Design management of sustainable fashion

Abstract

The aim of this research is to advance an understanding of how design in the fashion industry can be successfully managed to contribute to environmental sustainability. Its objectives are to investigate how fashion businesses establish and support environmentally sustainable strategies, and how design leaders and managers contribute to the setting of these goals. The paper reviews the literature of the fashion industry, its sustainability strategies, and the management of design. Semi-structured interviews and a quantitative survey of designers was undertaken in the UK. A framework based on the level of business engagement in sustainability was used to structure the thematic analysis of the findings. The research demonstrates the relatively weak influence of designers on sustainable fashion strategy and concludes by developing design management theory for sustainability through a modified Design Atlas framework.

The global fashion industry, driven by the 'fast fashion' business model has contributed to a significant increase in the volume of products with shorter life cycles and price deflation (Cachon and Swinney 2011; McColl & Moore 2011). Multiple fashion retailers have formed a significant part of this development and as production has extended to developing countries, the associated environmental impacts have raised concerns about the ethical and environmental sustainability of the industry (WRAP 2012, Fletcher 2007). These challenges and sustainable development initiatives (United Nations 2016) have led to the promotion of a 'circular' model of production and consumption that keeps resources in active use for as long as possible, extracts the highest possible value from them while in use, and to recover and recycle them at the end of their life (WRAP 2015).

However, the complexity and variety of fashion products, the need to differentiate through design content, respond to market pressures and work with short lead times present strategic sustainability challenges. Environmental impacts potentially involve all aspects of the fashion business's upstream and downstream supply chains (Curwen, Park and Sarkar 2012). In this, the fashion product itself determines critical aspects of these impacts, which can be reduced by taking a sustainable approach to their design (Bhamra and Lofthouse 2007).

The aim of the paper is to advance an understanding of how design can be successfully managed in the fashion retail industry to contribute to support environmental sustainability and circular economy. Its objectives are to define environmentally sustainable strategies, how design leaders and managers contribute to sustainability objectives and integrate them into working practices within the design team to achieve these objectives. The research will contribute to the development of sustainable fashion design practice by

providing a critical review of the organization of sustainable fashion design.

Literature Review

Studies of sustainable fashion design focus on a wide range of practice-based approaches, which require designers to be appropriately informed and able to influence the product development process (Fletcher 2007; Fletcher and Grose 2012; Gwilt and Rissanen 2010; Black 2008). The 'circular' or 'closed loop' design approach is the most sustainable where the impacts of each stage of the product lifecycle are considered (Charter and Clark 2007; McDonough and Braungart 2009). However, designers working for mainstream fashion businesses are rarely empowered to influence the process to this extent and in many cases may not have the awareness or technical knowledge required (Palomo-Lovinski and Hahn 2014). Furthermore, the range of known sustainable design practices are often at odds with other business objectives related to profitability as they are perceived as being more costly and time consuming to achieve, even by businesses with well-established sustainability strategies (Cooper et al 2013).

In order for sustainable design practice to be adopted successfully within mainstream fashion, design and product development teams must be informed, resourced and managed. The designer must have a 'mandate' through the alignment of business culture, objectives, structure and processes (Curwen et al 2012). As Moultrie (n.d.) suggests '…not only technical aspects of a particular product are primarily of interest, but also organisational, behavioural and managerial factors which set the product in the context of a wider picture of production and consumption.'

Mapping the entire life cycle along both the upstream and downstream supply chains,

Lifecycle analysis (LCA) is used to define energy consumption, chemical impacts, greenhouse gas (GHG), waste generation, and water use is assessed and quantified in order to provide designers with criteria and evidence for selecting sustainable materials (NIKE 2014; Patagonia 2009). Mainstream fashion brands have tended to prioritise aspects of sustainable practice that offer tangible benefits at some, but not all stages of the life cycle. All materials used in the production of a product determine its environmental impact (Huang et al. 2009), and the most common sustainable design strategies focus on the sourcing of low impact and/or resource efficient materials, followed by reduced impact production processes.

Initiatives to reduce material waste in manufacturing, sometimes referred to as 'pre - consumer' waste, have the advantage of saving cost, for instance at the fabric cutting stage of the production process (Bevilacqua et al 2011). At the niche or specialised end of the market, companies often have a very narrow sustainability concept that can be integrated into the brand ethos and values, and designers are able to focus on materials and production in the product lifecycle (Black 2008; McQuillan in Gwilt and Rissanen 2010). For small designer-led businesses it is possible for the designer to be at the centre of the process. However, more creative practices are seen as difficult to apply in mainstream businesses as they can restrict design scope or are difficult to scale up (Curwen, Park and Sarkar 2012, Cooper et al 2013). In larger businesses it is likely that the designer may lead the creative process, but many of the material and production decisions will be influenced or decided by other members of the NPD team (Gwilt 2014).

Sustainable approaches that deal with consumption waste refer to the 'use' and 'disposal' stages of the product lifecycle, which are much more difficult to assess, influence and measure. The 'use' stage is typified by energy consumption of the consumer laundering

process and waste volumes arising from discarded clothing (Allwood et al 2006). In this context, design strategies tend to be aimed at reducing rather than eliminating negative impacts (Gwilt 2014; Fletcher and Grose 2012). These are evident in the design of clothes for less frequent washing and use of lower temperatures to prolong clothing life (Laitala, Boks and Klepp 2011; Ginetex n.d.). In the disposal stage of the product lifecycle, clothing take-back services enable customers to deposit unwanted items to be recycled or re-sold (Balch 2013, Cooper et al 2013). A second approach at this stage is design for disassembly. This involves developing products that can be taken apart in order to replace worn or damaged components - a common practice before mass production was established (Gwilt and Rissanen 2010).

A key design strategy is to extend product durability or longevity. Products should be designed to be physically durable, but the concept also relies on the consumer to have an emotional attachment to the product to keep it in active use for longer (Gwilt 2014; (Fletcher 2007; Gwilt and Rissanen 2010). Some brands at the niche, luxury and mid-market levels are starting to adopt this strategy by emphasising durability and 'considered' design to increase their brand value with customers (Fisher 2015). As design for durability is more design-led and user-centred, there is an increased opportunity for designers to lead the process. Further, a focus on durable design enables products to have a second life via alternative business models such as second-hand and vintage clothing, and in product-service systems such as leasing or renting (Gwilt 2014).

