liyanage, K.L.A.K.T. and N. De Silva. 2018. 'Zero landfill framework for apparel industry solid waste', The 7th World Construction Symposium 2018: Built Asset Sustainability: Rethinking Design, Construction and Operations (July). pp. 1–44.

Maxwell, J.A. 2012. 'Designing a Qualitative Study'. In Maxwell, *Qualitative Research Design: An Interactive Approach*. SAGE Publications. pp. 214–52.

Morell-Delgado, G., L.T. Peiró and S. Toboso-Chavero. 2024. 'Revealing the management of municipal textile waste and citizen practices: The case of Catalonia'. *Science of the Total Environment* 907 (2024): 168093

Nijman-Ross, E., J.U. Umutesi, J. Turay, D. Shamavu, W.A. Atanga and D.L. Ross. 2021. 'Towards a preliminary research agenda for the circular economy adoption in Africa'. *Frontiers in Sustainability* **4** (3): 1061563. https://doi.org/10.3389/frsus.2023.1061563

Niinimäki, K., G. Peters, H. Dahlbo, P. Perry, T. Rissanen and A. Gwilt. 2020. 'The environmental price of fast fashion'. *Nature Reviews Earth & Environment* **1**.

Pal, R. and E. Sandberg. 2017. 'Sustainable value creation through new industrial supply chains in apparel and fashion'. *17th World Textile Conference AUTEX 2017 – Textiles – Shaping the Future*, 0–6. https://doi.org/10.1088/1757-899X/254/20/202007

Pingki, M.J., Md.S. Hasnine and I. Rahman. 2019. 'An experiment to create Zero Wastage Clothing by stitching and slashing technique'. *International Journal of Scientific & Engineering Research* **8** (1).

Rayman-Bacchus, L. and C.N. Radavoi. 2020. 'Advancing culture's role in sustainable development: social change through cultural policy'. *International Journal of Cultural Policy* **26** (5): 649–67. https://doi.org/10.1080/10286632.2019.1624735

Sahimaa, O., E.M. Miller, M. Halme, K. Niinimäki, H. Tanner, M. Mäkelä, M.,Rissanen, H. Härri and M. Humme. 2023. 'From simplistic to systemic sustainability in the textile and fashion industry'. *Circular Economy and Sustainability.* https://doi.org/10.1007/s43615-023-00322-w

Sabatini, F. 2019. 'Culture as fourth pillar of sustainable development: Perspectives for integration, paradigms of action'. *European Journal of Sustainable Development* **8** (3): 31. https://doi.org/10.14207/ejsd.2019.v8n3p31

Sandin, G. and G. Peters. 2018. 'Environmental impact of textile reuse and recycling – A review'. *Journal of Cleaner Production* 184: 353–68. https://doi.org/10.1016/j.jclepro.2018.02.266

Schaltegger, S., F. Lüdeke-Freund and E.G. Hansen. 2012. 'Business cases for sustainability: The role of business model innovation for corporate sustainability'. *International Journal of Innovation and Sustainable Development* **6** (2): 95–119. https://doi.org/10.1504/IJISD.2012.046944

Senayah, W.K. 2018. Skill-Based Competence and Competitiveness in the Garment-Manufacturing Firms of Ghana [University of Ghana]: https://ugspace.ug.edu.gh/handle/123456789/28928 (accessed 18 April 2020).

Stahel, W. 2016. 'The circular economy's hidden wealth': https://www.eco-business.com/news/the-circular-economys-hidden-wealth/

Steffen, W., K. Richardson, J. Rockström, S.E.Cornell, I. Fetzer, E.M. Bennett, R. Biggs, S.R. Carpenter, W. de Vries, C.A. de Wit, C. Folke, D. Gerten, J. Heinke, G.M. Mace, L.M. Persson, V. Ramanathan, B. Reyers,and S. Sörlin. 2015. 'Planetary boundaries: Guiding changing planet'. *Science* **347** (6223): 1–12. https://doi.org/10.1126/science.1259855

Tang, K. and D. Ho. 2023 'State of the art in textile waste management: A review'. *Textiles* **3** (4): 454–67. https://doi.org/10.3390/textiles3040027

Tremblay, D., C. Villeneuve, O. Riffon, G.Y. Lanmafankpotin and S. Bouchard. 2017. 'A systemic tool and process for sustainability assessment'. *Sustainability.* **9** (10): 1909. https://doi.org/10.3390/su9101909

Williamson, D., G. Lynch-Wood and J. Ramsay. 2006. 'Drivers of environmental behaviour in manufacturing SMEs and the implications for CSR'. *Journal of Business Ethics* **67** (3): 317–30. https://doi.org/10.1007/s10551-006-9187-1

World Bank. 2012. *Inclusive Green Growth: The Pathway to Sustainable Development*. International Bank for Reconstruction and Development / International Development Association or The World Bank. Washington DC 20433.

WRAP. 2017. Valuing Our Clothes: the cost of UK fashion: https://wrap.org.uk/resources/report/valuing-our-clothes-cost-uk-fashion (accessed 18 April 2020).

Yalcin-enis, I., M. Kucukali-ozturk and H. Sezgin. 2019. 'Risks and management of textile waste'. In K.M. Gothandam et al. (eds), *Nanoscience and Biotechnology for Environmental Applications*. Springer. pp. 29–53. https://doi.org/10.1007/978-3-319-97922-9

Zheng, X., R. Wang, A.Y. Hoekstra, D. Guan, E.G. Hertwich and C. Wang. 2021. 'Consideration of culture is vital if we are to achieve the sustainable development goals'. *One Earth* 4: 307–19. https://doi.org/10.1016/j.oneear.2021.01.012