Williams (Holland and Lam 2014, p.251) defines three possible categories of engagement in sustainability: companies which demonstrate a current 'ideal' approach to sustainability, for example aiming to achieve a circular design approach, second, those which

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'adapt' to sustainable approaches and finally those that 'adopt' sustainability from the start, normally 'niche' or specialist businesses. Companies can be categorized by their approach to, and level of engagement in sustainability and sustainable design strategies within this model (Table 1). Large brands such as NIKE, M&S and H&M in the 'ideal' category are considered leaders in sustainable business practice; they have well-established strategies which are widely publicised and seen as shaping the debate within the industry. They also engage in collaborative industry wide initiatives such as the UK SCAP 2020 commitment, and are involved in funding large sustainable innovation projects.

The niche brands in the 'Adopt' category have sustainability integrated into the business model from the start and can also be seen to lead sustainable design practice within their market niche. Supermarket brands George and Sainsbury's and fashion brand Ted Baker are in the 'Adapt' category. They have taken a similar approach to M&S but their strategies are smaller in scope and less well established (Cooper et al 2013).

Design Management

It is estimated that 80% of a product's environmental impacts are decided during the design stage (European Commission 2012), which influences all aspects of the final fashion product including aesthetics, materials, physical performance, cost, quality and sustainability (Bhamra and Lofthouse, 2007). The designer must balance the needs of all internal and external stakeholders to determine how to proceed with a design concept and make choices according to the risks and benefits (Howarth and Hadfield 2006). However, it is not necessarily the designer who makes the decisions about material sourcing and manufacturing methods; the 'design' of the product is also likely to be influenced by technologists, buyers and suppliers (Goworek 2010). Design management involves design, strategy, and supply chain management to control a process that supports creativity, and builds a structure and

organisation for design (Borja De Mozota 2003; Hands 2009). Within the organization the challenges of managing design, require a strategic perspective and its implementation at tactical and operational levels (Borja de Mozota, 2006; Topalian, 2014).

FASHION BUSINESSES' LEVEL OF ENGAGEMENT IN SUSTAINABILITY			
	IDEAL	**ADAPT**	**ADOPT**
Company	NIKE, M&S, H&M, Kering Group (PUMA, Stella McCartney), Eileen Fisher	Sainsbury's, George, Ted Baker, John Lewis	Small niche sustainable brands and new business models e.g. Christopher Raeburn, Natalia Allen
Environmentally sustainable design strategies	• Environmentally sustainable fibres and processes strategy with clear targets. • Design for physical and emotional durability. • Large innovation projects: e.g. working towards closed loop recycling. • Investigating new business models such as renting.	• Environmentally sustainable fibres and processes strategy. • Less established / ambitious targets than IDEAL brands. • Small innovation projects: e.g. design for disassembly, recycled fibres.	• Environmentally sustainable fibres and processes strategy. • Recycled fibres. • Recycled pre and post-consumer waste fabrics and garments. • Design for physical and emotional durability. • Product-service models (e.g. renting, collaborative consumption, mending and repair). • Vintage.
Other sustainable strategies	• Energy efficient factories, DCs, transport and stores. • Clothing take-back schemes. • High level of transparency in external communication of strategies, targets and progress.	• Energy efficient factories DCs, transport and stores (large companies). • External communication is less transparent and may not identify targets or include progress / achievements.	• Local production. • Integrated marketing strategy: sustainability message is embedded in all communications.

Table 1 A comparison of fashion brands' approaches to sustainable design (Claxton, 2015)

Strategy as a more fluid, creative and responsive activity, is better able to negotiate the increasingly changeable and complex business environment (Borja de Mozota 2006). Holland and Lam (2014) argue that such an adaptive strategic model is appropriate for the fashion industry However, achieving sustainable solutions also requires long-term approaches to business resilience in the context of global environmental and technological change. Visionary strategies where radical goals and innovation are prioritised may lead to more meaningful change, and greater brand value.

The strategic level is thought by some experts to be primarily concerned with the idea of 'responsibility' (Topalian 2014) where business leaders create the agenda and culture for design to contribute to achieving strategic goals, and relates to overall business strategies and agendas that design must connect with (Best 2006). For fashion businesses, design and NPD teams need to be empowered to adopt more sustainable products and practices (Curwen, Park and Sarkar, 2012, Epstein and Roy 2014). Mid-market fashion companies are less likely to have such well-defined long term sustainable aims (Cooper et al. 2013). However, designer labels and small niche businesses often base their whole business concept on an innovative product, process or business model concept. For this type of business the designer tends to operate at each of the strategic, tactical and operational levels.

At the tactical level, design management is concerned with the systems and processes needed to deliver against business sustainability targets. In the fashion industry, the business strategy should influence how design and NPD teams are structured and managed within the cross functional category team, ensuring that sustainability goals are built into design briefs and key performance indicators (Best 2006). Here too a distinction can be made between large and small fashion businesses. Size and infrastructure can build specialist knowledge

within the NPD and sourcing teams to achieve sustainability goals (H&M n.d.; M&S 2014). They are more likely to have access to training for sustainability, and be supported by team members with relevant specialist knowledge. Smaller fashion businesses are likely to employ fewer sustainability and/or technical specialists, and designers may be working on more than one type of product category. They may have less buying power than the larger brands, making it more difficult for them to influence the supply base towards a more sustainable model. However, in small designer brands or niche fashion businesses where sustainability is integral to the business concept, the ability and agency of the design manager to lead a more innovative design process may be much greater than in larger businesses (Black 2008).

The operational level is concerned with the design and delivery of tangible products and services. In the fashion context, this relates to the design and specification of the product in terms of aesthetics, cost, material selection and physical performance (Best 2006). The skill of the designer is to interpret these criteria in line with brand identity, commercial targets and user needs and wants. The designer's role may vary from business to business and between different levels of the market, which in turn has a bearing on the skills and knowledge required. Therefore, the agency of the designer to affect the design processes and materials used varies greatly.

Design management can provide a process for aligning strategic, tactical and operational sustainable design activities to support the development of more sustainable working practices (Cooper 2012). However this is less well understood in the context of sustainable fashion design amongst fashion retail brands. Given the importance of the designer in the fashion NPD, there is a need to ascertain the extent to which they influence strategic decision-making about sustainability. The second research question concerns the

complexity of tactical and operational management by design leaders, design managers and designers to achieve sustainability objectives.

Methodology

The research questions require in-depth investigation of how and why contemporary fashion brands work in their approach to sustainable design. In-depth interviews were used to access individuals' first-hand experience of the strategies and working practices relating to sustainable design, and their perceptions of the opportunities and barriers for wider adoption of more innovative circular initiatives. This allows an inductive approach to data analysis where the researcher interprets the emerging themes in order to draw conclusions and make recommendations (Creswell 2013). The interviews were supplemented by a survey of fashion designers, independent of an organizational context, in order to understand the broader awareness of design for sustainability and the extent to which sustainable design techniques are adopted.

Research participants for the qualitative interviews were identified using purposive selection described by Maxwell (2013) as an approach where the people, settings and activities are selected deliberately to provide information that is relevant to the research question and aims of the study. The research participants for this study represent national or international clothing brands, either based in the UK or with a UK retail presence and of differing size, market level and customer focus. Each has a stated commitment to sustainability that could relate to or influence design strategies. Seventeen industry experts represented nine fashion brands, and two sustainability experts (Table 2). At the strategic level, the aim was for to identify how business sustainability goals are interpreted into strategies for design departments by fashion design leaders, and to assess their involvement in goal setting.

Company		Description	Interviewees (19)
IDEAL	**A**	Large UK clothing retailer selling a comprehensive range of products across womenswear, menswear and childrenswear.	• Sustainable Raw Materials Manager (Interview A1) • Senior Knitwear Technologist (Interview A2) • Senior Knitwear Buyer (Interview A3)
	B	Scandinavian mid-market fashion retail brand with a minimalist style (under larger Scandinavian parent company). Womenswear, menswear and childrenswear.	• Production and Sustainability Manager B1.1; Quality Co-ordinator B1.2 (Interview B1) • Mens Concept Designer – recent ex-employee (Interview B2)
	C	US womenswear mid-upper market fashion retail brand with a strong ethical identity.	• 1 Senior Designer for Fabric R&D C1.1; 2 Fabric R&D Assistants C1.2 and C1.3. (Interview C1) • Product Development Director - ex-employee (Interview C2)
EARLY ADAPT	**D**	UK supermarket clothing retailer (with US parent company) selling womenswear, menswear and childrenswear.	• Responsible Retail and Sustainability Manager D1.1; Responsible Retail and Sustainability Assistant D1.2 (Interview D1)
	E	UK supermarket clothing retailer selling womenswear, menswear and childrenswear.	• Buying and Design Director for Menswear and Childrenswear (Interview E1)
	F	UK mid-upper market fashion brand with a distinctive design handwriting, selling womenswear, menswear and childrenswear.	• Conscience Manager (Interview F1)
LATE ADAPT	**G**	UK department store selling own brand clothing as well as stocking other brands across womenswear, menswear and childrenswear.	• Sustainable Sourcing Manager (Interview G1)
	H	German upper market premium fashion brand selling menswear and womenswear.	• Team Leader Development, Knitwear (Interview H1)
ADOPT	**J**	UK designer small niche brand / manufacturer with an integrated sustainability concept. Selling womenswear and menswear.	• Brand Owner / Design Director (Interview J1)
SUSTAINABILITY EXPERTS	**K**	Sustainability Consultancy UK. Supporting Fashion and Textiles companies in developing sustainable strategies and in staff training.	• Senior Consultant (Interview K1)
	L	WRAP: UK government funded programme to support brands selling in the UK to achieve reductions in water, waste and carbon footprint via the Sustainable Clothing Action Plan.	• Technical Specialist, Clothing and Textiles (Interview L1)

Table 2 Table of research participants taking part in qualitative interviews (Claxton 2016)

CSR and sustainability leaders were also approached in order to gain an understanding of business approaches to strategy setting, as these experts tend to act as champions with responsibility for driving and influencing change across the organisation (Epstein 2014). The study sought views from senior sustainability consultants who have worked with UK fashion brands to support them in developing a business sustainability strategy.

At the tactical level, evidence was sought from design managers on how sustainable strategies are communicated from the strategic level and then interpreted into plans, processes and criteria for managing the design process. At the operational level, participants include designers and other actors such as technologists and buyers who have a direct influence on the specification of the product and therefore the environmental impact. The aim was to investigate how design and product development are practiced as a multidisciplinary process, and what tools, processes and criteria are incorporated into procedures and design specifications for fashion products.

The interviews were carried out over a period of three months, with all interviews being transcribed as shortly after taking place. Throughout this process, the researcher made notes, identifying any emerging themes that could allow the research process to be refined as it progressed, as suggested by Bryman (2008). A process of thematic analysis was used to identify the key trends and ideas. NVivo software was used to organise and code the data; some of the codes were informed by the research questions based on the literature, whereas others emerged from ideas and themes suggested by the research participants. A further level of analysis was undertaken, where the data was grouped into themes that distinguished between description, that is concerned with actions and activities, and meaning, concerned with attitudes and opinions (Bryman 2008). Holland and Lam's 4 Ds of Design Management

framework (2014) was applied to evaluate design capabilities against strategic goals and used as a basis for grouping the emerging themes within the final analysis and interpretation of the data (Table 3).

FASHION BUSINESSES' LEVEL OF ENGAGEMENT IN SUSTAINABILITY				
	IDEAL	**ADAPT**		**ADOPT**
		EARLY	**LATE**	
Company	**A:** Large UK high street brand **B:** Mid-market Scandinavian fashion brand with fast fashion parent company **C:** US mid-upper market women's fashion brand	**D:** UK Supermarket clothing brand with US parent company **E:** UK Supermarket clothing brand. **F:** UK mid-upper market fashion brand	**G:** UK Department store with own brand clothing line **H:** German premium fashion brand	**J:** UK designer niche brand / manufacturer with an integrated sustainability concept
Environmentally sustainable design strategies	Environmentally sustainable fibres and processes strategy with clear targets Design for durability Large innovation projects: e.g. working towards closed loop recycling Investigating new business models such as renting	Environmentally sustainable fibres and processes strategy with clear targets Small innovation projects: e.g. design for disassembly, recycled fibres	Environmentally sustainable fibres and processes strategy (targets may not be set or publicly communicated)	Environmentally sustainable fibres and processes strategy. Recycled pre and post- consumer waste yarn Design for durability
Other sustainable criteria	Clothing take-back schemes. High level of transparency in external communication of sustainable brand values, strategies and targets. Progress towards targets is communicated.	External communication of strategies and targets is less comprehensive and transparent - may not include progress / achievements.	External communication of strategies and policies is limited and may not identify targets.	Local production Integrated marketing strategy: sustainability is central to all communications (website, blog, articles).

Table 3 Fashion Business's engagement with sustainability

As the survey of designers generated sixteen responses, the results are described rather than analysed, and integrated with the themes emerging from the qualitative interviews.

Results

As the research progressed it became apparent that 'design' in environmentally sustainable strategies, could best be grouped into categories representing the level of engagement that the organisations have with sustainability. The categories are based on Williams (Holland and Lam 2014, p.251) and include companies that demonstrate an IDEAL approach to sustainability that reflect current thinking and actions; those which ADAPT to sustainable approaches further split into EARLY ADAPT and LATE ADAPT to distinguish the respective level of progress between the brands in this section, and those who ADOPT sustainability from the start, normally 'niche' or specialist businesses. They are defined by the level of sustainability engagement and the criteria of the breadth and depth of the companies' sustainability strategies found in the engagement in future focused innovation projects, and level of transparency in external marketing and business communications.

Sustainability strategies

All of the brands participating in the research are signatories of the UK Sustainable Clothing Action Plan (SCAP) or members of the US Sustainable Apparel Coalition (SAC) apart from niche designer brand J and non-UK brand H. As such, they are required to measure and report on their progress towards sustainability and the requirement to report on improvement actions encourages brands to focus on those areas which will deliver the most rapid results. All respondents reported that their businesses have policies and targets on sustainable raw materials or fibres, which tends to be the main strategic focus. Additional goals include working towards developing sustainable manufacturing processes that reduce

water consumption and use of chemicals in processing, as well as increasing energy efficiency in factories and transparency in sourcing.

Fibre choice is a key element of the design and specification of all fashion products. When setting strategy, brands have tended to focus first on their largest volume fibres and product lines in order to make meaningful and rapid reductions on environmental impacts. The most significant fibre is cotton, which can account for a considerable proportion of fibre usage. For instance, supermarket brand E states that cotton is 'at least 60% of all we do on clothing'. The most sustainable option is considered to be organic cotton which is grown without use of chemicals; however, the amount of organic cotton available in the market is less than 1%. In recent years the 'Better Cotton Initiative' (BCI) non-profit organisation has worked with producers to develop a more sustainable model of conventional cotton where chemicals are reduced, water stewardship is improved and workers' health is more protected. BCI has grown quickly and enables fashion brands to meet sustainable fibre targets.

Fashion brands in the IDEAL category have ambitious targets for sustainable cotton; for example, brand A is aiming for 70% by 2020 which includes organic, BCI and recycled cotton. The EARLY ADAPT and LATE ADAPT targets are less ambitious at between 50% and 60%. Other key fibres discussed include sustainable versions of viscose (rayon), polyester and wool, although these are available in much lower quantities than sustainable cotton. Alternatives to viscose (such as Lyocell fibre from the Tencel fibre company) use wood pulp from sustainable forests. Environmentally sustainable wool alternatives discussed by interviewees include recycled and chlorine free fibres. Furthermore, all of the brands reported following similar animal welfare policies, such as ensuring that wool is sourced from sheep is not cruelly clipped. There are differences of emphasis on certain fibres among the brands

interviewed, influenced by the market position, product quality, product mix and target customer. Brand B uses more wool than their fast fashion parent. The brand's approach to sustainable fibres could differ between ranges: for instance their most significant fibre usage is cotton, but womenswear uses a higher proportion of polyester and viscose than menswear.

The second area of priority is the development of more sustainable textile production processes where chemicals and water are used. All brands must comply with regulations that restrict the use of harmful chemicals in global retail markets and already work with suppliers to monitor and verify this. Some of the brands are developing sustainable processes that go beyond these regulated harmful substances: investigating reduced water dyeing for denim products and another brand using a fabric printer whose inks do not contain harmful chemicals and are able to be re-used. A further motivation is that some of the processes have the advantage of saving cost, unlike using sustainable fibres: 'this pair of jeans uses 60% less water than a normal pair of jeans. Straight away that's a cost-saving.' Nevertheless, these voluntary initiatives are discussed as emerging, rather than established processes. In larger companies, the strategy for sustainability is likely to fall under the responsibility of the sourcing or technical team, thereby limiting the designer's input. However, in a smaller niche brand, sustainable processes can play a key role in the product concept enabling the designer to be directly involved in specifying and sourcing the product.

IDEAL and EARLY ADAPT categories considered product durability or longevity important in the design and new product development (NPD) process. For at least one ADOPT brand they are central to their concept and values behind the business strategy; the collection is promoted as being made to durable standards and possessing a timeless, classic quality. For the smaller brands there can be a strong link to the brand ethos and is integrated

into the design concept of the collections. The concept is expressed in terms of conscious consumption and considered design: 'we have to stay true to our design vision which is about pieces that go together, that can be built upon and that last more than one season so it's built into our DNA.' This is central to their perceived target customer values and behaviour.

Larger brands in the IDEAL and EARLY ADAPT categories had a different focus on physical durability and the technical engineering of core products, such as basic t-shirts and schoolwear, as well as the development of 'longer protocol testing' regimes. Least convinced were the LATE ADAPT brands who understood the concept of durability as a sustainability strategy, but did not think it would work commercially: it was difficult to make a business case for a strategy where customers are influenced to 'buy slightly less because everything is lasting longer'. Overall, they saw durability as a difficult concept to make a business case for in an increasingly competitive market, especially as it is difficult to set targets or report on impact reduction under the SCAP initiative. However, WRAP's technical specialist for textiles reported that there is a growing interest in the potential of durability as a sustainability strategy. A sustainability consultancy has recently trialled a 'use and durability' measurement tool for companies to use in evaluating their products. If this proves successful, it may provide an additional motive for brands to incorporate physical and emotional durability within garment collections as a sustainability strategy.

Recycled fibres form part of the sustainable materials strategy for most of the brands investigated. However, they are not widely available, tend to be poorer quality than their virgin equivalent, and are normally limited to single fibre content fabrics. From a strategic perspective, textile to fibre recycling was discussed by the majority of respondents as being the most significant potential breakthrough towards achieving a circular system if it could be

developed on a much larger scale. Clothing would be diverted from landfill to be recycled into its original fibres and then reprocessed into new yarns, fabrics and garments, ideally retaining the same quality and handle as the original version. This would theoretically enable the industry to continue with its current model in terms of production levels and retail outlets, with the advantage of reducing waste from garment disposal and reducing fibre consumption. However, it would not address other aspects of the product lifecycle such as transport, and energy used in manufacturing.

Small, niche brands demonstrated more creative approaches to recycling in their sustainability strategies. ADOPT brand J's concept is entirely based on the sourcing of pre-consumer waste yarn. Some more mainstream brands had also engaged in projects or collections that involved a form of recycling. Brand C has a garment recovery scheme and re-sells its own-brand used clothing through three 'vintage' stores. This brand is unable to re – sell the majority of returned items due to quality issues, so it is intended that the unused stock will be recycled into fibre. Brand A developed a limited edition womenswear collection using recycled materials in 2015 that sold successfully, and is now investigating the potential of this to be done at a larger scale. Brand D had engaged in a project where garments were designed to be disassembled following customer disposal, allowing the garment to be taken apart for the fabric panels to be re-used. However the concept can have negative connotations for some customers who perceive it as being inferior quality; some designers and buyers are also put off by the quality and technical aspect and image of recycling.

It was not clear whether design leaders or design managers were involved in developing and setting sustainable strategies in any of the companies. For instance, the buying and design director for supermarket brand E stated that the sustainability strategy is 'coming from the top, not from design'. Brand E's design function reports through a director with a

buying background which suggests that 'design' is not directly represented at main board level. If design tends to report through a commercial function, it is possible that the potential influence and contribution of design departments is not prioritised. Designers may not be taken seriously as business people within the industry, and when strategy is being discussed they are 'just not in the room'.

Fashion design practice

The previous section identified the key sustainability strategies used by fashion businesses to reduce the environmental impacts of clothing products and the low engagement of designers in strategic planning. The designer's involvement in contributing to and delivering these strategies is now analysed in relation to the tactical and operational levels of the business.

The designer survey concurred with the interviewees in terms of business priorities for sustainable materials. In terms of sustainable manufacturing processes, 44% of the designers responding to the survey stated that they used some form of 'eco dyeing' in the products they designed and 25% reported using natural dyes which have a lower environmental impact. Apart from one niche brand in the ADOPT category, most of the interviewees confirmed that designers lacked significant involvement or influence in either establishing the strategy or in the sourcing process.

At a tactical level, nearly all businesses represented in the research have a separate sustainability team who support NPD teams to achieve sustainable goals. In most of the businesses sustainability managers have technical backgrounds and report into a sourcing or production function. They operate across business teams, engaging with technologists,

buyers, designers and suppliers to develop and source sustainable materials and processes. The sustainability managers interviewed described the challenges of their role in terms of 'working across silos', acting as a 'bridge' and 'pushing the agenda forward' They also tend to be involved in collating the information on fibre usage and other sustainable improvement actions for reporting purposes. One sustainability consultant suggested that there is a lack of consistency and accuracy in terms of how companies report on progress towards achieving targets. This can contribute to criticism and a lack of trust, both externally and inside the organisation. Another respondent suggested that achieving profit margins tend to take precedence over certain aspects of sustainability and can lead to a perception and culture of 'box-ticking' within the organisation.

The sustainability agenda at NPD team level has initially been driven by technologists who are more knowledgeable about fibres, materials and processes; for the sustainability team 'the technologists tend to be our sort-of ally'. The larger companies in the IDEAL and EARLY ADAPT categories have specialist sourcing, sustainability and technical teams responsible for developing the appropriate materials and processes, often working closely with overseas buying offices. The buyer's contribution to the achievement of sustainable targets has become increasingly important as they are responsible for negotiating prices and order quantities with suppliers: 'without the CSR team having the relationship with the buying team, they'd have really struggled to get going on this strategy, even though they had buy-in from a senior level.' Engaging designers does not seem to be as strong a priority for the EARLY and LATE ADAPT brands, as the key strategies are driven technically and managed commercially, rather than by design or marketing-led approaches. The increased complexity of the business structure and NPD processes can make job roles more challenging, particularly when companies are at in the early stages of implementing sustainable strategies.

This can lead to some individuals being less engaged in delivering the strategy than others, and sustainability managers discuss the need to raise awareness, and to influence and persuade colleagues in the NPD team to take part in briefings and training related to sustainability: 'you can try and coax them, and bring them on the journey, with a bit more effort'.

Several of the interviewees discussed the importance of having 'champions' within the business, individuals who are personally interested in sustainability and take on the mantle of pushing the strategy forward for their area in a pro-active, rather than reactive way. Some IDEAL brands are looking at formalising this by creating sustainability committees or introducing ambassador schemes where representatives with an interest in sustainability from each business function can meet to discuss and progress the agenda. Developing a sustainability culture was seen as important in order to embed it within the business, with the potential of moving away from it being an external function and towards integration into all job roles. Such a culture has the potential of attracting employees who share the same interests and values as the brand.

Designers are more likely to be engaged in sustainable design where there is a company mandate and commitment to sustainability. Engagement is also likely to be found in smaller companies where the brand ethos and identity has sustainability embedded in design concepts. It was clear that design leaders need to be knowledgeable and well informed in order to champion and build a business case for design's potential contribution to sustainability. It may also be necessary to overcome assumptions within other areas of the business that sustainability is not directly relevant to the design role. A strategic approach to developing sustainability projects could be more holistic in nature and focus not only on

materials and technical processes, but on brand ethos, creative approaches and user perspectives. Design teams should be resourced appropriately to build the necessary skills and knowledge required, and a proactive approach to training and developing appropriate design tools should be taken.

A team-based approach was an important organizational finding from the research. The IDEAL category saw designers operating alongside others to implement the strategy. Company C has a team working on the development of sustainable fabrics alongside designers, who are 'seen as part of the design team'. Another team-based approach saw the whole NPD team (including the designer) being responsible for achieving the sustainable fibre targets for the product area and that the team had a degree of autonomy in how this was achieved. In the EARLY ADAPT category, designers are informed about sustainable strategies and targets, and directed towards the appropriate materials and suppliers for their product area. This primarily applies to core volume lines where fibres such as BCI cotton are widely used. In the LATE ADAPT category, the sustainable sourcing manager for department store G stated that establishing their sustainable fibre strategy had been straightforward and has involved engaging mainly the support of technologists and buyers in working towards sustainable goals. Designers were not engaged because they were not a priority in this process.

The role of the designer was more visible at tactical and operational levels to implement durability and longevity strategies. For some IDEAL and ADOPT brands, durability is associated with brand identity and informs the approach to design. The collections are less trend driven and more influenced by an internal design ethos and design 'handwriting'. These fashion brands are positioned at the mid to upper levels of market and

are aimed at a target customer who is assumed to have a more considered approach to dressing: 'when we start designing the line it's not just materials that get repeated; shapes get repeated, certain styles are considered part of a system of dressing'. The designer is central in developing this concept in which all aesthetic components of the product must be approached with a view to longevity. Brand C discussed the importance of the longevity of colour and fit; for example, core colours need to be reasonably consistent from season to season to allow customers to mix and match styles. They also reported fitting the new season styles alongside the previous season's garments to ensure consistency of the design identity and allowing flexibility in dressing. Company B also used this approach, suggesting that their brand ethos is 'based on timelessness, longevity and durability, the idea of considered design.' They are now making a stronger link between the brand ethos and physical performance by investigating ways to measure and, if necessary, improve the longevity of the product. For example, by upgrading the quality of their cotton to reduce pilling in knitted fabrics, and investigating long protocol testing regimes to evaluate the products' potential lifetime. A technical approach to durability was also used by larger brands A and D in certain product ranges, but not as well integrated into the creative design concept. One sustainability manager regularly carried out internal training workshops on design for durability based on technical approaches, and reported high attendance and engagement from design teams, although durability is not currently promoted as a sustainability strategy.

With recycling, the designers are less evident again. There were some exceptions: for one Adopter, brand J the designer is fully responsible for the design concept and the sourcing of recycled materials. Brand C had a well-developed sustainability strategy and designers and NPD teams are more involved in its initiatives. However, other companies engaged with recycling appear to have involved designers in a fairly limited way. This appears to be due to

the challenge of designing recyclable garments as consumers have certain expectations of fit and aesthetic properties associated with products, especially when there is a high emotional connection to the brand. Some products, for example those that contain Lycra blended with other fibres to improve comfort and fit were simply difficult to recycle, and would require further research into consumer acceptability.

There may be opportunities for designers to be more involved in recycling themed projects and collections if they are able to contribute creative ideas and their knowledge of the target customer to the concept. The success of brand A's limited edition recycled collection demonstrated that branding and marketing sustainable ranges in the right way can better engage both customers and internal staff. More specifically, brand D's design for disassembly project was based on a technical process that was driven by sustainability and production teams. Its main limiting factor was the need to create a different system from the traditional retail business model; to work commercially, the garment needs to be collected, disassembled, re-furbished, re-assembled and then returned to the original customer, or sold to a new one. However, the primary focus for all businesses is still on sustainable materials and manufacturing processes.

Operationally, designers and design departments tend to be advised of the materials and processes they should be using from designated suppliers. Their main focus is on core fabrics where volume lines can make a significant contribution to the achievement of targets. For the designer, it is generally a matter of assigning a nominated fabric for a new garment shape or silhouette. Developing sustainable products has added complexity to NPD processes and business structure, but the solutions to this are seen as being more in the domain of buyers and technologists. Designers are directed to use specific sustainable materials and processes, but do not tend to lead initiatives that contribute to the achievement of targets.

There is a perception of a lack of ability by designer to contribute either technically or commercially to those strategies that have commonly been identified as first priorities for all brands. However, the IDEAL brands that have more established sustainability practices are starting to look beyond these technical and sourcing strategies and considering other aspects of the product lifecycle where designers can potentially make more of a contribution. Design leaders may find that a more formalised and proactive approach to integrating sustainability through the appointment and training of ambassadors or champions will offer better opportunities to develop design-led solutions by allowing the discussion to take place on a wider platform.

Discussion

The themes generated from the research were initially analysed using Holland and Lam's '4 Ds of Design Management' framework (2014), that defines how best to use design to meet strategic goals. However, the level of business engagement with sustainability expanded the framework. Although there were similar approaches within IDEAL, EARLY ADAPT, LATE ADAPT and ADOPT categories, significant variations emerged particularly between large and small companies within the same category where the size and focus of the company influences the way business functions are positioned, structured and managed. The analysis identified two sustainable fashion design challenges and opportunities, the development of the 'circular' approach to fashion design, and second, the potential application of design management theory to enhance design's contribution to organizational sustainability objectives.

- **Design for textile to fibre recycling** (seen by all respondents as a priority for development)
- **Design for disassembly** (small projects)

- **Design for low impact materials and processes are the most prevalent approaches**

- **Design for efficient use of materials and resources**

Disposal

Materials

Fabric and Garment Production

Design Process

- **Design for durability** may have an impact if it reduces consumption

Use

Distribution and Retail

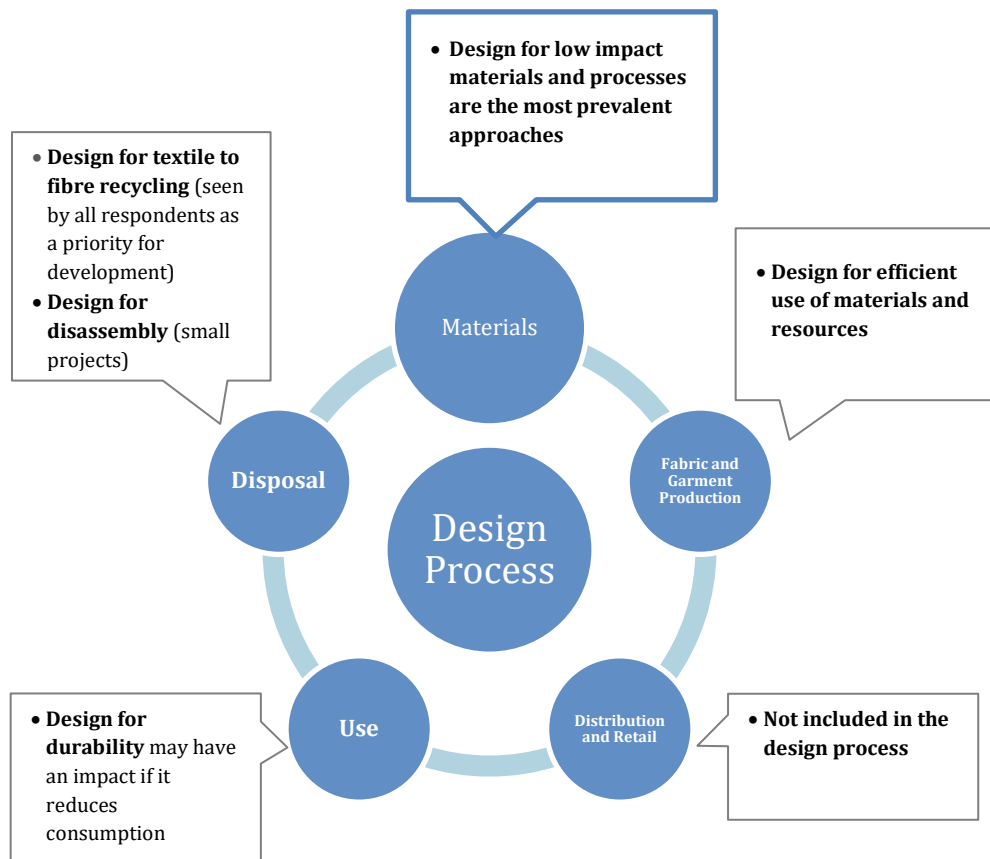- **Not included in the design process**

Figure 1 Fashion product lifecycle showing the main areas of focus from empirical research.

(Adapted from Gwilt 2014)

Current sustainability strategies are largely associated with the 'materials' and 'production' stages of the product lifecycle (see Figure 1). Providing sustainable products has focused on core volume lines where competitive advantage is generally achieved through price rather than through product differentiation. All the brands have sought to maintain garment prices and avoid passing on the increased cost of sustainable materials to the customer. In this sense, there is an element of brands wanting to maintain a 'business as usual' approach to sustainability

The research supports earlier findings about the complexity of the circular design model in the different disciplinary teams within the retailer and the supply chain working to

minimise the impacts of a wide range of textile processes which are interlinked. All of the IDEAL brands discussed their intention to move beyond fibres and technical processes towards more circular approaches to design, and outlined a range of challenges and opportunities associated with this. They provided the opportunity for brands to develop a competitive strategy based on product differentiation by engaging the consumer emotionally through the branding, identity and creative concept behind sustainable products. Approaches that aim to slow down consumption and therefore reduce waste, such as design for durability were proposed as a potential solution by many of the interviewees for achieving a more sustainable fashion industry.

Smaller, more upmarket brands such as B and C in the IDEAL category are better placed to employ a durability strategy as it relates to their brand identity and concepts of considered design and consumption. With this positioning, the use of better quality materials and manufacturing methods to achieve durable products can command higher retail prices accepted by their customers. Design leaders have an opportunity to be involved, champion and extend the designer's influence over the strategy as it requires creative skills and empathic customer knowledge. Larger, more mainstream brands have also engaged with durability, but this is from a technical performance perspective rather than linked to a creative concept. For these businesses designers' knowledge of the product and market contributes to thinking about how durability might lend itself to alternative business models such as leasing and renting.

Design for recycling, disassembly and zero waste pattern cutting have also been investigated by some of the IDEAL brands but they have not achieved any success at scale as of yet. Although these approaches work from a technical point of view, they have certain

practical and aesthetic limitations. The importance of marketing these collections in the right way was emphasised strongly, in order to engage both the consumer and the internal NPD teams.

The research demonstrated that designers and design teams are less directly involved in sustainability than other members of the NPD team, and rarely lead sustainable initiatives. The strategic focus on sourcing sustainable materials, and on maintaining retail prices has resulted in businesses prioritising investment in skills and knowledge to support impact mapping, supply chain engagement, and the training of buyers to manage the commercial implications. The operational design role in many businesses is narrow in focus and mainly concerned with researching fashion trends to interpret into design sketches and specifications with aesthetics being the main driver. Fibres and materials for nominated sustainable products are directed by sourcing teams, and fashion products are difficult to address anyway due to shorter lead times.

There appears to be a skills and knowledge gap that has developed over the last decade since sustainability has become a key business objective. Interviewees suggested that designers need better technical knowledge of fibres and textiles, and an understanding of the supply chain and sustainable design approaches in order to be able to make a better contribution to developing solutions. The findings indicate that design leaders and managers have not prioritised sustainability for design teams and are now only just starting to investigate their potential contribution. This may account for the limited response from designers and design leaders invited to participate in the research. Design teams and designers could be more effectively engaged if they are well-informed, have the necessary skills and knowledge, are able to evaluate sustainable materials, can utilise suitable tools to support

them in making design decisions and are able to apply creative thinking and user perspectives to products and marketing concepts.

It is proposed that the Design Atlas framework developed by the Design Council (UK) (Hands 2011) can be used to identify, plan and develop strategies to enhance design's contribution to the established and emerging sustainability approaches identified by the interviewees. The themes have been suggested primarily by respondents representing the IDEAL brands, and allow businesses to adapt their approach in relation to their size, structure, market level, customer focus and product offer. The audit tool is structured around a range of 'design strategy domains' that design leaders and managers can consider: planning, processes, resources, people and culture (see Table 3). The planning section relates to the strategic business level and emphasises the importance of the design function being represented in sustainable strategy setting. Processes are concerned with developing sustainable design competencies within the team, along with encouraging the use of creative thinking and consumer knowledge to provide sustainable design solutions that increase value through product differentiation. It also prioritises the development and adaptation of appropriate sustainable design tools that are user friendly and effective.

The 'resources' section is concerned with the allocation and management of budgets, and emphasises the need to prioritise time and finances to training, while maximising cost neutral opportunities to develop the design team. The 'people' section proposes that designers should have a range of skills that act as a foundation for sustainable design, and includes a basic knowledge of textile fibres and processes, and an understanding of how supply chains work. In addition, a pro-active approach to cross-functional and multi-disciplinary working is advised to broaden the scope of the design role and to allow designers to learn and share

Design Strategy Domain	Issues for Assessment	Design Management Strategies to increase the Contribution of Design to Sustainable Goals (based on research findings)
Planning	Awareness of purpose/value of sustainability strategy and plan. Integration of design function into business strategy.	Ensure full understanding of business sustainability strategy and plan. Aim for design to be represented in strategy setting at the highest level possible. Ensure that the design strategy is aligned with business sustainability strategy. Engage with collaborative platforms, conferences and management training to identify opportunities for integrating design teams into sustainability strategies.
Processes	Awareness and understanding of potential sustainable design approaches. Understanding of how design can contribute to these processes. Qualities of the tools and methodologies for sustainable design.	Train designers in a wider range of sustainable design approaches than materials and processes. Utilise internal and external training resources (e.g. WRAP and SAC workshops, closed loop design principles, Cradle to Cradle) to raise awareness in design teams. Utilise designers' knowledge of the customer and market to generate new thinking and sustainable solutions that offer competitive advantage through product and / or brand differentiation (e.g. considered / durable design, sustainable collections marketed to appeal to customer values and identity). Develop and adapt appropriate design tools to assist designers in sustainable approaches that are relevant to the brand, market and product: e.g. a pro-forma of questions for suppliers, a sustainable design module based on the SAC or WRAP sustainable design tool.
Resources	Awareness of purpose / value of budgetary allocation and control. Allocation of adequate budgets to sustainable design.	Develop a business case for allocating budget to training and upskilling the design team in sustainable design approaches. Prioritise time and budget for training and development of design staff. Maximise cost neutral opportunities to engage in knowledge sharing and training through participation in funded government projects, collaborative industry platforms and academic projects.
People	Skills for effective design activity. Development of cross - functional and multi-disciplinary working.	Recruit / train designers in basic textile knowledge of fibres, sustainable alternatives, sustainable processing and chemicals used in manufacturing in relation to their job role and product focus. Encourage a pro-active approach for designers in proposing ideas and solutions for sustainably designed products within the NPD team and with suppliers. Identify and appoint sustainability champions who can raise awareness within the design team and across the wider NPD team.
Culture	Support of senior management for sustainable design. Attitudes to design throughout the organisation.	Communicate and demonstrate the design team's contribution to, and achievements in, sustainability within the organisation. Demonstrate the wider potential application of design skills in sustainability in order to avoid stereotypical perceptions.

Table 3 Design Atlas Framework: Design Management Strategies to increase the Contribution of Design to Sustainable Goals (Claxton 2016)

knowledge effectively. The 'culture' section is about raising the profile of design within the organisation by demonstrating the contribution it can make to sustainability, in order to maximise opportunities for design teams and to reduce stereotypical perceptions.

Conclusion

The research has shown that a significant majority of fashion brands prioritise sustainability strategies largely associated with the 'materials' and 'production' stages of the circular design approach. Strategy setting is influenced by sustainable development principles interpreted through government legislation and policy initiatives such as SCAP, and supported by large scale industry wide sustainable sourcing platforms such as BCI cotton. There is evidence that emerging sustainable approaches that address other aspects of the lifecycle are now being explored; these include design for durability or longevity, recycling, zero-waste approaches and disassembly. However, large scale implementation has not been achieved due to technical and / or commercial barriers, and it is difficult to influence and measure impacts relating to consumer use and disposal stages.

Key themes that emerged included the relative involvement in sustainability of the different members of the NPD team and practical considerations of different sustainability approaches proposed by academic literature. Fibres and materials are the key strategic areas, the NPD process is multi-disciplinary, and the sustainability aspects are led by technologists, buyers and sustainability specialists. Although researchers have for some years been advocating a range of sustainable design strategies, it is only recently that fashion brands have started to explore more circular approaches outside those related to materials and processes. Therefore, aside from those brands with a high engagement in sustainability, it became apparent that designers are involved in a marginal way. Although seven of the interviewees

were involved in the design function, a wider range of first-hand opinions and perceptions of the designer's role in relation to sustainability would have enhanced the validity of the findings.

Progress in sustainability is largely measured in relation to targets on sustainable materials and processes which are informed by industry wide initiatives such as SCAP. It emerged that there is some inconsistency in how improvement actions are reported across the industry, which can lead to scepticism both inside and outside the organisation. In this respect, the research highlights the importance of businesses' approaches to reporting improvement actions on the organisation's culture and reputation.

The research generated data relating to the development of design management in the organization by identifying the complexity in NPD processes, awareness raising across the business, engaging designers and building skills and knowledge within design and NPD teams. Although a limited number of designers participated in the research, a picture emerged of sustainability being perceived as being too technical, or not relevant to their role. However, higher designer engagement was reported where sustainable strategies such as design for durability were informed by creative approaches to achieve product differentiation, and where training had been undertaken to support design decisions. A more informed approach to sustainability by design leaders will enhance design's potential influence and contribution to the future of the fashion industry.

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